UNIVERSITY OF FRIBOURG

Building an Intranational Regional Competitiveness Index

An Application to the Case of the Swiss Cantons

DOCTORAL THESIS

Presented to the Faculty of Management, Economics and Social Sciences at the University of Fribourg (Switzerland), in fulfilment of the requirements for the degree of Doctor of Economics and Social Sciences (Dr.rer.pol.)

by

Damiano Lepori

from Origlio TI

Accepted by the Faculty of Management, Economics and Social Sciences on December 14th, 2020, at the proposal of

Prof. Dr. Philippe Gugler (First Advisor) and of

Prof. Dr. Sergio Rossi (Second Advisor)

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The Faculty of Management, Economics and Social Sciences at the University of Fribourg (Switzerland) does not intend either to approve or disapprove of the opinions expressed in a thesis: they must be considered as the author's own (decision of the Faculty Council of January 23, 1990).

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List of abbreviations

4IR	Fourth Industrial Revolution
ACI	Asia Competitiveness Institute
AHP	Analytic Hierarchy Processes
BAP	Budget Allocation Processes
CA	Conjoint Analysis
CCI	Cantonal Competitiveness Index
COPRAS	Complex Proportional Assessment Method
CSA	Country Specific Advantage
EPO	European Patent Office
FCA	Federal Customs Administration (Switzerland)
FDF	Federal Department of Finance (Switzerland)
FDFA	Federal Department of Foreign Affairs (Switzerland)
FDI	Foreign Direct Investment
FOEN	Federal Office of the Environment (Switzerland)
FSA	Firm Specific Advantage
FSO	Federal Statistical Office (Switzerland)
FTA	Federal Tax Administration (Switzerland)
FTE	Full-Time Equivalent
GCR	Global Competitiveness Report
GDP	Gross Domestic Product
GITR	Global Information Technology Report
GRP	Gross Regional Product
IDHEAP	Institut de hautes études en administration publique
IMD	International Institute for Management Development
INSEAD	Institut Européen d'Administration des Affaires
ISC	Institute for Strategy and Competitiveness
LQ	Location Quotient
MCA	Multi-Criteria Approach
MNE	Multinational Enterprise

OLI	Ownership-specific, Location-specific and Internalization-specific advantages
p.	page
pp.	pages
PCA	Principal Component Analysis
PISA	Programme for International Student Assessment
PPP	Purchasing Power Parity
R&D	Research & Development
RCI	European Regional Competitiveness Index
RSA	Region Specific Advantage
SAW	Simple Additive Weighting
SBB	Swiss Federal Railways
SDm	Standard Deviation method
SECO	State Secretariat for Economic Affairs (Switzerland)
SERI	State Secretariat for Education, Research and Innovation (Switzerland)
SIF	State Secretariat for International Finance (Switzerland)
SIR	Scimago Institutions Rankings
TOPSIS	Technique for Order Preference by Similarity to an Ideal Solution
UCM	Unobserved Components Model
UKCI	United Kingdom Competitiveness Index
WCY	IMD World Competitiveness Yearbook
WEF	World Economic Forum
y.o.	years old

Swiss cantons

AG	Aargau
AR	Appenzell Ausserrhoden
AI	Appenzell Innerrhoden
BE	Bern
BL	Basel-Land
BS	Basel-Stadt
FR	Fribourg
GE	Geneva
GL	Glarus
GR	Graubünden
JU	Jura
LU	Luzern
NE	Neuchâtel
NW	Nidwalden
OW	Obwalden
SG	St. Gallen
SH	Schaffhausen
SO	Solothurn
SZ	Schwyz
TG	Thurgau
TI	Ticino
UR	Uri
VD	Vaud
VS	Valais
ZG	Zug
ZH	Zurich

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General introductory remarks

Regional competitiveness consists of the ability of a region to build its competitive advantages on the basis of its endowments, its political institutions and subsequent policies, its fiscal policies, its capital resources, and its human capital and to constitute a set of determinants that enhances the creation of new firms and the attraction of firms located elsewhere, or part of their activities, and that allows the firms located in that territory to improve their productivity and, therefore, the average standard of living of society. *Ergo*, regional competitiveness is a multi-dimensional concept that must be measured accordingly. Indeed, whereas estimating the productivity of a territory is a relatively well-established process, capturing the correlated competitiveness determinants remains relatively challenging because of two major considerations. First, regional competitiveness is multi-dimensional, and measuring its level, in either relative or absolute terms, requires the analysis of a combination of competitive factors. Second, evaluating regional competitiveness entails considering dynamic sequences of economic development. Indeed, any territory experiences a sequence of competitiveness input factors that generate competitiveness outputs. Hence, causality chains specific to each territory relate to distinctive dynamic competitiveness factors organized in an idiosyncratic manner.

Determining the level of competitiveness of regions requires building an index of indicators that allows a ranking process and comparisons of relevant regions constituting a nation. To build consistent competitiveness indicators suitable for regional analysis and to organize these indicators in a systematic manner in order to structure an index necessitate 1) investigating the multi-dimensional concept of location competitiveness in the academic literature and retrieving the most pertinent features related to that subject and 2) subsequently using those features to develop and build a generic index structure enabling the measurement of intranational regional competitiveness. The logical sequence is therefore to implement and test this generic structure to assess the extent of its conceptual and methodological validity. Consequently, this study is divided into 3 major chapters.

First, chapter 1 aims to scrutinize the multi-dimensional concept of location competitiveness in the academic literature. Location competitiveness and the determination of the stylized factors most likely to generate a positive dynamic sequence leading to an improvement in the overall competitiveness level of a location have captured the attention of numerous prominent scholars over the years. To investigate this subject in a relevant manner, chapter 1 focuses primarily on pioneering theories of location competitiveness. Indeed, seminal authors such as Adam Smith (1776), David Ricardo (1971) and John Maynard Keynes (2007) all consider economic prosperity from distinctive perspectives and, to various degrees, the correlated role of public authorities. As such, they lay the foundations for a deeper understanding of territories' ability to prosper in terms of wealth creation and competitive advantages. However, whereas the aforementioned seminal authors predominantly build their theories at the national level and/or from a macroeconomic perspective, they do not comprehensively investigate dynamic sequences of innovation and of specialization leading to agglomeration patterns and, *in fine*, to productivity and prosperity improvements from a regional perspective. For that matter, endogenous growth theorists such as Arrow (1962), Lucas (1988), Romer (1986, 1990, 2000), Sidrauski (1967) and Uzawa (1965) include technological progress and human capital in their models, thus indirectly exploring the factors of uneven distribution of relatively productive economic activities with the correlated effects on agglomeration forces and on location competitiveness.

In fine, agglomeration forces of economic activities imply that intranational territories constituting a single nation might differ in terms of productivity and competitive advantages. Consequently, chapter 1 focuses at a deeper level on location competitiveness *per se*. For that matter, two major schools of theories provide us with relevant tools to investigate location competitiveness: 1) economic geography and 2) international business. Economic geography focuses *inter alia* on agglomeration patterns and localization processes. It investigates the manner in which competitive factors influence the expansion of economic activities, the ability of firms to improve their productivity and, *in fine*, the ramifications of productivity and the competitiveness levels experienced by the territories in which those firms operate. Regarding those issues, with their theories, Krugman (1991), Krugman and Venables (1995), Marshall (1920), and most importantly Porter (1980, 1990a, 2000a, 2000b, 2003, 2008), and Porter *et al.* (2008) contribute to the extensive understanding of agglomeration patterns and their correlated effects on location competitiveness. International business theses, and for that matter theses from theorists such as Dunning (1988a, 1998, 2000a, 2000b, 2001), Dunning and Gugler (2008), Dunning and Lundan (2008), Rugman (1981, 1985, 2005a, 2005b, 2009, 2010), Rugman and D'Cruz (1993), Rugman and Fina (1996), Rugman and Girod (2003), and Rugman and Verbeke (2001a, 2001b, 2002, 2003, 2004, 2008a, 2008b, 2009), concentrate on internalization processes and on the subsequent localization choices of multinational enterprises (MNEs). The international business perspective allows us to refine the criteria most likely to improve locations' attractiveness and to improve the competitive advantages of firms already located in a specific territory, especially those that have internationalized or intend to do so. Ultimately, chapter 1 aims to relate economic geography theories and international business theories, as they both investigate location competitiveness in a relatively systemic manner.

Second, on the basis of the theoretical framework presented in chapter 1, the purpose of chapter 2 is to develop a broad methodology to design and build a generic structure allowing the measurement of intranational regional competitiveness. It is generic because it is designed to be implementable for all relevant cases. To do so, chapter 2 not only systematically examines the major existing competitiveness indexes at all levels of analysis but also, and most importantly, elaborates on the mandatory methodological and quantitative steps. The framework built in chapter 2 relates not only to regular yet meaningful statistical and econometric tests but also to fundamental methodological issues. Indeed, it notably elaborates on the process, relating it to the major theoretical insights of chapter 1 so that multi-dimensionality in the case of a concept such as competitiveness is consistently approached and a relevant definition of a statistically significant region is acknowledged. Furthermore, chapter 2 extensively addresses the major methodological steps to build the generic structure. Those steps include, *inter alia*, 1) the broad definition of the major determinants of intranational regional competitiveness; 2) the actual building of the corresponding pillars, sub-pillars and indicators; 3) the conceivable methodological limitations of this process; and, most importantly, 4) the unveiling of the generic structure in its full version suitable for a relatively decentralized nation. With regard to the first aforementioned step, regional competitiveness is considered to be a multi-dimensional and systemic concept that is determined at three levels categorized on the basis of their corresponding outcomes in relation to that concept: 1.1) endowments, 1.2) macroeconomic competitiveness and 1.3) microeconomic competitiveness (Porter *et al*., 2008, p. 45). With regard to the second aforementioned step, the actual building of the corresponding pillars, sub-pillars and indicators is based on the theoretical insights of chapter 1 and on the studies of Porter *et al*. (2008) and Delgado *et al*. (2012) and systematically adapted to the purpose of an intranational regional competitiveness index. With regard to the third aforementioned step, the conceivable limitations of implementing methodological adaptations have been analysed to build a systemic framework that incorporates *inter alia* 3.1) the influences of dynamic sequences on the inter-related factors and indicators, 3.2) a certain degree of political autonomy of the regions constituting a nation, and 3.3) a certain degree of homogeneity in terms of the average economic development of the regions constituting the considered nation. With regard to the fourth aforementioned step, the generic structure in its full version is exhibited, considering that specific measures for each sub-pillar or indicator are not disclosed, as they can only build on the available data. Furthermore, the unabridged version of the structure obviously necessitates case-specific conceptual adjustments, notably resulting from distinctive distributions of political capabilities, which might differ from one nation to another. Chapter 2 therefore tackles the conceptual adaptations to be considered in the cases of relatively centralized and highly centralized nations, as those specificities also influence the integrity of the structure. Finally, chapter 2 ends with a synthesis to highlight the main findings related to the conceptualization and construction of the intranational regional competitiveness index and the corresponding generic structure.

Third, chapter 3 materializes the contents of chapter 1 and chapter 2 in considering the case of the Swiss cantons. By way of explanation, the aforementioned generic structure is implemented to build a regional competitiveness index, which allows the assessment of the Swiss cantons' competitiveness levels and the subsequent comparisons. To do so, chapter 3 concentrates primarily on the adjustments to be executed to safeguard the relevance of the structure while it is used for this specific case. Switzerland is considered a relatively decentralized nation. Therefore, the unabridged version of the structure must be used. Moreover, the adjustments to be executed necessitate a pillar-to-pillar analysis. Following these conceptual case-specific modifications, chapter 3 elaborates on 2 major steps: 1) data selection, construction, configuration, and adjustments of the measure(s) constituting each indicator and 2) the implementation of the methodological and quantitative sub-steps presented in chapter 2. With regard to the first step, the structure specific to the Swiss case is exhibited, and all implementable indicators are constructed, configured, adjusted, and disclosed along with the associated models and pertinent equations. With regard to the second step, the methodological and quantitative sub-steps presented in chapter 2 are reviewed, and the most significant sub-steps are examined at a deeper level: 2.1) the normalization process, 2.2) the weighting and aggregation strategy, and 2.3) the correlation analysis between the multi-dimensional concept captured in the index, in this case the competitiveness levels of the cantons, and the associated measure, in this case productivity. Subsequently, the results of the intranational regional competitiveness index applied to the Swiss cantons are extensively published. To do so, as a first step, general index rankings are exhibited to allow relative analyses. As a second step, charts of the results for all Swiss cantons are displayed to provide the means for detailed case-specific investigations. Finally, conclusive remarks highlight the major methodological and quantitative findings related to the results and, in a more general manner, to chapter 3.

Chapter 1 – Location competitiveness: a literature review and discussion

1 Location competitiveness in the pioneering theories: introductory remarks

Firms' prosperity, from their creation to their potential expansion, results *inter alia* from localization and specialization processes. For that matter, location plays a crucial role in firms' strategies, performances and ability to build and sustain competitive advantages. Firms' performances *per se* have an impact on value creation at the location where they operate. *In fine*, firms' capabilities in terms of productivity generate positive externalities for the locations where they operate, as wealth actually results from firms' activities (Porter, 2008).

Therefore, measuring the competitiveness of a location implies understanding what constitutes this multi-dimensional concept. In other words, it is mandatory to investigate location competitiveness *per se* and *ergo* to determine the stylized factors most likely to generate a positive dynamic sequence leading to an improvement in the overall competitiveness level of that location.

In some measures, pioneering theories consider localization and specialization processes and the advantages of specific locations relative to others. Consequently, this inaugural section investigates in a relatively broad manner how classical and neo-classical schools of thought address the competitiveness of location either directly or in a more circumlocutory manner. First, it reviews Smith (1776) and Ricardo (1971). Then, it scrutinizes how more recent theories of endogenous growth include human capital, innovation, and knowledge as decisive factors leading to economic growth (Lucas, 1988; Romer, 1986, 1990, 2000). As those factors are intrinsically related to localization and specialization processes, it is necessary to investigate how they influence growth in their respective models. Last, a discussion highlights the main teachings of those pioneering theories in relation to location competitiveness and why it is pertinent to further scrutinize it.

1.1 The absolute advantages

Considering that a location is constituted from certain advantages and will improve its competitiveness level through gains in average productivity through acts of specialization, it is cogent to refer to "An Inquiry into the Nature and Causes of the Wealth of Nations" (1776) by Adam Smith, particularly to Book IV. Indeed, Smith acknowledges that any territory is constituted from natural and/or acquired advantages (Smith, 1776, pp. 458-459). According to Smith, "whether the advantages which one country has over another be natural or acquired is (…) of no consequence. As long as the one country has those advantages, and the other wants them, it will always be more advantageous for the latter rather to buy of the former than to make" (Smith, 1776, pp. 458-459). From that perspective, we understand the assumption that a location's ability to form a unique set of advantages will most likely lead to higher trade capabilities of specific industries located in that territory.

Adam Smith's contribution to the understanding of specialization forces is rooted in the fundamental theory of absolute advantages (Smith, 1776). Indeed, the "division of labor" leads to "the greatest improvement in the productive powers of labor" (Smith, 1776, p. 14), notably because it leads to greater innovation (Smith, 1776, p. 17) and to the improvement of the productivity of the corresponding workforce (Smith, 1776, p. 17). This specialization process leads to the production of a greater output, which is intimately correlated with the "extent of the market" (Smith, 1776, p. 31). Indeed, "the power of exchanging" (Smith, 1776, p. 31) implies that access to other markets and/or the expansion of a market will allow greater specialization and, as a result, improved output and ultimately greater wealth creation. Therefore, international trade is in the interest of nations because the limitations related to the size of the domestic market are mechanically surpassed by the potential absorption capabilities of other nations. Moreover, trade improves competition and reduces the probability of the formation of monopolies, as they "can never be universally established but in consequence of that free and universal competition" (Smith, 1776, p. 164).

As for absolute advantages *per se*, they rely on the hypothesis that "if a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry employed in a way in which we have some advantage" (Smith, 1776, p. 457). Consequently, each country should specialize in the production of the goods for which it possesses an absolute advantage, that is, the capability to produce them for a lower price than others (Smith, 1776, p. 457). From that hypothesis arises two decisive consequences in terms of 1) localization processes and 2) international trade.

First, an industry located in territory *a* possessing an absolute advantage in the production of good *x*, goods *y+z*, or even goods *y+z+n* is left with no option but to produce the good or series of goods, as they cannot be bought more cheaply elsewhere. For that matter, it is decisive to understand that this advantage is bonded to the relative prices of the corresponding goods, meaning that they include the costs of transportation, of which the amplitude may vary substantially due to the nature of the goods. That conclusion remains partly true today, especially between *traded* and *non-traded* sectors (Porter, 1990a, 2008). Moreover, this advantage also depends on a territory's "soil, climate, and situation" (Smith, 1776, p. 17) and "laws and institutions" (Smith, 1776, p. 112). Hence, Adam Smith recognizes the decisive role played by the endowments in allowing not only for the creation but also for the development of firms and their ability to trade within a territory and elsewhere. Most importantly, he also acknowledges the influence of location advantages. Consequently, firms' specialization capabilities occur not only because of acts of labour division but also on the basis of other endowments and factors. Smith indirectly observes localization processes *per se*, as he identifies the concentration of certain industries in certain territories. However, Smith's dynamic sequence begins with firms' ability to trade. Only then might specialization processes and, mechanically, localization processes occur, as we would observe in advanced economies. For that matter, the complexification of buyers' needs, among other factors, obviously somehow reshapes Smith's analyses.

Regarding international trade *per se*, Smith's seminal contribution still influences "modern" economists. As indicated above, international trade free of most governmental restrictions is imperative for specialization processes to occur, as home market imperfections and limitations are supposed to be overtaken by the advantages induced by that international trade. However, the opportunity to trade is profoundly related to the nature of the corresponding products and the related transportation costs (Smith, 1776, pp. 458-464). International trade leads to specialization processes and thus to increasing profitability. Moreover, specialization is also correlated with localization processes, as "the industry which is carried on in towns is, everywhere in Europe, more advantageous than that which is carried on in the country" (Smith, 1776, p. 103). Even if the concept of town is not fully comparable with Marshall's later-developed industrial districts, Adam Smith still considers that "local advantage, it is evident, cannot be communicated to the lands at a distance" (Smith, 1776, p. 166). Mechanistically, the concentration of manufacturing activities leads to higher productivity through acts of specialization. *In fine*, improvements in productivity lead to higher competitiveness levels of the locations of these activities.

Nonetheless, in light of later economic developments, Smith's approach can be put into perspective first because it overestimates the relative weight of natural advantages, as he considers that "natural advantages which one country has over another in producing particular commodities are sometimes so great that it is acknowledged by all the world to be in vain to struggle with them" (Smith, 1776, p. 458). Moreover, it is commonly acknowledged that the theoretical framework of absolute advantages does not provide enough reasoning on specialization, as one nation might still have an interest in producing certain goods even though it does not benefit from absolute advantages in producing those goods relative to another nation in *t0*. For that matter, Ricardo's theoretical framework on comparative advantages is often regarded as a fundamental improvement on Smith's seminal works, as we shall see.

1.2 The comparative advantages

Economists are often taught that the major contribution of Smith is the theory on absolute advantages and that of Ricardo is the theory on comparative advantages as an indirect argument against the former. According to Ricardo, his divergence from Smith lies in the idea that "the equality of profits will be brought about by the general rise of profits; (…) that the profits of the favored trade will speedily subside to the general level" (Ricardo, 1971, p. 149). That assertion is later translated into the author's developments on comparative advantages, as we shall see below.

However, it is relevant first to concentrate on the fact that Ricardo adheres *inter alia* to Smith's productivity theory. Indeed, the motives and benefits of free trade rely on the concept that "under a system of perfectly free commerce, each country naturally devotes its capital and labor to these employments as they are most beneficial to one another. This pursuit of individual advantage is admirably connected with the universal good of the whole. By stimulating industry, by rewarding ingenuity, and by using most efficaciously the peculiar powers bestowed by nature, it distributes labor most effectively and most economically: while, by increasing the general mass of productions, it diffuses general benefit, and binds together by one common tie of interest and intercourse, the universal society of nations throughout the civilized world" (Ricardo, 1971, p. 152). From that conception arise numerous decisive direct and indirect consequences in explaining territorial specialization and therefore location competitiveness. First, it confirms Smith's emphasis on specialization forces, as it is in the interest of firms to use the production factors of a location in the most beneficial manner. Second, it identifies the crucial role of innovation in building an individual advantage, which will ultimately benefit the general welfare and improve location competitiveness. This advantage is inextricably related to the role of innovation as a productivity enhancer. Indeed, Ricardo indicates that "the labor of a million men in manufactures, will always produce the same value, but will not always produce the same riches. By the invention of machinery, by improvements in skill, by a better division of labor, or by the discovery of new markets where more advantageous exchanges may be made, a million of men may produce double, or treble the amount of riches" (Ricardo, 1971, p. 278). Hence, Ricardo acknowledges the positive impact of labour specialization as a productivity enhancer as well as the crucial role of technology. Access to new markets could be understood as an interpretation of Smith's extension of the market.

Regarding when foreign trade might occur, Ricardo's theory still relies on classic factors of production and on the belief that in *t0,* a tradable good *a* produced in nation *a* is of a relatively substitutable nature with that good *a* produced in nation *b*. The advantage therefore relies in *t0* on the ability to improve every step of the value chain of that good, notably in terms of skills or other manufacturing processes. Ricardo's development of Smith's theory regarding foreign trade crucially demonstrates that location *a*, with relatively lower productivity advantages in the production of good *a* and good *b*, still benefits from free trade by specializing in the production of one of the goods for which it has the lesser comparative disadvantage *vis-à-vis* location *b* (Ricardo, 1971, pp. 152-159). Through acts of specialization in classical terms, *inter alia*, free trade always benefits either location *a* or location *b*. Consequently, and as suggested by Smith, acts of specialization and the implicit agglomeration forces that concomitantly occur result predominantly from the extension of markets.

Furthermore, it is compelling that Ricardo already recognizes that increases in wages, if they are the results of improvements in productivity, are beneficial to producers or the manufacturers (Ricardo, 1971, p. 164). That observation highlights later theoretical developments on the positive impact of specialization on wages and therefore on location competitiveness and the overall economic performance of the considered location, as high wages in highly specialized industries generate positive spillover effects on the average level of wages in that location. However, specialization in classical terms still relies predominantly on the assumption that division of labour and improvements in manufacturing processes lead to higher profits, whereas the role of highly skilled labour in improving productivity is not explicitly noticed. However, the later impacts of agglomeration forces and innovation processes are inextricably related to the labour factor. The Ricardian definition of innovation and the role of labour are obviously shaped by the stage of economic development observed at the time by the author.

Another frequently stressed limitation of Smith's and Ricardo's theoretical developments is that trade more often than not occurs between locations benefiting from comparable production factor endowments either in terms of either quantity and/or composition. Moreover, whereas Ricardo's approach allows the analysis of comparative advantages as they occur, it lacks a deeper understanding of the processes leading to their formation. Later, authors such as Heckscher and Ohlin developed a model that allows a deeper understanding of those formations. Indeed, production resources are unevenly distributed across territories (Leamer, 1995, p. 1). Therefore, trade in commodities at the international level allows the transfer of "otherwise immobile factors of production from locations where these factors are abundant to locations where they are scarce" (Leamer, 1995, p. 1). Consequently, "the option to sell factor services externally (through the exchange of commodities) transforms a local market for factor services into a global market. As a result, the derived demand for inputs becomes much more elastic, and also more similar across countries" (Leamer, 1995, p. 1). As the marginal productivity of capital potentially decreases, international trade allows "a shift in the product mix toward capital-intensive products" (Leamer, 1995, p. 2). Consequently, that potential contraction of the marginal productivity of capital is more than compensated for by that shift and openness to trade (Leamer, 1995, pp. 1-2). From that major model arise *inter alia* two major considerations: 1) efficiency is achieved through the strict limitation of state interventions (Leamer, 1995), and 2) combinations of factors of production may vary between countries due *inter alia* to differences in production methods (Cho and Moon, 2013, p. 11).

Those considerations engender further observations: 1) later prominent authors regard the state as a decisive actor not only in a regulatory way but also in the specialization process *per se*, and 2) the Heckscher and Ohlin model captures technology in terms of production methods, as they "indicate different combinations of capital and labor" (Cho and Moon, 2013, p. 11). Even though the Heckscher and Ohlin model was later expanded *inter alia* by Stolper-Samuelson, it still partially addresses innovation reflected by technology. Combinations of capital and labour are actually the results of innovation processes and not the converse. Consequently, it is decisive to address how innovation processes and international trade impact agglomeration forces and therefore a territory's ability to improve its competitiveness level, as is further developed in this chapter. At this point, however, we will first succinctly address how seminal economist John Maynard Keynes influenced later academics with his thoughts on the role of the state in industrial activities and intervention in international trade flows.

1.3 The role of government in location competitiveness

Whereas Smith and Ricardo, as classic economists, tend to consider the advantages of *laissez-faire* doctrines as more likely to be beneficial to the prosperity of a territory than interventionist policies, Keynes and his followers tend to see the state as a regulator acting "against the notion that the rate of interest and the volume of investment are self-adjusting at the optimum level" (Keynes, 2007, p. 339). The state has to ensure the appropriate propensity to consume and plays a decisive role *inter alia* by implementing policies, which "ought to be directed to increasing and supplementing the inducement to invest" (Keynes, 2007, p. 377). Keynes's approach therefore implies that whereas it is not in the interest of society that the state own "the instruments of production", it should be able "to determine the aggregate amount of resources devoted to augmenting the instruments and the basic rate of reward to those who own them" (Keynes, 2007, p. 378). From that consideration, we understand that the state has two major tasks: 1) to stimulate the propensity to consume *inter alia* by acting on taxes and 2) to stimulate the inducement to invest (Keynes, 2007, pp. 378-379). Whereas Keynes considers that public authorities have to work in partnership with "private initiative" (Keynes, 2007, p. 378), the role of government as an investment enhancer is not yet perceived as it would be today since the Keynesian approach is more a cyclical one according to which the state intervenes to ensure full employment by compensating for market fluctuations. For that matter, the Keynesian point of view focuses on the role of government acting at a later stage of the dynamic sequence leading to the economic prosperity of territories, as is developed *inter alia* by Porter (1980, 1990a, 1990b, 1998, 2000a, 2000b, 2002, 2003, 2008), as we shall see later in this chapter. Moreover, Keynes does not see international trade and the consequent specialization processes as necessarily beneficial to territories (Keynes, 2007, p. 382). Indeed, according to Keynes, technological improvements could potentially collude with labour instead of improving the productivity of that labour. Consequently, technology and innovation as drivers of the economic prosperity of a territory are not perceived as such by Keynes, who sees economic prosperity mostly from a macroeconomic point of view detached from the dynamic sequences of innovation and specialization leading to agglomeration patterns, thus generating productivity improvements and ultimately enhancing the prosperity of that territory. For that matter, endogenous growth theorists include technological progress and human capital in their models, as we shall observe henceforth.

1.4 Technical progress and human capital as factors in endogenous growth theory

Whereas exogenous growth theories are based on the fundamental assumption that companies succeed by building their advantages primarily on the basis of factors that are exogenous to those companies and/or to the territory in which they operate (Domar, 1946; Harrod, 1939), endogenous growth theories are built on the assumption that human capital, innovation, and knowledge are decisive factors leading to economic growth.

Models developed by Arrow (1962), Sidrauski (1967) and Uzawa (1965) lay the foundations of endogenous growth theories in which technological progress plays a decisive role in explaining a territory's ability to prosper. In fact, technological progress is a cause of economic growth but itself a result of improved productivity due to investment in human capital leading to spillover effects generating technological progress and ultimately the economic prosperity of territories. Therefore, later prominent authors (Lucas, 1988; Romer, 1986, 1990, 2000) develop growth models integrating the dynamic nature of spillover effects.

In one of his seminal contributions, Romer builds a model in which "a fully specified competitive equilibrium, per capita output can grow without bound, possibly at a rate that is monotonically increasing over time" (Romer, 1986, p. 1003). He views knowledge "as the basic form of capital" (Romer, 1986, p. 1003). This model is theoretically based on Adam Smith's specialization assumptions and on Marshallian internal and external economies (Romer, 1986, p. 1004). New knowledge will benefit not only the firm where it is produced but also other firms, at least partly (Romer, 1986, p. 1015). The growth rate of productivity is captured by gross domestic product per capita (Romer, 1986, p. 1008). Hence, Romer builds his growth model on three elements: "externalities, increasing returns in the production of output, and decreasing returns in the production of new knowledge", which "combine to produce a well-specified competitive equilibrium model of growth" (Romer, 1986, pp. 1003-1004). From those assumptions arise numerous features: 1) Romer's model recognizes the impact of Marshall's external economies, which provoke *inter alia* agglomeration processes of similar or related industries that will positively impact the productivity of the agglomerated firms; 2) it captures the benefits of specialization; 3) the production of output is not mechanically limited since the production of new knowledge "will grow without bound" (Romer, 1986, p. 1003); and 4) the equilibrium model is competitive, implying that it is not Pareto optimal, as assumed by Porter (1990a) in his later work. As a consequence, Romer's endogenous growth model enables the capture, either direct or indirect, of the processes allowing the virtuous circle of prosperity to operate, even if it still relates largely to the results of agglomeration effects on innovation and therefore to technological advancements and not to the causes or dynamic sequences allowing innovation.

Lucas (1988) also considers that productivity levels across territories vary as a result of disparities in knowledge levels (Lucas, 1988). Technology is "the one factor isolated by the neoclassical model that has the potential to account for wide differences in income levels and growth rates" (Lucas, 1988, p. 15). Nonetheless, Lucas scrutinizes knowledge as emanating mostly from the accumulation of human capital (Zamparelli, 2004, p. 45). Human capital is based on knowledge, which an individual accumulates, therefore impacting its relative productivity. Individuals might reach a certain level of productivity by acquiring knowledge early in their cursus. They might also improve their level of productivity by producing specific goods and/or services. These considerations imply that specialization of the workforce, for which the probability of agglomerating in specific territories is high, will positively affect the accumulation of human capital in those territories and ultimately the ability of the workforce to prosper.

Moreover, Lucas also introduces international trade in his work and finds that "production patterns are dictated by comparative advantages: each country produces goods for which its human capital endowment suits it" (Lucas, 1988, p. 33). Hence, a territory will capitalize on the production of goods and services on the basis of previous comparative advantages precisely because of the accumulation of human capital in the production of goods and services of the same, a similar or a related nature.

Most interestingly, Lucas also introduces the fact that taking the national economy as a unit of analysis is not necessarily appropriate (Lucas, 1988, p. 37). Indeed, external productivity can be localized (Lucas, 1988, p. 38). "Group interactions" are decisive in building individual productivity, and those interactions occur between people performing similar or related activities, thus generating "external human capital" (Lucas, 1988, p. 38). Consequently, human capital accumulation is also influenced by localization processes and does not usually evolve evenly across territories. Hence, we can consider the accumulation of human capital, either internal or external, to be highly inter-connected with agglomeration forces of economic activity, as cluster development relies *inter alia* on highly skilled labour forces, and this shared knowledge benefits companies located within a specific cluster, thus improving the average productivity of that labour force and, *in fine*, the competitiveness of the corresponding location.

In conclusion, endogenous growth theories are built on the assumption that human capital, innovation, and knowledge are decisive factors leading to economic growth. Hence, those theories acknowledge at the macrolevel numerous key figures leading to the understanding of the fact that the reasons why economic prosperity might occur are actually micro-based. Moreover, the theories allow a better understanding of the systemic functioning of economic prosperity, as they combine human capital accumulation, both internal and external, with correlated features such as international trade. However, whereas those theories are able to combine the analysis of the effects of multiple factors, they actually focus on those effects and do not provide a holistic approach leading to knowledge of how those effects are constituted or developed.

1.5 The pioneering theories of location competitiveness: concluding remarks

The pioneering theories on economic prosperity lay the foundations for a deeper understanding of territories' ability to prosper in terms of wealth creation and competitive advantages. Adam Smith is commonly considered one of the most prominent founding fathers of modern economics. The *classical school* has evolved and influenced economic policies to the present day. His emphasis on the effect of specialization on a territory's ability to build an absolute advantage in the production of specific goods, which will ultimately lead to the greater prosperity of that territory, also lays the foundation for later trade theories. Moreover, Smith indirectly acknowledges that agglomeration forces result from specialization, and even more so within a nation's territory. Ricardo's theory on comparative advantage allows a more sensible understanding of the fact that even a location with relatively lower absolute advantages always has an interest in trading. Moreover, he understands that higher wages are often beneficial to manufacturers as long as they result from the improved productivity levels of the corresponding labour forces. That conclusion is crucial with regard to later analysis of agglomeration forces of economic activities and their impact on average wages. Keynes's emphasis on states' ability to stimulate the inducement to invest constitutes a precursor to numerous modern investment policies.

However, discrepancies in territories' ability to distinguish themselves from other territories with which they compete arise from competitive advantages relying notably on decisive factors such as human capital, innovation, and knowledge. For that matter, endogenous growth theorists play a crucial role in relatively indirectly addressing the reasons for the uneven distribution of relatively productive economic activities and their subsequent effects on location competitiveness. Indeed, technology, which intrinsically influences economic growth, accumulates asymmetrically across territories, thus implying that industries' specialization processes generate agglomeration forces. *In fine*, agglomeration forces of economic activities signify that sub-national territories constituting a single nation might differ in terms of productivity and ultimately in terms of competitive advantages.

In conclusion, the pioneering theories briefly scrutinized above indirectly or relatively directly reflect the influences of their times in addressing the issues of territorial competitive advantages. However, unevenly distributed competitiveness levels across territories respond to agglomeration processes and to location advantages, necessitating further investigation. It is only by understanding the systemic functioning of these location advantages that is presumably feasible to determine 1) the stylized factors most likely to generate a positive dynamic sequence leading to an improvement in the overall competitive environment of a location and subsequently 2) the manner in which it is relevant to measure that level. Ultimately, measuring this level in absolute terms allows a relative assessment of territories constituting a single nation. Hence, it is fundamental to investigate as comprehensively as possible the major theoretical contributions that explicitly and systematically address locations' ability to offer the most appropriate set of stylized factors most likely to generate a positive dynamic sequence leading to an improvement of firms' productivity capabilities and, *in fine*, of the corresponding locations' levels of competitiveness.

Economic geography contributes to a large extent to the determination of those stylized factors, as it concentrates on localization processes and on the subsequent externalities in terms of territories' ability to build economic prosperity, as we shall see in sub-section 2.1. Moreover, international business theory also focuses extensively on location and, more specifically, on the effects of the competitive advantages of home and host locations on multinational enterprises' activities. As a result, sub-section 2.1 scrutinizes those theories in more detail with the aim of highlighting the manner in which each investigates location competitiveness and, indeed, the stylized factors most likely to generate a positive dynamic sequence leading to an improvement in the overall competitiveness level of a location.

2 The theoretical approaches of economic geography and international business to location competitiveness: introductory remarks

Location competitiveness and the determination of the stylized factors most likely to generate a positive dynamic sequence leading to an improvement in the overall competitiveness level of a location have captured the attention of numerous prominent scholars over the years (Begg, 1999; Huggins, 2003; Porter, 1980, 1990a, 2008; Storper, 1997). Whereas the pioneering theories investigated above provide some explicit and/or implicit elements of the role of location in firms' ability to compete and to prosper and, *in fine*, on the ability of the corresponding location to build and sustain its competitive advantages, other theories specifically examine location competitiveness as an intrinsic feature of economic prosperity. Determining those factors and their systemic functions constitutes the passkey to understanding the manner in which dynamic sequences occurring in a location potentially lead to greater prosperity of firms, economic growth, and ultimately the improvement of the standards of leaving. This dynamic sequence depends on the ability of that location to build and sustain its competitive advantages. In other words, it relies on that location's competitiveness level in relative terms. This relativity is even more decisive because firms are increasingly mobile and thus aware of competitiveness differences between locations. As a result, it is not only necessary to analyse how locations build their competitive advantages but also crucial to scrutinize which factors will potentially lead to the internalization of firms and/or which factors will potentially attract firms located elsewhere. Consequently, as pointed out by Gugler, "we need more theoretical insights to scrutinize the competitive advantages of territories or, in other words, their ability to offer the best conditions that enable economic agents to achieve higher rates of productivity in open markets" (Gugler, 2019, p. 18).

For that matter, two major schools of theories provide us with major tools for understanding location competitiveness. Economic geography concentrates *inter alia* on agglomeration forces through localization processes explaining the expansion of economic activities and the ability of firms to improve their productivity. These processes result from domestic economic agents whose ability to expand their economic activities depends on the corresponding location that offers the most appropriate set of competitiveness advantages. If that location's competitiveness level is augmented, it may attract external economic agents from other locations. International business theorists scrutinize the internalization process and resulting localization choices of MNEs. This analysis allows us to refine the criteria most likely to improve locations' attractiveness and ultimately to determine the set of related competitive factors. These theories are complementary in numerous ways and necessitate further investigation.

Consequently, this chapter consists of an in-depth analysis of the concept of location competitiveness from two major perspectives: 1) the economic geography perspective (sub-section 3.1) (Krugman, 1991; Krugman and Venables, 1995; Marshall, 1920; Porter, 1980, 1990a, 2000a, 2000b, 2003, 2008; Porter *et al.*, 2008) and 2) the international business perspective (sub-section 2.1) (Dunning, 1988a, 1998, 2000a, 2000b, 2001; Dunning and Gugler, 2008; Dunning and Lundan, 2008; Rugman, 1981, 1985, 2005a, 2005b, 2010; Rugman and D'Cruz, 1993; Rugman and Fina, 1996; Rugman and Girod, 2003; Rugman and Verbeke, 2001a, 2001b, 2003, 2004, 2008a, 2008b, 2009). The essence of those two perspectives will be summarized in 2 distinctive discussions.

Some of the academic literature scrutinized in the following sections does not exclusively address location competitiveness *per se*. It is, however, necessary to analyse the foundational theories of industry localization processes, agglomeration effects *inter alia* on firms' strategies, and locations' advantages for which more recent authors have developed indexes and indicators capturing territories' competitiveness levels.

2.1 Location competitiveness: an economic geography approach

2.1.1 The pioneers: the Marshallian fundamentalists

Numerous scholars (Huggins and Thompson, 2017; Jacobs, 1969; Krugman, 1991; Porter, 1980, 1990a, 2008) consider Alfred Marshall a pioneer in the field of industry localization and consequently in the field of regional competitiveness if defined as "the capability of a particular region to attract and maintain firms with stable or rising market shares in an activity, while maintaining stable or increasing standards of living for those who participate in it" (Huggins and Thompson, 2014).

Whereas most authors of the period still consider vertically integrated production methods to be the only production systems allowing economies of scale, namely, an increase in productivity, Alfred Marshall develops the idea that the concentration of relatively smaller but more integrated firms is also an efficient manufacturing system, as stated by Becattini (2002, p. 84): "There were two efficient manufacturing systems: the established method, (…), and the concentration of many small factories specializing in different phases of the same production process and operated in one location or in a cluster of locations". Those locations or clusters of locations are defined by Marshall as "industrial districts" (Marshall, 1920). Indeed, as indicated by the founding author, "the largest industries, and especially those that need massive plants, are located increasingly in industrial districts; the central cities of which are giving themselves more and more to work directly or indirectly connected with marketing. But the advantages to be derived from personal contact between customer, trader and producer have caused capital cities to become the homes of miscellaneous industries of all grades and especially of high grades; and to offer unrivalled opportunities to middlemen, who procure from working artisans and small masters the making of high-class goods to the order of wealthy customers" (Marshall, 1920, p. 189). These "industrial districts" allow "agglomeration economies of scale" due to "localization externalities" (Huggins and Thompson, 2017, p. 93). Therefore, Marshall is at the forefront of location competitiveness. The functions of the industrial districts are comparable with Porter's later cluster theory. Specialization processes respond to agglomeration forces, and positive externalities occur as a result of these processes. Marshall even recognizes to some extent the role of knowledge spillovers on agglomerated firms' ability to improve their productivity.

Based on more recent works (Arrow, 1962; Romer, 1986), these "agglomeration economies of scale" are related to the assumption that "the plants will locate near other plants in the same industry because there is a benefit to locating near plants that share some characteristics" (Ellison, Glaeser and Kerr, 2010, p. 1196). "Agglomeration economies of scale" are due to three major factors: 1) proximity with numerous specialized suppliers (intermediate goods and services), 2) the presence of a stable pool of skilled workers, and 3) the role of technological externalities due to localized knowledge spillovers (Gauthier, Lapointe and Laurin, 2003, p. 211). While incomplete, these three main factors lay the foundation for numerous modern studies on the localization of economic activity and location competitiveness, notably those of Krugman (1991), Krugman and Venables (1995), Porter (1980, 1990a, 1990b, 2000a, 2000b, 2003, 2008), and Porter *et al.* (2008).

2.1.2 Agglomeration forces in the new economic geography

2.1.2.1 Economies of scale

Rooted in the Marshallian fundamentals, Paul Krugman's early work, notably on regional divergence (Krugman, 1991), is commonly considered the core of geographical economics (Martin and Sunley, 1996). As indicated above, a territory's ability to attract and maintain firms is multi-factorial. Krugman's paper "Increasing Returns and Economic Geography" (1991) aims to answer why manufacturing companies in general and consecutively, not only in particular cases, tend to concentrate in a specific area (Krugman, 1991, p. 485). Therefore, if Krugman does not contradict Marshall's assumptions of firms' localization patterns, he first considers that a non-case-specific approach necessitates a model in which *indirect* externalities, notably technological spillovers, must be replaced by pecuniary externalities (Krugman, 1991, p. 485).

Krugman builds a model in which there are two types of production (agriculture and manufactures) and two regions (Krugman, 1991, p. 487). Agriculture is considered to be a "constant-returns sector tied to the land" (Krugman, 1991, p. 487), and manufactures is an "increasing-returns sector that can be located in either region" (Krugman, 1991, p. 487). Krugman's main intention is to show that "circular causation" (Myrdal, 1957), that is, the assumption that "manufactures production will tend to concentrate where there is a large market, but the market will be large where manufactures production is concentrated" (Krugman, 1991, p. 486), can be proven through the use of a simplified yet generalized model.

In Krugman's model, manufacturing concentration occurs under "necessary conditions" (Krugman, 1991, p. 494), depending on the setting of the key parameters: 1) "the larger the share of income spent on manufactured goods, the lower the relative sales of the defecting firm"; 2) "the larger the share of expenditure on manufactures, the larger the relative size of the region 1 market and hence the stronger the home market effect"; and 3) the transport costs between two regions are relatively low (Krugman, 1991, pp. 495-496). In other words, firms' tendency to locate in relatively large markets, owing to their choosing to move to regions where manufacturing production is already relatively concentrated, bolsters local consumption and therefore increases the size of the local market. The conclusion according to which market size has a positive effect on the localization processes of firms and therefore constitutes a potential driver of competitiveness is broadly accepted by numerous scholars and notably by those assessing the level of competitiveness of specific countries, such as the authors of the Global Competitiveness Report.

In terms of location competitiveness, "Increasing Returns and Economic Geography" (Krugman, 1991) is of great importance because it relies on the neo-classical assumption that there is a trade-off between transport costs, which have a centrifugal effect, and economies of scale, which have agglomerating effects (Krugman, 1991). Even though it relies on previous theories, it is often considered one of the foundational studies in "modern" agglomeration effect analysis. As we shall see hereafter, Krugman's contribution to the analysis of location competitiveness includes another seminal paper (Krugman and Venables, 1995).

2.1.2.2 Costs of geographic distance

In the paper "Globalization and the Inequality of Nations", Krugman and Venables (1995) build a model with the purpose of analysing the effect of globalization on manufacturing agglomeration and whether "increased globalization, a closer integration of world markets, affect[s] the real incomes of core and periphery nations" (Krugman and Venables, 1995, p. 858). The publication of this paper occurs during a period of growing concern about the effect of globalization on developed countries' "ability to sustain high living standards" (Krugman and Venables, 1995, p. 857). This model is interesting from the point of view of location competitiveness, as it includes the effect of increasingly integrated markets on agglomeration tendencies.

Krugman and Venables's (1995) model contains two regions that can potentially produce agricultural goods with constant returns to scale and intermediate and final manufactured goods with increasing returns to scale. None of these regions benefit from inherited comparative advantages in manufacturing, which is considered to be the production process more likely to encounter agglomeration effects (Krugman and Venables, 1995, p. 860). As in "Increasing Returns and Economic Geography" (Krugman, 1991), the level of transport costs is crucial in determining the level of trade and specialization of manufacturing industries between the two regions and is therefore considered a significant factor of integration (Krugman and Venables, 1995, p. 861).

Krugman and Venables's purpose is *inter alia* to prove through their model that the progressive reduction of transport costs has a non-linear effect on agglomeration forces. They define 4 stages of transport costs (Krugman and Venables, 1995, pp. 860-861): 1) transport costs between the two regions are significant. There is therefore no trade between the two regions, which are self-sufficient. 2) Transport costs are moderately decreasing. The two regions will start to trade since they both produce "many differentiated manufactured products" (Krugman and Venables, 1995, p. 861). However, transport costs are still significant and do not allow "specialization at the aggregative level" (Krugman and Venables, 1995, p. 861). 3) Transport costs reach a critical level under which "a circular process arises that leads to regional differentiation" (Krugman and Venables, 1995, p. 861). These "forward" and "backward linkages" (Krugman and Venables, 1995, p. 861) imply that specialization will occur and that one of the regions will "organize itself into an industrialized core" (Krugman and Venables, 1995, p. 861) to the detriment of the other region. 4) Transport costs reach an even lower critical level under which the "forward and backward linkages" "decline as well" (Krugman and Venables, 1995, p. 861). Hence, the advantage of the industrialized core will decrease as the other region offers lower wages to potential producers, moving progressively from the industrialized region to the other region (Krugman and Venables, 1995, p. 861).

Consequently, in terms of location competitiveness, Krugman and Venables build a convincing model determining the effects of transportation costs as indicators of economic integration on agglomeration patterns. A great contribution of "Globalization and the Inequality of Nations" (Krugman and Venables, 1995) is the construction of a generalized model that can be implemented in specific cases when firms concentrate in particular locations.

Krugman (1991) and Krugman and Venables (1995) base their work on Marshallian assumptions and therefore consider that "the plants will locate near other plants in the same industry because there is a benefit to locating near plants that share some characteristics" (Ellison, Glaeser and Kerr, 2010, p. 1196). They put these assumptions into perspective by relating transport costs, which must be understood as a significant component of trade costs, to agglomeration patterns, arguing that the decrease in transport costs does not automatically foster firms' concentration in particular areas to the detriment of others. Even though transport costs constitute a significant component of trade costs, firms' localization strategies rely on numerous other factors, both qualitative and quantitative (Kurmanalieva, 2006).

The infinite quantity of firms' localization strategies requires a micro-founded and conceptualized model, which allows a methodical analysis of each firm's localization strategy. In a second step, the gathering of these strategies allows the determination of specific factors, both micro- and macro-founded, at both the local and national levels, and which tendencies to impact firms' localizations are generally observed. As we shall see in the next section, Michael Porter's work on firms' localization strategies and on location competitiveness allows this analysis (Porter, 1980, 1990a, 2000a, 2003, 2008; Porter *et al.,* 2008).

2.1.3 Endowments and macro- and microeconomic competitiveness of location

Michael E. Porter's contribution to the analysis of location competitiveness has had a significant impact on both academics and practitioners for almost 3 decades. The author's holistic approach to locational competitiveness relies on the correlation between the competitiveness level of a location and the average productivity of the firms located there. As indicated heretofore, Smith considers that location endowments create the foundations for prosperity (see 1.1). Porter does not contradict this conclusion but develops it by specifying that "true prosperity is created by productivity in the use of endowments" (Porter, 2020). Endowments constitute the first level of competitiveness and include, *inter alia*, the physical location of a territory with the correlated effects it can have on the firms operating there. The second level is macroeconomic competitiveness. It "sets the potential for high productivity, but is not sufficient" (Porter, 2020). As a result, macroeconomic competitiveness consists of various macro-based factors, such as the fiscal policy of a specific territory, the monetary policy of a specific territory when implementable or the state of order of a specific territory. However, "productivity ultimately depends on improving the microeconomic capability of the economy and the sophistication of local competition" (Porter, 2020). In other words, it is at the microeconomic level of competitiveness that productivity is actually created, taking into consideration the location(s) in which firms operate.

Microeconomic competitiveness is intrinsically related to the business environment of that location, as is analysed in a systemic manner by Porter in his diamond model (Porter, 1990a, 2008). For that matter, clusters constitute a significant element of that business environment and are defined as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" (Porter, 2008, p. 215). Consequently, it is of interest to scrutinize the multi-dimensional concept of location competitiveness as investigated by Porter (1980, 1990a, 2000a, 2003, 2008) and by Porter *et al.* (2008). First, it is compelling 1) to scrutinize the difference between comparative advantages as reviewed above and the concept of competitive advantages, 2) to elaborate on Porter's diamond framework as it tackles in a systemic manner the business environment of a location or of an industry, and 3) to review Porter's cluster theory as it explores in detail the roots and impacts of agglomeration forces of economic activities on competitiveness of location.

2.1.3.1 The distinction between comparative and competitive advantages

Even though it is not his first publication, Porter's book "The Competitive Advantage of Nations" (1990a) constitutes the *fundamentum* of an extensive academic literature in various fields, including research on regional economic development and on location competitiveness. Porter's major objective is "to highlight the crucial distinction between the concepts of comparative advantage and the concept of competitive advantage" (Porter, 1990a, p. xi). Whereas most traditional trade theories rely on the reinterpreted Ricardian assumption that "nations all have equivalent technology but differ in their endowments of so-called factors of production" (Porter, 1990a, p. 11), Porter considers that "the assumptions underlying factor comparative advantage were more persuasive (…), when many industries were fragmented, production was more labor- and less skill-intensive, and much trade reflected differences in growing conditions, natural resources, and capital" (Porter, 1990a, p. 13). Moreover, if "the need for macroeconomic stability, and sound political and legal institutions" (Porter in Snowdon and Stonehouse, 2006, p. 165) can be decisive for firms, "it is not sufficient to raise productivity" (Porter in Snowdon and Stonehouse, 2006, p. 165). These attributes constitute a context that lays the foundation for potential competitive advantages. However, the improvement of firms' productivity occurs at the micro-level.

In today's globalizing economy, many locations constituted by highly specialized industries compete and trade with other, similar locations in terms of specialization and with a comparable set of endowment factors mitigating the evidence provided by theories based on comparative advantages. Moreover, Porter considers that "globalization of industries (both in manufacturing and services) decouples the firms from other nations to gain access to their strengths" (Porter, 1990a, p. 14). Hence, the importance of having certain factors of production in abundance has decreased over time as access to other nations' factors of production has been facilitated. This consideration indirectly rejoins in some ways Krugman and Venables's theory (1995) underlying the importance of transportation costs on agglomeration patterns and the dynamics of intra-industrial trade.

Porter's diagnosis of comparative advantage-based theories brings him towards the conceptualization of a reinvented paradigm (Porter, 1990a, pp. 18-19): the competitive advantage of firms located in a specific territory. Porter considers that "companies achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things. They perceive a new basis for competing or find better means for competing in old ways. Innovation can be manifested in a new product design, a new production process, a new marketing approach, or a new way of conducting training. Much innovation is mundane and incremental, depending more on a cumulation of small insights and advances than on a single, major technological breakthrough. It often involves ideas that are not even 'new'—ideas that have been around but never vigorously pursued. It always involves investments in skill and knowledge, as well as in physical assets and brand reputations" (Porter, 1990b, p. 75). These acts of innovation depend extensively on firms' localization, as we shall see further below.

The competitive advantage of firms in a globalizing economy is achievable, *inter alia*, and for some counterintuitively, "through a highly localized process". As indicated by Porter (1990a, p. 19), "the home nation takes on growing because it is the source of the skills and technology that underpin competitive advantage". Therefore, the geographic concentration of firms, or clusters of firms, active in similar industries and/or related to similar industries is essential, as it fosters "the forces that upgrade and sustain advantage" (Porter, 1990a, p. 622). National governments, local governments and numerous other actors play a crucial role in offering adequate endowments to firms to enhance their competitive advantage. A great dilemma consists of the identification and adequate configuration of the strengths and weaknesses that determine the level of competitiveness and the competitive advantage(s) of a specific nation, region, or urban area, as we shall see in the next section devoted to the diamond metaphor.

2.1.3.2 The diamond framework

Porter's approach in "The Competitive Advantage of Nations" (1990a, 1990b) not only is theoretical but also and most interestingly relies on case-based observations. The author conceptualizes a model in which the forces and weaknesses determining the level of competitiveness and/or the competitive advantage(s) of a specific nation, a region, an urban area, and an industry are identified: the "diamond metaphor" (Porter, 1990a, 1990b). As Porter explains, "the diamond addresses the information, incentives, competitive pressures, and access to supporting firms, institutions, infrastructure, and pools of insight and skill in location that support productivity and productivity growth in particular fields" (Porter, 1990a, p. xi) where "the effect of one determinant is contingent on the state of others" (Porter, 1990a, p. 72).

Porter's diamond relies on the determination of "four broad attributes (…) that shape the environment in which local firms compete that promote or impede the creation of competitive advantage" (Porter, 1990a, p. 71):

1) **Factor conditions:** Some factors can be understood as Marshallian factors, such as the presence of a stable pool of skilled workers (Gauthier, Lapointe and Laurin, 2003, p. 211), but Porter also insists on the importance of differentiating factors that are inherited from those that are created (Porter, 1990a, pp. 74-76). These factors are 1) human resources, 2) physical resources, 3) knowledge resources, 4) capital resources, and 5) infrastructures (Porter, 1990a, pp. 74-75). In the first step, Porter categorizes factors according to the fundamental distinction between the inherited and created factors of a given territory. In a second step, the author hierarchizes factors according to "the rate at which they are created, upgraded, and made more specialized to particular industries" (Porter, 1990a, p. 74), thus differentiating basic factors from advanced factors (Porter, 1990a, pp. 77-78). Last, factors are sorted according to their degree of specialization, implying that more specialized factors are related to specific industries, whereas less specialized factors serve numerous industries (Porter, 1990a, pp. 78-80). Porter also insists on the fact that "competitive advantage from factors depends on how efficiently and effectively they are deployed" (Porter, 1990a, p. 76), meaning that firms have to use the proper strategy to *capitalize* on those factors. Obviously, national and local public authorities play a crucial role in enhancing specific factor conditions, as we shall see in section 2.1.3.3.
2) **Firm strategy, structure and rivalry:** The location choice of new firms and the evolution of existing firms depend strongly on the conditions encountered by those firms in a specific territory, as "the goals, strategies, and ways of

organizing in industries vary widely among nations" (Porter, 1990a, p. 107). Moreover, the "nature of domestic rivalry" (Porter, 1990a, p. 107) has a significant impact on an industry's capability to build its competitive advantage.

a. **Firm strategy and structure:** Managerial and competition mechanisms are markedly influenced by territorial circumstances, as they somehow reflect national and, in some cases, regional business practices and governmental policies. "Attitudes toward authority, norms of interpersonal interaction, attitudes of workers toward management and vice versa, social norms of individualistic or group behavior, and professional standards" (Porter, 1990a, p. 109) remarkably affect those managerial mechanisms and organization practices of firms.

   From a more location-based perspective, managerial and competition mechanisms are also influenced by the form of political governance of a region/country, which differs from one nation to another, as we shall see in section 2.1.3.3.

b. **Domestic rivalry:** The strength of "domestic rivalry" (Porter, 1990a, p. 117), that is, the relatively high concentration in a given territory of firms competing in the same industry, is of prominent importance in explaining "the creation and persistence of competitive advantage in an industry" (Porter, 1990a, p. 117). This theory contradicts a somehow intuitive mercantilist mechanism according to which a strong domestic rivalry prevents local firms from gaining significant economies of scale (OECD, 2001). On the contrary, Porter observes that Smithian competition allows the development in a specific territory of successful firms that "compete vigorously at home and pressure each other to improve and innovate" (Porter, 1990a, p. 117). In most cases, domestic rivalry is even more pressurizing than international rivalry in an industry, as it incentivizes firms to gain economies of scale and higher efficiency by selling abroad (Porter, 1990a, p. 119). Hence, the presence of strong competitors in a specific territory is perceived as a positive attractiveness factor of that territory, and "new business formation" (Porter, 1990a, p. 122) itself "is vital to the upgrading of the competitive advantage" (Porter, 1990a, p. 122). Consequently, the level of domestic rivalry in a specific territory for an industry can potentially foster the virtuous circle of that territory's attractiveness to other firms active in that industry.

3) **Related and supporting industries:** a nation's advantage in an industry relies on "the presence in the nation of supplier industries or related industries that are internationally competitive" (Porter, 1990a, p. 100). This determinant rejoins Marshall's theory, according to which "the proximity with numerous specialized suppliers (intermediate goods and services)" (Gauthier, Lapointe and Laurin, 2003, p. 211) allows "agglomeration economies of scale" (Marshall, 1920). Porter goes more deeply into the process, which allows those "agglomeration economies of scale" (Marshall, 1920) and differentiates the competitive advantage provided by the related industries from that of the supporting industries:
    a. **Related industries:** The competitive advantage of an industry evolving in a specific environment also relies on its relative proximity with industries active in the production of similar products and/or services in terms of "technology development, manufacturing, distribution, marketing, or services" (Porter, 1990a, p. 105). The level of internationalization of related industries can potentially foster the competitive advantage of an industry, as it "provides opportunities for information flow and technical interchange" (Porter, 1990a, p. 106). Hence, the geographical location of firms active in an industry near firms active in related industries according to the terms described above has a substantial impact on an industry's capability to build a sustainable competitive advantage. Porter's theory implies that the presence of internationally competitive related industries in a specific territory generates a virtuous circle in which the competitive advantage of an industry reinforces the competitive advantage of a related industry and *vice versa*.

b. **Supporting industries:** Whereas some might suggest that the effect of proximity for an industry with highly competitive supporting industries is declining as globalization expands, Porter considers that "ongoing coordination" (Porter, 1990a, p. 103) between an industry and its home-based suppliers is a significant competitiveness factor of that industry. The geographic proximity between the two often implies shorter cultural distances and greater "information flow" (Porter, 1990a, pp. 103-104). Regarding related industries, Porter considers that supporting industries that are internationally competitive are much more likely to offer greater benefit to the corresponding industry (Porter, 1990a, p. 104). When the suppliers of an industry are global competitors, "they possess the wherewithal to best upgrade their own advantages, thereby providing the needed technology flow to their home-based customers" (Porter, 1990a, p. 104).

   Porter further emphasizes the influence of the proximity between an industry and the subsequent related and supporting industries later in his work. Indeed, the cluster theory considerably developed by Porter provides substantial knowledge on the formation of dynamic networks that allow firms to improve their competitive advantages, notably because of supporting industries. However, at this stage, his theory already suggests that to maintain and/or attract firms active in a specific industry to a given territory, the level of territorial attractiveness of a country/region depends on two forces that are potentially oppositional: 1) the more diversified an industry mix is, the higher the probability for a firm active in a specific industry to remain in or to be attracted by this territory, and 2) the more specialized and internationally competitive the related and supporting industries of an industry are, the more likely they are to foster their international competitive advantage. To a certain extent, these forces embody the debate between Marshallian specialization theory (Marshall, 1920) and Jacobian diversification externalities theory (Jacobs, 1969).

Porter, especially in his later work, somehow passes over this debate with his cluster theory, as we shall see in section 2.1.3.3.

4) **Demand conditions:** Home demand conditions have a direct impact on national competitive advantage (Porter, 1990a, p. 86) and are determined by "three broad attributes": 1) "the composition (or nature of buyer needs) of home demand", 2) "the size and pattern of growth of home demand", and 3) "the mechanisms by which a nation's domestic preferences are transmitted to foreign markets" (Porter, 1990a, p. 86). Even though the quantity of home demand can be significant, thus potentially reinforcing the emphasis of home market size on national competitive advantages, especially specific kinds of industries or segments, Porter insists on the greater impact of the quality of home demand on national competitive advantage (Porter, 1990a, p. 89). Moreover, "nations gain competitive advantage in industries or industry segments where the home demand gives local firms a clearer or earlier picture of buyers' needs than foreign rivals can have" (Porter, 1990a, p. 86) based on three characteristics: 1) the "segment structure of home demand", that is, "the distribution of demand for particular varieties" (Porter, 1990a, p. 87); 2) the "nature of home buyers", that is, the propensity of home buyers to be among "the most sophisticated and demanding buyers for the product or service" (Porter, 1990a, p. 89); and 3) the "anticipatory buyer needs" (Porter, 1990a, p. 91) relative to those of foreign buyers in particular industries or segments.

Most importantly, "each of these four attributes defines a point on the diamond of national advantage; the effect of one point often depends on the state of others" (Porter, 1990b, p. 86). As those points of the diamond are "self-reinforcing", "they constitute a system" (Porter, 1990b, p. 86). Indeed, specific determinants influence others and *vice versa* and "combine into a dynamic system" (Porter, 1990a, p. 131).

According Porter, 2 elements are more likely "to transform the "diamond" into a system" (Porter, 1990a, p. 131): 1) "geographic concentration" and 2) "domestic rivalry" (Porter, 1990a, p. 131). As the effects of geographic concentration are analysed in depth hereafter, it is necessary to again consider at this stage the decisive role of domestic rivalry from a more rationalistic point of view. Strong domestic rivalry translates into the fact that "local competitors in vigorous competition stimulates the rapid development of skilled human resources related technologies, market-specific knowledge, and specialized infrastructures" (Porter, 1990a, p. 134). This element, in relation to other elements and, more importantly, to the presence of competitive clusters in a specific territory, constitutes a unique set of factors reinforcing the system (Porter, 1990b, p. 86).

Interestingly, even the author's in-depth analysis of the "determinants of national advantage" (Porter, 1990a, p. 132) still implies that "the cause and effect of individual determinants becomes blurred" (Porter, 1990a, p. 132). Indeed, "every determinant can affect every other determinant, though some interactions are stronger and more important than others" (Porter, 1990a, p. 132). Consequently, assessing the level of competitiveness of a location implies a deep understanding of the potentially unique composition of the self-reinforcing points of the specific diamond, thus constituting a dynamic sequence. Singularity *per se* could intuitively involve non-rigorous relative assessments. For that matter, the author's diamond system provides greater capabilities to establish the tree diagram composed of the determinants most likely to lead to a self-reinforcing system and, through that system, directly or indirectly, to contribute to the upgrading of the level(s) of competitiveness of the corresponding territory or territories. In this regard, Porter identifies four "determinants of national competitive advantage" (Porter, 1990a, p. 133) that decisively stimulate factor creation: 1) "a cluster of domestic rivals stimulates factor creation", 2) "perceived national challenges stimulate factor creation", 3) "home demand influences priorities for factor-creating investments", and 4) "related and supporting industries create or stimulate the creation of transferable factors" (Porter, 1990a, p. 133).

At this stage of the discussion, it is crucial to examine the role of policies in the context of the diamond as a system. Indeed, in the complex structure of self-reinforcing determinants and inter-related factors, policies might either strengthen or deteriorate factors through determinants and alternatively or cumulatively either improve or hamper the proper functioning of that system. According to Porter, "government's proper role is as a catalyst and challenger; it is to encourage—or even push—companies to raise their aspirations and move to higher levels of competitive performance, even though this process may be inherently unpleasant and difficult" (Porter, 1990b, p. 87). Consequently, he sees that role as more indirect than direct and proposes eight major rules to follow: 1) "focus on specialized factor creation", 2) "avoid intervening in factor and currency markets", 3) "enforce strict product, safety, and environmental standards", 4) "sharply limit direct cooperation among industry rivals", 5) "promote goals that lead to sustained investment", 6) "deregulate competition", 7) "enforce strong domestic antitrust policies", and 8) "reject managed trade". Obviously, from a location perspective, these rules should be considered according to the decentralization level of governance. Indeed, nations have varying propensities to apply the general principle of subsidiarity. Therefore, assessing the potential for the competitiveness of various locations from a policy point of view implies carefully analysing which rules are applied at the national level and which rules are applied at sub-national levels.

In conclusion, distinguishing comparative advantages from competitive advantages allows a more sensible explanation of the role of localization in building and sustaining an industry's competitive advantage. The level of geographical concentration of firms active in a similar industry has a prominent impact on their ability to achieve and sustain their competitive advantage and to compete globally. Those *clusters of firms* and all the forces orbiting around them have a direct impact on a territory's propensity to attract and maintain firms. They are thoroughly scrutinized by Porter in his work "On Competition" (2008), as we shall see below (see section 2.1.3.3).

2.1.3.3 The role of clusters

Porter's contribution to the role of clusters in location competitiveness is extensively analysed in his work "On Competition" (Porter, 2008), followed by complementary articles on the role of location in company strategy (Porter, 2000a) and on "The Economic Performance of Regions" (Porter, 2003). This section aims to explore how clusters affect the level of location competitiveness and *vice versa*. Moreover, detecting the presence of a cluster based on data and measuring how it performs are of great value in quantitatively assessing the economic performance of a specific territory.

Whereas the diamond metaphor depicts "the effect of location on competition" (Porter, 2000a, p. 257), clusters are "best seen as a manifestation of the interactions between among all four facets" (Porter, 2000a, p. 258) of that metaphor (see previous section). Hence, assessing the role of clusters on location competitiveness allows the overcoming of 1) dated concepts such as "agglomeration economies of scale" (Huggins and Thompson, 2017, p. 93) and 2) numerous inadequate industry data classifications.

Clusters are essential in building an industry's competitive advantage when a specific location is considered (Porter, 2008, p. 229) in three major ways: 1) "by increasing the productivity of constituent firms or industries", 2) "by increasing their capacity for innovation and thus for productivity growth", and 3) "by stimulating new business formation that supports innovation and expands the cluster" (Porter, 2008, p. 229):

1) **Productivity growth of clustered firms/industries**: Access to "specialized inputs and employees" (Porter, 2000a, p. 259) allows firms located within a cluster to assemble inputs more effectively or efficiently. This static aspect noticeably rejoins Marshall's "localization externalities" (Huggins and Thompson, 2017, p. 93). However, Porter elaborates more broadly on static productivity and specifies that "extensive market, technical, and other specialized knowledge, both explicit and implicit, accumulates within a cluster in firms and local institutions" (Porter, 2000a, p. 260). Moreover, powerful linkages between firms and their suppliers and local privately owned, partially privately owned or publicly owned related institutions contribute to the economic performance of the location where they are located (Porter, 2000a, p. 261).
2) **Increasing capacity for innovation**: The identification of the evolution of buyers' needs is enhanced by the concentration of firms active in the same industries and related industries (Porter, 2008, p. 237). Hence, "the potential advantages of clusters in perceiving both the need and the opportunity for innovation are significant" (Porter, 2008, p. 237). A firm located within a cluster is more likely to be at the forefront to "source the new components, services, machinery, and other elements needed to implement innovations" (Porter, 2000a, p. 262). For example, a firm located within a cluster is likely to more easily recruit adequate workers as concentration in a specific territory occurs. Moreover, "local suppliers and partners" (Porter, 2000a, p. 262)

located within the cluster are often in a better position to fulfil the specific needs of the corresponding clustered industries, as they are often included in the innovation processes and/or accustomed to the patterns of local markets. Furthermore, strong competition among clustered competitors "forces firms to distinguish themselves creatively" (Porter, 2000a, p. 262).

3) **New business formation**: The impact of the presence of clusters on the ability of a given territory to attract and/or foster new firms' creation is of significant importance when determining the level of competitiveness of that territory. The presence of a cluster of firms active in a specific industry is likely to imply that "barriers to entry are lower than elsewhere" (Porter, 2000a, p. 263). This is true due to numerous factors, such as 1) the presence in the corresponding territory of adequate financial institutions, implying privileged access to capital (Porter, 2008, p. 240); 2) advantageous access to "needed assets, skills, inputs, and staff" (Porter, 2008, p. 240); and 3) the presence of a constituted network of competitors, related and supporting industries, and private, semi-private and/or public institutions related to the activities of the corresponding industry. The factors cited above create "the potential for economic value" (Porter, 2008, p. 241).

Cluster theory overcomes the intuitive yet simplistic exclusively cost-related location advantage, as "locations with low wages and low taxes, (…) often lack efficient infrastructure, available suppliers, timely maintenance, and other conditions that clusters offer" (Porter, 2000a, p. 267). Therefore, whereas costs and taxes constitute relevant factors in determining firms' location choices, "a shift back toward clusters is beginning among companies who once believed in the cost savings of highly dispersed activities" (Porter, 2000a, p. 267). This shift also implies that firms involved in a globalization process should seek strategic locations of specific activities in accordance with the performance of correlated clusters that in many cases are located elsewhere (Porter, 2000a, p. 267).

In conclusion, the presence in a given territory of clusters of "interconnected companies, suppliers, service providers and associated institutions in a particular field" (Porter, 2003, p. 562) generates numerous externalities and has direct and indirect impacts on the level of competitiveness of that territory. In this regard, empirically defining the boundaries of clusters and of sub-clusters allows the proper measurement of those externalities, notably the levels of average wages. The average wages registered by a cluster can differ significantly "due to differences in its sophistication and productivity, patterns of unionization and cost of living" (Porter, 2003, p. 564). Moreover, average wages tend to be higher in locations where all the corresponding clusters undergo specialization processes and productivity growth (Porter, 2003, p. 564). Regarding the effect of specialization on wage growth, Porter considers that regions with relatively high degrees of specialization will experience positive effects on wages and *in fine* on regional economic performance (Porter, 2003, p. 566).

2.1.4 Economic geography theories in relation to location competitiveness: concluding remarks

The economic geography approach to agglomeration patterns of economic activities relies on the "industrial districts" developed by Marshall (1920). These districts allow "agglomeration economies of scale" (Ellison, Glaeser and Kerr, 2010, p. 1196) due *inter alia* to the proximity of firms operating in similar or related industries. This assertion is the main pillar on which economic geography researchers build their theories.

While Krugman (1991) and Krugman and Venables (1995) build their generalized model on theoretical hypotheses indirectly corresponding to Marshall's fundamental assumptions, Porter bases his reasoning on a more inductive approach. Based on numerous observations and comprehensive datasets, he builds a holistic approach and assesses it through quantitative methods. This allows a more accurate understanding of 1) the localization processes, 2) the evolution of agglomeration patterns, and 3) the effects of agglomeration on location economic performance.

Porter's contribution to the understanding of location competitiveness allows a multi-dimensional and sequenced analysis based on both qualitative and quantitative models and instruments. The firm- and strategy-based approach is strongly micro-oriented, which implies that whereas macroeconomic endowments are of great importance when determining a territory's ability to attract and maintain firms and to allow the creation and expansion of firms, micro-based attributes, as exposed in Porter's diamond model (see section 2.1.3.2), are decisive factors in building solid and sustainable competitive advantages. Indeed, whereas context potentially influences firms' ability to build and sustain their competitive advantages, value creation occurs at the firm level and is the firms' ability to build and sustain their competitive advantages, which might ultimately generate an effect on wages in a specific location (Porter, 1990a, 2008). Porter's methods for the analysis of agglomeration patterns and of cluster performance measurements have been applied to various cases and augmented (i.e., Delgado, Porter and Stern, 2012; Resbeut and Gugler, 2016). Obviously, the specificities of every territory and/or *transregional* territories necessitate various adjustments.

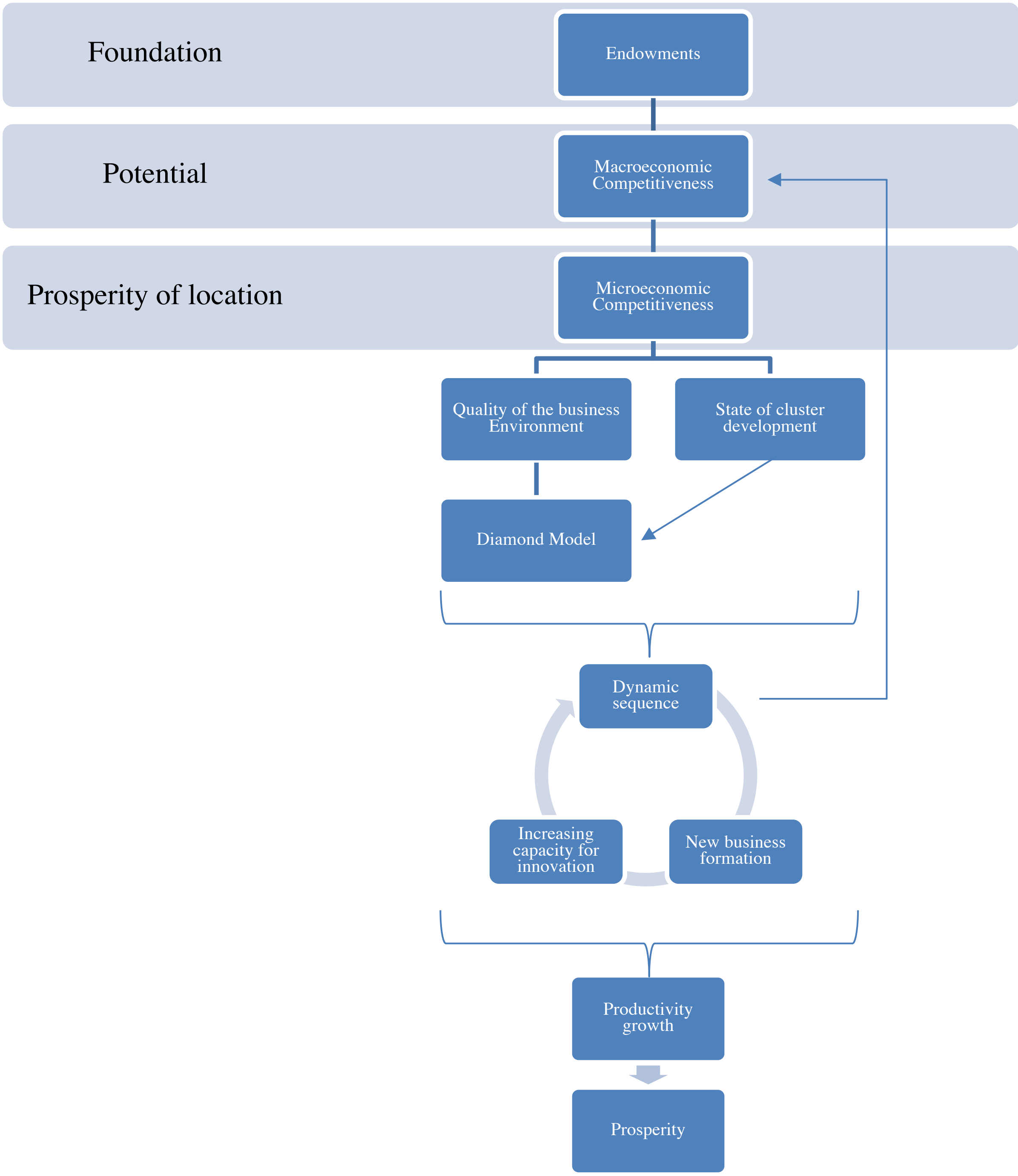
Competitive determinants (Porter, 1990a, p. 132) perform only when they are organized in a dynamic sequence, allowing self-reinforcing effects on Porter's diamond as a system. Whatever the quality of the context faced by firms considering a specific territory, that is, *inter alia*, the quality of the macroeconomic environment, only the dynamic evolution of an efficient sequence of determinants forming competitive factors will ultimately result in the higher relative and absolute economic performances of that territory. A specific sequence is most likely to be *sui generis*, as it covers a longer period of time and occurs in a developed economy. Indeed, inter-relations between determinants accelerate, and those determinants tend to form a complexifying tree diagram of interdependent competitive factors. Henceforward, it is arduous to answer the fundamental question: which inceptive set of determinants is most likely to launch a positive self-reinforcing sequence of determinants leading to an efficient diamond system?

Understanding the dynamic functioning of the diamond implicitly attenuates the relevance of determining which determinants are the causes and which are the consequences of those causes. Indeed, whereas that distinction is cardinal when assessing the level of competitiveness of a specific location to accurately capture the self-reinforcing dynamism generated by a corresponding set of determinants, the singularity of each territory in terms of competitive factors implies that sorting the determinants in each of those two categories will most likely engender results of a contrasting nature. Even if two locations share similar fundamental endowments, a specific set of self-reinforcing determinants might not be as efficient in location *a* as in location *b,* as numerous exogenous conditions also impact not only the speed of interactions between determinants but also the capability of firms located in each of those locations to benefit from them. For that matter, it is necessary to ascertain which determinants are most likely to stimulate factors' creations relative to others, and even more so because they operate conjointly and influence one another. Hence, Porter considers that 1) "a cluster of domestic rivals stimulates factor creation", 2) "perceived national challenges stimulate factor creation", 3) "home demand influences priorities for factor-creating investments", and 4) "related and supporting industries create or stimulate the creation of transferable factors" (Porter, 1990a, p. 133). Consequently, even if a location is likely to face a specific set of self-reinforcing determinants, some determinants are more decisive than others, and there is a high probability that they will decisively impact that location's ability to build and sustain the corresponding competitive advantages.

In conclusion, economic geography theorists' approach to agglomeration patterns of economic activities, especially that of Porter (*inter alia* 1990a, 1990b, 1998, 2003), scrutinizes from a micro-based perspective the dynamic sequences of determinants that allow a location to experience enhanced factors leading to sustainable competitive advantages relative to other locations but ultimately in favour of the nation of which it is a constituent part. Whereas each location's success or failure in the matter is due to a singular set of leading factors interacting in a system, comparable patterns of determinants seem to replicate success, while others do not or do so only partly. The decisive task is therefore to properly weight the incidence of each determinant to capture a location's competitiveness level on the basis of a sounder methodology and ultimately with greater accuracy.

The major outcomes of Porter and Porter *et al.* (2008) from the perspective of location competitiveness can be illustrated through a systemic matrix, which constitutes a general understanding of the determination process of the stylized factors most likely to generate a positive dynamic sequence leading to an improvement in the overall competitiveness level of a location. This matrix shall be exhibited hereafter and justified accordingly.

Figure 1: Matrix of the Porterian's approach to competitiveness of location



Source: personal elaboration based on Porter (1980, 1990a, 1990b, 1998, 2002, 2003, 2008) and on Porter *et al*. (2008).

Figure 1 constitutes an abridgment of the major conceptual conclusions of Porter (1980, 1990a, 1990b, 1998, 2002, 2003, 2008) and of Porter *et al*. (2008). The endowments of a location are inherited. They might influence prosperity, but only in the manner with which they are potentially productively exploited. On the basis of the existence of a specific set of endowments of a territory, macroeconomic competitiveness creates the potential for productivity to increase. In general, macroeconomic competitiveness includes *inter alia* the efficiency of public institutions. It is, however, at the level of microeconomic competitiveness that wealth is indeed created, that productivity increases and, *in fine*, that a territory prospers more than other comparable territories. That juncture constitutes the actual starting point of the dynamic sequence in terms of productivity creation, even if improved productivity in *t0* is likely to enhance macroeconomic competitiveness in *t+1* and this advanced macroeconomic competitiveness is likely to have a beneficial effect on microeconomic competitiveness in *t+n*.

In terms of location competitiveness, microeconomic competitiveness is correlated predominantly with the quality of the business environment and crucially with the state of cluster development. This business environment is analysed in the diamond model in a systemic manner. The model determines the set of inter-related factors that influence the corresponding dynamic sequence. Indeed, microeconomic competitiveness and the subsequent dynamic sequence determine the manner in which productivity is created and the extent to which that productivity might increase. *In fine*, productivity determines the ability of territory to prosper.

In conclusion, Porter's and Porter *et al.*'s approach to the multi-dimensional concept of locational competitiveness is of distinctive value, as it tackles numerous potential biases related to the measurement of that concept in either relative or absolute terms. Indeed, as competitiveness of location is analysed dynamically, it acknowledges the systemic nature of inter-related factors and provides an understanding of causality among these factors. Moreover, it makes a clear distinction between the levels of competitiveness, which is crucial in determining the scale of analysis. Ultimately, it allows the determination of the inter-related factors most likely to have a positive impact on productivity.

However, the localization patterns of economic activities are evolving relatively rapidly with the effect of globalization on firms' localization strategies and with the expansion of the "knowledge-based economy" (Dunning, 2000a). With the rising quantity of MNEs and “cross-border interfirm coalitions” (Dunning, 2000a) operating in various territories of the globe, one could intuitively suggest a decrease in the influence of location on firms’ ability to build sustainable competitive advantages. However, the presence in a territory of competitive clusters of traded industries proves to even have an increasing impact on that territory’s ability to attract and maintain firms, including MNEs, some of their activities and/or spatially mobile investments. Consequently, it is relevant to analyse localization patterns and the correlated role of location on agglomeration forces from the perspectives of prominent international business theorists.

3 Competitiveness of location in international business theory

Whereas localization processes are often analysed from an economic geography point of view, international business theories are also of decisive importance in explaining those processes, as they offer dynamic and behavioural-oriented thinking. The competitiveness of location is therefore approached from another perspective. International business theory offers valuable insights that reinforce and/or complement economic geography theory. For example, and as we shall see in this section, the distinctive role of state-based and/or state-related policies has been highly developed by international business theorists, notably with the analysis of location-specific policy orientations, which ultimately impact localization processes and, *in fine*, the competitive advantages of territories.

International business theory concentrates *inter alia* on the analysis of MNEs’ localization strategies when they wish to operate value-adding activities in specific locations. Both home and host locations influence MNEs’ activities, which consecutively generate positive externalities in these locations and improve their corresponding location competitiveness levels. Hence, it is of great interest to investigate location advantages from the perspective of international business theorists.

Although trading costs in neo-classical terms tend to decrease over the years, agglomeration forces and localization processes still impact MNEs’ behaviours, and even more so with the development of the “knowledge-based economy” (Dunning, 2000a). Indeed, “new research agendas, particularly those of economic geographers, trade theorists and international political economists, are not only paying more attention to the spatial aspects of value-added activity, but are also seeking to incorporate these aspects into the mainstream thinking about the growth and competitiveness of firms, the relationship between trade and foreign direct investment (FDI), and the economic structure and dynamic comparative advantage of regions and countries" (Dunning, 1998, p. 46).

Localization processes respond to potentially antinomic forces, the composition of which will most likely vary due to numerous factors that vary across industries and/or activities. Indeed, "knowledge-intensive and export-oriented activities tend to be more geographically concentrated than other kinds of activities" (Dunning, 1998, p. 58). Intuitively, that assertion implies that the stage of economic development of a nation/sub-national territory correlated with those economic forces will impact localization processes in different manners and that self-reinforcing mechanisms will correspondingly vary in terms of efficiency.

Consequently, investigating location competitiveness uniquely from an economic geography perspective might hamper an analysis of which the ultimate purpose is to serve as a theoretical framework for an intranational regional competitiveness index. Indeed, as globalization increasingly affects localization processes, and even more so in knowledge-based economies, it is vital to scrutinize these processes from an international business perspective. Therefore, two major angles are scrutinized. First, the competitiveness of the host location is investigated because it constitutes a major factor of MNEs' strategy, as they "desire to exploit their competitive advantages and/or to augment them and/or to create new competitive advantages" (Gugler, 2019, p. 23). Dunning's and Dunning and Lundan's works on location-specific advantages and on the role of sub-national entities on MNEs' behaviours are especially useful. As a result, sub-section 3.1.1 investigates their contributions to location competitiveness (Dunning, 1981, 1988a, 1998, 2000a, 2000b, 2001; Dunning and Gugler, 2008; Dunning and Lundan, 2008). Second, the competitiveness of home location is also examined, as it represents a decisive factor for MNEs to build and/or advance their competitive advantages (Gugler, 2019, p. 23). In this regard, the contributions of Rugman (1981, 1985, 2005a, 2005b, 2010), Rugman and D'Cruz (1993), Rugman and Fina (1996), Rugman and Girod (2003), and Rugman and

Verbeke (2001a, 2001b, 2003, 2004, 2008a, 2008b, 2009) are most convincing, as we shall see in sub-section 3.1.2.

3.1.1 The concept of location-specific advantages developed by Dunning

3.1.1.1 The OLI paradigm

John Harry Dunning is commonly considered one of the most influential economists in the field of international business. His work on firms' internationalization advantages and internalization theory lays the foundation for the analysis of globalization effects on firms' localization choices and/or on firm-related international business activities (Dunning, 1981, 1988a, 1998, 2000a, 2000b, 2001; Dunning and Gugler, 2008, Dunning and Lundan, 2008). Consequently, we will focus on three major contributions of Dunning (1981, 1988a, 2000) and Dunning and Lundan (2008) that are specifically related (but not only) to localization processes and to the role of sub-national territories in attracting foreign direct investment and/or MNEs. In the first section, we will present the impact of Dunning's seminal work (Dunning, 1981), updated in an edited version (Dunning and Lundan, 2008), notably the eclectic paradigm (ownership-specific, location-specific, internalization-specific advantages paradigm (OLI)) (Dunning, 1981, 1988a) and its implications for the assessment of location competitiveness.

The eclectic paradigm constitutes a general framework that is widely used in the analysis of international business behaviours (Dunning, 1981, 1988a). Whereas previous Ricardian theoreticians such as Heckscher (1919) and Ohlin (1933) based their seminal models on somehow heroic assumptions in light of recent specialization processes, Dunning goes one step further and develops "a paradigm which encompasses various explanations of the activities of enterprises engaging in cross-border value-adding activities" (Dunning, 2001; Dunning and Lundan, 2008, p. 95). Hence, it "seeks to offer a general framework for determining the extent and patterns of both foreign-owned production undertaken by a country's own enterprises, and that of domestic production owned or controlled by foreign enterprises" (Dunning and Lundan, 2008, p. 95). In terms of location competitiveness *per se*, it focuses *inter alia* on location-specific advantages (L-advantages), as it reflects "the 'assets'—offered by the recipient country—explaining why a specific firm has decided to invest in this specific host location" (Dunning, 1998, p. 45).

Dunning does not oppose his paradigm to those of previous trade theorists, as they accept the impact of "spatial distribution on some kind of output" (Dunning and Lundan, 2008, p. 95), but the author also takes into consideration "other kinds of output which require the use of resources, capabilities and institutions that are not equally accessible to all firms" (Dunning and Lundan, 2008, p. 95). Therefore, the paradigm represents the continuum of internalization theory since it seeks to understand the broad tenets determining the willingness and capability of a firm to initiate foreign production and "the growth of such production" (Dunning, 1988a, p. 1). It did so at first, as Dunning then reinterpreted the eclectic paradigm as a "general but operationally testable paradigm of international trade" (Dunning, 1988a, p. 1). In Dunning's paradigm, location-related advantages constitute a major pillar of the framework.

A firm engaged in foreign value-adding activities captures the correlated performances of those activities (Dunning, 1981; Dunning and Lundan, 2008, p. 99) on the basis of three cumulative conditions:

1) **Ownership-specific advantages** (Dunning, 1981; Dunning and Lundan, 2008): the value of the assets of a firm engaged in international production depends on "the extent to which it (the considered firm) possesses unique and sustainable owner-specific advantages *vis-à-vis* firms of other nationalities in the servicing of particular markets or groups of markets" (Dunning and Lundan, 2008, p. 99). These advantages are notably determined by the "privileged possession of or access to intangible assets", which are in many cases location related.
2) **Location-specific advantages** (Dunning, 1981; Dunning and Lundan, 2008): "Location-based resources, capabilities and institutions" are not geographically distributed uniformly. Therefore, those territories that possess "them over those that do not" (Dunning and Lundan, 2008, p. 100) benefit from a competitive advantage, thus fostering the creation, access and utilization of an enterprise's ownership-specific advantage "in a foreign location" (Dunning and Lundan, 2008, p. 100). This aspect illustrates the extent to which location-based fundamental

endowments have an impact on a territory's capability to attract and/or maintain foreign value-adding activities. For that matter, both national and local governments as well as public institutions and/or *para*-public institutions and/or private institutions related to an industry play a significant role.

3) **Internalization-specific advantages** (Dunning, 1981; Dunning and Lundan, 2008): The "market internalization advantages" (Dunning and Lundan, 2008, pp. 99-100) indicate the amplitude with which a firm engaged in international production identifies and indeed enforces strategies that "add value to its ownership-specific advantages rather than to sell them, or their right of use, to independent firms" (Dunning and Lundan, 2008, p. 99). This condition is mainly behaviourally related, as it epitomizes the forms of managerial structures that allow the sustainability and/or the improvement of market internalization advantages and, *in fine*, the addition of value to the ownership-specific advantages.

The configuration of those ownership-specific, location-specific, internalization-specific advantages differs significantly across locations, industries and firms (Dunning, 1981; Dunning, 2001, p. 176), and these advantages are not "evenly spread" (Dunning and Lundan, 2008, pp. 100-101). Moreover, as an enterprise faces a specific aggregate of ownership-specific, location-specific, internalization-specific advantages while engaged in foreign value-adding activities, foreign production needs to be "consistent with the long-term objectives of its stakeholders and the institutions underpinning its managerial and organizational strategy" (Dunning and Lundan, 2008, p. 100). In this respect, this condition has a higher probability of being satisfied if foreign production takes place in territories that benefit from a stable and competitive business environment. Indeed, long-term objectives prove to be easier to determine if foreign value-adding activities are located in these territories.

The eclectic paradigm can also be interpreted dynamically, as modifications of either of those advantages will inevitably impact the overall configuration of those forces and potentially lead to a relocation of outbound foreign direct investment, *inter alia* (Dunning, 1981; Dunning and Lundan, 2008, p. 100). Indeed, a location's ability to attract value-adding activities from foreign firms will potentially modify its strategies in time *t* and "affect the extent and composition of its ownership-specific advantages in time t +1" (Dunning and Lundan, 2008, p. 101). Consequently, as all those advantages are co-dependent, the "where of production" (that is, a location's ability to build and maintain a sustainable competitive advantage) impacts not only the set of location advantages but also the overall configuration of the paradigm at some point in time (Dunning, 1981; Dunning and Lundan, 2008, p. 102, p. 104).

3.1.1.2 The factors of location-specific advantages

We will now focus on the factors influencing the paradigm configuration (Dunning, 1981; Dunning and Lundan, 2008, pp. 102-104) and, more specifically, on those related to location-specific advantages:

1) **Economic characteristics**: the factors specifically related to the characteristics of the home locations and/or of the countries of definite enterprises and the characteristics of the foreign locations and/or countries in which those enterprises wish to invest.
2) **Institutional characteristics**: the factors specifically related to the characteristics of the "particular types of activities undertaken by firms" (Dunning and Lundan, 2008, p. 103).
3) **Culture-specific characteristics**: the factors specifically related to the characteristics of the activities "specific to particular firms" (Dunning and Lundan, 2008, p. 103).

All these characteristics have direct and indirect impacts on location-specific advantages, as a "firm's propensity to invest in a particular country is likely to be strongly influenced by the factor endowments, created capabilities and markets available in that country relative to others, as well as the extent to which it is perceived that the economic system and policies of a country enable it to exploit its ownership-specific advantages profitability" (Dunning and Lundan, 2008, p. 323). We could argue that location-specific advantages constitute a continuity of Michael Porter's diamond metaphor analysed in section 2.1.3.2 as "certain attributes", or competitive advantages in Porter's theory (Dunning and Lundan, 2008, p. 324), are specific to a location and/or to a country impacting the attractiveness of that location and/or of that country and the localization choices of value-adding activities.

Dunning determines 4 types of international production strategies: 1) "natural resource seeking", 2) "market seeking", 3) "efficiency seeking", and 4) "strategic asset seeking" (Dunning and Lundan, 2008, p. 104):

1. "Resource seeking": "That designed to gain access to natural resources, e.g., minerals, agricultural products, unskilled labor" (Dunning, 2000b, p. 164);
2. "Market seeking": "That designed to satisfy a particular foreign market, or set of foreign markets" (Dunning, 2000b, p. 164);
3. "Efficiency seeking": "That designed to promote a more efficient division of labor or specialization of an existing portfolio of foreign and domestic assets by MNEs" (Dunning, 2000b, p. 164); and
4. "Strategic asset seeking": "That designed to protect or augment the existing O specific advantages of the investing firms and/or to reduce those of their competitors" (Dunning, 2000b, p. 165).

MNEs' potential intention to determine 1 type of strategy does not necessarily imply that other aspects of the 3 other strategies are not taken into consideration to a certain extent (Dunning, 1998). MNE motives are based *inter alia* on the assessment of current location-specific advantages in order to potentially foster their other advantages in $t+1$ (Dunning, 2000b). Each location is composed of a set of location-bound assets, on which MNEs will *inter alia* build their strategies on the basis of the activities they wish to localize. For instance, if a firm's main motive is to seek resources in a specific sector, the most important host location's assets are likely to be related to "specific infrastructures" and/or "specific natural resources" (Gugler, 2019, p. 26). Alternatively, if a firm's main motive is to seek strategic assets, the most important host location's assets are likely to be related to "cluster externalities" and/or to "innovative capabilities" (Gugler, 2019, p. 26). Consequently, measuring the competitiveness of a location implies identifying the "set of location bound created assets" (Dunning, 2000b, p. 178) that is most likely to attract MNEs' value-adding activities, which themselves share a relatively high degree of consistency with that location's current specialization process.

Location-specific advantages are of various natures. The manner in which they are organized and the extent to which they impact MNEs' motivations in a certain way indicate that the dominant strategy adopted by those MNEs is correlated to distinctive location-specific advantages and to the corresponding typologies. Each country is composed of assets that are not evenly spread across its territory (Dunning, 2000b, p. 175, p. 178). Hence, "both nation states and sub-national authorities are becoming more aware of the need to provide the appropriate economic and social infrastructure, both for their own firms to generate the O specific assets consistent with the demands of world markets, and for foreign investors to engage in the kind of value adding activities which advance[s] the dynamic comparative advantage of the immobile assets within their jurisdiction" (Dunning, 2000b, p. 178). Consequently, in terms of location competitiveness, the industrial composition of specific locations will influence the nature and typology of the strategies enforced by MNEs. This composition is dynamic and is intrinsically related to the presence of clusters, which in return benefit from FDI (Dunning, 1998). In terms of attractiveness of location, Dunning observes that "contemporary economic events are suggesting that the nature and composition of a country and/or a location's comparative advantage, which has been traditionally based on its possession of a unique set of immobile natural resources and capabilities, is now more geared to its ability to offer a distinctive and non-imitable set of location bound created assets, including the presence of indigenous firms with which foreign MNEs might form alliances to complement their own core competencies" (Dunning, 2000b, p. 178). Indeed, a location should be able to offer a systemic yet unique value proposition to the firms located there and to the potential MNEs that intend to locate value-adding activities elsewhere in order to augment their ownership advantages. This conclusion is fundamentally complementary to that of Porter (1990a, 1998). However, Dunning's investigation of tangible and intangible assets of created and inherited assets (Dunning, 2000b) allows a deeper understanding of the systemic functioning of the "set of location bound created assets" (Dunning, 2000b, p. 178), which is noticeably related to the dynamic sequences leading to enhanced levels of regional competitiveness.

Whereas a location should aim to offer a unique "set of location bound created assets" (Dunning, 2000b, p. 178), Dunning determines the generic factors of location-specific advantages that are decisive while evaluating the level of competitiveness of a given territory, such as 1) the quality of the "transport and communication infrastructure"; 2) the tax policy and the related "incentives"; 3) the government policy, notably in terms of business regulations and "investment incentives"; and 4) the "economies of product or process specialization and concentration", or more generally "a favorable business environment" (Dunning and Lundan, 2008, pp. 104-105). Once again, those factors reflect Porter's theory, as specific factors are indeed decisive for a location to build a strong and sustainable competitive advantage relative to other locations.

Regarding the location-specific determinants of a host country's ability to attract foreign direct investment, Dunning (Dunning and Lundan, 2008, p. 324) considers that the "task of national governments is to ensure that the macro- and micro-incentive structures of the society, and its constituent wealth-creating entities, are best able to create organize effectively and utilize the resources, capabilities and markets available to them, while promoting its own long-term economic and social goals" (Dunning and Lundan, 2008, pp. 324-326). Those structures and determinants of FDI are not homogeneously distributed over a territory. The distribution results from numerous quantitative measures, such as the size and localization of that territory, but also from qualitative considerations, such as the structures of public authorities and the level of governmental centralization. Whereas some determinants of foreign direct investment are more likely to be the results of and/or influenced by national governments (i.e., "trade policy", "competition policy", "private property protection", "bilateral international investment agreements" or "policies on functioning and structure markets" (Dunning and Lundan, 2008, p. 325)), regional and/or local structures of governance also have a decisive influence on those determinants (i.e., "social amenities", "land and building costs", "physical infrastructure", "investment incentives and performance requirements", "development of competitive clusters", or "industrial and regional policies" (Dunning and Lundan, 2008, p. 325)). Moreover, those regional and local structures of governance potentially foster their location attractiveness to foreign direct investment if they are engaged in competition within the national territory and with territories located elsewhere.

Regarding location-specific determinants, Dunning (Dunning, 1981; Dunning and Lundan, 2008) also considers the increasing role of location-bound institutions in light of more recent multinational enterprises' localization behaviours (Dunning and Lundan, 2008, p. 326). Hence, governments at all levels are co-responsible for the "provision or upgrading of a range of institutions necessary to supplement, by way of imports, foreign direct investments and cross-border alliances, the capabilities and resources of foreign firms" (Dunning and Lundan, 2008, p. 326). This results from the "increasing complexity of cross-border economic transactions, and the new emphasis in the social goals of developments" (Dunning and Lundan, 2008, p. 326). Consequently, recent developments in terms of cross-border economic transactions not only foster the importance of those location-bound institutions but also suggest a growing need for greater collaboration between them and MNEs. According to Dunning (Dunning, 1981; Dunning and Lundan, 2008), location-bound institutions can be identified relatively broadly, notably because they can be active at the national level as well as at the local/regional level. For example, some local/regional institutions in conjunction with local governments can set up a range of tools to improve "investment promotion policies" (Dunning and Lundan, 2008, p. 326). As indicated above, the quantity of attributions embodied by those institutions as well as the extent to which they are able to positively influence the determinants of foreign direct investment is closely related to the political structures of the territories in which they are active.

We shall further consider the role of governments in policies directly affecting the level and nature of inward direct investment. Governments at the national level as well as at the local and/or regional levels, depending on the corresponding political structures, can potentially apply numerous policies that may be attributed to four categories: 1) those related to "the conditions of entry or setting up of a foreign affiliate" (Dunning and Lundan, 2008, p. 681), 2) those related to "the operating requirements demanded or expected of foreign-owned affiliates" (Dunning and Lundan, 2008, p. 681), 3) those related to "the conditions for exit of foreign investors" (Dunning and Lundan, 2008, p. 681), and 4) those encompassing "the other three" but considering more specifically "the most cost-effective way of attracting inbound direct investment" (Dunning and Lundan, 2008, p. 681).

These policies supposedly generate three broad types of investment incentives: 1) fiscal incentives, 2) financial incentives, and 3) incentives not elsewhere classified (Dunning and Lundan, 2008, pp. 682-683). These incentives are of very different natures and tend to impact the overall aggregation of policies as a result of numerous other factors, such as 1) the weight of each broad type of investment incentive in the overall governmental strategy, 2) the level of governance developing and applying the investment incentives, and 3) the agglomeration level of the specific types of investment incentives selected by the corresponding government.

Many investment incentives are likely to be executed at the regional/local levels, such as 1) "corporate income tax deductions based on, for example, expenditures relating to marketing and promotional activities"; 2) "deductions from taxable earnings based on the number of employees or on other labor-related expenditures"; 3) "loan guaranties"; 4) "publicly founded venture capital participating in investments involving high commercial risks"; 5) "subsidized dedicated infrastructure"; and 6) "subsidized services" (Dunning and Lundan, 2008, pp. 682-683). These examples also illustrate the fact that investment incentives somehow reflect the strategy of a local/regional government or the relative absence of one. The corresponding strategy usually includes a range of investment incentives that are executed with varying intensities. The overall configuration of the selected investment incentives also indicates the general direction a local/regional government is willing to take. Some local/regional governments are more likely to conduct a strategy mainly based on subsidies, whereas others might choose a strategy relying primarily on tax deductions. Other might also choose a strategy based on the absence of any intervention, thus "involving encouragement of both inward and outward investment, with few performance requirements or institutional controls imposed on investors" (Dunning and Lundan, 2008, p. 690).

Whereas investment incentives are essential in attracting *inter alia* foreign direct investment, Dunning (Dunning, 1981; Dunning and Lundan, 2008) insists that they are much more likely to have an actual impact on locational competitiveness if they are coordinated with other policies that might not produce "immediate results" (Dunning and Lundan, 2008, p. 687), such as the relative quality of "educational facilities or physical infrastructure" (Dunning and Lundan, 2008, p. 687). If a local/regional government's strategy relies exclusively on investment incentives defined as such by Dunning, there is a strong risk that the corresponding territory will attract only firms "less committed to the region" (Dunning and Lundan, 2008, p. 687) and therefore more likely to leave that territory if relatively minor changes were to be implemented within the range of the investment incentives. If amplified, this dynamic might have a negative impact on both the governmental strategic responses and the relative stability of the economic environment of the corresponding territory.

In conclusion, Dunning's eclectic paradigm (Dunning, 1981, 1988a) constitutes a robust framework from which we can more easily understand the main issues related to multinational enterprises' behaviours and more specifically those related to the localization choices of foreign value-adding activities. In this regard, the economic, institutional and culture-specific characteristics of the location in which those foreign value-adding activities take place and the ability of that location to sustain and improve those characteristics are closely related to the corresponding location's overall endowments and, to a certain extent, to the level of efficiency of governmental policies at local, regional and national levels. Most importantly, in this section, location advantages decisively impact MNEs' strategies for their localization choices and entry-mode choices. Foreign territories are more likely to attract FDI (i.e.) if they are able to offer the most appropriate set of location-based advantages, such as high-skilled labour or efficient institutions for collaboration. As an economy evolves progressively into a knowledge-based economy, the set of location-based advantages is modified and therefore influences MNEs' behaviours correspondingly.

Dunning lays the foundation for understanding MNEs' behaviours and provides some insights into the role of sub-national territories in attracting and sustaining foreign value-adding activities. The importance of the sub-national perspective will be further developed in the following section.

3.1.1.3 MNEs and the spatial distribution of economic activities

The competitiveness of location implies considering various geographical levels of analysis that influence MNEs' strategies for their localization choices and entry-mode choices. A country potentially contains various location-specific advantages that are relatively evenly distributed within its borders. However, territories constituting one nation also offer potentially distinctive location-specific advantages that have an impact on the "spatial distribution of economic activity" (Dunning, 2000a, p. 1) and *vice versa*. Agglomeration forces influence this distribution, particularly so as globalization proceeds and as the knowledge-based economy occupies an increasing proportion of all economic activities (Dunning, 2000a, p. 1). Indeed, "the emergence of the knowledge-based global economy and asset augmenting FDI is compelling scholars to take a more dynamic approach to both the logistics of the siting of corporate activities, and to the competitive advantages of nations and/or regions" (Dunning, 2000b, p. 175). In other words, knowledge-based activities are more likely to generate relatively higher value than other activities and therefore contribute more to the economic performance of the location in which the firms are located, thus improving the corresponding competitiveness level. However, in return, the relatively higher levels of the competitiveness of sub-national competing entities might also consecutively influence MNEs' behaviours abroad. Therefore, it is also of great interest to investigate the "dynamic aspects of competition among microregions" (Dunning, 2000a).

In "Regions, Globalization, and the Knowledge Economy: The Issues Stated" (2000a), edited by Dunning, the contributors focus their analysis on the "impact of the increasing globalization of economic activity, and the advent of the knowledge-based economy, on the spatial distribution of economic activity, both between countries and within countries" (Dunning, 2000a, p. 1). This volume elaborates more specifically on one of the main issues addressed by Dunning in his previous work: the location-specific determinants of a host country's ability to attract foreign direct investment in light of the "advent of the knowledge-based economy" (Dunning, 2000a, p. 1). This section is specifically dedicated to the following issues: 1) the effect of globalization on the distribution of wealth-creating activities (Dunning, 2000a) and 2) the conceptualization of a regional policy that allows the improvement of a territory's prosperity in consideration of the "dynamic aspects of competition among microregions" (Dunning, 2000a).

According to Dunning, "intangible created assets" (Dunning, 2000a, p. 8) constitute the "main source of wealth in market economies" in the OECD countries, and this share is still increasing. These intangible created assets result notably from the efficient management of human capital, and particularly of intellectual capital (Dunning, 2000a,

p. 9). Intellectual capital is noticeably not comparable with “other forms of capital” (Dunning, 2000a, p. 9) because it is the appropriate addition and composition of knowledge units that allow the profitable production of a good or a service. The nature of intangible created assets and the correlated extensive use of intellectual capital in addition to the still growing openness of most countries (Dunning, 2000a, p. 11) engender a “cross-border augmentation of assets as an important instrument for increasing economic well-being” (Dunning, 2000a, p. 9). Intuitively, those factors could imaginably lead to either the dispersion or the concentration of production, whether or not it is highly knowledge intensive in relative terms.

Dunning discerns two broad tendencies resulting from globalizing forces: 1) “the dispersion of knowledge-intensive production between and within countries” and 2) “a concentration of such production in particular countries, and in microregions within those countries, in which case economic structures of the countries and microregions will tend to diverge from, rather than converge with, each other” (Dunning, 2000a, p. 16). The growing share of knowledge-intensive production relative to other types of production tends to foster specialization processes and therefore the clustering of highly specialized industrial activities in specific locations (Dunning, 2000a, p. 16). This scheme mostly rejoins Porter’s cluster theory even though the concept of traded industry goes beyond the definition of knowledge-intensive production.

According to Dunning, “this observation is consistent with the growing sophistication of both intra-industry and FDI between countries and/or microregions” (Dunning, 2000a, p. 16). Moreover, the profits generated by the concentration of knowledge-intensive production are highly activity-specific and/or industry-specific. For example, some industries tend to work with highly integrated value chains, whereas others rely more on firm interdependency. The growing share of knowledge-intensive production necessitates the clustering of knowledge spillovers; in addition, “the increasing mobility of firms-specific assets and the growing complementarity between different kinds of technology has fostered more diversity of economic activity” (Dunning, 2000a, p. 17). Such diversity also leads to highly specialized processes, often fostering agglomeration forces of economic activity.

As indicated above, MNEs play a very specific role in the localization processes of economic activity, notably because they own and/or control "value-added activities in a large number of countries and do so via both FDI and cross-border alliances" (Dunning, 2000a, p. 17). This stylized fact has numerous implications for country and sub-national governing authorities as well as public, para-public and/or private institutions (e.g., trade associations) of which the major aim is to attract and maintain value-adding activities in their corresponding territories to build a strong and sustainable competitive advantage relative to other countries/sub-national territories.

Obviously, MNEs with different "types of governance structures" (Dunning, 2000a, p. 17) can be globally or regionally integrated (Dunning, 2000a, p. 18) and promote distinctive kinds of specialization (Dunning, 2000a, p. 19). All these features impact the spatial concentration of MNEs' activities as they "are conducting a rising proportion of their value-added activities outside their home countries and also in more countries" (Dunning, 2000a, p. 21). Hence, the goal is to locate those activities in the locations where the correlated affiliates tend to be increasingly connected to the advantages related to those locations. Interestingly, those affiliates' location-specific advantages help to "foster the dispersion of at least some kinds of intellectual capital" (Dunning, 2000a, p. 21). Otherwise, the increasing share of the knowledge-based economy, especially in the so-called developed economies, leads to the rising "spatial costs of related economic transactions" (Dunning, 2000a, p. 21). Hence, "MNEs and affiliates are being increasingly drawn to a network of sticky places for their wealth-creating activities" (Dunning, 2000a, p. 21). Dunning considers that those schemes do not constitute a paradox *per se*, as globalization actually leads to more spatial clustering. This is due to the specific governance structures of MNEs and to their location choices being determined mainly on the basis of "their capabilities to harness and utilize resources, capabilities, and markets from throughout the world" (Dunning, 2000a, p. 21). Consequently, according to Dunning, *ceteris paribus*, the globalization of economic activities and the growing share of the knowledge-based economy tend to foster the clustering of economic activities in locations where MNEs are encouraged "to locate their R&D and production units in a geographical area large enough to accommodate a concentrated nexus of competitors, suppliers, competitors, customers, and/or firms using common support services, but small enough to maximize the benefits of 'untradable independencies'" (Dunning, 2000a, p. 21). In this regard, Dunning's analysis of agglomeration forces is consistent with that of Porter if we consider the virtuous circle of location attractiveness from the same angle. That angle, however, and the delimitation of the causes of location attractiveness and the related consequences remain difficult.

Both authors recognize the conspicuous role played by sub-national territories "as spatial entities" (Dunning, 2000a, p. 22) and their correlated governance structures. Indeed, the "growing mobility of firm-specific core competencies" (Dunning, 2000a, p. 29) implies that sub-national governing authorities should adopt an adequate strategy in order not only to build a strong and sustainable competitive advantage but also to set the appropriate range of "location-bound complementary assets to attract the right kind of mobile investment" (Dunning, 2000a, p. 29).

The governmental authorities of sub-national territories are in competition with each other, and the notably increasing mobility of investment works as a competition enhancer. Therefore, the governmental authorities of sub-national territories need to build a unique competitive advantage that relies on "a unique set of spatially fixed competitive advantages, which are either customized to their individual need or are not easily imitated by other regional governments" (Dunning, 2000a, p. 23). This stylized fact rejoins Porter's analysis in implying the enforcement of specific cluster policies by local governments. It further implies that those local governments, in partnership with local institutions, need to set up a business environment "in which mobile investors can accumulate resources and capabilities, yet from which they may find it difficult to exit" (Dunning, 2000a, p. 24).

For that matter, the upgrade of local capabilities and resources depends on the agglomeration forces shaping the distribution of economic activities, "asset-augmentation activities" and "asset-exploiting activities" (Dunning, 2000a, p. 24). Similarly, numerous other scholars consider that spatial clusters should be regarded as strategic priorities by local governments. According to Dunning, the corresponding policies should be adjusted in accordance with numerous factors that may vary extensively since spatial clusters are of different "scope, density, pattern of activities, growth potential, innovatory capacity, and governance structures" (Dunning, 2000a, p. 24). Dunning identifies several kinds of clusters and concludes that MNEs are often "most active in clusters involving below average knowledge-intensive activities" in the case of "asset-exploiting activities" (Dunning, 2000a, pp. 28-29), whereas in the case of "asset-augmenting FDI", MNEs "are increasingly gravitating to above average knowledge-intensive activities" (Dunning, 2000a, p. 29).

In conclusion, Dunning highlights two decisive consequences of globalization for the spatial distribution of value-added activities: 1) the "locational strategy" of MNEs has a growing impact on their global competitive advantage (Dunning, 2000a, p. 29), and 2) the increasing mobility of "firm-specific core competencies" (Dunning, 2000a, p. 29) correlated with the corresponding locational strategy implies that sub-national governmental authorities are playing a greater role in ensuring "the availability and quality of location-bound complementary assets to attract the right kind of mobile investment" (Dunning, 2000a, p. 29).

In relation to the growing responsibility of local authorities in ensuring "the availability and quality of location-bound complementary assets" (Dunning, 2000a, p. 29), Dunning lays the foundation for a theory of regional policy in light of the effects of globalization on the distribution of economic activity, notably that of MNEs. The nomenclature of what constitutes a sub-national territory and the extent to which local authorities are able and allowed to implement a specific policy varies considerably among countries and/or among political and economic unions. To distinguish the sub-national territories that are allowed and able to implement an economic policy from those that cannot, Gray and Dunning consider that "an economic policy can only be formulated by units which have the ability to tax (i.e. to generate revenues) to fund financial incentives, and the legal authority to initiate and implement a variety of measures affecting the creation, utilization, and geographical distribution of resources" (Gray and Dunning, 1999, pp. 410-411). This relatively narrow definition of the prerequisites necessary for the implementation of such sub-national policy allows 1) reliable comparisons between sub-national territories, 2) the formulation of comparable and realistic policy measures, and 3) the formulation of comparable and significant objectives to be achieved.

All locations possess attributes that are inherited from a period of time when non-traded industries constituted a greater share of the overall economic structure than they usually do today. The tendency is for the share of created assets to increase, and those assets are spatially more mobile, as indicated above. The inherited attributes "include resources, capabilities, institutions, and a set of policies, as well as a population of enterprises whose competitiveness rests on the possession of a portfolio of proprietary intangible assets which, in the main, are usable in different locations" (Gray and Dunning, 1999, p. 413). Hence, all locations are not equal in terms of compatibility between their attributes and the needs of investing firms 1) in general and 2) in relation to the specificities of an industry and/or a certain range of industries (Gray and Dunning, 1999, p. 413). Moreover, the attractiveness of a specific location will also depend on the ability of the local government to present its specific attributes in way that fosters the location-based attractiveness of "value-adding activities of a specific investment" (Gray and Dunning, 1999, p. 413).

Gray and Dunning organize these attributes in 5 distinctive categories: 1) "the resource base of the regional economy", that is, "the accumulation of both natural and created assets" (Gray and Dunning, 1999, p. 413), which are predominantly inherited from previous economic periods; 2) "the efficiency of upstream and downstream industries", that is, "the ease with which information can be transferred and intermediate goods can be traded within the region" (Gray and Dunning, 1999, pp. 413-414); 3) the Porterian "characteristics of demand", that is, the extent to which "the business and consumer cultures, and levels of industrialization" (Gray and Dunning, 1999, p. 414) impact the local demand; 4) "the contribution of the region to managerial efficiency", that is, I) the extent to which "rivalry among the competing firms in the region (…) promotes the region's competitive advantage" (Gray and Dunning, 1999, pp. 414-415) and II) the extent to which "institutional infrastructures" (Gray and Dunning, 1999, p. 415) are available and consistent with the needs of the firms located on the corresponding location; and 5) "the commercial environment", that is, "the setting in which business operates" (Gray and Dunning, 1999, p. 415).

The nature of these attributes and their share relative to the others logically lead local governments to determine a specific set of instruments, with correlated effects potentially occurring at different periods of time. Moreover, "each investment project will have its own set of requirements, and the attractiveness of a particular location essentially rests on the degree to which the needs of the project are compatible with the attributes of regions" (Gray and Dunning, 1999, pp. 416-417). The "characteristics of the incoming investment" (Gray and Dunning, 1999, p. 417) also have an impact on the effectiveness of a location's set of attributes, as "the more specific the requirements of the project, the less is the scope for regional policy" (Gray and Dunning, 1999, p. 417). This rejoins Porter's cluster theory, as highly specialized clusters tend to attract firms from abroad for reasons that are not necessarily related to tax burden only.

Taking into consideration the attributes defined above and their varying influence on the potential incoming investments, Gray and Dunning determine 4 broad inferences: 1) "the absolute attractiveness of any region derives from the (relative) *goodness of fit* between the region's attributes, (…), and the requirements of the investing firm" (Gray and Dunning, 1999, p. 419); 2) "the ability of a subnational government will inevitably be limited by the economic measure and the social environment created by the national government and/or macroregion" (Gray and Dunning, 1999, p. 419); 3) "a sub-national government, (…), can either improve the business friendliness of the commercial environment of the special domain for which it is responsible (…) and/or focus its attention more narrowly on making its indigenous resources and capabilities more effective for a particular kind of investment or, more probably, an individual project" (Gray and Dunning, 1999, p. 419); and 4) "given the potential importance of project-specific measures, the operational efficiency of the policy-making division of the regional government can be vital" (Gray and Dunning, 1999, p. 420).

The increase in future gross regional product (GRP)/capita and consequently of gross domestic product (GDP)/capita as exclusive objectives of local and national governments is not satisfactory. To create a "virtuous circle of growth" (Gray and Dunning, 1999, p. 420), which leads to the improvement of the corresponding location's competitiveness level, local authorities need to set adequate policy measures that are coordinated with those of the corresponding national governments. The weighing of those policy measures and the level of governance at which they are enforced will deeply impact the increase in

GRP/capita as well as the distribution of that increase among the corresponding territory's population.

However, as indicated above, the influence of sub-national and national policy measures on the ability of a territory to attract and preserve foreign investment depends, among other factors, on the knowledge intensity of that investment. Highly knowledge-intensive investments tend to be relatively mobile and therefore less attracted by generic policy measures designed to attract foreign investment. For example, "highly technology-reliant investments are likely to be drawn to areas in which a suitable cluster of related firms exists and in which industry-specific infrastructure (physical and technological) is in ample supply" (Gray and Dunning, 1999, p. 422). Once again, this rejoins Porter's cluster theory and implies that the territories in which knowledge-intensive activities are accountable for a relatively important share of the overall economic performance are more likely to improve their competitiveness by setting policy measures that do not prioritize attracting efficiency-seeking mobile investment but rather seek to foster the competitive advantage of the existing clusters located in those territories. This analysis does not imply that local governments are not strongly encouraged to create an attractive overall business environment for all firms located in their territories or that the macroeconomic endowments do not substantially impact those territories' ability to attract knowledge-intensive investments.

Obviously, the level of consistency between the competitiveness policies of locations and the existing needs and future needs of investment projects are dynamic and may vary over time (Gray and Dunning, 1999, pp. 422-424). Consequently, local governments must try to anticipate potential technological changes and/or policy adjustments introduced by competing locations in order to maximize the effects of policies implemented in *t* and/or in *t+1*. The increase in spatial mobility and the growing share of "created knowledge-intensive assets" (Gray and Dunning, 1999, p. 423) require the elaboration of evolutionary strategies by local governments. These strategies should also consider the dynamics of clusters' life cycles.

In conclusion, Gray and Dunning insist that location economic performance is particularly and positively influenced by "the existence of a good resource base of immobile assets, the existence of clusters of technology-related activities, and the degree of fiscal comfort which allows microregional government to supply the necessary support services for continued growth" (Gray and Dunning, 1999, p. 427). As indicated above, the level of competitiveness of MNEs is strongly influenced by the competitive advantages of the sub-national territories in which they operate even though the relative costs of spatial mobility are decreasing.

3.1.1.4 The concept of location-specific advantages in relation to location competitiveness: concluding remarks

Dunning's eclectic paradigm (1981, 1988a) constitutes a general framework that is widely used in the analysis of international business behaviour. It seeks to understand the broad tenets determining the willingness and capability of a firm to initiate foreign production and therefore constitutes a relevant tool for capturing the performance of those activities in t and/or in $t+1$. To do so, Dunning determines three main advantages (ownership-specific, location-specific, and internalization-specific advantages) that are not evenly spread across territories (Dunning, 1981, 1988a; Dunning and Lundan, 2008, pp. 101-102) and differ significantly across industries and firms (Dunning, 2001, p. 176).

The force of the impact of locations and of their local governments and institutions on location-specific advantages is correlated with both endogenous and exogenous factors, such as 1) the political structure of governance; 2) the level of economic development, notably in terms of industrial structure; 3) the state of cluster development; 4) the level of competition between geographically concentrated locations and/or between the locations of comparable industrial structures; 5) the level of congruity between the corresponding forms of foreign direct investment and local economic endowments; and 6) the level of congruity between the corresponding forms of foreign direct investment and regional, macro-regional and national competitiveness policies.

Prominent scholar Alan M. Rugman argues that Dunning's OLI paradigm overdetermines the three major "motives for FDIs" (Rugman, 2010, p. 2). Regarding location advantages, Rugman considers Dunning's definition broad in relative terms, as it includes "market size, natural resources, aspects of the infrastructure, the education system, governance structures, and other aspects of political and government activity" (Rugman, 2010, pp. 2-3). Consequently, it can be difficult to distinguish certain ownership advantages from certain location advantages. Regarding internalization advantages, Rugman argues that they are "clearly strongly linked to O advantages. Indeed, without the institutional form of the MNE, it is difficult to see how O advantages could exist on their own without being owned (internalized) by the firm. In their essence, intangible knowledge assets are an example of the firm replacing the market" (Rugman, 2010, p. 3). Consequently, the next section covers Rugman's conceptualization of internalization theory as well as the firm-specific advantages (FSAs) and home country-specific advantages (CSAs) framework.

3.1.2 The concept of country-specific advantages developed by Rugman

Alan Rugman offers a complementary approach to location competitiveness in international business and, more specifically, emphasizes the role of home locations in firms' internalization capabilities. Rugman (1981, 1985, 2005a, 2005b, 2010) is a leading academic figure in the conceptualization of the internalization theory of MNEs (Buckley, 2016). As indicated above, Rugman expresses various criticisms of Dunning's OLI paradigm before reconciling his approach with Dunning's at the end of his academic career. Nevertheless, his seminal work on internalization theory in "Inside the Multinationals" (Rugman, 1981) offers a somewhat different approach to market imperfection and FDI drivers.

This section first reviews Rugman's early developments of internalization theory (1981). Second, it presents his later country-specific advantages and firm-specific advantages (CSAs and FSAs) matrix and its implications for the localization processes of MNEs and the correlated effects on location competitiveness.

3.1.2.1 Internalization theory from a location-bound perspective

The capabilities of a firm to internalize and/or to augment its competitive advantages are intrinsically related to the comparative advantages of the home location. Hence, location competitiveness plays a crucial role in these capabilities. Indeed, Rugman argues that "the location economics approach to FDI can also be regarded as an aspect of internalization" (Rugman, 1981, p. 48). Spatial cost savings may vary notably as a function of the type(s) of activities constituting the business portfolio of an MNE. Hence, a market-oriented MNE may rely more on location economics than an MNE active in industries in which transport costs play a less significant role (Rugman, 1981, p. 48).

In "Inside the Multinationals" (Rugman, 1981), following pioneering scholars on the subject such as Hymer (1970, 1971, 1972) and Buckley and Casson (1976), Rugman's approach to internalization theory focuses on knowledge, as "the MNE can overcome an exogenous market imperfection governing the production of knowledge or another intermediate good by internalizing this externality. In a similar vein, the concept of internalization can be applied to other areas of market imperfection, including those in international good, labor and capital markets" (Rugman, 1981, p. 50). Moreover, those market imperfections are mostly the results of public policies and of governmental interventions "such as tariffs, taxes and controls on international capital" (Rugman, 1981, p. 51). Hence, according to Rugman, "the MNE is both a victim of external market imperfections" in the host countries (Rugman, 1981, p. 51) "and a villain in seeking to retain them" in the home country (Rugman, 1981, p. 51). In other words, an MNE seeks an appropriate synergy between location competitiveness and its own competitive advantages.

More generally, Rugman argues that the localization process can be considered "an aspect of internationalization" (Rugman, 1981, p. 48). Whereas authors such as Krugman build models based on hypothetical cases (1991, 1995), Rugman insists on the intrinsic firm-specific justification for international activity. However, he considers that "the sourcing of production by the MNE to service its foreign markets is often determined by location economics" (Rugman, 1981, p. 48). Hence, Rugman indirectly recognizes that the internal market influences MNEs' knowledge and ultimately their firm-specific advantages. To a certain extent, that assertion rejoins Porter's later work on the impact of the demand condition on competitive advantage, as the latter depends *inter alia* on "the mechanisms by which a nation's domestic preferences are transmitted to foreign markets" (Porter, 1990a, p. 86). If "the MNE is always a creature of internalization" (Rugman, 1981, p. 48), its ability to engage in this process is fundamentally related to location-bound factors constituting a specific institutional and business environment. Hence, home location is crucial for an MNE.

From the internalization theory point of view, host developed countries fundamentally benefit from the localized operation of foreign-based MNEs. In other words, protectionist regulations against foreign MNEs lead to the perpetuation of "regional inequalities" (Rugman, 1981, p. 135). Moreover, protectionist measures such as relatively high tariffs act "as an inducement to foreign direct investment" from the territory in which these protectionist measures are applied to more free-trade-friendly territories (Rugman, 1981, p. 135). Indeed, since the export mode has relatively high costs, MNEs tend "to go the subsidiary route" (Rugman, 1981, p. 135), reinforcing the actual tendency for foreign ownership instead of protecting domestic production. Furthermore, protectionist measures usually fail to foresee the overall scope of operational prospects such as licensing agreements and/or joint ventures at the disposal of MNEs (Rugman, 1981, p. 135). Indeed, by implementing protectionist measures, public authorities tend to emphasize the vicious circle that leads to the weakening of the competitive advantages of local production. Hence, as competitiveness of location includes a legal assessment of business-specific rulings, the minimization of protectionist measures should potentially engender location-bound advantages. However, the opposite might also occur. Indeed, if country *a* has relatively high trade tariffs and relatively high import quotas, a firm coming from country *b* might be encouraged to locate part of its corresponding production in country *a*. This contingency relies on the fact that trade should not be confused with FDI *per se*.

In conclusion, Rugman's development of internalization theory allows firm- and micro-based analyses of MNEs' operational developments and entry-mode strategies. It relies on the assumption that MNEs respond to market imperfections, which lead to the reinforcement of internationalization forces. Therefore, public authorities are strongly encouraged to seek free trade strategies and reduce all forms of transaction costs instead of using interventionist tools to protect their markets. Whereas "Inside the Multinationals" (1981) insists on the intrinsic relevance of firm-specific advantages, it lacks an in-depth understanding of location-specific advantages, which may be at the core of MNEs' capabilities. Interestingly, Rugman indicates in his conclusions that country-specific advantages are inter-related with firm-specific advantages in knowledge-based industries (Rugman, 1981, pp. 159-160). For example, the author considers that "the firm specific advantage of the US-based MNE in knowledge (and especially in its technological components) is best utilized by its internal market. Yet the internal market of the MNE is not one-dimensional. The other attributes of internalization permit the MNE to work a two-way flow of information within itself" (Rugman, 1981, pp. 159-160). Indeed, the quality of local demand also impacts internationalization processes, and even more so in knowledge-based industries. This inter-relation constitutes the core of Rugman's later contributions and the basis for the country-specific advantages and firm-specific advantages (CSAs and FSAs) matrix analysed hereafter.

3.1.2.2 The country-specific advantages and firm-specific advantages (CSAs and FSAs) matrix in relation to location competitiveness

The options of an MNE to establish a unique strategic space most often rely on the interactions between firm-specific advantages and country-specific advantages (Rugman, 2009, p. 51). A firm-specific advantage is defined as "a unique capability proprietary to the organization" (Rugman, 2009, p. 50). In other words, it can be related to value chain-based innovative strategies, optimized technological processes, enhanced marketing and/or distributional skills, etc. (Rugman, 2009, p. 50). As for a country-specific advantage, it "can be based on natural resource endowments (mineral, energy, forests) or on the labour force and associated cultural factors" (Rugman, 2009, p. 50).

Those broad advantages need further analysis. The sources of an MNE's firm-specific advantages "are based ultimately on its internalization of an asset, such as production knowledge, managerial or marketing capabilities, over which the firm has proprietary control" (Rugman, 2009, p. 51). They are indeed intrinsically related to the specificities of a firm and can be location and non-location bound. However, location-bound FSAs are distinct from CSAs, as the latter are of a more general nature. Indeed, "the CSAs form the basis of the global platform from which the multinational firm derives a "home-base 'diamond' advantage in global competition" (Rugman, 2009, p. 51). Hence, an MNE has the potential to build FSAs on the basis of competitive home or host CSAs, therefore reshaping its strategic position as the relative share of each type of advantage constantly evolves. From this perspective, CSAs in many ways rejoin Porter's analysis of fundamental endowments on which a firm can build and sustain a competitive advantage.

Notably, for this reason, Rugman and D'Cruz elaborated on Porter's diamond framework by developing the "double diamond model" (Rugman and D'Cruz, 1993, pp. 17-39).

An MNE is composed of various CSAs and FSAs, each of relative strength, on the basis of which the potential strategic options are defined (Rugman, 2009, p. 51). Rugman's CSA-FSA matrix allows the analysis of the strategic position of an MNE, as "the strengths" or "weaknesses" of FSAs and CSAs constitute a relative notion, depending on the relevant market and on the CSAs and FSAs of potential competitors. "A strong FSA implies that if the CSAs are identical, a firm has a potential competitive advantage over its rivals" (Rugman, 2009, p. 51). Therefore, we intuitively understand that strong CSAs are not guarantees *per se* of potential competitive advantages and that strong sub-national fundamental endowments constitute part of a territory's ability not only to foster locally based traded firms to build a sustainable competitive advantage but also to attract new firms and/or units of foreign-based firms.

The CSA-FSA matrix consists of four quadrants covering four broad strategic positions with the relative weight of each varying: 1) relatively strong country-specific advantages but relatively weak firm-specific advantages, 2) relatively weak country-specific advantages and relatively weak firm-specific advantages, 3) relatively strong country-specific advantages and relatively strong firm-specific advantages, and 4) relatively weak country-specific advantages but relatively strong firm-specific advantages (Rugman, 2009, p. 51).

Firms positioned in quadrants 2 and 3 face opposite yet relatively straightforward strategic choices. Firms positioned in quadrant 3 "can benefit from strategies of both low cost and differentiation" (Rugman, 2009, p. 52), whereas for the firms positioned in quadrant 2, "there is no alternative but to restructure or to eventually leave the market" (Rugman, 2009, p. 52). Obviously, quadrants 1 and 4 necessitate a deeper analysis. Firms positioned in quadrant 1 are often identified as "mature" and rely mostly on strong CSAs. Therefore, there is potential for strategic improvement, notably by "increasing value added though vertical integration" (Rugman, 2009, p. 52), allowing the corresponding firm to relocate itself in quadrant 3. Firms positioned in quadrant 4 are "generally differentiated firms with strong FSAs in marketing and customization" (Rugman, 2009,

p. 52). Therefore, “in world markets the home-country CSAs are not essential in the long run”, and “these firms are following low-cost and price-competition strategies” (Rugman, 2009, p. 52).

The CSA-FSA framework can be applied from the perspective of location competitiveness. Indeed, the CSA-FSA framework can be used not only at the firm level, as indicated above, but also as a “public policy tool” (Rugman and Verbeke, 2001b, p. 161). The framework is pertinent “at the level of cross-country analyses, whereby a country’s relative attractiveness *vis-a-vis* other countries can be described in terms of on the one hand general location parameters (in system) and on the other hand characteristics of the ‘average’ firms” (Rugman and Verbeke, 2001b, p. 161). FSAs are also affected by sub-national location advantages (Rugman and Oh, 2013, p. 464). Indeed, “MNEs reduce their foreignness and risks in their home region”. For that matter, demand conditions, as investigated by Porter (1990a, 2008), have a great influence on MNEs’ strategic orientation. MNE localization processes respond to relatively regionalized factors (Rugman and Oh, 2013, p. 466). Hence, sub-national discrepancies in location advantages are notably correlated with “the costs of distance and benefits of formal and informal integration” (Rugman and Oh, 2013, p. 467), which constitute one of the explanatory variables of sub-national disparities between locations in terms of competitiveness. These costs can be related to geographical distances but also to cultural distances (Morschett, Schramm-Klein and Swoboda, 2010; Ghemawat, 2007). The later Uppsala model of internationalization developed by Johanson and Vahlne (1977) constitutes the basis of internalization processes, notably in relation to psychic distance, which comprises “business practices, culture, and industrial development” (Johanson and Vahlne, 1977, p. 24). Thus, distance should be understood in both material and immaterial terms.

The development of intra-firm relationships and inter-firm cooperative agreements is also driven by agglomeration processes, particularly in activities where knowledge is a key wealth-creating asset (Rugman and Verbeke, 2001b, p. 162). For example, “localized networks of related and supporting activities act as an agglomeration magnet on FDI” (Rugman and Verbeke, 2001b, pp. 162-163). This conclusion rejoins Porter’s assertion that the state of cluster development and the level of competitiveness of that cluster also impact existing and/or potential FDI. Rugman and Verbeke also recognize that “the location distribution of foreign owned and domestically owned production operations is (not) necessarily the same" (Rugman and Verbeke, 2001b, p. 163).

Along with Krugman's forces leading to either the dispersion or concentration of economic activities at various levels and with the importance of knowledge spillovers, Rugman and Verbeke insist on the impact of MNEs' behaviours on FDI concentration/dispersion (Rugman and Verbeke, 2001b, p. 164). Indeed, "agglomeration economies and spillover effects only arise over time and are created through a process of cumulative causation. It is a self-reinforcing set of firm level actions that largely contributes to the spatial concentration of industries and the creation of specialized geographic areas" (Rugman and Verbeke, 2001b, p. 164). Once again, from this conclusion arises the conceptual questioning related to self-reinforcing actions. Even if the "self-reinforcing set of firm level actions (…) largely contributes to the spatial concentration of industries and the creation of specialized geographic areas" (Rugman and Verbeke, 2001b, p. 164), the related and decisive role of public authorities and institutions in collaboration to foster localized advantages remains ambiguous, as the implementation of policies responds to numerous challenges, such as the risks associated with counterproductive measures or with uncompetitive measures. To those risks should be added that policy measures should be implemented in accordance with firm-specific and/or industry-specific states of development. Each cluster faces a specific state of development and therefore benefits more positively from micro-founded and *ad hoc* policy measures.

Considering again that the "self-reinforcing set of firm level actions (…) largely contributes to the spatial concentration of industries and the creation of specialized geographic areas" (Rugman and Verbeke, 2001b, p. 164), Rugman and Verbeke indicate that the FSA-CSA framework is of great value when analysing "the creation of 'sticky places'". Indeed, "the creation of sticky places fundamentally depends upon synergies between strong mobile or non-location bound FSAs and immobile CSAs". The authors determine four types of "sticky places": 1) "threatened local networks", 2) "challenged local networks", 3) "non-cooperative sustainable local networks", and 4) "cooperative sustainable local networks" (Rugman and Verbeke, 2001b, p. 165). This classification allows a deeper understanding of the causality dilemma's implications. Indeed, agglomeration forces and the positive spillover effects that these forces potentially produce might result, intentionally or not, from uncoordinated actions or from coordinated and institutionalized fundamental policy measures. Therefore, the causality is somehow mercurial and built on a specific succession of industry-, location-, and/or internationalization-specific conditions. As an economic agent, a firm is inextricably linked to a location. During its lifetime, and even more so in the case of an MNE, that firm will face a succession of conditions and therefore of strategic choices in t, $t+1$, $t+2$, (…) that constitute a unique body of causalities. The sustainability level of stickiness is of great use not only for existing firms or for the potential localization of others but also for local and regional institutions and governments (Rugman and Verbeke, 2001b, p. 165).

The extent to which an industry relies on knowledge creation has an effect on the dependency ratio between strong mobile or non-location-bound FSAs and immobile CSAs. Moreover, "the spatial proximity between firms in a specific industry and, e.g., a pool of workers with specialized skills, the non-business infrastructure, etc. leads to technological and organizational spillover effect benefiting the entire, localized industrial district" (Rugman and Verbeke, 2001b, p. 164). Once again, that aspect of the analysis rejoins Porter's cluster theory. Indeed, the authors question "whether clustering benefits in the form of, e.g. agglomeration economies, access to 'thick' markets for knowledge inputs, and technological spillover effects are equally important for all MNE value added activities" (Rugman and Verbeke, 2001b, p. 165). Interestingly, Rugman and Verbeke consider that clustering will have consequences of various natures on MNEs depending on "each value chain activity" (Rugman and Verbeke, 2001b, p. 165). Indeed, MNEs logically seek strategies that allow the maximization of each of their activities. Additionally, MNEs potentially face multi-dimensional and localized processes that are also influenced by other factors such as heritage (Rugman and Verbeke, 2001b, p. 166). However, in another study, the authors do not question the fact that the state of cluster development of a location positively impacts MNEs' competitiveness levels, as "localized networks of related and supporting activities act as an agglomeration magnet on FDI" (Rugman and Verbeke, 2009, pp. 162-163).

Consequently, the authors do not question the decisive role played by home CSAs and host CSAs on MNEs' relative competitiveness levels. They confirm the benefits of Porter's analysis of the "sources of competitiveness" (Rugman and Verbeke, 2001b, p. 166). Nonetheless, Rugman and Verbeke still consider that "the key problems in Porter's (1990a) framework is his concentration on non-location bound FSAs developed by companies in their home country prior to engaging in FDI. As a result, he largely neglects a) the systemic advantages of MNEs resulting precisely from the common governance internationally dispersed value-added activities, each building upon an idiosyncratic bundle of CSAs, and b) the benefits of strategic asset seeking FDI, accruing to the MNE, whereby these assets may largely have been created in the basis of host CSAs" (Rugman and Verbeke, 2001b, p. 167). This critic indirectly addresses the causality issue repeatedly addressed in this conceptual chapter. Notwithstanding, an analysis of Porter's framework should always consider 1) the fundamental endowments of a location and 2) the micro-based competitive advantages that constitute aspects of that location.

The CSA-FSA framework applied at a sub-national level with a condensed approach indirectly addresses the specific succession of industry-, location-, and/or internationalization-specific conditions of firms (or businesses within firms). Those quadrants are divided by two axes, one measuring 1) "the number of locations relied upon by the firm or each business within the firm as key sources of CSAs for any given business" and the other measuring 2) "whether the firm or business within the firm relies primarily on location bound or non-location bound FSAs" (Rugman and Verbeke, 2001b, p. 168).

In conclusion, whereas the decisive role played by locations in MNEs' strategic behaviours from a broad perspective constitutes a key aspect of Rugman and Verbeke's chapter "Location, Competitiveness, and the Multinational Enterprise" (Rugman and Verbeke, 2001b), the single home-base argument is nonetheless extensively criticized by the authors (Rugman and Verbeke, 2001b, p. 169). Indeed, "the main challenge facing MNEs today in the location area is to combine effective access to – and participation in – foreign knowledge clusters, with efficient firm-level leveraging of the resulting knowledge base" (Rugman and Verbeke, 2001b, p. 171). An MNE's potential strategic localization options are highly influenced *inter alia* by the ability of that firm to rightfully assess the corresponding states of development of clusters and, more importantly, the extent to which those clusters will factually provide agglomeration benefits such as relatively uncostly knowledge transfers (Rugman and Verbeke, 2001b, p. 172). The ability to correctly assess the levels of competitiveness of the corresponding clusters can be influenced by local and regional public agencies, which directly or indirectly affects the attractiveness of a specific cluster or a range of clusters (Rugman and Verbeke, 2001b, p. 172). Regarding the potential positive effects of MNEs' activities on clusters, a widely recognized MNE or numerous widely recognized MNEs may enhance clusters' competitiveness levels (Rugman and Verbeke, 2001b, p. 172). Moreover, "MNEs may well act as intermediaries in the international cross-fertilization of localized knowledge clusters" (Rugman and Verbeke, 2001b, p. 172). As a result, whereas MNEs seek highly competitive locations related to a specific set of activities and most often to a peculiar cluster, those locations benefit from the presence of those MNEs' activities in numerous ways in a process that is self-reinforcing.

3.1.2.3 Internationalization theory and the FSA-CSA framework in relation to location competitiveness: Concluding remarks

From a location-based perspective in economic terms, Rugman's contribution allows a deeper understanding of 1) the complex bonds between MNEs' activities and the localization processes of those activities and 2) the structural impacts of MNEs' activities on locations leading to the self-reinforcement of the competitive advantages of corresponding clusters and territories.

Rugman's development of internalization theory provides a firm- and micro-based analysis of MNEs' operational developments and entry-mode strategies. It relies on the assumption that MNEs respond to market imperfections, leading to the reinforcement of internalization forces. Thus, governments at all levels should seek strategies that broadly allow lower transaction costs and policy tools that do not distort markets.

More broadly, the CSA-FSA matrix elaborates on the relative forces and weaknesses of an MNE in order to define its potential strategic options while also considering the advantages of its competitors (Rugman, 2009, p. 51). In terms of location competitiveness, strong CSAs are of decisive importance for MNEs, which tend to build their FSAs on high-value-added products and/or services and less significantly on price-competition strategies. The matrix is also of great use for institutions and/or sub-national and/or national authorities to coordinate actions to shape the appropriate set of CSAs following a complete assessment of the corresponding territory's potentially most competitive elements.

Whereas MNEs tend to direct their activities following globalization tendencies, the increasing role of knowledge as a form of intrinsic capital has tended to increase the relative weight of location specificities and advantages considered by MNEs in weighing potential strategies. In addition, public authorities play a decisive role: 1) national governments and agencies should seek trade agreements that reduce market imperfections; 2) regional authorities and institutions, in coordination with national authorities and institutions, should guarantee highly efficient infrastructures and institutional facilities; and 3) regional authorities and cluster- and/or industry-specific institutions should implement measures that enhance positive agglomeration effects supporting the internationalization process of locally based firms but also augmenting the attractiveness of a territory and/or a cluster for MNEs' activities.

To conceptualize and implement the appropriate set of measures and to coordinate them with trade agreements, it is crucial for public authorities and institutions to assess the relative competitiveness level of the sub-national territories that they administer. Indeed, it is imperative for those public authorities and institutions to identify the strategic strengths and weaknesses of each location in terms of competitiveness to avoid establishing measures that could result in new market imperfections and/or the bolstering of existing ones due *inter alia* to uncoordinated and/or anti-competitive policy tools. By the same token, MNEs must obviously evaluate the level of competitiveness of the location(s) that they might strategically consider for specific activities. To do so, it is crucial to conceptualize tools that allow the assessment of a location's relative level of competitiveness.

3.1.3 International business theories in relation to location competitiveness: concluding remarks

As globalization continuously influences the agglomeration patterns of firms and therefore impacts territories' ability to build and/or sustain their competitive advantages, the formalization of MNE behaviour, notably in terms of localization strategy, is crucial when assessing the level of competitiveness of a specific territory relative to others. Indeed, whereas a neophyte might argue that the relative decrease in international transaction costs implies that a location is less advantageous than others, the knowledge-based economy actually strengthens the effect of MNEs' localization strategies (Dunning, 2000a, p. 29). To some extent, this assertion contradicts the conclusions of other authors, such as Friedman (who, however, is not an academic) in *The World Is Flat: A brief history of the twenty-first century* (Friedman, 2005). According to the author, globalization leads *inter alia* to a lesser influence of location-bound advantages. Regardless of these conclusions, most international business authors still recognize the decisive impact of location competitiveness on MNE localization strategies.

The attractiveness of a location depends on its ability to attract foreign direct investment, and foreign direct investment fosters the level of attractiveness of that territory, notably when it strengthens the competitive advantage of existing clusters. Consequently, this dynamic sequence illustrates that 1) the factors of foreign direct investment attractiveness engender the specific localization choices of such foreign direct investment, 2) foreign direct investment fosters the level of competitiveness of the corresponding location, and 3) the relative increase in the level of competitiveness of the corresponding location amplifies the level of attractiveness of that location for additional foreign direct investment. Hence, it can be difficult to determine the causes from the consequences. The fact remains that this positive sequence is dynamic and heavily depends on the nature of the corresponding foreign direct investment and on the characteristics of schemes of specialization.

MNEs' operations in a location have repercussions on that location's economic performance. Particularly in innovation-driven economies, the attractions of MNEs' operations are *inter alia* perceived as a way of fostering local competition and creating/drawing highly productive labour factors. These operations are regarded as determinant enhancers contributing to the reinforcement and/or development of competitive factors. Therefore, governmental authorities at all ruling levels are likely to implement policies that support location advantages and expect consequently to attract MNE operations that will ultimately generate positive outcomes not only for those advantages but also generally for the economic performances of the corresponding territories.

To design and implement these policies and decisively improve locations' attractiveness capabilities, it is imperative to use a systemic approach to analyse MNEs' operational developments and entry-mode strategies. Based on major international business theories such as internationalization theory, resource-based theory, knowledge-based view theory, the Uppsala model, Dunning's OLI paradigm and Rugman's FSA-CSA framework, firms' behaviours and entry-mode strategies are investigated, allowing public and para-public institutions as well as governmental entities to carefully consider the state of the advantages of an industry and of a specific location at a broader level. However, acknowledging these advantages in *t0* to implement policy measures in *t+1* on solid grounds requires accurately capturing, particularly in quantitative terms, the relative levels of those advantages. The likelihood of imprecise judgements is relatively high. Consequently, Dunning's OLI paradigm and Rugman's FSA-CSA framework perform in a fully satisfactory manner only when they are established on the basis of consistent measures, allowing the elaboration of robust indexes independent of any damaging mis-estimates.

The dynamic nature of an inter-related sequence in terms of a location's ability to attract FDI is obviously related not only to exogenous factors but also to the attractiveness of locations located nearby. Consequently, dynamic sequences are potentially inter-related while competing among themselves to a certain extent. The greater the delta of the state of attractiveness between two locations, the more difficult it is for the weaker location to catch up to the stronger location. At the same time, outstanding locations in terms of attractiveness capabilities potentially generate positive externalities for bordering and/or nearby weaker locations. Whereas the replication behaviours of institutions or governmental authorities could be perceived as legitimate, they could require a certain proportion of analogous steps and implemented policies. That replication is of potential interest only if the dynamic aspect of the corresponding positive sequence operates more vigorously than that of the outstanding region in order to reduce the attractiveness delta between them. However, the potential reduction of the gap in attractiveness capability between two locations might well be the result of exogenous determinants or even of the decreasing economic performance of the leading location. Consequently, it is more likely that the attractiveness capabilities of relatively uncompetitive locations can be improved by implementing coordinated policies, which might potentially advance their respective dynamic sequences in a manner allowing relative singularity and for a unique value proposition in Porterian terms (Porter, 1980, 1990a, 2008).

The role of uniqueness does not alter the fact that location advantages are built on factors that are more likely to stimulate attractiveness capabilities in terms of probability relative to others. For that matter and as stated above, Dunning considers that the force of the impact of micro-regions and of their local governments and institutions on location-specific advantages is correlated with both endogenous and exogenous factors such as 1) the political structure of governance; 2) the level of economic development, notably in terms of industrial structure; 3) the state of cluster development; 4) the level of competition between geographically concentrated locations and/or between locations of comparable industrial structures; 5) the level of congruity between the corresponding forms of foreign direct investment and local economic endowments; and 6) the level of congruity between the corresponding forms of foreign direct investment and regional, macro-regional and national competitiveness policies. These location-specific advantages potentially result from other location-specific advantages and operate conjointly, thus forming positive dynamic sequences. Obviously, these dynamic sequences are likely to appear at relatively advanced stages of economic development and to occur in locations with previously existing relatively strong competitive advantages.

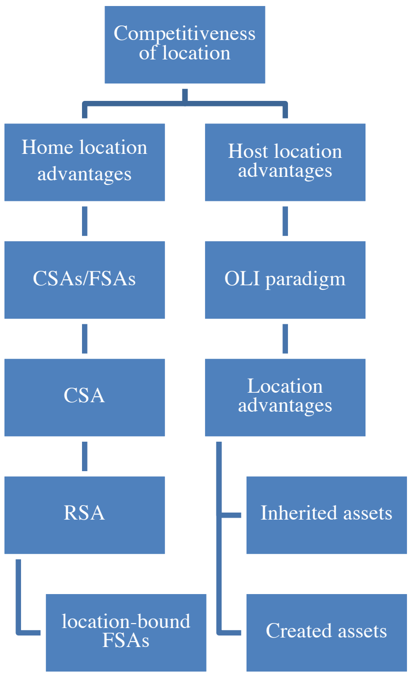
Rugman implements CSAs as the basis of the global platform from which the multinational firm derives a "home-base 'diamond' advantage in global competition" (Rugman, 2009, p. 51). As the relative weight of natural resources has tended to decrease over recent periods, knowledge has become the "key wealth creating asset" (Rugman and Verbeke, 2001b, p. 162). As a result, MNEs have tended to "attach much more importance to locations with excellent infrastructure and institutional facilities" (Rugman and Verbeke, 2001b, p. 162). Obviously, some MNEs still focus on relatively reasonable natural resources, but indigenous and exogenous factors tend to increase the relative importance of knowledge-based advantages. Such advantages perform properly only when they are in a position to do so, that is, when they are not hampered by weak intellectual property laws or when competition laws are not suitably implemented.

From a location perspective, Rugman and Verbeke's recognition of the role of "spatial concentration of industries" (Rugman and Verbeke, 2001b, p. 164) assesses the decisive role of clusters and of specialization in MNEs' strategies and ultimately on MNEs' behaviours. Accordingly, local authorities and/or institutions should aim to foster "the creation of sticky places" (Rugman and Verbeke, 2001b, p. 164), which constitute a "cooperative sustainable local network" (Rugman and Verbeke, 2001b, p. 165). In other words, "sticky places" respond to numerous exogenous and endogenous factors, such as the relative specialization levels of firms and/or the extent to which local authorities are able to foster networking externalities. As "the creation of sticky places fundamentally depends upon synergies between strong mobile or non-location bound FSAs and immobile CSAs" (Rugman and Verbeke, 2001b, p. 165), assessing the sustainability levels of stickiness is of great interest not only for existing firms and for the potential localization processes of firms but also for local and regional institutions and governments (Rugman and Verbeke, 2001b, p. 165). The challenge is then to ensure a suitable assertion through appropriate measures of the extent to which a sticky place is able to sustain and improve its advantages, that is, to measure its ability to coordinate consistent CSAs with the corresponding FSAs in a sequence that ultimately improves the overall quality of the business environment.

As "the main challenge facing MNEs today in the location area is to combine effective access to – and participation in – foreign knowledge clusters, with efficient firm-level leveraging of the resulting knowledge base" (Rugman and Verbeke, 2001b, p. 171), assessing the average state of cluster development is decisive when assessing a location's level of competitiveness. However, the intensity with which an MNE relies on location-bound or non-location-bound FSAs (Rugman and Verbeke, 2001b, p. 168) may vary considerably depending on the industry in which it operates and the extent to which it depends on "non-location bound FSAs developed by companies in their home country prior to engaging in FDI" (Rugman and Verbeke, 2001b, p. 167). Consequently, one should assess not only the state of cluster development of a territory but also the relative intensity of knowledge network operations and the relative quality of the "specific bundles of CSAs as sources of international competitiveness" (Rugman and Verbeke, 2001b, p. 168).

Regardless of the perspective, home- and host location-related comparative advantages decisively influence MNEs' strategic capabilities. Some nations have a superior set of location-bound assets constituting comparative advantages relative to other nations. However, most nations are divided into territories that offer relatively diversified sets of comparative advantages that MNEs must take into consideration. Hence, to condense the international business theories scrutinized above and to extract the essence of the subsequent contributions, it might help to sort and summarize them systematically, as demonstrated in Figure 2.

Figure 2: Matrix of international businesses' approach to location competitiveness



Source: personal elaboration based on Dunning (1988a, 1998, 2000a, 2000b, 2001), Dunning and Lundan (2008), Gugler (2019), Rugman (1981, 1985), and on Rugman and Verbeke (1992, 2001a, 2001b, 2009).

Figure 2 exhibits a condensed approach to location competitiveness from the international business perspective. Whereas host locations of MNEs' activities are at the core of the analysis of comparative advantages, MNEs' home locations also extensively influence the manner in which the corresponding firms develop their ownership advantages (Gugler, 2019, p. 24).

The home location of an MNE is likely to influence its motivations for internalization (Rugman and Verbeke, 1992). CSAs encompass factors that influence MNEs' capabilities, whereas FSAs "are based on the unique assets and capabilities of a company" (Gugler, 2019, p. 27). Therefore, in terms of location competitiveness, a country's ability to build strong CSAs is crucial. Whereas some CSAs exist at the national level, others are influenced by localized endowments and policies. Hence, CSAs can be scrutinized at the sub-national level and even as RSAs (Gammelgaard and McDonald, 2018, pp. 305-306). However, FSAs can also be location related in either the home or the host location (Rugman and Verbeke, 1992, 2001a, 2009). For example, "regarding the location-bound FSAs, the firms' competitive forces, based on a location's assets, may be impacted by the presence of clusters" (Gugler, 2019, p. 28). Hence, Rugman's CSA-FSA approach rejoins geographic economists to some extent in terms of the role of agglomeration forces in firms' ability to compete globally.

Host locations' capabilities of attracting MNEs' activities are extensively investigated by Dunning on the basis of the OLI paradigm. Indeed, location-specific advantages are decisive determinants of MNEs' internalization strategies. Dunning also recognizes the impact of agglomeration forces on the localization process of economic activities, as "the spatial distribution of L-bound resources, capabilities and institutions is assumed to be uneven and, hence, will confer a competitive advantage on the countries possessing them over those that do not" (Dunning and Lundan, 2008, p. 100). Hence, this uneven distribution will influence MNEs' strategies and a territory's capabilities in terms of competitiveness advantages. Moreover, location-bound resources are to a certain extent unevenly distributed across territories constituting a nation.

Location advantages can be either inherited or created (Gugler, 2019, p. 25), thus rejoining Porter's distinction between the endowment level and the macro- and microeconomic levels of competitiveness. This distinction should be considered in light of Dunning's identification of MNEs' motivations for internalization (Dunning, 1998, p. 50; Dunning, 2009, p. 8). Those motivations do not implicate a zero-sum game, as a set of motivations often has relative degrees of intensity. Hence, a territory's competitiveness level is also correlated with its ability to offer the most efficient set of incentives in accordance with its existing agglomeration and specialization patterns. Measuring competitiveness also implies considering the "costs of distance and benefits of formal and informal integration" (Rugman and Oh, 2013, p. 467) between sub-national territories, as each case being analysed experiences a specific set of stylized factors, such as the size of the country in absolute terms, the way governmental authorities operate, and the multi-dimensional homogeneity of the territory. Most importantly, Rugman and Oh observe that "within a region, the industry life cycle is likely to follow the same evolutionary path because new capabilities, knowledge, technology, financial capital and competition have similar effects. Regional path dependency can be observed once institutions, infrastructure and human resources have been developed" (Rugman and Oh, 2013, p. 474). To a great extent rejoining Porter's emphasis on clusters, this also shows that firms' internalization capabilities are intrinsically related to home advantages with improvements correlated with the quality of the "institutions, infrastructure and human resources" (Rugman and Oh, 2013, p. 474).

In conclusion, attracting FDI, maintaining existing MNE activities and developing MNE activities in a location require sustaining a specific equilibrium of location-related advantages in accordance with the specialization patterns of the most productive traded industries operating in that territory. Location advantages are decisive in both home and host locations. They improve the quality of the location's business environment, not only for MNEs but also for all firms competing in the local market and/or for the territory in competition with other territories constituting a nation. Moreover, in $t+1$, MNEs' activities either at home or abroad generate various positive externalities *inter alia* for the quality of local competition, knowledge spillovers, fiscal resources and education quality. A location should aim to offer a "set of location bound created assets" (Dunning, 2000b, p. 178) that are intrinsically related to existing agglomeration and specialization processes. For instance, the presence of specific competitive clusters constitutes an asset for MNEs with policies focused on strategic asset seeking (Dunning, 2000b). However, those MNEs might also seek specialized workers in specific fields and therefore also base part of their strategies on resource-seeking investments, albeit to a lesser extent (Gugler, 2019, pp. 25-26). Consequently, in measuring location competitiveness, we should also consider these created assets because of their relative ability to attract value-adding MNE investments. However, the likelihood of this set being particular is relatively high. Therefore, its efficiency should be assessed in correlation with productivity.

The dynamic condition of factor sequences requires evolving policies and consequently calls for enhanced methods of measuring regional attractiveness. Regional attractiveness depends *inter alia* on the extent to which regional authorities are able to implement, coordinate and in some cases initiate cluster and FDI policies. However, some location advantages are mostly the result of policies and measures at the national level (e.g., competition laws, legal access to markets), and similar legal frameworks and enduring comparable macroeconomic forces actually have a direct and fundamental impact on localization processes and on entry-mode choices. Not only are regional authorities and institutions in a position to implement policies to improve specific dynamic sequences, but they are also in a position to potentially capture their existing attractiveness levels more accurately to determine their strengths and weaknesses. Moreover, the uneven distribution of location advantages not only among nations but also among the territories constituting a nation responds to case-specific agglomeration forces. Consequently, the measurement of location in regard to competitiveness should take into consideration not only fundamental, institutional and macroeconomic endowments but also clusters' performances, knowledge creation capabilities and relative capabilities to attract FDI.

4 Competitiveness of location: concluding remarks

Whereas the academic literature focusing on national advantage and competitiveness is relatively extensive, its counterpart from a sub-national perspective remains comparatively incomplete, especially in terms of measurement methods. As measurement methods will be scrutinized in chapter two, chapter one focuses on the conceptualization of location competitiveness from two different yet complementary perspectives: 1) that of economic geography theorists (Krugman, 1991; Krugman and Venables, 1995;

Marshall, 1920; Porter, 1990a, 2000a, 2000b, 2003, 2008; Porter *et al*., 2008) and 2) that of internationalization theorists (Dunning, 1981, 1988a, 1998, 2000a, 2000b, 2001; Dunning and Gugler, 2008; Rugman and D'Cruz, 1993; Dunning and Lundan 2008; Rugman and Fina, 1996; Rugman and Girod, 2003; Rugman and Verbeke, 2001a, 2001b, 2003, 2004, 2008, 2008b, 2009).

This chapter emphasizes that those two analytical perspectives are conspicuously related and complementary. Indeed, they both investigate locations' competitive advantages from two perspectives in terms of either conceptualization level or dynamic sequences. Depending on the critical juncture considered, both theories deliver correlative observations that ultimately allow a deeper understanding of the two fundamental questions of the present chapter: 1) which determinants and factors are more likely to have a decisive and positive impact on dynamic sequences in $t+n$ and 2) which determinants and factors have a higher probability of being the causes of certain consequences and thus being spillover effect initiators? Nonetheless, we can infer that on the basis of the structural grounds and the numerous exogenous and endogenous factors affecting a location, there is a prospect for a high degree of uniqueness for any positive dynamic sequence. Consequently, even though academics seek to identify the determinants and factors that appear to be more significant, what is observed in location *A* might not necessarily be similar in location *B* and *vice versa*.

This chapter endeavours to structure location competitiveness on the basis of economic geography theories and international business theories, as both tackle it in a relatively systemic manner. Location competitiveness is a multi-dimensional concept. This observation implies that the identification of location-bound advantages is noticeably case related, as causality issues do not always generate similar dynamic sequences. Nevertheless, each approach provides some complementary tools that explicitly and systematically address locations' ability to offer the most appropriate set of stylized factors that are most likely to generate a positive dynamic sequence leading to an improvement of firms' capabilities in terms of productivity and of the corresponding locations' levels of competitiveness. Porter (1980, 1990a, 2000a, 2000b, 2008) and Porter *et al*. (2008) address causality issues by considering that "correlation among many of the indicators (of an index comparing location competitiveness) makes disentangling the impact of individual indicators complex from a statistical standpoint" (Porter *et al.*, 2008, p. 44).

The holistic approach introduced by Porter and further investigated by authors such as Delgado and Stern provides a systemic understanding of location competitiveness (see Figure 1) that might potentially serve as an underlying structure for the assessment of a location's competitiveness level in either relative or in absolute terms (Porter, 1980, 1990a, 2000a, 2000b, 2003, 2008; Porter *et al.*, 2008). For instance, at the macro-level, 1) institutions, 2) fiscal policy, 3) basic education, and 3) the state of order have been identified as having an influence on the stylized factors most likely to generate a positive dynamic sequence (Porter *et al.*, 2008). Most importantly, at the micro-level, numerous factors and sub-factors of the diamond framework have been identified as decisive in initiating, sustaining and/or improving a positive dynamic sequence of location competitiveness, such as efficient 1) operational infrastructures, 2) administrative infrastructures, and 3) financial infrastructures (Porter *et al.*, 2008). Most decisively, agglomeration forces and the state of cluster development deeply impact location competitiveness in a dynamic manner (Porter, 2008; Porter *et al.*, 2008). Moreover, strategy effectiveness is intrinsically correlated with MNEs. The same condition applies to the context for strategy and rivalry.

International business theories are most valuable for evaluating the impact of MNEs on location competitiveness at all levels and, conversely, how location competitiveness in *t0* may positively influence location competitiveness. The location specific advantages developed by Dunning in the OLI paradigm constitute a major component of MNE strategies in evaluating localization opportunities such as 1) the extent of inter-cluster collaboration, 2) the quality of host-location infrastructures, and 3) the presence of case-specific skilled workers (Dunning, 1981; Dunning and Lundan, 2008). However, FDI in return generates positive externalities for *inter alia* the intensity of local competition, cluster development, and fiscal revenues. Moreover, home location, as investigated by Rugman in the CSA-RSA/FSA matrix, wields a powerful effect on internalization processes and firms' ability to create O-advantages (Gugler, 2019, p. 24). Indeed, "a firm's competitiveness and strategy in international markets depend on its home CSAs and on its FSAs, the roles of which may vary depending upon their respective strengths or weaknesses as drivers of competitiveness" (Gugler, 2018, p. 445). At the sub-national level, RSAs also influence MNEs' competitive advantages, notably in the manner in which they 1) interact efficiently with FSAs and 2) respond to agglomeration and specialization processes. RSAs are associated to a certain extent with location competitiveness. Indeed, numerous factors and sub-factors constituting locations' competitive advantages can be perceived as RSAs in numerous cases, such as 1) the intensity of local competition, 2) the extent of cluster development and specialization, and 3) access to operational infrastructures (Porter *et al.*, 2008). Consequently, the competitiveness level of a specific location might positively influence the internalization process and firms' capabilities in terms of O-advantage creation, whereas in return, those firms' activities might positively impact productivity and generate positive externalities for their home location. Moreover, the competitiveness level of a specific location determines its potential attractiveness to FDI, and FDI positively impacts productivity and generates positive externalities for its host location(s). Hence, measuring location competitiveness also requires comprehensively considering internalization processes and MNEs' activities.

Furthermore, the present chapter highlights the fact that national authorities, regional authorities, local authorities, public institutions, para-public institutions, private institutions and all companies, especially those that are traded and/or MNEs, base their respective strategies on various analyses of the determinants, factors and correlated operating frameworks. To do so, they prominently use the frameworks of geographic economy theorists and internationalization theorists. To build this analysis, soundly appraising the level of competitiveness of a territory is of decisive importance since it is difficult to implement any strategy at any level on the unique basis of qualitative assessments and/or partial quantitative measures. This is why sound indicators properly organized in an index of comparable entities are often of great use not only for policy makers but also more decisively for firms with relatively high mobility. Hence, measuring location competitiveness consistently and thoroughly is a strenuous yet meaningful process.

In conclusion, building these measures is cogent only when they are based on legitimate theories that allow a rigorously applied methodology. Building measures also contributes to the implementation of hypotheses likely to capture the most decisive determinants of the competitive advantages of locations and their correlated measurements. The next challenge is thus to build a methodology based on rigorous hypotheses that properly take into account the various yet complementary conclusions of the theories presented and analysed above.

Chapter 2 – Design and structure of a generic intranational regional competitiveness index

5 General introductory remarks

Chapter 1 extensively scrutinizes location competitiveness on the basis of economic geography theories and international business theories and ultimately cross-references the most decisive factors that underlie the capacity of a territory to build, improve and sustain its competitive advantages. On this basis, it is subsequently possible to design a broad methodology to build a generic structure for the measurement of intranational regional competitiveness. Chapter 2 is divided into 6 major sections.

First, section 6 investigates the major quantitative steps related more generally to the construction of a composite index. Indeed, before proposing a comprehensive and specific methodology for an intranational regional competitiveness index, it is necessary to recognize that numerous quantitative steps must be implemented regardless of the focus of the assessment and are prerequisites for properly considering any methodology. Consequently, section 6 comes first in order to be mindful of the quantitative steps that will ultimately be executed while implementing the methodology developed in this chapter.

Second, section 7 is an overview of the major existing competitiveness indexes at all levels of analysis. It allows a general understanding of the methodologies and findings of those indexes and the determination of the most relevant conclusions to be used in the process of building the intranational regional competitiveness index.

Third, section 8 focuses on the preceding process in relation to the construction of an intranational regional competitiveness index. Indeed, in existing indexes, primary hypotheses are often not developed and/or disclosed, thus hampering the overall validity of the structure and thus of the case-related results. Hence, section 8 addresses the issues related to the process of relating the major theoretical insights of chapter 1 in terms of the competitiveness measures to the manner in which multi-dimensionality in the case of a concept such as competitiveness should be approached and to the definition of a statistically significant region.

Fourth, section 9 constitutes the core of this chapter. It defines the 5 major methodological steps for building a generic structure to measure intranational regional competitiveness:

the broad definition of the major determinants of intranational regional competitiveness; the actual building of the corresponding pillars, sub-pillars and indicators; the conceivable methodological limitations of the process; and, most importantly, the unveiling of the full version of the generic structure. Subsequently, a sub-section of section 9 is dedicated to the conceptual adaptations to be considered in the cases of relatively centralized and highly centralized nations, as these specificities also influence the integrity of the structure.

Fifth, the concluding remarks underscore the major findings of the chapter, notably to implement the generic structure in a specific case.

6 Quantitative steps to build composite indicators and indexes

6.1 Quantitative steps to build composite indicators and indexes: introductory remarks

An index is composed of indicators, which are based on measures, which are based on data of various types and from various sources. That composition requires following numerous decisive theoretical, methodological and technical steps. The previous chapter has extensively elaborated on the theoretical backgrounds of territorial economic performance, and section 9 shall endeavour to extract the essence of those theoretical backgrounds and to relate them to regional competitiveness measures in order to identify the indicators and build the structure of that index. The purpose of this section is to scrutinize the prevailing quantitative steps related to the construction of a composite index. Consequently, the next sub-sections are based *inter alia* on the "Handbook on Constructing Composite Indicators" (OECD, 2008) and divided in accordance with the steps commonly considered imperative in building a sound and convincing composite index on the basis of previously chosen indicators already organized in pillars: 1) data selection, 2) multi-variate analysis, 3) normalization, 4) weighting and aggregation, 5) robustness and sensitivity analysis, 6) identification of potential correlated indicators, and 7) assessment of the results. It might seem inconsistent that the following sub-sections precede the process of building the composite index on the basis of the theoretical framework. However, that decision is correlated with the acknowledgement that whereas any composite index potentially faces the technical issues presented here, not all composite indexes are based on an extensive theoretical framework, nor are they structured, even partly, to correspond with one another. For example, it is possible to build an index on the basis of data availability. Consequently, it is more consistent to first present the methodological steps, as they are an overall prerequisite, and only then to elaborate on the comprehensive process of building the index.

6.1.1 Data selection

Data selection is normally considered the first technical step that follows the theoretical framework. Whereas this prevailing order could generate fundamental bias in the results, as we shall see henceforth, data selection is still a decisive matter that impacts the overall quality of the final index. A first decision of principle must be made: either 1) to modify the structure of the index on the basis of the data or 2) to stick to the structure and consider compensatory methods in a second sequence. Then, a second decision of principle must be made: either 1) to stick to difficult data or 2) to consider the possibility of using data based on other sources, such as surveys.

Data based on surveys are broadly used in numerous competitiveness indexes in an attempt to estimate relatively few yet decisive quantifying variables, such as those related to the quality of the business environment. Survey research can be based on 4 main research methods: 1) questionnaires, 2) face-to-face interviews, 3) telephone interviews, and 4) online questionnaires (Kelley *et al.*, p. 262). At this stage, 2 major issues already arise. First, even if the chosen sample is relatively representative of the category (categories) of agents the author wishes to analyse, how the research methods are conducted and, more importantly, how agents choose either to reply or not reply generates potential biases, particularly if the intention is then to build variables comparable with those built on hard data. Second, conducting these surveys frequently in numerous territories is not only arduous but also hazardous since agents' replies may vary in terms of time and quality as a consequence of exogenous factors yet potentially be perceived as at least partially endogenous. Consequently, one should always consider that fundamental bias and determine the appropriate method for reducing the negative repercussions on the overall quality of the index.

More generally, data should correspond to the indicators and corresponding measures previously determined on the basis of the theoretical framework. If that symmetry is not possible, proxy variables should be favoured on the basis of strict correlation analyses. Once the correlation analyses are found to be relatively satisfactory, the measures should be summarized in a table on the basis of their corresponding characteristics: 1) the "availability" of the indicators in time and/or across territories, 2) the "sources" of those indicators, and 3) the "types" of those indicators ("hard, soft or input, output, process") (OECD, 2008, p. 20). The table will then be of great use when weighting and aggregation methods are discussed.

"Imputation of missing data" (OECD, 2008, p. 20) is a subsequent step that allows missing values to be assessed. Whereas that step is especially decisive for indexes covering cross-country competitiveness analyses or transnational regional competitiveness analyses, intranational regional competitiveness analyses often rely on data selected on the basis of methods set at the national level or even by authorities at the national level. Nevertheless, some regions might suffer from missing data. Moreover, reliability measures should be implemented for imputed value(s) to "assess the impact of the imputation on the composite indicator results" (OECD, 2008, p. 20). Ultimately, any odd results should be scrutinized to ensure general reliability.

In conclusion, it is evident that the data selection process must be considered with considerable assiduousness. Indeed, that process will have an impact on the general soundness of the index and on the weighting and aggregation determinations that follow. Whereas the overall structure of the pillars and the correlated indicators should not depend on data availability, exercising the appropriate judgement for data and imputing missing values will inevitably lead to questions about previous methodological choices. Moreover, as indicated above, data based on surveys and, more importantly, the process of comparing such data with hard data even in weighted terms is a methodological choice that should be scrutinized with considerable attention. The use of proxies is a valuable alternative for measuring previously chosen indicators, which constitute the pillars of the considered index, with appropriate accuracy. Beyond the fact that overall data quality should be scrupulously scrutinized, the overall structure of the dataset must be investigated even if that process leads to potential adjustments of the general framework of the index, as we shall see hereafter.

6.1.2 Multi-variate analysis

The multi-variate analysis allows the researcher to study "the overall structure of the dataset, assess its suitability, and guide subsequent methodological choices" (OECD, 2008, p. 20). More specifically, as indicated by Olkin and Sampson (2001), the multi-variate analysis measures "the strength of relationships among various measurements" (Olkin and Sampson, 2001, p. 10240). It allows the quantitative disclosure of potentially related measures that might subsequently allow the identification of cross-territory similarities and/or indicator correlations. In the aftermath of those analyses, it might be necessary to modify the structure of an indicator or a set of indicators or even to adapt the structure of a pillar or even multiple pillars. Indeed, the theoretical framework might generate relationships among some measures that might cause biases and consequently inconsistent choices in terms of weighting and aggregation and false and/or incomplete interpretations of the results.

Multi-variate analyses can be implemented on the basis of numerous methods. In this section, a selection of methods is listed on the basis of the probability that they are more likely to be of use in constructing and testing a territorial competitiveness index. First, the multi-variate normal distribution is relatively common yet crucial, as it allows the probability density of the "multiple random variables measured" to be calculated (Olkin and Sampson, 2001, p. 10240). Second, regression obviously constitutes the core of multi-variate analysis in the case of relative territorial competitiveness indexes. Indeed, regression analysis "is designed to predict a measure Y based on concomitant variables ($\mathrm{X} = \mathrm{X}_{1,\dots,}X_p$)" (Olkin and Sampson, 2001, p. 10242). It therefore allows the measurement of the conditional mean of Y and concomitantly of its conditional variance, hence exhibiting whether it is independent of X. Third, correlation hierarchy can be partial, multiple, or constituted on the basis of canonical correlations (Olkin and Sampson, 2001, p. 10242). Canonical correlations are especially meaningful, as they allow the measurement of "the strength of the relationship between two sets of variables" (Olkin and Sampson, 2001, p. 10242).

Numerous developments follow the multi-variate analysis methods indicated above, notably multi-variate probability computational techniques (Olkin and Sampson, 2001, p. 10244). However, most of the existing competitiveness indexes adhere to more straightforward multi-variate analysis methods or even do not implement any. It is difficult to interpret those choices without further enquiries. The corresponding outcomes conceivably rely on theoretical assumptions that are not or only partly tested at a later stage of the index construction. Nonetheless, multi-variate analyses should be considered a valuable tool for evaluating the soundness of the theoretical assumptions and indeed of the chosen indicators and the overall structure of the index.

6.1.3 Normalization

The procedure of variable normalization is a central step in the construction of an index. Indeed, normalization is expected to make comparisons between variables achievable and, as a consequence, to address *inter alia* the potential biases of previously designed indicators and to "make scale adjustments, if necessary" (OECD, 2008, p. 20). An index is composed of numerous indicators providing measures or proxies of multiple characteristic factors that a territory experiences in terms of economic performance. Hence, it is critical to use the appropriate normalization method to make those scale adjustments.

In an index, the use of multi-criteria evaluation is obvious, as "quantitative methods quantitatively evaluate each alternative determining the differences in the values obtained for the alternatives considered" (Ginevičius, 2008, p. 80). Hence, there is a direct link between the procedures of multi-variate analysis and those of normalization, as they correspond to subsequent yet correlated steps. Indeed, "the sequence of normalization operations depends on the methods of multicriteria evaluation used" (Ginevičius, 2008, p. 80). Ginevičius (2008) identifies 4 major data normalization methods on the basis of multi-criteria evaluation: 1) simple additive weighting (SAW), 2) complex proportional assessment method (COPRAS), 3) technique for order preference by similarity to an ideal solution (TOPSIS), and 4) multi-criteria evaluation method VIKOR (Ginevičius, 2008, p. 81).

It is difficult to rank those methods without correlating them with the theoretical framework of the considered index. In the case of an intranational regional competitiveness index in which variables are of various natures yet presumably collected and exhibited in a relatively analogous manner, the simple additive method should constitute the first step of normalization, as it allows variable comparisons to be made and tests the robustness not only of the multi-variate analysis but also of the overall structure of the pillars and of the sub-pillars.

6.1.4 Weighting and aggregation

The weighting process between indicators and corresponding measures and between the pillars categorizing those indicators constitutes the core of the technical procedure leading to the construction of a composite index. Indeed, either theoretical or methodological reasoning can lead to the implementation of weighting processes that will ultimately influence the relative measures of all indicators. For example, weighting might vary on the basis of the geographical level of analysis. Whereas an indicator might be considered to have a more decisive influence on the competitiveness of a territory at the national level, that influence might decrease as the scope of analysis shifts from transnational to transregional analysis. The first and most decisive step is to decide whether equal weighting is the appropriate method and if so, whether it should be applied to all categorization levels of the index. If only partly or if not, other weighting methods exist, as we shall see below.

The first option is to use equal weights for all indicators with equal weights for all pillars and sub-pillars because all pillars and sub-pillars are composed of the same quantity of measures. In this case, equal weights clearly apply for all levels of categorization. Sound normalization processes are needed for all indicators and, most importantly, a comprehensive theoretical framework disclosing how all indicators, pillars and sub-pillars equally impact the overall competitiveness of the considered territory. Moreover, this option requires extensive correlation tests to detect "causal relationships or a lack of consensus on the alternative" (OECD, 2008, p. 31). Indeed, allocating equal weights to indicators with some being the causes and others the corresponding consequences might ultimately engender unequal weights of those indicators relative to the others.

The second option is to use equal weights for all indicators and for all sub-pillars and pillars but to admit uneven numbers of indicators between pillars and between sub-pillars. This option mechanically allocates higher relative weights to the indicators that are categorized in lesser numbers than those in other pillars and sub-pillars. That option might be the result of data limitations or a theoretical choice implying that whereas all pillars and sub-pillars impact the overall competitiveness of the considered territory in the same manner, all indicators are not even in relative terms. Once again, this methodological choice should be disclosed. If that choice relies on external grounds such as data limitations, the probability that biases might occur is relatively high since it might affect the overall structure of the index.

The third option is to allocate equal weight at one level of categorization only. That option might necessitate the use of other weighting method(s) at one or another level of categorization. For example, the hypothesis could be that all indicators are normalized and therefore comparable but that all pillars and/or sub-pillars do not evenly impact the overall competitiveness of the considered territory. In this case, weighting methods are mandatory, as we shall see.

The fourth option is to use weighting methods at all levels of categorization. This methodological choice might result from the pursuit of exactitude in the assessment of all components at all levels of categorization of the index. Weighting methods, other than the equal weighting method, are based either on statistical models or on participatory processes (OECD, 2008, p. 31). For example, "factor analysis, data envelopment analysis and unobserved components models (UCM)" are based on statistical models, whereas "budget allocation processes (BAP), analytic hierarchy processes (AHP) and conjoint analysis (CA)" are based on participatory methods (OECD, 2008, p. 31). All these methods have positive and negative effects on the overall structure of the index. Weighting methods based on statistical models could be of use *inter alia* in detecting indicators that are correlated to a critical extent in relative terms. Nonetheless, those methods are to be considered with close attention. Indeed, "if weights should ideally reflect the contribution of each indicator to the composite, double counting should not only be determined by statistical analysis but also by the analysis of the indicator itself vis-à-vis the rest of indicators and the phenomenon they all aim to capture" (OECD, 2008,

p. 32). A sound theoretical framework could prevent the inappropriate use of weighting methods based on statistical models. Weighting methods based on participatory methods rely on the externalization of weight assignments on the basis of an existing methodological method. For example, the weights of the pillars could be assigned on the basis of a specific policy orientation. Obviously, those methods are relatively likely to engender bias since it is difficult to assess whether the assigned weights are consistent with the pre-existing theoretical framework, and even more so if specific policy orientations precede the construction of a subsequent index.

Whether the decision is to select one weighting method over another or not to select any, weighting choices should be regarded as based on subjective judgement to a certain extent (OECD, 2008, p. 31). Indeed, they depend on both internal factors and external factors. Numerous indexes capturing either competitiveness or a specific component of the dynamic sequence leading to a certain degree of competitiveness of a territory use equal weights, at least partly. Indeed, equal weights allow potential issues related to the selection of other weighting methods to be avoided. However, no method can be considered fully objective. A sound theoretical framework and a fully disclosed methodological process should always be exhibited to avoid hampering the overall validity of the considered index.

Aggregation methods are complementary to weighting methods, as "aggregation essentially reflects the substitutability of different dimensions" (Gan *et al*., 2017, p. 492). Indeed, "weights express trade-offs between indicators" (OECD, 2008, p. 33). Therefore, "a deficit in one dimension can thus be offset (compensated) by a surplus in another. This implies an inconsistency between how weights are conceived" (OECD, 2008, p. 33). Gan *et al*. (2017) identify 3 major groups of aggregation methods that are likely to be used in a composite index: 1) the "additive aggregation method", 2) the "geometric aggregation method", and 3) the "non-compensatory aggregation method" (Gan *et al*., 2017, p. 497). The selection of an aggregation method should be coherent with that of a weighting method. The main issue related to the relative assessment of indicators is that the normalization process might lead to the potential comparison of indicators that are composed of measures based on numerous data sources. Consequently, if indicators can be compared, one should be aware of their potential compensatory logic (OECD, 2008,

p. 33). In this regard, the use of a “non-compensatory multi-criteria approach (MCA) could assure non-compensability by finding a compromise between two or more legitimate goals” (OECD, 2008, p. 33).

In conclusion, the weighting and aggregation of variables is a critical process that might hamper the overall validity of the composite index if not implemented consistently and/or if not fully disclosed. The decision to attribute equal weights at all levels of categorization is a weighting method *per se* and should be perceived as such. Other weighting methods also need to be based on sound and fully disclosed assumptions in order to understand whether the considered index is based on an experimental research focal point or on a pre-existing agenda, such as policy orientation. To test the chosen weighting and aggregation methods and, more generally, the overall validity of the composite index and its structure, “robustness and sensitivity” (OECD, 2008, p. 34) tests must be implemented. That step is also decisive in assessing the soundness of the methodological process.

6.1.5 Robustness and sensitivity analysis

Numerous theoretical and methodological choices potentially challenge the overall validity of an index. Even if those choices might be consistent when considered individually, systematizing them could hamper the soundness of the considered index. Consequently, it is mandatory to conduct robustness and sensitivity tests. These tests are especially crucial, as the preceding steps result from relatively subjective judgement that might benefit from positive robustness and sensitivity analyses.

As indicated by Saisana and Tarantola (2002), “once the system of sub-indicators is determined and used to obtain the composite indicator it is important to analyze how much the composite indicator values are influenced by uncertainty in the source data and/or uncertainty in the weights” (Saisana and Tarantola, 2002, p. 60). Indeed, even if databases are selected at a later stage, uncertainty must be tested at some point. Uncertainty analysis “allows the analyst to assess the uncertainty associated with the composite indicator values (or model in a more general context) as the result of the propagation through the errors in the sub-indicators data, and uncertainties in the weights of the subindicators” (Saisana and Tarantola, 2002, p. 56). Most interestingly, as indicated by Saltelli (2004), “the target of interest should not be the model output *per se*, but the question that the model has been called to answer” (Saltelli, 2004, p. 29). Indeed, if the objective of the test is to assess the level of correlation between certain variables with, for example, the level of GDP per capita and/or per full-time equivalent (FTE) positions observed in a specific territory, the test might not necessarily consider the model output as such.

The OECD handbook on composite indicators identifies 7 sub-steps to be considered when assessing the robustness of those indicators: 1) “inclusion and exclusion of individual indicators”; 2) “modeling data error based on the available information on variance estimation”; 3) “using alternative editing schemes, e.g. single or multiple imputation”; 4) “using alternative data normalization schemes, such as Min-Max, standardization, use of rankings”; 5) “using different weighting schemes, e.g. methods from the participatory family (budget allocation, analytic hierarchy process) and endogenous weighting (benefit of the doubt)”; 6) “using different aggregation systems, e.g. linear, geometric mean of un-scaled variables, and multi-criteria ordering”; and 7) “using different plausible values for the weights” (OECD, 2008, p. 34). In fact, this sub-process mostly consists of using alternative methods at numerous steps of the methodological process to guarantee the overall validity of the index.

Robustness and sensitivity analysis results should be disclosed and discussed. The results serve *inter alia* as a basis for implementing relevant adjustments to the framework of the index. Moreover, “these sensitivity measures represent how much the uncertainty in the composite indicator for a country would be reduced if that particular input source of uncertainty were removed” (OECD, 2008, p. 35). Hence, those measures provide a quantitative benchmark of indicators’ uncertainty levels and allow the assessment of the potential weaknesses to be addressed in relative terms.

Robustness and sensitivity analyses are crucial in the overall assessment of an index. At this stage, the OECD handbook on composite indicators advises de-constructing the considered composite indicators so “that the contribution of sub-components and individual indicators can be identified and the analysis of country performance extended” (OECD, 2008, p. 35). However, at this stage, this process is not fully appropriate. Indeed, sub-analyses are more likely to be consistent while the overall profile of each scrutinized subject is exhibited. However, at a later stage of the analysis, methods such as “path analysis, Bayesian networks and structural equation modelling” (OECD, 2008, p. 35) highlight compelling stylized features of consistent trans-level linkages in the categorization. At the present stage, however, it might be more appropriate to identify the potential linkages between the composite indicators and other relevant variables.

6.1.6 Correlation analysis

Correlation analysis allows the assessment of linkages between the composite indicators and other related variables. It differs from multi-variate analysis in that the objective is not to detect potential causality issues between indicators but to correlate the considered composite indicators with measures such as GDP per capita in purchasing power parity, GDP per employment in FTE positions, and economic performance expressed by median wages.

In the case of competitiveness indexes, correlation analysis is especially meaningful. Indeed, territories with relatively high levels of competitiveness should benefit from relatively high levels of GDP per capita in purchasing power parity and high levels of GDP per employment in FTE positions. Similar tests are conducted in the Global Competitiveness Report (GCR) concerning GDP per capita in purchasing power parity. Indeed, the authors of the report find that “the level of productivity determines the rate of return of an economy, and hence its growth rate; in other words, most growth theories – including the neo-classical growth theories of Solow-Swan or Ramsey-Cass-Koopmans – predict that the productivity level not only determines the level of income (…) but also its growth rate” (WEF, 2018, p. 43). Hence, it is possible to measure whether an index that endeavours to assess the relative level of competitiveness of a considered territory on the basis of numerous and distinctive indicators actually assesses the overall competitiveness of a territory as expressed by a conclusive measurement of economic performance.

However, it is important to use correlation methods that consider the assessed level(s) of categorization and/or the geographical scope of analysis. Indeed, regional economic performance indicators might benefit from adjustments. Moreover, technical adjustments might also benefit the soundness of correlation analyses, as potential variance levels between regions of a single political unit might differ significantly from those between nations or even between regions that are not part of a single political unit.

Most importantly, as indicated by the OECD handbook on composite indicators, "it should be noted that composite indicators often include some of the indicators with which they are being correlated, leading to double counting. For example, most composite indicators of sustainable development include some measure of GDP as a sub-component. In these cases, the GDP measure should be removed from the composite indicator before running any correlation" (OECD, 2008, p. 40). Indeed, this conclusion rightly highlights the common issue of double counting that results from dynamic sequence biases. Numerous existing competitiveness indexes mix different sections of the dynamic sequences experienced by a territory and compare them in a horizontal scheme. Consequently, double counting is relatively likely to occur, and consequently, issues related *inter alia* to previous weighting methods might hamper the overall validity of the index. As a result, it is imperative to conduct correlation analysis with a clear view of those dynamic sequences.

6.1.7 Presentation of the results

Regardless of the index, the scheme chosen to exhibit the results should be consistent among the analysed territories. As indicated by Tufte, "the basic structures for showing data are the sentence, the table, and the graphic. Often two or three of these devices should be combined" (Tufte, 2001, p. 178). Consequently, one should select the devices that most accurately express the essence of the results 1) for all subjects in relative terms and 2) for each subject individually.

An index is characterized by its ability to rank subjects on the basis of their relative scores, which encompass numerous indicators. Therefore, most reports based on indexes begin with tables ranking the subjects on the basis of their overall scores. Those overall scores can be computed on the basis of various methods, such as scale methods allowing individual assessments. It is also feasible at this stage to exhibit the overall scores but also scores of sub-categories to detect the major strengths and weaknesses of all subjects. Another option is to display the most recent overall scores in comparison with previous periods to identify dynamic propensities.

In competitiveness indexes, it is common to see tables of overall scores followed by graphics exhibiting similar stylized facts. This approach allows an extensive assessment of score discrepancies between subjects and for general cohort identification. Indeed, although graphics do not exhibit scores as accurately as tables do, they are beneficial for the general understanding of the most stylized features of an index. If the number of subjects analysed is relatively small, it is possible to exhibit graphics of individual yet general scores of an analysed subject. For example, a regional competitiveness index covering *n* regions could include after the overall table(s) of scores *x* corresponding graphics exhibiting scaled scores for all pillars or sub-pillars of each region.

The most advanced competitiveness indexes (e.g., The Global Competitiveness Report) usually complete the overall presentation of relative results with individual scoreboards for all the territories analysed. Indeed, individual scoreboards are the most valuable tools for building rigorous policy measures. They also allow a more transparent assessment of specific indicators for each subject and the identification of the strengths and weaknesses at sub-levels. These scoreboards are usually organized in an extensive table that reproduces the structure of the index. It might also be compelling to exhibit overall and corresponding scores of peer subjects and overall identification features.

The most complete competitiveness indexes also include what Tufte calls "the sentence" (Tufte, 2001). Indeed, explaining the relevance and the content of all tables and graphics increases the overall validity of the considered index. Most importantly, elaborating on individual scoreboards serves as the basis for further discussion and ultimately for the identification of potential specific policy measures. Obviously, comments on scoreboards should follow a systematic approach rather than an idiosyncratic path. The same rigour and systematic approach must be applied to all tables, graphs and comments. In other words, for example, subject *a* should not benefit from an extensive analysis when subject *b* benefits only from stylized comments on its overall scoreboards.

In conclusion, exhibiting the results of an index should rely on a rigorous and systematic approach to the overall presentation of the results as well as the presentation of the individual results of all subjects. All presentation tools should be used to improve the impact and readiness of the index.

6.2 Quantitative steps to build composite indicators and indexes: concluding remarks

An index is constituted of indicators, which are based on measures, which are based on data of various types and from various sources. Whatever the theoretical framework or fundamental methodological assumptions, the validity of an index depends *inter alia* on the extent to which decisive technical steps are implemented. Indeed, whereas any composite index potentially faces the technical issues presented henceforth, not all composite indexes are based on an extensive theoretical framework, nor are they structured, even partly, correspondingly. For example, it is possible to build an index in *t0* on the basis of an extensive theoretical background without considering that in *t+1*, data might not be available for all the designated indicators. Nevertheless, the data selection process, either in *t0* or in *t+1*, is a decisive step in the construction of an index. Consequently, as the structure of this index is built on exogenous assumptions related to the measured sequences, it might be configured in numerous manners. Regardless of those configurations, the 7 steps presented above are decisive in avoiding as many biases as possible, challenging the design and composition of the pre-existing structure and, most importantly, enhancing the validity of the overall index. In other words, those steps constitute an independent process that must be implemented in any index construction. The 7 steps are summarized in Table 1.

Table 1: The 7 major quantitative steps to implement in order to build and safeguard the structure of a composite index

Quantitative step	Brief overview	Main purpose in an index
I) Data selection	Selection and assessment of the most appropriate databases and subsequent data in relation with the measured indicators and to make the decision either to stick to hard data either to use other data sources	To improve the validity of the results by following systematized rules while selecting hard databases and, if other sources are used, to ensure the significance and consistency of the derived data

II) Multivariate analysis	Quantitative disclosure of potentially related measures, which might subsequently allow for the identification of cross-territories similarities and/or of indicators correlations	To identify cross-territories similarities and/or of indicators correlations
III) Normalization	Methods in order to make comparisons between variables achievable. These methods are implemented on the basis of the related theoretical framework	To compile and subsequently compare variables measuring diversified indicators based on various measurement units
IV) Weighting and aggregation	Methods in order to properly capture the relative impact of all components on the structural consistency of an index	To ensure consistent intra- and inter-ponderousness between pillars, subpillars, indicators and measures
V) Robustness and sensitivity analysis	Quantitative analyses in order to challenge the structural integrity of the index	To safeguard the structural integrity of the structure
VI) Correlation analysis	Assessment of linkages between the composite indicators and other relevant related variables	To ensure the avoidance of correlation problems such as double counting issues
VII) Presentation of the results	Consistent strategy in order to present in a comprehensible manner the multilevel results	To allow for the transparent and comprehensible display of the results at all levels of analysis

Source: personal elaboration based on OECD (2008), Olkin and Sampson (2001), and Tufte (2001).

Indexes measuring competitiveness usually comprise numerous related and unrelated measures from various provenances. They aim to measure a dynamic and complex sequence that potentially engenders double-counting issues, *inter alia*. Thus, implementing the 7 steps presented above, providing the chosen methods and presenting the corresponding results are decisive in reducing the potential prejudices associated with theoretical and/or methodological biases. Existing competitiveness indexes at all levels of analysis to a certain extent use some of the methods presented above. However, some indexes provide only basic methodological reports and/or do not publish the corresponding results. Others are more complete, and the interpretations of the results are therefore more obvious. Consequently, major competitiveness indexes at all levels of analysis are presented in more detail henceforward.

7 Existing competitiveness indexes

7.1 Existing competitiveness indexes: introductory remarks and overview

Various academics, institutions and MNEs have designed and built indexes capturing the competitiveness of territories at various levels. These indexes are commonly considered valuable tools for academics, companies and policy makers to compare regions on the basis of diversified indicators, allowing analyses in both relative and absolute terms.

Competitiveness analyses comparing nations are the core of competitiveness indexes. Indeed, they are of great use for national governments, international institutions and organizations, associations of nations, unions of nations, multi-national corporations, etc. They differ *inter alia* from competitiveness indexes at the regional level, as 1) macroeconomic factors necessitate broader considerations, and 2) hard data are often more accessible at the national level than at the regional level.

Numerous indexes at the national level exist for relatively long periods of time. The Global Competitiveness Report a reference in terms of either theoretical background or methodology, as we shall see further below. The IMD World Competitiveness Yearbook is often considered an alternative to the Global Competitiveness Report. These indexes are based on different theoretical and methodological assumptions, so comparisons between them are of great value in assessing the competitive advantages of countries.

Other indexes comparing nations rank them on the basis of one specific factor or a selection of factors that potentially foster competitiveness. For instance, the Doing Business index developed by The World Bank Group focuses on the ease of doing business and is based on the assumption that “an economy cannot thrive without a healthy private sector. When local businesses flourish, they create jobs and generate income that can be spent and invested domestically. Any rational government that cares about the economic well-being and advancement of its constituency pays special attention to laws and regulations affecting local small and medium-size enterprises (SMEs)” (The World Bank, 2019, p. 1). As suggested, this index analyses domestic firms and the impact on them of business regulations of specific countries. As a consequence, it focuses on one specific aspect of the dynamic sequence leading to competitiveness improvements.

Regulations constitute one aspect that allows the potential improvement of firms' competitive advantages. However, business regulations may vary widely across regions as a result of numerous external factors, and their actual influence on firms' competitive advantages may fluctuate across territories and industries.

Another factor-based index, "The Global Information Technology Report" (GITR), is published by the World Economic Forum (WEF) and the Institut Européen d'Administration des Affaires (INSEAD). It focuses on the impact of ICT on the competitive advantage of countries. It is not published on a yearly basis and aims to highlight "the ways in which the digital revolution is changing both the nature of innovation and the rising pressure for firms to innovate continuously" (Baller, Dutta and Lanvin, 2016, p. xii). It is related to competitiveness as "an important channel by which digital technologies can contribute to increased prosperity is via their impact on innovation. As the digital transformation is gathering speed and looks ready to substantially change the global industrial landscape, staying ahead of the curve is becoming more and more important for business survival" (Baller, Dutta and Lanvin, 2016, p. 3). This assertion constitutes the core of the recently adopted revised methodology of the GCR, as we shall see henceforth. For the Doing Business index, the GITR assesses one aspect of the dynamic sequence leading to competitiveness improvements. Whereas that aspect can be considered crucial to that sequence, it does not capture the overall competitive frameworks of the assessed territories. The International Institute for Management Development (IMD) also publishes a sub-index to the IMD World Competitiveness Yearbook: the IMD Talent Ranking. It aims to capture "the efforts invested in developing local talent while being able to attract overseas staff. Ultimately, it describes the quality of the talent pool available in an economy" (Bris *et al.*, 2018, p. 12). The IMD also publishes a ranking on digital competitiveness: the IMD World Digital Competitiveness Ranking. Its purpose is to "assess the extent to which a country adopts and explores digital technologies leading to transformation in government practices, business models and society in general" (Bris *et al.*, 2019). The IMD's other factor-based index, the IMD World Digital Competitiveness Ranking, systemically measures a selection of factors potentially leading to the improvement of competitive advantages and consequently to greater economic prosperity. According to the authors, a set of specific sequences will likely lead to competitiveness improvements. However, that assertion is not statistically tested in the IMD World Digital Competitiveness Ranking, as it is in the GCR.

In conclusion, indexes built on a specific factor or on the basis of a selection of factors that potentially foster competitiveness focus on one aspect or on a selection of aspects that potentially lead to higher competitiveness levels of the considered territories. Hence, they do not assess competitiveness *per se* but rather analyse sub-sequences, dynamically or not, that might ultimately enhance the competitiveness levels of the considered firms and/or the territories in which those firms operate. As a result, indexes built on the basis of one specific factor or a selection of factors will not be further analysed henceforth.

Countries located in similar and/or related areas might benefit from specific indexes that allow transnational analyses of territories facing similar standardized factors. This is especially valuable for countries that are members of an economic association and/or under the rule of an economic agreement, as it allows the integration processes and economic performance improvements of those members to be assessed. For example, the Asia Competitiveness Institute (ACI) engages in competitiveness analysis mostly at the sub-national level for member states of the ASEAN as well as non-member states. It bases its analyses on 4 competitiveness factors: 1) "quality of life and infrastructure development"; 2) "macroeconomic stability"; 3) "financial, business and manpower conditions"; and 4) "government and institutional setting" (Amri *et al.*, 2017, p. 10). Without discussing the theoretical framework or the methodology, the scope of analysis is based on geographic and political considerations. Therefore, it allows sub-regional analyses of countries in which economic relations are relatively intensive. The European Regional Competitiveness Index (RCI) as we shall see hereafter, goes beyond the ACI, as it analyses sub-national regions of nations that are members of a single political institution with authority far more decisive for its member-states than for countries that are members of an economic association and/or under the rule of an economic agreement. Most importantly, all transnational regional analyses must rely on a distinctive theoretical framework and a specific methodology, as macroeconomic factors might differ among a selection of regions, whereas some other regions analysed in relative terms are located within one nation.

Numerous nations endeavour to assess the level of competitiveness of the regions that constitute their territories. Measuring regional competitiveness is crucial, as the agglomeration of economic activities may vary extensively within a national territory and ultimately generate varying economic performances among regions. The extent to which this assessment is realized relies on the political powers that are given to those regions. Indeed, countries based on a federalist structure will not assess or build economic-oriented policy measures in the same manner as countries where centralized governments possess substantial enforcement capabilities. Moreover, countries are often constituted of political regions that only partly correspond to the agglomeration processes of economic activity. Hence, intranational regional competitiveness assessments vary significantly across countries. For example, the United Kingdom Competitiveness Index (UKCI) developed by Huggins, Thompson and Prokop (2019) assesses the competitiveness of a nation composed of highly diversified great regions yet under the rule of a relatively centralized national government. Hence, it focuses on localities as units of analysis. The authors consider competitiveness to be “the capability of an economy to attract and maintain firms with stable or rising market shares in an activity, while maintaining stable or increasing standards of living for those who participate in it” (Huggins, Thompson and Prokop, 2019, p. 7). This definition is predominantly consistent with that of the GCR. As the UKCI assesses competitiveness at the regional level, “the key concern with the design process (…) is to develop a series of indices incorporating data that are available and comparable at the local level, and that go some way towards reflecting the link between macro-economic performance and innovative business behavior” (Huggins, Thompson and Prokop, 2019, p. 8). The index is especially interesting, as it aims *inter alia* to measure the dynamic effects of external factors such as Brexit on a region’s competitiveness (Huggins, Thompson and Prokop, 2019, p. 17). Because there is a “complex interaction between input, output, and outcome factors” (Huggins, Thompson and Prokop, 2019, p. 8), the authors consider that a set of variables must be scrutinized, as those variables influence one another. Hence, the methodology takes into account the fact that variables may reflect factors that are most likely to induce other variables, thus generating location-specific dynamic sequences. As indicated above, the United Kingdom is one of the numerous nations in which intranational regional indexes are produced and used by academics, institutions, governmental authorities, and firms. Even small countries such as Switzerland experience varying agglomeration processes and therefore relatively meaningful disparities in the economic performances of the regions constituting them, as we shall see further below. Indeed, intranational regional competitiveness indexes also exist in smaller nations such as Switzerland.

In conclusion, competitiveness can be assessed through the elaboration of an index on the basis of different theoretical backgrounds and methodologies but first and foremost at different geographical levels. Whether one compares a country, a region or an urban area has decisive aftereffects on the considered index. Consequently, the next sub-sections scrutinize in more detail a selection of indexes that assess the level of competitiveness of territories at different geographical levels and/or on the basis of diverse theoretical backgrounds and methodologies: 1) the Global Competitiveness Report (GCR), 2) the IMD World Competitiveness Yearbook (WCY) at the global level, 3) the European Regional Competitiveness Index (RCI) at the regional level between nations that are members of a single political institution, and 4) the Cantonal Competitiveness Indicator (CCI) comparing regions located within one nation. All sections focus on the theoretical framework of the indexes and the chosen methodology. Ultimately, the concluding remarks address all four indexes with the purpose of providing a general assessment of their prevailing strengths and weaknesses.

7.2 Competitiveness indexes at the national level

7.2.1 The Global Competitiveness Report (GCR)

In terms of cross-national competitiveness analysis, the Global Competitiveness Report (GCR) is commonly considered one of the most influential indexes in terms of competitiveness measurement and comparison. It analyses 141 economies on the basis of 12 pillars. Since 2018, dynamic analysis has no longer been possible, as the methodology has been changed to capture the impact of the "Fourth Industrial Revolution (4IR)" (WEF, 2018, p. 1). The report has been published every year since 1979 (WEF, 2018, p. 1) and aims to provide "policy-makers and other stakeholders around the world with an annual assessment of the drivers of long-term growth" (WEF, 2018, p. 1).

7.2.1.1 Theoretical backgrounds

In the GCR, competitiveness is assessed "through the factors that determine an economy's level of productivity—widely considered as the most important determinant of long-term growth and income. The causal link from productivity to growth and income is firmly grounded in theory and has been established empirically" (WEF, 2018, pp. 1-2). Moreover, "competitiveness is an important starting point because it contributes to higher living standards and generates the resources needed for wider societal goals. There are, inevitably, tensions – social, economic, and environmental – between the various dimensions of economic progress. However, there are no inherent trade-offs among them" (WEF, 2018, p. 2).

Competitiveness when "equated to productivity" is not "a zero-sum game" (WEF, 2018, p. 5). Indeed, all territories can improve their competitiveness levels concomitantly without consecutively deteriorating others' ability to improve their competitiveness. At the national level, the GCR considers that dynamic sequences leading to progressive industrialization are not as clear as they might have been during the twentieth century due *inter alia* to the Fourth Industrial Revolution (WEF, 2018, p. 6). Indeed, "ICTs and globalization enable the rapid transfer of ideas and technologies and lower the barriers to innovation, offering new ways to develop" (WEF, 2018, p. 6). This assertion implies that all countries' competitiveness levels are assessed through the implementation of a unique framework. Obviously, this argument relies on a broad conceptualization of industrialization patterns and more decisively on a simplistic understanding of dynamic sequences that are mostly influenced by labour (WEF, 2018, p. 6). However, numerous countries' inability to build and sustain their competitive advantages are still undoubtedly related to insufficient "institutions, infrastructure and skills" (WEF, 2018, p. 6). Consequently, the report's methodology to a certain extent still expects those matters to precede leverage effects and the ability of a territory to improve its economic performance.

7.2.1.2 The GCR framework

As the latest structure of the GCR relies on the fundamental assumption that the "Fourth Industrial Revolution" impacts dynamic sequences, its framework focuses on "the institutions, policies and other factors that drive productivity" (WEF, 2018, p. 38). Indeed, "raising productivity is a necessary pre-condition towards greater human development" (WEF, 2018, p. 38). That framework consists of 12 pillars in which factors "that collectively determine the level of a country's productivity" are categorized (WEF, 2018, p. 38). The pillars are sorted according to their contributions to the 4 dimensions: 1) "enabling environment", 2) "human capital", 3) "markets", and 4) "innovation ecosystem" (WEF, 2018, p. 39). The fourth dimension constitutes the core of the GCR's new methodology and framework. It aims to capture innovation with a systemic approach, as knowledge accumulation contributes to economic growth (WEF, 2018, p. 42).

In terms of aggregation and weights, the GCR uses the scale method, which implies that pillars are calculated relative to an ideal model. Each pillar is weighted equally, regardless of the number of indicators constituting it. For the normalization of scores, the 98 indicator values are computed using a progress score method (WEF, 2018, p. 42, p. 45). When normalized, the scores are "combined to produce pillar and index scores", with 100 always corresponding to the best value (WEF, 2018, p. 45). Imputation is used to avoid weighting issues in relation to lacking data. Hence, some indicators are calculated on the basis of estimates (WEF, 2018, p. 46). Indeed, "the imputation method for each indicator is based either on econometric models or on the performance of peer countries" (WEF, 2018, p. 46). Estimates are calculated on the basis of relative values "using the average score of a peer group to fill in missing values of countries in that group for a specific indicator" (WEF, 2018, p. 46). Peer groups of countries are considered as such "in terms of the combination of their region and income level" (WEF, 2018, p. 46).

To assess whether the GCR is a compelling measurement of productivity, the authors test the scores with productivity levels. Indeed, they consider that "the level of productivity determines the rate of return of an economy, and hence its growth rate; in other words, most growth theories – including the neo-classical growth theories of Solow-Swan or Ramsey-Cass-Koopmans – predict that the productivity level not only determines the level of income (…) but also its growth rate” (WEF, 2018, p. 43). The authors find significance levels as high as 99% (WEF, 2018, p. 44). Hence, they consider the GCR an accurate measurement of productivity and thus of economic performance.

7.2.1.3 Concluding remarks

In conclusion, the GCR is commonly considered one of the most advanced competitiveness indexes. The fact that it measures competitiveness among nations implies a greater focus on macroeconomic endowments, which vary more widely among nations than among regions of the same nation. The theoretical framework relies on the fundamental assumption that competitiveness can be measured by productivity in terms of income level. Because the GCR is based on a scale method, it allows a dynamic score analysis. However, further dynamic analysis will not be achievable for several years since the fundamental theoretical and methodological changes do not allow comparisons with previous GCR indexes. Moreover, even though imputation is a convenient tool, it still relies on strong assumptions that might alter the quality of the results for one nation relative to another. The fact that some indicators based on surveys are weighted similarly to the stylized figures is potentially problematic. Most importantly, the relatively undetailed approach to the presentation of the theoretical framework and methodology does not allow a complete understanding of the results. Indeed, the sequence leading to economic prosperity is dealt with by relatively straightforward hypotheses. Whereas they have a strong theoretical basis, the process leading to the methodology might have benefited from a more detailed commentary. Nevertheless, the GCR constitutes a relatively complete analysis that allows a deep overview of each nation’s economic record. Even though its structure is not fully relevant when analysing regions collocated within a single political boundary, it still relies on a pertinent understanding of competitive advantages and productivity measurements. Indeed, the GCR might be of great use in framing and building an intranational regional competitiveness index.

7.2.2 IMD World Competitiveness Rankings (WCR)

The International Institute for Management Development (IMD) has published the annual “IMD World Competitiveness Yearbook” (WCY) since 1989 (IMD, 2019). It ranked 63 countries in 2019, which is noticeably inferior to the GCR (141 economies in 2019). It has the particularity of focusing on survey data in addition to statistics through "The Executive Opinion Survey" (IMD, 2019, p. 6).

7.2.2.1 Theoretical backgrounds

The WCY does not provide specific theoretical backgrounds. According to the author, competitiveness is "the extent to which a country is able to foster an environment in which enterprises can generate sustainable value" (IMD, 2019). Indeed, it "provides the framework to quantify the outcome of dealing with these challenges from a country perspective. Ultimately, it allows us to recognize the factors that facilitate prosperity" (IMD, 2019). Therefore, competitiveness is seen as "both a tool and an objective of economic policy" (IMD, 2019). At this stage, we can discern that competitiveness is the result of the economic performance of firms operating in a specific country. Therefore, it is a measure *per se* that is not compulsorily correlated with productivity in terms of output.

7.2.2.2 The WCY framework

The authors of the WCY measure competitiveness on the basis of 4 factors: 1) "economic performance", 2) "government efficiency", 3) "business efficiency", and 4) "infrastructure" (IMD, 2017, p. 4). Those factors encompass various criteria, such as "international investment" and "attitudes and values" (IMD, 2017, p. 4). All criteria are categorized and then standardized to make them comparable. In contrast to the GCR, the WCY bases its framework not on a scale method but on a relative ranking method. Of the criteria, 143 are based on hard data and 92 on surveys. The surveys are "designed to quantify issues that are not easily measured, for example: management practices, corruption, adaptive attitudes and the agility of companies" (IMD, 2019, p. 5). Then, "the survey responses are transformed into their standard deviation values, from which the rankings are calculated" (IMD, 2019, p. 5).

In terms of aggregation and weight, the WCY indicates that "all hard data indicators are reviewed to determine the shape of the distribution. Non-normal data is normalized by taking the log. The SDm (Standard Deviation Method) is then calculated using the logged values" (IMD, 2017, p. 7).

7.2.2.3 Concluding remarks

Whereas the CGI's theoretical background and methodology are publicly published in detail, the WCY's theoretical background and methodology are kept relatively confidential. Its extensive use of surveys is not problematic *per se*. However, it is hardly conceivable in technical terms that it takes into account all the external factors that might either positively or negatively influence the scores provided by the managers selected by the institution. There is no public transparency of the questionnaires or the selection process of those managers. Moreover, selecting "middle and upper level managers in the economies" (Bris *et al*., 2019) could be perceived as a bias since the chosen sample may not be sufficiently representative and/or the answers may not represent a qualitative assessment of a territory's competitiveness level cogent enough to be computed. Ultimately, using a combination of hard data and survey data might be an arduous task as we build indicators that will ultimately be categorized within comparable pillars. Indeed, the assumption in t0 that answers given in t-1 and t-2 are comparable and that their respective significance satisfactorily allows comparisons with hard data might be perceived as unfounded.

Moreover, considering competitiveness a measure *per se* leads to various questions. First, it does not allow a dynamic analysis in terms of factor sequences. Indeed, whereas indicators can be modified from one period to another, they are not categorized in a manner that allows a compelling sequenced frame of reference. As a result, the recommendations attributable to each case cannot be addressed in a categorized and sequenced approach. Second, considering competitiveness "the extent to which a country is able to foster an environment in which enterprises can generate sustainable value" (Bris *et al*., 2019) has an impact on the intrinsic nature of the index since neither that value nor the impact of those firms on the economic performance of the considered territory is defined in quantitative terms. Hence, several sections of the dynamic sequences leading to some of the results used as competitiveness indicators in the index might be biased due to inconsistent categorization.

7.3 Competitiveness indexes at the regional level: transnational regional competitiveness indexes

7.3.1 European Regional Competitiveness Index (RCI)

The RCI is published not yearly but every three years on the order of the European Commission. It is a distinctive index since it compares regions of member nations of the European Union. This implies the implementation of specific indicators, as the European Union is not considered to be a state *per se*. Therefore, the RCI scores regions evolving within a unique political institution that itself influences various indicators of the competitiveness of those regions, whereas other indicators are predominantly influenced by member nations and ultimately by the distinctive levels of autonomy of the regions.

7.3.1.1 Theoretical backgrounds

The authors of the RCI, which is based on the methodology and structure of the GCR, define regional competitiveness as "the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work" (Annoni, Dijkstra and Gargano, 2017, p. 2). The authors consider that whereas GDP is correlated with productivity, other complementary measures should be implemented. This definition of regional competitiveness is indirectly related to that of the GCR. However, whereas it is supposed to focus on regional competitiveness, it actually widens the concept of competitiveness by nominatively introducing residents' ability to live and work within a region as an intention. However, it is not contradictory to consider that "the ability of a region to offer an attractive and sustainable environment for firms" (Annoni, Dijkstra and Gargano, 2017, p. 2) will ultimately enhance that region's ability to improve its productivity. Hence, the modified definition expressed by the authors does not expand the GCR's definition of competitiveness. Consequently, we can consider that the RCI is theoretically based on the GCR.

7.3.1.2 The RCI framework

The RCI framework is comprehensively developed by the authors. It uses a statistical nomenclature of regions (Annoni, Dijkstra and Gargano, 2017, p. 2). Although it is based on the GCR methodology, the RCI is modified to address issues related to the regional analysis. It relies on 11 pillars that are categorized into 3 major groups: 1) “basic”, 2) “efficiency”, and 3) “innovation” (Annoni, Dijkstra and Gargano, 2017, p. 14). The basic drivers included in the first group are considered to be present “in all types of economies” (Annoni, Dijkstra and Gargano, 2017, p. 14) and therefore are least likely to determine a specific region’s ability to enhance its competitive advantage. Regarding the efficiency group, as “a regional economy develops and advances in its competitiveness, factors related to a more skilled labour force and a more efficient labour market come into play” (Annoni, Dijkstra and Gargano, 2017, p. 14). Ultimately, “at the most advanced stage of a regional economy’s development, drivers of improvement are part of the Innovation group” (Annoni, Dijkstra and Gargano, 2017, p. 14). As a result, the RCI aims to capture the fact that whereas regions can be located in the same nation or within the same political organization, they can potentially experience various levels of economic development. This dynamic assessment is of great use since it indirectly introduces the impact of agglomeration processes in a general assessment of competitiveness levels.

The authors use only existing databases of diversified sources, including other specific indexes with frameworks of diverse types. The sourcing and selection processes of existing indicators as well as hard data are exhaustive. The weighting method used by the authors focuses first on the 3 major groups because their interactions perform according to the state of economic development of the considered region. Indeed, “it is assumed that as regions move along the development path, their socio-economic conditions change and different determinants become more and more important for competitiveness” (Annoni, Dijkstra and Gargano, 2017, p. 16). That assumption is implemented for the weighting process of those groups for all regions according to the corresponding levels of GDP per capita expressed in purchasing power parity (PPP) (Annoni, Dijkstra and Gargano, 2017, p. 16).

Additionally, “to correct for different range and measurement units, weighted z-scores are adopted with the regions' population sizes as weights” (Annoni, Dijkstra and Gargano, 2017, p. 19). Most importantly, the authors verify the consistency of each pillar categorized in each major group by implementing principal component analysis (PCA). This analysis is significant since it detects potential indicator inconsistencies within each pillar. Indeed, PCA distinguishes in statistical terms whether 1) “each pillar shows a unique, most relevant PCA component accounting for a large amount of variance" and 2) "all the indicators contribute to roughly the same extent and with the same orientation to the most relevant PCA component" (Annoni, Dijkstra and Gargano, 2017, pp. 19-20). Whereas PCA does not supplant the elaboration and categorization of all indicators, it provides a statistical assessment of those indicators' relative relevancies, thus supporting previously expressed theoretical and methodological assumptions.

7.3.1.3 Concluding remarks

The RCI is of great interest for two main reasons. First, it bases its framework on that of the GCR, implying theoretical backgrounds and methodological assumptions that are similar yet adapted for transnational regional competitiveness analysis. Second, it attempts to deal with transnational relative competitiveness assessments of regions with different political systems that are nonetheless part of a single political organization. Therefore, the authors of the RCI have to manage numerous methodological issues, such as the integration levels of every analysed region and the use of data issued by various institutions. The provenance of the data used in the index could constitute a potential issue, as it implies the comparison of indicators based on data collected in numerous countries in accordance with various collection processes. Moreover, the fact that regions are categorized in terms of their state of economic development is coherent with the GCR methodology prior to 2018 but potentially problematic for transnational regional competitiveness analyses in relative terms. Whereas it might be sensible to perform this categorization for countries with an impact on the competitiveness factors analysed regardless of the extent of political subsidiarity, categorizing regions that are parts of the same political organization but not always of the same nation might generate fundamental biases in the results, even when the indicators are tested through PCA. Moreover, and as in any indexes using data provided by numerous external institutions, one should always be cautious about data collection processes and in this specific case about survey-based indicators and data. Nevertheless, the RCI constitutes a solid ground for regional competitiveness analysis in general. Most importantly, it extensively discloses its theoretical basis and methodological processes. This great transparency allows a thorough understanding of the sequences that, according to the authors, contribute to the improvement of a territory's level of competitiveness.

7.4 Competitiveness indexes at the regional level: intranational regional competitiveness indexes

7.4.1 UBS Cantonal Competitiveness Indicator (CCI)

The UBS bank usually publishes the Cantonal Competitiveness Indicator (CCI) on a bi-yearly basis. It aims to provide “information about the long-term growth potential of Swiss cantons” (Hofer, Holzhey and Skoczek, 2018). Based on a scale method with the best subject reaching the score of 100, it aims to analyse that potential in relative terms since it covers only regions defined in legal terms as included within a single nation. Therefore, in contrast to the RCI, the CCI focuses on regions located within the boundaries of a state.

7.4.1.1 Theoretical backgrounds

The theoretical backgrounds of the CCI are not based on an extensive academic literature on location competitiveness. Instead, the theoretical framework is based on the assumption that competitiveness levels in *t0* provide knowledge on growth potentials in *t+n*. Indeed, according to the authors, the CCI “describes the potential of a canton to sustainably increase its economic output. Cantons with high relative competitiveness are likely to grow faster than the over- all Swiss economy over the long term. Cantons with low relative competitiveness can expect below-average growth” (Hofer, Holzhey and Skoczek, 2018, p. 4)

The 8 competitive pillars constitute *de facto* the theoretical assumptions of the authors. For example, pillar 1 aims to assess the “economic structure” of each canton based on the hypothesis that “the future economic dynamism of a canton depends on its economic structure” (Hofer, Holzhey and Skoczek, 2018, p. 6). Another example is pillar 6, “catchment area”, which “refers to the number of people that can reach an area within a certain time” (Hofer, Holzhey and Skoczek, 2018, p. 8). Indeed, all the pillars are based on theoretical assumptions that are not formally related to any academic literature. The issue is not to determine whether those assumptions are rigorous but to understand how they are related to the existing academic literature. Consequently, it is difficult to analyse the theoretical backgrounds since the theoretical assumptions are incorporated into the CCI framework and not formally related to any previously developed theories.

7.4.1.2 The CCI framework

The CCI is based on 8 competitive pillars composed of a total of 55 indicators (Hofer, Holzhey and Skoczek, 2018, p. 6). For each pillar, cantons are scored in relative terms on a 0-100 scale. That is, in contrast to the GCR, the canton with the highest score is set at 100, and the canton with the lowest score is set at 0. The pillars comprise varying numbers of indicators that are based on hard data from various sources. Some indicators are considered to have a positive impact on cantons' competitiveness levels, whereas others are not. For example, the number of employees per inhabitant in public administrations is supposed to have a negative impact on competitiveness, whereas "export diversification by country" is considered to have a positive impact (Hofer, Holzhey and Skoczek, 2018).

For the weighting method, "the variables are weighted and aggregated so that each canton receives a point value between 0 and 100 for each pillar. To determine the CCI for each canton, the average of the number of points from the eight pillars is calculated and standardized so that the highest cantonal figure is 100" (Hofer, Holzhey and Skoczek, 2018, p. 4). Mechanistically, this implies that all indicators are not weighted equally among the pillars but are weighted in relative terms within those pillars. Standardization is then used to allow comparisons between indicators.

Each canton is also compared to the median value of each pillar, as "the median value of each pillar divides the ranking list of the cantons into an upper and a lower half, each consisting of 13 cantons" (Hofer, Holzhey and Skoczek, 2018, p. 9). This process allows an overall comparison of the scores of all cantons for all pillars relative to the "median canton", which statistically constitutes the median competitiveness profile. The comparison is not based on mean values in order to avoid disruptive values due to irrelevant discrepancies between cantons. As indicated above, the final scoreboard is then built based on "the average of the number of points from the eight pillars" (Hofer, Holzhey and Skoczek, 2018, p. 4).

Interestingly, using the same framework, the authors also test the districts of each canton to observe whether specific patterns occur in terms of competitiveness scores. Indeed, scores at the cantonal level might be the result of districts scoring more disparately in some regions than in others. This sub-level analysis provides insights into the impact of localization processes and agglomeration effects on the overall competitiveness scores of regions. It constitutes a compelling base for the analysis of dynamic sequences leading to greater regional economic performance.

7.4.1.3 Concluding remarks

The construction of an intranational regional competitiveness index is an arduous task since the assessment of the endowments and the macroeconomic indicators must be adjusted in a significant manner. For example, all regions constituting one nation usually benefit from a single monetary policy and, in most cases, from the same property rights protection, *inter alia*. In this respect, the CCI is of interest since it is adapted to capture inter-regional discrepancies.

However, the CCI suffers from a lack of theoretical backgrounds. The suitability of the numerous hypotheses cannot be questioned since we do not even know their provenances. Considering that they are built by the authors, it is likely that those authors followed a theoretical framework that is related to some degree to the academic literature. One could argue that this fundamental issue has side effects on the quality of the overall structure of the index as well as on the choice of indicators. Moreover, the authors choose not to publish the integral elements of the chosen methodology. Hence, it is not possible to rigorously investigate the results. Consequently, it is even more difficult to address decisive policy measures for a specific region.

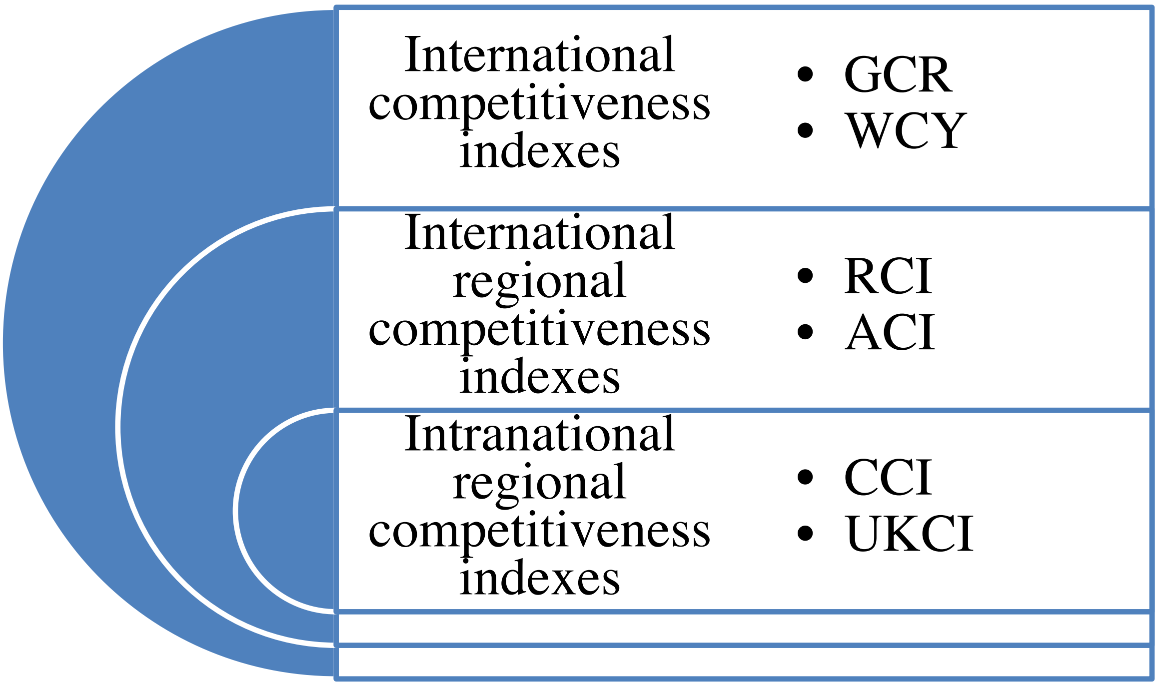
Regardless of those issues, the CCI offers valuable insights into cross-regional relative discrepancies. The fact that the index also tests sub-regions is highly relevant in terms of localization process and agglomeration effect analysis. It is based on diversified indicators that avoid survey-based data. As survey-based data often suffer from fundamental biases, the decision not to use those data strengthens the overall structure of the index.

7.5 Existing competitiveness indexes: concluding remarks

Location competitiveness is difficult to capture. Consequently, indexes composed of multiple indicators are commonly considered tools of considerable value for academics, and even more so for policy makers and firms. Indexes capturing the competitiveness of nations constitute the highest level of analysis. Even though the GCR and the WCY have divergent theoretical frameworks and methodologies, they obviously aim to capture competitiveness at the national level, therefore attributing more weight to endowments and macroeconomic levels than to microeconomic factors, which axiomatically tend to be more localized. However, the GCR constitutes a basis of great value for any index aiming to assess the competitiveness of territories. Indeed, its theoretical framework is thoroughly designed to capture *inter alia* the dynamic nature of economic performance sequences. That is achievable only because the authors test the measured scores with productivity levels expressed in terms of GDP. Correlating index scores with GDP records is a decisive test, regardless of the geographical level(s) of assessment. For indexes capturing the competitiveness of regions transnationally, the most challenging procedure is building a methodology allowing relative analyses of regions located within one nation but also in other nations. Therefore, the RCI is eminently valuable, as it theoretically relies on the GCR but is based on fundamental adaptations to capture competitiveness at a sub-level. Its methodology is even more challenging, as it compares regions under varying ruling systems. Consequently, the RCI methodology provides further insights into standardization measures to make relevant comparisons on the basis of an existing theoretical framework.

Figure 3 summarizes 1) the levels of analysis and 2) the corresponding existing competitiveness indexes scrutinized heretofore.

Figure 3: Levels of assessment of the analyzed competitiveness indexes



Note: GCR: Global Competitiveness Report (WEF); WCY: World Competitiveness Yearbook (IMD); RCI: European Regional Competitiveness Index (European Commission); ACI: Asian Competitiveness Institute; CCI: Cantonal Competitiveness Indicator (UBS); UKCI: United Kingdom Competitiveness Indicator (Cardiff University).
Source: personal elaboration.

Figure 3 summarizes the most consistent levels of analysis and the corresponding existing indexes that have been investigated in this section. The 3 major levels of analysis reflect politically based parameters that are usually pertinent in selecting data in conformity with the correlated nomenclatures. Whereas other parameters, such as employment areas, might be relevant in statistical terms, the existing competitiveness indexes rely on politically based parameters not only because of data availability but also because potential policies, which might subsequently be implemented, are related to authorities and/or entities that are usually modelled on politically based parameters.

As we have seen previously, whereas some indexes, such as the GCR, RCI, UKCI and, to a lesser extent, ACI, are published with their related methodological frameworks, others, such as the WCY and CCI, are presented with little attention to methodological issues. Moreover, some indexes, such as the WCY and CCI, rely on a theoretical definition of competitiveness, thus generating undisclosed correlation choices. We do not suggest that the authors of those indexes did not conduct the relevant correlation tests following the aggregation of their results. However, the fact that there is no disclosure of the indicator(s) with which the final outcomes of those indexes are correlated hampers the ability to determine their overall validity, as the primary guarantee of structural consistency remains concealed and/or is missing. Indeed, if the fundamental hypothesis related to the definition of location competitiveness relies on the postulate that, ultimately, competitiveness is interdependent with productivity, the authors should be encouraged to publish their correlation analyses as major findings. The GCR and RCI exhibit their correlation results, whereas others do not.

In conclusion, as indicated above, intranational regional competitiveness indexes are of decisive value for firms, academics, policy makers and institutions since they capture directly, or indirectly in some cases, the numerous consequences of agglomeration forces for localized economic performance in a more detailed manner than competitiveness indexes comparing nations. Agglomeration forces also occur in relatively small countries, such as Switzerland, in which regional competitiveness levels are measured *inter alia* by the CCI. However, as indicated above, the CCI suffers from a lack of theoretical backgrounds and does not provide thorough explanations of its methodological hypotheses and decisions, whereas those aspects are decisive in measuring the overall quality of the published results. Hence, as we shall see henceforth, it is decisive to elaborate extensively on the concept of location competitiveness as measured in an intranational regional index considering *inter alia* that the process of relating theoretical insights to regional competitiveness measures is of the utmost importance.

8 The concept of regional competitiveness as measured in an index: the preceding process

8.1 The concept of regional competitiveness as measured in an index: introductory remarks

Numerous existing competitiveness indexes at all levels of analysis (i.e., the RCI, the GCR, and the UKCI) are based on sound theoretical backgrounds and on well-designed structures that allow a compelling assessment of the levels of competitiveness of the territories analysed. However, the process of relating the theoretical backgrounds to regional competitiveness measures can be arduous. Indeed, before defining and selecting the determinants of intranational regional competitiveness, it is mandatory to master the transition process between theoretical insights into competitiveness and competitiveness measures. Using a condensed definition of competitiveness as a theoretical basis for building an index might hamper the validity of that index. Consequently, the first sub-section of section 8 elaborates on that transition process.

The second sub-section aims to highlight the difficulty of capturing dynamic sequences in an index in relation to the multi-dimensional phenomenon of competitiveness. Indeed, territorial competitiveness is achieved as a result of a combination of dynamic factors. These sequences imply that potential biases such as double-counting issues in the design of competitiveness indicators and prudential measures should be considered prior to complementary multivariate analysis.

The third sub-section concentrates on the definition of a statistically significant region. Indeed, constructing a competitiveness index implies addressing the issue of comparing territories in which boundaries are not or are only partly framed on the basis of statistically significant economic patterns. Territorial boundaries respond first and foremost to exogenous factors, and it is therefore decisive to discuss the relevance of comparing territories in which boundaries are based on these factors.

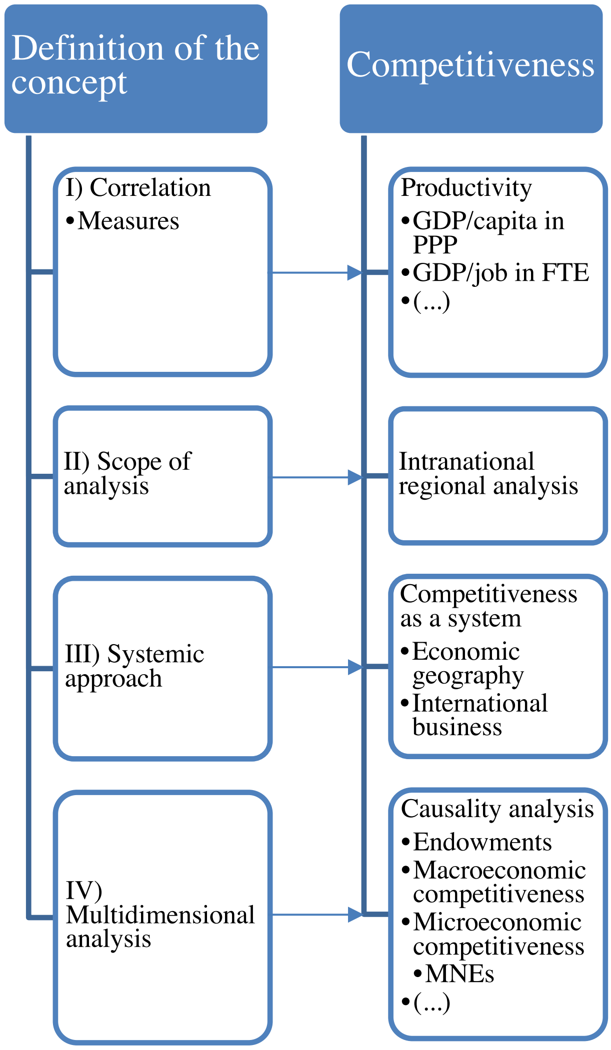
8.2 Relating theoretical insights to competitiveness measures

Some indexes are elaborated on the basis of their theoretical framework, whereas others are not. However, "a theoretical framework should be developed to provide the basis for the selection and combination of single indicators into a meaningful composite indicator under a fitness-for-purpose principle" (OECD, 2008, p. 15). Indeed, the overall validity of an index depends on the extent to which it relies on a comprehensive and clearly presented theoretical framework. Otherwise, it is difficult to recognize the overall logic of the identified dynamic sequences that are considered more likely to enhance territories' competitiveness levels and, consequently, which indicators should be considered, to what extent and, most importantly, how to categorize them since they are all inter-related to a certain degree. As indicated above, control methods should work as firewalls and not as compensators for a weak theoretical background. Therefore, relating theoretical insights to regional competitiveness measures should follow a strict process.

Whereas some broad quantitative measures such as gross domestic product per capita expressed in purchasing power parity (GDP/Capita in PPP) or income Gini coefficient benefit from well-established delimitations, other, more systemic concepts are influenced by various schools of economic thought. For example, competitiveness is defined in numerous ways on the basis of various factors, such as the level of analysis (firm level, industry level, territorial level) and/or the author's school of thought (Dunning, 1988b, 1998, 2009; Dunning and Lundan, 2008; Krugman, 1991; Porter, 1990a, 1998, 2002; Porter *et al.,* 2008; Rugman and Verbeke, 2001b, 2009; Scott, 1985). Indeed, at the national level, Scott defines competitiveness as "a nation's ability to produce, distribute, and service goods in the international economy in competition with goods and services produced in other countries and to do so in a way that earns a rising standard of living. The ultimate measure of success is not a 'favorable' balance of trade, a positive current account, or an increase in foreign exchange reserves: it is an increase in the standard of living" (Scott, 1985, pp. 14-15). Porter states *inter alia* that "the only meaningful concept of competitiveness at the national level is productivity" (Porter, 1990a, p. 6). Based primarily on Porter, the WEF considers that competitiveness is "the set of institutions, policies, and factors that determine the level of productivity of an economy" (WEF, 2017, p. 11). At the regional level, the authors of the Regional Competitiveness Index (RCI) define regional competitiveness as "the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work" (Annoni, Dijkstra and Gargano, 2017, p. 2), thus implementing adjustments based on the level of analysis.

The overall process of relating theoretical insights with competitiveness measures can be translated into a two-sided figure (see Figure 4). The figure is two-sided because it proposes an overview of the process from a generic perspective on one side and converts that process for competitiveness measures into an index on the other side as an example. Relating the two columns ultimately allows the elaboration of an extensive definition of the systemic concept, which is then assessed through the subsequent index.

Figure 4: Process translating theoretical insights with competitiveness measures



Note: FTE: Full-Time Equivalent; GDP: Gross Domestic Product; MNE: Multinational Enterprise; PPP: Purchasing Power Parity.
Source: personal elaboration based on OECD (2008) and on Porter *et al*. (2008).

An index is more likely to reach a relatively high degree of validity when it is based on a sound theoretical framework that is implemented methodologically and systematically. The structure exhibited in Figure 4 divides this process into 4 cumulative steps, which allow us 1) to narrowly define the concept measured in the index and to indicate to which measure(s) that index will be correlated and to what extent, 2) to delimit the scope of analysis, 3) to elaborate on the systemic characteristics of that concept, and 4) to theoretically address the issues related to the multi-dimensional analysis. All the steps indicated above embody aspects that should be considered when selecting the measures and the correlated indicators.

First (step 1), the systemic concept of competitiveness implies indicating the ultimate measure(s) to which it will be correlated. For example, the measure of competitiveness measure can be captured by productivity expressed in quantitative terms and/or by standards of living expressed by a set of quantitative indicators. Moreover, it implies identifying the main factors it will rely on and elaborating on the scope of analysis. As indicated above, the relative competitiveness of industries is not measured in the same manner as the relative competitiveness of territories. However, the relative competitiveness levels of nations are not measured in the same manner as the relative competitiveness levels of regions, and the relative competitiveness levels of regions must be considered differently depending on whether those regions constitute a single nation. Consequently, the definition of competitiveness, as it is a multi-dimensional concept, should include the ultimate measure(s) to which it is correlated.

Second (step 2), it is necessary to clearly establish the scope of analysis of the index, which follows the definition. A competitiveness index is composed of indicators that are expected to measure the level of competitiveness of territories. Ultimately, all the territories analysed achieve a score that can be investigated in absolute or relative terms. Whatever the index, its intrinsic nature is to rank subjects on the basis of their ability to achieve a score. Consequently, it is necessary at an earlier stage to clearly indicate 1) the scope of analysis and 2) the characteristics of the parameters included in the assessment.

Third (step 3), theoretical insights should be utilized with consideration of the multi-dimensional nature of the concept they aim to define. A concept such as competitiveness is investigated either directly or indirectly by numerous researchers in a mostly complementary manner. Indeed, geographic economists elaborate on competitiveness using a scope of analysis that effectively does not contradict that of international business theorists. Hence, it is necessary to use theoretical insights in relation to a specific concept, in this case competitiveness, while considering that it is likely to have complementary approaches that allow a more systemic analysis and ultimately the ability to measure more consistently the dynamic sequences leading to higher relative levels of competitiveness for certain territories in comparison with others.

It is likely that an index capturing a multi-dimensional concept will be based on numerous theoretical perspectives. Whereas the process of selecting the existing theoretical frameworks on which an index will be built is somehow a more subjective operation, extracting the major characteristics of those frameworks requires a systematic approach. Indeed, different theoretical frameworks might potentially investigate the same concept 1) from different angles, 2) at different stages of a dynamic sequence, or 3) as a sub-concept of an overall system. For example, geographic economists such as Porter consider *inter alia* that territorial competitiveness is captured by productivity, which results from the firms operating in the considered location (Porter, 1998, p. 9). The productivity levels of firms is highly influenced by agglomeration forces (Porter, 1998). On the other hand, international business theorists such as Dunning concentrate on the crucial role of location in comparative advantages for MNEs in both host and home locations (Dunning, 1998; Dunning and Lundan, 2008; Gugler, 2018). Consequently, we understand that the competitiveness of a location is investigated from two different yet highly complementary perspectives that influence one another. This example shows that systemic concepts should be investigated from different perspectives. Indeed, identifying theoretical sources in light of the systemic nature of the analysed concept is mandatory.

Fourth (step 4), on the basis of the concept's definition and considering the level of analysis, it is necessary to elaborate on its multi-dimensional characteristics (OECD, 2008, p. 22). In other words, the definition must be deconstructed to identify 1) the sub-concepts and 2) "the underlying indicators" (OECD, 2008, p. 22). For example, as indicated above, Porter considers productivity "the only meaningful concept of competitiveness" (Porter, 1990a, p. 6). Porter *et al.* (2008) identify 3 "underlying causes of productivity": 1) "endowments", 2) "macroeconomic competitiveness", and 3) "microeconomic competitiveness" (Porter *et al.*, 2008, p. 45). Therefore, Porter *et al.* (2008) consider that competitiveness is ultimately correlated with the corresponding level of productivity. The productivity level therefore relies on those three underlying yet cumulative causes. Then, the authors elaborate on each of those factors and identify sub-factors and ultimately underlying indicators.

Sub-dimensions might also benefit from theoretical explanations. Defining and elaborating on those sub-dimensions do not axiomatically imply that those sub-dimensions constitute, at a later stage, the pillars structuring the index. Indeed, they each embody one feature of the concept and correspondingly allow a deeper understanding of its systemic functioning. Consequently, the next sub-section further scrutinizes the difficulty of capturing dynamic sequences in an index in relation to the multi-dimensional phenomenon of competitiveness measures.

8.3 The multi-dimensional phenomenon of competitiveness measures

Measuring competitiveness is a demanding process, as it is a dynamic and multi-dimensional phenomenon. As indicated by Porter *et al.* (2008), measuring territories' competitiveness is a challenging exercise "because of the sheer number and variety of influences on national productivity. Correlation among many of the indicators makes disentangling the impact of individual indicators complex from a statistical standpoint. It is precisely because of these challenges, as well as the fact that most studies highlight a subset of influences rather than seeking a comprehensive model, that the academic literature has not achieved consensus on the causes of productivity" (Porter *et al.*, 2008, p. 44). Indeed, correlation among indicators results predominantly from dynamic sequences leading to specific levels of territorial competitiveness.

Dynamic sequences imply that any territory experiences a sequence of competitiveness input factors generating competitiveness outputs. Crucially, these outputs might in return impact competitiveness inputs in *t-1,* whereas those inputs are considered as such in *t0*. For example, if the costs of doing business in a region are relatively low and relatively specialized industries are already prospering in *t-1*, the rate of creation of new firms and related and supporting industries might increase. Then, those firms operating in the same, similar, related or supporting industries might *inter alia* positively impact labour and capital productivity in *t0*. Therefore, relatively high levels of labour and capital productivity might not only improve the state of development of the clusters located within the considered territory and quantitatively recognized as such but also improve the comparative advantages of the location for MNEs. Ultimately, relatively higher levels of labour and capital productivity might in *t+1* positively impact the fiscal resources of the concerned public authorities that might in *t+1* and in *t+n* implement an even more efficient fiscal policy for firms, including MNEs. Therefore, whereas an efficient fiscal policy for firms might be perceived as an input in *t-1*, it could encounter shifts in *t0*, *t+1* and/or *t+n* as a result of competitiveness outputs from another perspective of the considered sequence.

Whereas econometrists and statisticians recommend numerous methods of analysing dynamic causal chains, particularly in macroeconomics (Masih and Masih, 1995), dynamic sequences leading to improvements in territorial competitiveness still require specific analysis. Indeed, each territory experiences a dynamic sequence of competitiveness that is likely to differ to a certain degree from that of other territories. Consequently, holistic investigations allow us to identify stylized factors that are most likely to engender spillover effects, improving the overall competitiveness system of a territory (Porter, 1998).

At this stage, it is *de rigueur* to provide an audience for the theoretical investigation of those sequences in order to select the appropriate measures for building the indicators that are categorized correspondingly. As indicated by Porter *et al.* (2008), in any territory, "at a particular point in time, a subset of microeconomic conditions will represent the most pressing barriers to reaching higher levels of productivity" (Porter *et al.*, 2008, p. 48). As a result, the authors conclude that economic development is enhanced by "many simultaneous changes across a broad number of policy areas" (Porter *et al.*, 2008, p. 48). That assertion at the country level can be translated with even greater impact at the regional level. Indeed, regions constituting a single nation encounter *inter alia* a single monetary policy and comparable political institutions, thus strengthening the role of microeconomic conditions *vis-à-vis* macroeconomic conditions.

Indeed, the extent to which those regions are influenced by macroeconomic competitiveness at the national level may vary. Nevertheless, at the regional level, microeconomic competitiveness is consecutively more likely to represent a greater share of the foundations of productivity. Regarding the stages of economic development (Porter *et al.*, 2008, p. 51), regions constituting a single nation are more likely to share relatively comparable economic sophistication levels than nations compared to one another at the global scale. However, "the sequential process of building interdependent microeconomic capabilities, improving incentives, evolving company strategies, and increasing rivalry creates important pitfalls in economic policy" (Porter *et al.*, 2008, p. 51). This conclusion is especially cogent when comparing regions experiencing harmonized policy measures at the national level. Indeed, whereas each territory's level of competitiveness influences other territories contained within the same political boundary, each territory has encountered and continues to encounter a unique sequential process. Consequently, the only possibility is to address this relative singularity by considering the systemic functioning of all sequential processes that share a common thread.

The systemic functioning of all sequential processes implies interdependencies between competitiveness enhancer factors, with relative weights varying from one territory to another. As quoted above, Porter *et al.* identify 3 "underlying causes of productivity": 1) "endowments", 2) "macroeconomic competitiveness", and 3) "microeconomic competitiveness" (Porter *et al.*, 2008, p. 45). There are interdependencies among those causes, but the factors constituting each of them are not categorized equally in terms of how they influence productivity. Indeed, Porter *et al.* consider that "macroeconomic factors operate indirectly to affect the productivity of firms in an economy. They are necessary, but not sufficient, for higher productivity" (Porter *et al.*, 2008, p. 46). In contrast, microeconomic factors "operate directly on firms in affecting productivity" (Porter *et al.*, 2008, p. 47). They are divided into two broad categories: 1) "the sophistication of company operations and the quality of the business environment" and 2) "the state of cluster development" (Porter *et al.*, 2008, p. 48). As these two broad economic factors substantially influence the probability that a territory will achieve higher competitiveness levels yet influence one another, "moving to more sophisticated ways of competing depends on parallel improvements in the microeconomic business environment" (Porter *et al.*, 2008, p. 48). More advanced regions within a single political boundary *ergo* build their relative competitive advantages as a result of their ability to improve their microeconomic business environment, as depicted in Porter's diamond model (Porter, 1990a). Consequently, it is possible not only to sort indicators on the basis of the 3 "underlying causes of productivity" (Porter *et al.*, 2008, p. 45) but also to attribute theoretical weights to those causes on the basis of the scope of analysis. Moreover, the systemic functioning of the diamond allows a deep understanding of the stylized factors improving territories' business environments. As a result, indicators can be designed and implemented dynamically, thus to a certain extent addressing the potential biases related to dynamic sequences.

Until 2018, the WEF based the GCR's theoretical framework on Porter *et al.* (2008). In later reports, that is, the 2018-2019 version, at the country level, the WEF considers that the dynamic sequences leading to the progressive industrialization of territories are not as clear as they might have been during the twentieth century due to the Fourth Industrial Revolution (WEF, 2018, p. 6). Consequently, stylized factors leading to improvements in the business environment are heavily influenced by that global dynamic sequence. Whatever the potential issues related to that shift in the theoretical framework, it shows that dynamic sequences are investigated theoretically before being tested quantitatively.

In conclusion, the overall validity of a competitiveness index depends on the extent to which the dynamic sequences most likely to lead to higher competitiveness levels are theoretically scrutinized and translated into 1) the definition of the concept and 2) the overall structure of the measured concept. The scope of analysis plays a crucial role. Indeed, assessing the stylized dynamic sequences of regions constituting one nation will differ from assessing the stylized dynamic sequences of countries. Moreover, interdependencies among factors imply making a significant judgement call to address the issue of the input and output categorization process: 1) to sort factors, indicators and sub-indicators on the basis of their respective causality characteristics; 2) to consider that interdependencies among factors do not allow a systematic categorization of indicators on the basis of dynamic sequences; or 3) to implement this process at specific levels of the framework only. Whatever the result of that judgement call, elaborating on stylized dynamic sequences strongly depends *inter alia* on the geographical scope of analysis, as we shall see henceforth.

8.4 The definition of a statistically significant region

As mentioned above, a competitiveness index is composed of indicators that are expected to measure the level of competitiveness of locations. Ultimately, all the locations analysed achieve a score that can be investigated in absolute or relative terms. Whatever the index, its intrinsic nature is to rank subjects on the basis of their ability to achieve a score. That score is designed to measure as accurately as possible a multi-dimensional concept, in this case competitiveness. As indicated above, measuring the competitiveness of a country, a region, or an urban area requires determining 1) the scope of analysis and 2) the characteristics of the parameters included in the assessment.

The scope of analysis is particularly relevant at the regional level. Indeed, as quoted above, "of these smaller units, it is regions (including city-regions) that are the most appropriate for analysis of competitiveness because they are increasingly significant units for policy making in many (though not all) countries" (Aranguren *et al*., 2010, p. 9). It is necessary at this stage to define a region in order to compare it with other regions in a normalized process. It is likely to be more problematic to define a region than a nation, which is the benchmark in terms of territorial comparison. Regions are the constituent parts of nations of various sizes in geographical and/or economic terms. The geographical and/or economic sizes of regions may vary across and within territories. Regions located within some nations might outrank other nations in such terms.

Moreover, the characteristics of the parameters included in the assessment may be of numerous natures. The most standard approach to the process of region selection is selection on the basis of political boundaries. Most nations are divided into numerous regions in which levels of autonomy may vary considerably according to the political distribution of power. The level of political autonomy of those regions constituting a nation will have an impact on the assessment, as policy measures might be implemented at different governing levels. A less standard approach is to compare regions with statistically shaped boundaries on the basis of economic measures such as employment concentration. Indeed, territories' borders might be the consequences *inter alia* of labour market areas that overcome the phenomenon of cross-border economic activities and acknowledge that an economic agent may live in one region and work in another. Furthermore, statistically shaped boundaries on the basis of economic measures also take into account the fact that agglomeration forces and the clustering of economic activities often cross regional borders.

However, regional competitiveness indexes tend to select regions on the basis of political boundaries. First, this approach allows better data collection. Indeed, as competitiveness is a multi-dimensional concept, it requires building indicators on the basis of various measures that are collected at either the regional level or the national level but cover the considered regions. One could argue that since data selection is a process that might occur at a later stage, statistically shaped boundaries are more suitable since they integrate agglomeration forces of economic activities. However, an index is an instrument dedicated to policy makers, whose scope for action results mostly from public authorities that are predominantly related to political boundaries, even if coordinated measures are often implemented. Consequently, it is seemingly more appropriate to select regions shaped by political boundaries while assessing regional competitiveness. This approach does not hinder the implementation of complementary measures based on statistically shaped boundaries, notably while assessing the clustering of economic activities and the correlated effects on productivity.

Determining the scope of analysis and normalizing the characteristics of the parameters included in the assessment are two fundamental steps in the construction of an index. Indeed, the authors must clearly indicate 1) the subjects of their analysis and 2) whether it is possible to measure those subjects in absolute and relative terms with regard to the considered multi-dimensional concept. Other subsequent decisions must also be made. First, it is necessary to determine whether to compare all the regions within a single political boundary. Indeed, it is potentially conceivable to compare only regions achieving relatively similar levels of GDP/capital expressed in PPP and/or only to compare regions located close to one another in geographical terms. However, if those regions are contained within a single political boundary, there is a fundamental bias in the decision not to compare all the subjects within that political boundary. If the regions are not contained within a single political boundary but are compared, for example, because of their geographical proximity, biases might occur due *inter alia* to discrepancies in data selection and/or the extent to which the regions have various levels of autonomy.

Consequently, it is seemingly more relevant to compare politically delimited regions contained within a single political boundary, i.e., a nation, and to construct an index that is not based on a selection of regions but allows a comprehensive analysis of all regions in absolute and relative terms. Whereas this selection process is not free of all obstacles, it avoids fundamental biases such as subjective decisions not to compare all regions within a single political boundary and/or to use statistical boundaries based on partial measures that do not allow further emphasis on the assessment of a multi-dimensional concept. Perhaps most importantly, a selection process based on politically delimited regions contained within a single political boundary allows practical policy measures to be implemented subsequently, as that process indirectly follows the diagram of political power distribution.

8.5 The concept of regional competitiveness as measured in an index: concluding remarks

The production process of an index is preceded by the elaboration of a strong theoretical framework that not only covers the appropriate literature on the matter but is also built on the basis of that literature in order to implement it consistently. Indeed, aiming to measure a multi-dimensional concept, competitiveness here implies 1) defining the concept as accurately as possible and 2) considering 2.1) the systemic functioning of all sequential processes, 2.2) the scope of analysis, and 2.3) the characteristics of the parameters included in the assessment. On this basis, it is possible to provide a consistent definition of the concept and subsequently to build a corresponding index structure.

The first step is especially decisive, as it constitutes the basis for the entire index. This is why it is imperative to follow a consistent process that allows the elaboration of an exhaustive definition. That definition must be suited to the index that will subsequently be constructed. In other words, it should address the issues related to the correlated indicators and indicate the scope of analysis.

Once the definition is disclosed, the validity of the overall index is enhanced if the most relevant components of the definition are scrutinized separately in light of the academic literature on one hand and the corresponding implementations in the subsequent index on the other hand. For example, if the authors consider that a stylized dynamic sequence is more likely to lead to relatively high levels of territorial competitiveness, that sequence must be scrutinized on the basis of each of its components and then analysed systemically.

Only then is it possible to understand how an index is structured and whether it tackles the issue of causality among indicators.

The scope of analysis also influences the manner in which the overall concept is structured and should also be investigated in further detail. Indeed, defining the competitiveness of nations or of regions might engender numerous adjustments, which should be not only implemented but most importantly demonstrated. Moreover, the parameters of the analysis should be clearly indicated as well as the reasons why they include or do not include all the comparable territories within a single political boundary.

Considering the steps scrutinized in this section (section 8), the next section (section 9) applies them to the structuring of the definition of regional competitiveness, which might subsequently be used as a foundation for the construction of an intranational regional competitiveness index, as we shall see further below. Indeed, it summarily refers to the theoretical backgrounds that will subsequently be used to systematically define the measured multi-dimensional concept, competitiveness at the regional level.

9 The steps of the production process of an intranational regional competitiveness index and the corresponding generic structure

9.1 Step 1: defining intranational regional competitiveness as measured in an index and identifying the determinants of intranational regional competitiveness

Following the methodology disclosed in the previous section, it is now necessary to implement it to 1) define intranational regional competitiveness considering its multi-dimensional characteristics and 2) subsequently analyse the main determinants of intranational regional competitiveness. *In fine*, those determinants are the major constituting elements of the structure of the index and lay the foundation for identifying and constructing its pillars.

First, the competitiveness of firms should not be confused with that of territories. As indicated by Porter in Snowdon and Stonehouse (2006), whereas the competitiveness of firms is measured by market share and profitability, the competitiveness of locations is measured *inter alia* by “the productivity of the resources utilized in that location” (Porter in Snowdon and Stonehouse, 2006, p. 165). The goal of an intranational regional competitiveness index is to assess the levels of competitiveness of the locations it compares. Second, competitiveness might be perceived from different angles depending on the approach. Classical economists all refer indirectly or directly to competitiveness in their works, considering that a territory is constituted of certain advantages and will improve its competitiveness level through gains in average productivity through acts of specialization (e.g., Smith, 1776; Marshall, 1920). Neo-classical theorists’ emphasis on the effect of human capital and technological progress on productivity also rejoins to a certain extent the concept of territorial competitiveness and, most importantly, its systemic functioning (*inter alia* Porter, 1990a, 1998). As competitiveness is a multi-dimensional concept, further investigations of the factors that enable territories to improve their competitive advantages are addressed *inter alia* by two major economic approaches: 1) the economic geography approach and 2) the international business approach.

The economic geography approach concentrates on agglomeration forces of economic activities that potentially engender positive externalities and, among the correlated externalities, higher relative productivity levels. As epitomized by Krugman, “most of the literature in this area follows Marshall in identifying three reasons for localization. First, the concentration of several firms in a single location offers a pooled market for workers with industry-specific skills, ensuring both a lower probability of unemployment and a lower probability of labor shortage. Second, localized industries can support the production of non-tradable specialized inputs. Third, informational spillovers can give clustered firms a better production function than isolated producers” (Krugman, 1991, pp. 484-485). In other words, highly localized processes lead to higher relative productivity levels of the firms located in a territory that consequently benefits from higher prosperity levels than those of other territories. Ultimately, as indicated by Porter, “the appropriate definition of competitiveness is productivity” (Porter, 2002, p. 2). From that definition, we can extract *inter alia* 2 major characteristics while considering the elaboration of a regional competitiveness index: 1) competitiveness is multi-dimensional and depends on factors of various compositions (endowment-based, macro-based and micro-based), and 2) competitiveness, whereas it is a multi-dimensional concept, is correlated with productivity.

The international business approach addresses the problem of territorial competitiveness from MNEs' point of view, which is crucial as globalization progresses, thus impacting the return agglomeration forces of economic activities. Regions' ability to attract MNEs on the basis of their competitive advantages but also to enhance those advantages or even to create advanced competitive advantages will ultimately augment their capabilities in terms of productivity (Dunning, 1981, 1988b, 1998, 2009; Dunning and Lundan, 2008). This ability is correlated with the stage of economic development of those regions, as "knowledge-intensive and export-oriented activities tend to be more geographically concentrated than other kinds of activities" (Dunning, 1998, p. 58). Moreover, the attractiveness of regions depends on their ability to attract foreign direct investment (FDI), and FDI fosters the attractiveness of a territory, notably when it strengthens the competitive advantages of existing clusters. From a regional perspective, location microeconomic assets are of even greater importance. In principle, from a legal point of view, regions share similar macroeconomic endowments, such as a common monetary policy and/or the same access to foreign markets. Hence, as indicated by Dunning, "the spatial distribution of L-bound resources (location-bound resources), capabilities and institutions is assumed to be uneven and, hence, will confer a competitive advantage on the countries possessing them over those that do not" (Dunning and Lundan, 2008, p. 100). It is in the interest of a region not only to attract MNEs and/or part of their activities but also to offer the best set of conditions that will allow the firms located there to compete globally, as indicated by Rugman and Verbeke (2001b). Indeed, it should be an objective for local authorities and/or institutions to foster "the creation of 'sticky places'" (Rugman and Verbeke, 2001b, p. 164) that constitute a "cooperative sustainable local network" (Rugman and Verbeke, 2001b, p. 165). In addition, clusters, as scrutinized by Porter, play a crucial role, as "localized networks of related and supporting activities act as an agglomeration magnet on FDI" (Rugman and Verbeke, 2009, pp. 162-163). In other words, the agglomeration of highly specialized activities tends to attract FDI, but FDI might in return influence agglomeration forces. Moreover, the agglomeration of highly specialized activities potentially pushes firms to compete globally.

This succinct overview of the theoretical insights allows the implementation of those theoretical insights following *inter alia* the steps defined in Figure 4. Consequently, competitiveness as measured in an intranational regional competitiveness index is defined as follows, based on Porter (1980, 1990a, 1998, 2002), Porter *et al.* (2008), Dunning (1981, 1988b, 1998, 2009), Dunning and Lundan (2008), and Rugman and Verbeke (2001b, 2009):

> "Regional competitiveness consists of the ability of a region to build its competitive advantages on the basis of its endowments, its political institutions and subsequent policies, its fiscal policies, its capital resources, and its human capital and to constitute a set of determinants that enhances the creation of new firms and the attraction of firms located elsewhere or part of their activities and allows the firms located in that territory to improve their productivity and thus the average standard of living of the society. Competitiveness is ultimately determined by productivity as measured *inter alia* by 1) GDP/capita in purchasing power parity and GDP/employment in full time equivalent positions in purchasing power parity. A region is considered as such if its boundaries correspond to the jurisdiction of a ruler and it is a constituent part of a nation, along with other regions with which it competes. Regional competitiveness is considered a multi-dimensional and systemic concept that is determined at three levels categorized on the basis of their corresponding outcomes: 1) endowments, 2) macroeconomic competitiveness and 3) microeconomic competitiveness (Porter *et al.*, 2008, p. 45)" (personal elaboration based on Dunning, 1981, 1988b, 1998, 2009; Dunning and Lundan, 2008; Porter 1980, 1990a, 1998, 2002; Porter *et al.*, 2008; and Rugman and Verbeke, 2001b, 2009).

This definition is distilled from the essence of the major findings of the two complementary economic approaches. It follows the scheme produced in Figure 4. It also includes the three major components that will allow the construction and categorization of the index pillars constituted of the corresponding indicators. Only then is it consistent to select these indicators, which are assessed through various measures tested and assessed by following the steps commonly considered imperative in building a sound and convincing compositive index. For example, weighting choices are legitimized by the preceding ability to build an index structure on the basis of a definition supported by a theoretical framework that allows multi-dimensional analysis. Consequently, following a systematized intrinsic procedure relating theoretical choices to the subsequent construction of an index before dealing with weighting or normalization choices allows the potential quantitative biases related to those choices to be minimized.

The process, which follows the definition exhibited above, consists of the analysis of the three parts of regional competitiveness: 1) endowments, 2) macroeconomic competitiveness and 3) microeconomic competitiveness (Porter *et al*., 2008, p. 45), as we shall see hereafter.

9.2 Step 2: analysing the determinants of intranational regional competitiveness

9.2.1 Endowments

According to Porter, considering the endowments in an index allows a distinction to be made "between prosperity and productivity" (Porter *et al*., 2008, p. 45). Endowments are inherited and include, *inter alia*, natural resources and/or location *vis-à-vis* other territories (Porter *et al*., 2008, p. 45). Moreover, "endowments influence prosperity but not the underlying productivity, and cannot be changed through policy" (Delgado *et al*., 2012, p. 8). At the regional level, location also plays a significant role in terms of endowments. Indeed, the distance of a region from the national border and/or from other regions might influence its prosperity. Moreover, the composition of the territory in geographical terms might be influential. Historical legacy also constitutes an endowment, as "some important recent studies show the very long-term impact of institutions on cross-country prosperity differences" (Delgado *et al*., 2012, p. 23). This legacy has ramifications for regions, notably in institutional terms. Indeed, the extent to which the decision process is historically centralized or decentralized has an extensive impact on existing institutions and decision processes.

Most importantly, the location of a country influences its potential prosperity. This is also true for the location of the regions constituting it. A region's endowments in terms of location also influence the prosperity of other regions. Moreover, proximity between national authorities and specific regions might impact the relative prosperity in light of inherited governmental processes. Proximity between regions also influences endowments *per se*.

As Delgado *et al*. observe that "endowments influence prosperity but not the underlying productivity" (Delgado *et al*., 2012, p. 8), the authors "introduce endowments in (the) framework as controls" (Delgado *et al*., 2012, p. 8). Indeed, they consider that as some endowments are dynamic, they might influence the current factors leading to prosperity. Those endowments are constituent factors of prosperity *per se*. Consequently, an intranational competitiveness index should clearly differentiate endowments from macroeconomic and microeconomic competitiveness. It is especially crucial to correlate the scores of that index with productivity measures.

In conclusion, the endowments constitute the basis on which a territory has the potential to build its competitive advantage and consequently to improve its productivity, as "prosperity is ultimately rooted in the ability to (…) achieve high productivity" (Delgado *et al*., 2012, p. 2). However, "the economic value of endowments will be affected by policy choices countries make. A competitive nation is one which enhances the value of endowments through a better environment for business" (Delgado *et al*., 2012, p. 2). This conclusion is also true at the regional level, as it is the ability of a territory to maximize the value of its endowments that will ultimately impact its prosperity. However, prosperity *per se* "is created by productivity in the use of endowments" (Porter, 2020), and this productivity is built on macroeconomic factors that "operate indirectly to affect the productivity of firms in an economy" (Porter *et al*., 2008, p. 46) and, most importantly, on microeconomic factors that "operate directly on firms in affecting productivity" (Porter *et al*., 2008, p. 47), as we shall see hereafter.

9.2.2 Macroeconomic competitiveness

According to Delgado *et al*. (2012), based on Porter (1990a, 1998) and Porter *et al*. (2008), "macroeconomic competitiveness is driven by a range of institutions, policies, and public good investments that set the context for an entire economy" (Delgado *et al.*, 2012, p. 9). It plays an indirect role in firms' ability to improve their productivity levels. Macroeconomic competitiveness is divided into two groups: 1) "social infrastructure and political institutions", which includes 1.1) "basic human capacity", 1.2) "political institutions", and 1.3) "rule of law", and 2) "macroeconomic policy", which includes 2.1) "fiscal policy" and 2.2) "monetary policy" (Delgado *et al.*, 2012, p. 55). Obviously, that framework is intended to compare nations and not regions. Consequently, some aspects cannot be implemented in the same manner at the regional level. For instance, monetary policy is in principle metonymic across a nation composed of regions, and the same principle can be applied to regions constituting countries under the rule of a single monetary policy. Therefore, the impact of monetary policy is not a forceful sub-group at the regional level.

Nonetheless, other factors leading to the improvement of macroeconomic competitiveness may vary considerably across regions constituting a single nation. These factors differ substantially on the basis of a region's level of autonomy, as that autonomy will have an impact on government spending efficiency (Delgado *et al.*, 2012, p. 46). According to Delgado *et al.*, decentralization has a positive impact on policy making (Delgado *et al.*, 2012, p. 46). In relatively decentralized countries, fiscal policy will notably be designed and implemented by regional authorities even if the central government also levies taxes. In more centralized countries, most taxes are levied by the national government, which then attributes shares of the taxes to regions on the basis of various conditions. This crucial difference therefore constitutes a syllogism. The greater the decentralization of governmental processes, the more macroeconomic competitiveness must be taken into consideration in designing and framing the regional competitiveness index. This is also significant for sub-groups of macroeconomic competitiveness, such as political institutions, and for indicators such as "government spending efficiency" or "transparency of government policy-making" (Delgado *et al.*, 2012, p. 46).

In conclusion, macroeconomic competitiveness is constituted of factors impacting productivity indirectly at the national level and potentially at the regional level. This potential depends on the subjects that the regional index aims to assess in terms of competitiveness. Each indicator based on measures must be assessed in accordance with the level at which it is appropriate to consider it, fully or partly. Additionally, the level of macroeconomic competitiveness is not necessarily related to the size of the nation composed of the regions. It is related more to the extent to which the regions are in a position to impact macroeconomic competitiveness. As indicated above, macroeconomic competitiveness has an indirect impact on productivity, whereas it is the microlevel that has a direct impact on competitiveness, and even more so at the regional level in relative terms, as developed henceforth.

9.2.3 Microeconomic competitiveness

Microeconomic competitiveness is the cornerstone of the framework. Whereas endowments are the basis of prosperity, and macroeconomic competitiveness offers the potential for competitiveness improvements, "microeconomic factors operate directly on firms in affecting productivity" (Porter *et al.*, 2008, p. 47). Moreover, "the policy literature often makes a distinction between inputs (often from government investments) and incentives (competition, openness) as drivers of higher productivity" (Delgado *et al.*, 2012, p. 10). This distinction and other dimensions are categorized in Porter's diamond model, which works systemically manner, as discussed in chapter 1 (Porter, 1990a, 1998). Porter's diamond is to some extent relevant at the regional level in explaining territorial disparities with regard to the quality of the business environment. Moreover, micro-based factors are more likely to differ across territories constituting a nation. As a result, it is consistent to specifically consider microeconomic competitiveness in a regional competitiveness index, and even more so than at the national level. It is at the micro-level that most disparities are expected to occur, and this stylized fact should be considered in an intranational regional competitiveness index.

Microeconomic competitiveness is divided into 3 sub-categories: 1) "sophistication of company operations and strategy", 2) "quality of the microeconomic business environment", and 3) "state of cluster development" (Porter *et al.*, 2008, p. 48). The sophistication of companies refers to the fact that "productivity rises as a company improves the operational effectiveness of its activities and assimilates global best practices" (Porter *et al.*, 2008, p. 48) in order to compete. In other words, it measures *inter* *alia* firms' capacity to innovate and to offer a unique value proposition to the greatest extent possible. At the regional level, sophistication can be assessed by analysing the extent to which firms spend resources for research and development or the "prevalence of foreign technology licensing", which is a corollary to the "internationalization of firms" (Delgado *et al*., 2012, p. 45). However, it is necessary to note that research and development spending does not axiomatically correlate with actual results in terms of innovation.

As indicated above, the business environment comprises the four inter-related dimensions of Porter's diamond (Porter *et al*., 2008, p. 48). These dimensions must be adapted to some extent to the corresponding levels of analysis. At the regional level, the diamond's dimensions will not be constituted of strictly or relatively analogous subdimensions in which complementarity and/or inter-related natures should be considered. For instance, at the regional level, factor conditions may vary in terms of "quality of transport network" and/or "quality of roads" (Delgado *et al*., 2012, p. 45). On the other hand, the burden of customs procedures (factor condition) or intellectual property protection (context for strategy and rivalry) are likely to be implemented by the central government in the same manner in all regions (Delgado *et al*., 2012, p. 45) unless, for instance, a country is constituted of regions under specific ruling processes.

It is in the interest of a region not only to attract MNEs and/or part of their activities but also to offer the best set of conditions that will allow the firms located there to compete globally (Dunning, 1988b, 1998, 2009; Dunning and Lundan, 2008; Rugman and Verbeke, 2001b, 2009). Most of those conditions are micro-based and related to some extent to the business environment and the "state of cluster development" (Porter *et al*., 2008, p. 48). However, location-bound resources are influenced by factors that are specific to MNEs and potentially complementary to regional cluster policies. Therefore, the ability of a region to foster the "creation of 'sticky places'" (Rugman and Verbeke, 2001b, p. 164) is related not only to the "state of cluster development" (Porter *et al*., 2008, p. 48). Indeed, the agglomeration of highly specialized activities tends to attract firms' investments, but those investments might in return influence agglomeration forces.

The "state of cluster development" (Porter *et al.*, 2008, p. 48) is a key component of regional competitiveness at the micro-level. Even though clusters often generate patterns that are not constrained by regional borders, cluster policies and the role of institutions in collaboration are often coordinated at the regional level. Whereas the role of clusters in regional prosperity has been scrutinized in chapter 1, it is compelling to observe that Porter *et al.* consider "the state of cluster development" to be "conceptually distinct" yet difficult to measure in a competitiveness index (Porter *et al.*, 2008, p. 48). As a result, the authors include clusters as factors of related and supporting industries (Porter *et al.*, 2008). However, clusters should be considered key aspects of regional competitiveness, as they allow the specialization of specific industries and ultimately higher relative productivity levels. Moreover, whereas clusters might generate patterns that are not constrained by regional borders, their state of development obviously follows localization processes.

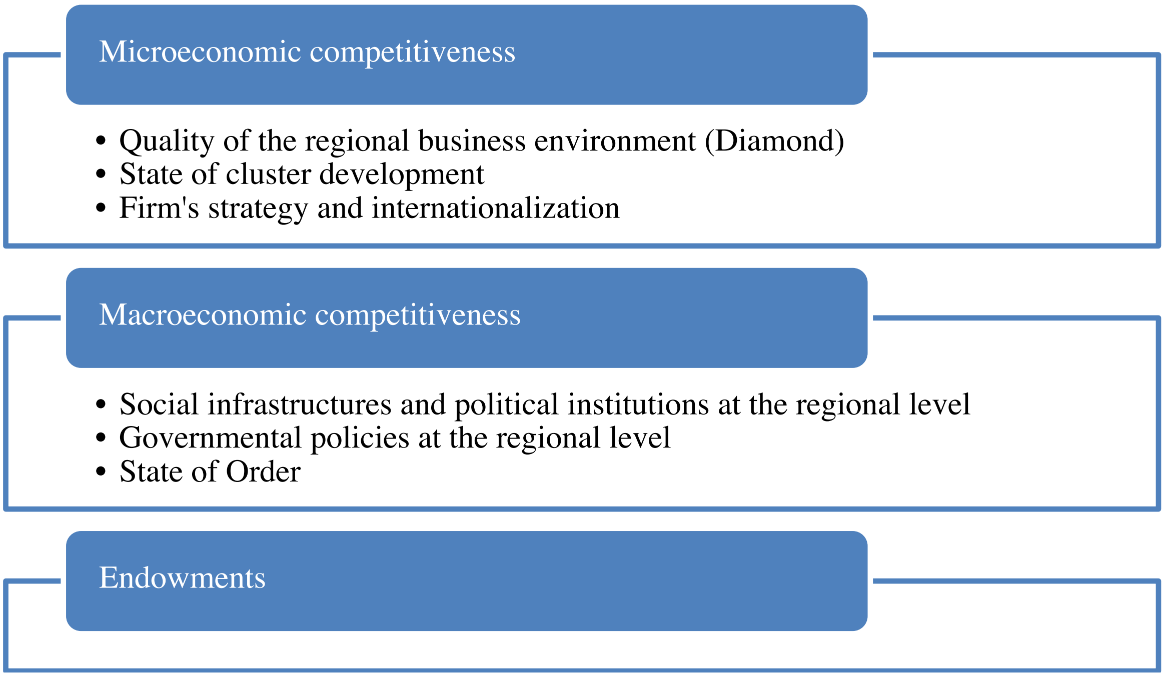
Regarding the problem of dynamic sequences, "each country will have its own unique strengths and weaknesses. In any given country at a particular point in time, a subset of microeconomic conditions will represent the most pressing barriers to reaching higher levels of productivity" (Porter *et al.*, 2008, p. 48). To some extent, that conclusion also applies to regions, as microeconomic conditions are notably influential in relative terms at the regional level. Moreover, "the constraints change over time" so that "governments need to review and update priorities in intervals that might not coincide with the political cycle" (Porter *et al.*, 2008, p. 48). Those priorities are more likely to be addressed consistently if there is relative immediacy between the authorities and the most pressing issues. Immediacy might result *inter alia* from the relative autonomy of local governments in terms of policy measure implementation. For example, policy measures might be designed on the basis of the major clusters located in a region. Those policies may vary among clusters and, most importantly, on the basis of the relative state of cluster development. In other words, microeconomic competitiveness results directly from firms' ability to improve their productivity level through acts of specialization. As specialization tends to be correlated with the agglomeration of similar and related economic activities, clusters are decisive components of regions' ability to achieve higher levels of prosperity.

In conclusion, microeconomic competitiveness constitutes a decisive determinant of regional competitiveness not only because “microeconomic factors operate directly on firms in affecting productivity” (Porter *et al.*, 2008, p. 47) but ultimately because microeconomic competitiveness increasingly influences territorial prosperity as the scope of analysis focuses on intranational entities. Delgado *et al.* (2012) and Porter *et al.* (2008) assess microeconomic competitiveness between nations, whereas the purpose of an intranational regional competitiveness index focuses on regions that are in principle under the rule of a centralized power. Consequently, some crucial aspects of the other 2 dimensions are supposedly similar or at least predominantly comparable between regions constituting a single nation. As a result, it is even more consistent to consider microeconomic competitiveness as we assess regional competitiveness and not national competitiveness. Moreover, it is mandatory to take into account a centralization process variable that considers not only the levels at which some indicators are influenced but also the extent to which results discrepancies among subjects are based on competitive factors and/or institutional factors.

9.2.4 Defining intranational regional competitiveness as measured in an index and identifying the determinants of intranational regional competitiveness: concluding remarks

Step 1 lays the foundations for building the generic structure of the intranational regional competitiveness index. First, it allows the proposal of a relatively exhaustive definition of regional competitiveness, considering its multi-dimensional attributes as well as the measure(s) to which it is ultimately related. Second, based *inter alia* on Porter (1990a, 1998), Porter *et al.* (2008), and Delgado *et al.* (2012), it sets the general organizational scheme on which the entire structure will subsequently rely by separating the 3 levels of competitiveness: 1) endowments, 2) macroeconomic competitiveness, and 3) microeconomic competitiveness. Those levels are summarized in Figure 5.

Figure 5: The 3 determinants of regional competitiveness



Source: personal elaboration based on Porter (1998) and on Delgado *et al*. (2012, p. 41).

Based on Porter (1998) and Delgado *et al*. (2012, p. 41), Figure 5 condenses the 3 determinants of regional competitiveness, considering their relative levels of significance for territorial competitiveness (endowments < macroeconomic competitiveness < microeconomic competitiveness). It includes Porter's diamond model as a fundamental measuring instrument. The state of cluster development as well as firms' strategy and internationalization are separated from the diamond, as their influences on the framework at the regional level are relatively extensive.

The 3 levels of competitiveness summarized in Figure 5 establish the first grade of categorization needed to build the pillars of the intranational regional competitiveness index. Their relative weights in territories' competitiveness capabilities are subsequently included in the categorization process of the pillars and sub-pillars, as we shall see when implementing the second step.

9.3 Step 3: building the pillars of intranational regional competitiveness and the corresponding sub-pillars and indicators

As the major determinants of regional competitiveness have been analysed extensively in the previous sub-sections, the third step consists of the selection of the pillars, sub-pillars and indicators that allow the translation of the systemic functioning of the inter-related determinants. At this stage, the goal is not to address weighting issues between pillars, sub-pillars or indicators. However, based on the abovementioned theoretical approach, it is necessary to implement the hypothesis according to which microeconomic endowments are even more influential in territorial competitiveness levels in relative terms, as the scope of analysis is regions constituting a single nation. Moreover, it is mandatory to consider throughout the process the conceptual integrity of the generic structure in its full version and in light of the case-based adjustments, which will be implemented at a later stage.

The three competitiveness determinants are divided into pillars, of which some are constituted of sub-pillars and indicators. The pillars in some cases, and the sub-pillars and indicators in other cases, are constituted of measures that are case related and can be considered only on the basis of data availability when applying the structure to a specific case, as we shall see in chapter 3. Indeed, measures *per se* are exclusively case related, whereas the structural components (determinants, pillars, sub-pillars and indicators) are generic.

The pillars and sub-pillars are built and indicators selected *inter alia* on the basis of Porter *et al*. (2008) and Delgado *et al*. (2012) and systematically adapted on the basis of the first chapter for the purpose of building an intranational regional competitiveness index. These adaptations strictly respond to 1) the theoretical framework elaborated in chapter 1 and 2) the methodological approach developed heretofore.

9.3.1 Endowments

As exhibited in Table 2 and based on chapter 1 and on the previous sub-section, the endowments are constituted of 4 pillars: I) relatedness to the capital city, II) relatedness to the central government, III) relatedness to the largest economic poles in terms of employment, IV) the availability of expendable land, and V) cultural distance from the central government.

Table 2: Endowments and the corresponding pillars of the generic structure of the intranational regional competitiveness index

Endowments	
I)	**Relatedness to the capital city**
II)	**Relatedness to central government**
III)	**Relatedness to the biggest economic poles in terms of employment**
IV)	**Availability of expendable land**
V)	**Cultural distance to central government**

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Gugler (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), and Rugman and Verbeke (2001a, 2001b, 2004, 2009).

Endowments "influence prosperity but not the underlying productivity and cannot be changed through policy" (Delgado *et al*., 2012, p. 8). This is reflected in the selection of the endowments that play a specific role at the regional level. Indeed, regional competitiveness can be influenced by location itself and the extent to which that region is

- I) connected to the capital city.
- II) connected to the central government.
- III) relatively near highly competitive regions in terms of employment. Some of the pillars can be correlated to some extent, which should be taken into consideration depending on the subject.
- IV) has available expendable land, which also constitutes a significant endowment that is dynamic to a certain extent. Expendable land implies that there is potential to use it either for economic activity and/or for other purposes related to the development of this activity. Obviously, that pillar could also include a measurement of the relative prices of expendable land.
- V) culturally distant from the central government, which is also case related. Indeed, some nations are constituted of regions that are relatively less integrated than in other nations, notably in terms of language. Language could also be considered a control variable in some cases, but this assumption should be

analysed and demonstrated. In some cases, how political authority is distributed in the territory might also be influenced by cultural distance from the central government.

9.3.2 Macroeconomic competitiveness indicators at the regional level

At the regional level, macroeconomic competitiveness factors also conclusively impact the dynamic sequences of territorial economic development. They play an indirect role in firms' ability to improve their productivity. Obviously, numerous macroeconomic factors, such as monetary policy or access to foreign markets in legal terms, are influential at the national level in most nations. However, that is not the case for all macroeconomic competitiveness factors. As exhibited in Table 3, at the regional level, they constitute 4 pillars: VI) health, VII) political institutions, VIII) fiscal policy, and IX) state of order. This selection of pillars and corresponding indicators might benefit from adjustments, notably in terms of weight, on the basis of the case-specific distribution of political autonomy, as discussed in sub-section 9.3.

Table 3: Macroeconomic competitiveness pillars, subpillars and indicators of the generic structure of the intranational regional competitiveness index

Macroeconomic competitiveness pillars, subpillars and indicators at the regional level

- **VI) Health**
- **VII) Political institutions**
  - a. Local authorities' efficiency
  - b. Accessibility to local authorities
  - c. Local authorities' independence
- **VIII) Fiscal policy**
  - a. Regional public finances' soundness and public funds spending efficiency
  - b. Regional public authorities' auto-financing capabilities
  - c. Fiscal policy toward firms
  - d. Fiscal policy toward workers
    1. Overall taxation burden on individuals
    2. Regional disposable income
  - e. Fiscal policy toward innovation and R&D
  - f. Average and median earnings
    1. Average taxable income
    2. Median taxable income
- **IX) State of order**

a. Efficiency of judicial institutions at the regional level b. Judicial independence at the regional level

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Gugler (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), and Rugman and Verbeke (2001a, 2001b, 2004, 2009).

- VI) Health and, more particularly, health services accessibility is a necessary component of macroeconomic competitiveness. Indeed, healthy workers are obviously likely to perform better, and it is more convenient to attract new firms if they can rely on an efficient healthcare system. Moreover, this system must be accessible to ensure proper treatment along the healthcare chain.
- VII) Political institutions at the regional level play an essential role from a macro-based point of view. Indeed, the overall governing process might differ from one nation to another. However, the ease of doing business can notably be impacted by local rules and policies, especially in the case of highly decentralized nations. This impact also depends on the ability of local institutions to implement rules at higher levels and to offer transparent processes for firms located in a specific territory. Moreover, the extent to which highly specialized firms compete at the regional level may also be influenced by local authorities' accessibility. However, this accessibility must not be confused with special considerations. This aspect indirectly addresses the issue of corruption. Unequal rules imply favouring some competitors to the detriment of others. Therefore, the advantage is based not on competitiveness but on discrimination. This discrimination might not only hamper local competition but also diminish a territory's attractiveness. Consequently, the institution pillar in its full version is divided into 3 sub-pillars: a. local authorities' efficiency, b. accessibility to local authorities, and c. local authorities' independence.
- VIII) Fiscal policy is a significant factor in regional competitiveness. However, measuring its impact on a specific region requires considering two aspects: 1) the extent to which a region and its authorities are lawfully competent to apply its own fiscal policy, partly or completely, or at least the extent to which a region and its authorities are in a position to benefit from the attribution of centrally collected tax money, and 2) the extent to which a region and its authorities are equipped

both by law and institutions to control tax money. Mechanistically, the more sovereign a region is, the more that region will compete fiscally with other comparable regions and the more this aspect must be considered. Whatever those considerations, based on chapter 1 and most importantly on Delgado *et al.* (2012), fiscal policy in its full version is divided into 6 sub-pillars: a. the soundness of regional public finances and the spending efficiency of public funds, b. regional public authorities' auto-financing capabilities, c. fiscal policy towards firms, d. fiscal policy towards workers, e. fiscal policy towards innovation and R&D, and f. average and median earnings. Even if fiscal policy is a pillar of macroeconomic competitiveness and, as such, has the potential for competitiveness improvements (Porter, 2008), it constitutes a relatively dynamic factor, as demonstrated in sub-section 9.3.2. Hence, some indicators are situated on the causes side of the causality chain and others on the results side. Consequently, case-specific post-liminary tests might imply weighting adjustments and the implementation of double-counting countermeasures. The sub-pillars and indicators *per se* cover the matter from the perspectives of 1) the regional authorities, 2) the firms, and 3) the workers. The soundness of regional public finances and the spending efficiency of public funds are related to a certain degree to regional public authorities' auto-financing capabilities. These indicators capture *inter alia* the ability of regional authorities to finance business-friendly policies (directly and/or indirectly) and infrastructures and to evaluate tendencies regarding that region's fiscal policies and the correlated impacts on taxes. Regarding fiscal policy towards firms, fiscal policy towards workers, and fiscal policy towards innovation and R&D, those indicators more specifically capture the effects of tax rates and other fiscal instruments on firms' behaviours, notably in terms of innovation, and on workers' purchasing power capabilities. Indeed, the role of a regional authority, if a region is lawfully competent to apply its own fiscal policy, is to accommodate tax rates and other fiscal instruments in order, *inter alia*, to improve a context for firms as well as for those working and buying. Consequently, fiscal policy itself is a complex set of inter-related and dynamic indicators impacting the overall macroeconomic level of competitiveness.

- IX) The state of order might differ from one region to another even if a single legal framework is enforced. Indeed, even if higher courts of justice might establish a narrow benchmark of law interpretation, differences in practices still exist between territories of a single nation. These differences are enhanced on the basis of the distribution of local law enforcement capabilities. The state of order is composed of 2 sub-pillars: a. the efficiency of judicial institutions at the regional level and b. judicial independence at the regional level. It corresponds to some extent to what Delgado *et al*. call "the rule of law" (Delgado *et al*., 2012, p. 46) yet from a distinct point of view, as the aim of this structure is to assess regional discrepancies in relation to the state of order.

  Efficient judicial institutions are important not only to enforce the law and to deal relatively expeditiously with litigious situations but also to appropriately signal all economic agents and investors that potential litigation will be dealt with consistently. Regarding judicial independence at the regional level, in terms of ease of doing business, equal treatments among market actors allow improved competition. These fundamental conditions are necessary for firms to be able to build their competitive advantages on equal terms and potentially to compete globally.

9.3.3 Microeconomic competitiveness indicators at the regional level

As indicated above, microeconomic competitiveness factors axiomatically have a relatively more consequential impact on competitiveness at the regional level than at the national level. It is necessary not only to capture the relative impact in an intranational regional competitiveness index but also to consider the multi-dimensionality of regional competitiveness in terms of dynamic sequences in building those indicators. As a result, the pillars sorting the microeconomic competitiveness indicators are notably constructed on the basis of Porter *et al*. (2008), Delgado *et al*. (2012) and, from a theoretical point of view, chapter 1. Crucially, the microeconomic pillars to a great extent reproduce Porter's diamond framework (Porter, 2008), in which systemic functioning addresses the issue of causality from a holistic point of view.

As a result, the microeconomic competitiveness indicators are sorted into 6 pillars, as we shall see in Table 4: X) firms' strategy and internationalization, XI) factor conditions, XII) supporting and related industries, XIII) demand conditions, XIV) cluster development and specialization, and XV) context for strategy and rivalry. As the diamond model has been analysed in chapter 1, the comments that follow focus on specific aspects that are markedly significant in terms of regional competitiveness.

Table 4: Structure of the intranational regional competitiveness in the case of the Swiss cantons

Microeconomic competitiveness pillars, subpillars and indicators at the regional level

Pillar correlated to the Diamond

X) Firms' strategy and internationalization

a. MNEs' competition effectiveness
   i. Share of employment in MNEs
   ii. Local authorities' accessibility for MNEs
   iii. Accessibility to international markets
   iv. FDI role in technology transfer
   v. Regulatory easiness for MNEs
b. Strategy effectiveness
   i. Technology absorption of firms

Pillars within the Diamond

XI) Factor conditions

a. Operational infrastructures
   i. Access to international airports
   ii. Accessibility by public transportation
   iii. Accessibility: road network
   iv. Access to internet infrastructures
b. Administrative infrastructures
   i. Ability to start a business
   ii. Burden of regional government regulation
c. Financial infrastructures
   i. Financial market sophistication
   ii. Venture capital availability
   iii. Ease of access to loans
d. Innovation effectiveness
   i. Patenting dynamics
   ii. R&D capabilities and spending
   iii. Quality of research institutions
e. Education and labor-market consistency

i. Quality of basic education (obligatory)
ii. Quality of superior education (non-obligatory)
iii. Accessibility to superior education (non-obligatory)
iv. Education and labor-market consistency and labor market quality
v. Tertiary school enrollment

f. Availability of specialized research & training

XII) Supporting and related industries

a. Superior schools and research institutions' dynamics
   i. Presence of internationally recognized research institutions
   ii. Presence of university/universities of applied sciences
b. Presence and/or efficacy of technological parks
c. Supplier quality
d. Supplier quantity

XIII) Demand conditions

a. Local government procurement of advanced technological products
b. Demanding regulatory standards
c. Sophistication of local demand

XIV) Cluster development and specialization

a. Extent of cluster development and specialization
b. Extent of cluster policy
c. Extent of inter-clusters collaboration
d. State of development of institutions for collaboration

XV) Context for strategy and rivalry

a. Intensity of local competition
b. Presence of local monopoly(ies)
c. Rigidity of employment
d. Low market disruption of state-enterprises and/or state-related enterprises
e. Low distortive effect of taxes/subsidies on competition
f. Labor-employer cooperation
g. Local regulatory quality

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Gugler (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), and Rugman and Verbeke (2001a, 2001b, 2004, 2009).

- X) Firms' strategy and internationalization are constituted of two major sub-pillars: MNEs' a. competition effectiveness and b. strategy effectiveness. This pillar is not part of the diamond *per se*. Indeed, firms' strategy and internationalization correlate with the diamond and influence dynamic sequences but are not formal components of the diamond at the regional level. However, they contribute to the overall quality of the business environment. *Mutatis mutandis,* the components of the diamond have a decisive impact on firms' strategy and internationalization and on regions' ability to build and sustain their competitive advantages.

MNEs' competition effectiveness is likely to diverge from one region to another, notably since location-bound advantages are not evenly spread across territories (Dunning, 1981; Dunning and Lundan, 2008). Moreover, ownership-related advantages are also likely to diverge from one region to another, thus impacting MNEs' capacity for innovation and export capabilities.

Indeed, this attractiveness is *inter alia* influenced by regional authorities and policy makers as well as by existing agglomeration patterns and region-specific advantages (Gammelgaard and McDonald, 2018, pp. 305-306). It is therefore crucial to constitute the most appropriate set of policy measures at the regional level to offer a unique value proposition for MNEs. This aspect is also linked with the state of cluster development, as highly specialized firms tend to attract FDI from firms active in similar and/or related fields. Moreover, policy makers at the regional level also play a crucial role in attracting FDI. Specific policies are complementary to cluster policies and, in some cases, to distinctive fiscal regimes that accommodate MNEs' interests. Strategy effectiveness *per se* includes MNEs but goes beyond to capture the technology absorption of firms.

- XI) Factor conditions compose one of the "four broad attributes (...) that shape the environment in which local firms compete that promote or impede the creation of competitive advantage" (Porter, 1990b, p. 71). Based on Porter (2008) and Delgado *et al*. (2012), 6 sub-pillars constitute the pillar of factor conditions: a. operational infrastructures, b. administrative infrastructures, c. financial infrastructures, d. innovation effectiveness, e. education and labour-market consistency, and f. availability of specialized research and training.

First, operational infrastructures obviously play a crucial role in regional competitiveness. Whereas some nations offer relatively comparable infrastructures across their territories, others concentrate on specific flagship territories at the risk of altering dynamic sequences and hampering competition between regions. Operational infrastructures cover the accessibility to strategic infrastructures that firms need to operate, such as international airports, public transport networks, road networks, and internet.

Second, administrative infrastructures, most crucially for relatively decentralized nations, have an impact on firms' ability to start a business. This aspect, among others, is influenced by the quality of potential regional regulation in order for firms to compete locally and, most importantly, elsewhere.

Third, sound financial infrastructures are likely to imply, *inter alia*, privileged access to capital (Porter, 2008, p. 240) and are essential for firms' attractiveness, operation and potential expansion. The correlated indicators are therefore i. financial market sophistication, which is decisive in the case of relatively specialized industries and venture capital availability, and ii. ease of access to loans.

Fourth, innovation effectiveness captures not only the extent to which firms located in a region perform in terms of innovation but also the extent and quality of the inter-related innovative infrastructures and capabilities on which those firms rely. It is relevant to capture the following factors on the basis of their correlated indicators: i. patenting dynamics, ii. R&D capabilities and spending, and iii. quality of research institutions. Patenting dynamics directly capture innovation in terms of patents even though they cover only a specific side of innovation activities. However, when measuring innovation in relative terms, they constitute a relevant reflector of innovation dynamics. Regarding R&D capabilities and spending, this indicator captures innovation-related spending in monetary terms. As mentioned above, R&D capabilities and spending do not axiomatically capture actual innovative outcomes but are nonetheless relevant. The quality of research institutions obviously impacts the innovation capabilities of firms located relatively nearby. Furthermore, highly innovative firms located within clusters tend to have a positive impact on collocated research institutions (Porter, 2008).

Fifth, education quality and consistency with the needs of the local labour market are notably decisive for regional attractiveness. Indeed, relatively specialized industries are in need of highly specialized workers. The mobility of these workers may vary. Potential benefits from this consistency may also influence a region's ability to improve firms' creation, to attract firms, notably MNEs or part of their activities, and to lead to firms' expansion. Based notably on Delgado *et al.* (2012,

p. 45) and on chapter 1, this sub-pillar is divided into 5 indicators: i. quality of basic education (obligatory), ii. quality of superior education (non-obligatory), iii. accessibility to superior education, iv. education and labour-market consistency and labour market quality, and v. tertiary school enrolment. Crucially, education is a constituent part of the diamond at the regional level, and even basic education should not be considered a macroeconomic factor. Indeed, quality of education at all levels and the degree of consistency between education and the corresponding labour market have an explicit and influential impact on the overall quality of the business environment and, *mutatis mutandis*, the quality of the business environment generates repercussions for those indicators, particularly for the quality of superior education, education and labour-market consistency, and tertiary school enrolment. Whereas Delgado *et al*. (2012, pp. 45-46) separate basic education (macroeconomic competitiveness) from superior education and the quality of the education system (microeconomic competitiveness), it is relatively more relevant at the regional level to consider the education system to be an integrated combination of all degrees of advancement and therefore to introduce education to the greatest extent possible as part of the diamond and, *in fine*, as a microeconomic factor.

Let us consider each indicator individually. The quality of basic education is an important indicator not only of social wellbeing but also of the potential for higher average productivity in economic activities and better access to superior education. Superior education more directly relates to the productivity of those participating in economic activities. If companies can count on a pool of highly skilled workers, they will potentially improve their competitive advantages. This indicator must be combined with the correlated accessibility, as it is necessary not only to have high-quality superior educational institutions but also to ensure that they are accessible. Education and labour-market consistency covers another angle of this sub-pillar, as it captures the extent to which graduates actually fit the needs of firms located in a specific region. Indeed, even if an educational system purposefully aims to allow higher rates of tertiary school enrolment, it does not axiomatically imply higher productivity levels, as the degree of consistency between education and the labour market plays a decisive role in this matter.

However, tertiary school enrolment is a consistent measurement of an educational system's ability to provide firms with highly skilled workers (Delgado *et al*., 2012, p. 45).

Sixth, the availability of specialized research and training (Delgado *et al*., 2012, Dunning and Lundan, 2008; Porter, 2008) obviously plays an important role in firms' localization processes, as human capital is not as mobile as other forms of capital (see chapter 1). This aspect is even more decisive in highly specialized industries clustered in specific regions and is thus more likely to impact firms in highly innovative industries. The availability of specialized research and training relates to some extent to the indicator of education and labour-market consistency but is more specifically related to specialized industries located in a region and, as such, not only improves the potential for the improvement of that region's competitiveness advantage but contributes directly to it.

- XII) Supporting and related industries play a decisive role in the economic ecosystems of industries located in specific regions, thus impacting the competitiveness of those regions. As indicated in the first chapter, Porter considers that "ongoing coordination" (Porter, 1990a, p. 103) between an industry and its home-based suppliers is a significant competitiveness factor of that industry. Regarding related industries, Porter considers that supporting industries that are internationally competitive are much more likely to offer greater benefits to the corresponding industries (Porter, 1990a, p. 104). As a result, notably based on Delgado *et al*. (2012) and on chapter 1, this pillar is constituted of 4 sub-pillars: a. superior schools and research institution dynamics, b. presence and/or efficacy of technological parks, c. supplier quality, and d. supplier quantity.

First, superior schools and research institutions are essential supporting industries. The effectiveness of collaboration with specialized industries located in a specific territory is an influential factor in these firms' ability to build and sustain their competitive advantages and, consequently, of that location's ability to improve its overall competitiveness level. This sub-pillar is not to be confused with that of education and labour-market consistency. It measures the presence of internationally recognized research institutions, universities and universities of applied sciences and not their corresponding levels of quality. Indeed, these levels are considered factor conditions, as mentioned above. Hence, there is no structural double-counting issue.

Second, the presence and/or efficacy of technological parks respond to a syllogism. Technological parks can be public, private or a combination. When fully or partly public, they are typical prerogatives of regions and serve as agglomeration and innovation enhancers with potential positive effects on the overall business environment. Hence, an index should capture not only the presence of technological parks but also their overall efficiency levels, which depend on their state of development.

Third, supplier quantity and quality generally measure the level of "ongoing coordination" (Porter, 1990a, p. 103) between industries in a specific territory. As indicated above, the level of coordination between home-based suppliers and the specialized industries located in a territory is an influential factor of case-specific dynamic sequences and territorial attractiveness. Whereas the impact of the presence of suppliers is relatively conspicuous, so is the quality of those suppliers. Additionally, Porter considers that when the suppliers of an industry are global competitors, "they possess the wherewithal to best upgrade their own advantages, thereby providing the needed technology flow to their home-based customers" (Porter, 1990a, p. 104).

- XIII) Demand condition *inter alia* captures the propensity of home buyers to be among "the most sophisticated and demanding buyers for the product or service" (Porter, 1990a, p. 89) and the extent of anticipation of "buyer needs" (Porter, 1990a, p. 91). This pillar is composed of 3 sub-pillars based on Porter *et al.* (2008), Delgado *et al.* (2012) and the first chapter: a. local government procurement of advanced technological products, b. demanding regulatory standards, and c. sophistication of local demand. The local government procurement of advanced technological products relates to the sophistication of the government's demand and its propensity to buy advanced technological products. With respect to demanding regulatory standards, this indicator correlates with the legal necessity of local firms conceiving highly sophisticated products and services. The complexity of local demand noticeably correlates with the sophistication of this demand *per se*.

- XIV) Cluster development and specialization are imperative contributors to regional competitiveness. A specific pillar is dedicated to those contributors even though clusters are theoretically bound to related and supporting industries, as determined in chapter 1 on the basis of Porter's theories (Porter, 1990a, 2000a, 2000b, 2003, 2008). However, dedicating a specific pillar to cluster development and specialization relates to chapter 1, which demonstrates the determining impact of clusters, particularly at the regional level, as corroborated quantitatively by Porter in "The Economic Performance of Regions" (Porter, 2003). Hence, whereas it is relevant to measure cluster development and specialization as factors of related and supporting industries when implementing a competitiveness index comparing nations (Delgado *et al.*, 2012), it is consistent when implementing a competitiveness index comparing regions to allocate a specific weight to this matter considering the corresponding level of analysis. Agglomeration processes have significant repercussions for regions' economic ecosystems and business environments, and this factor should also be recognized in structural terms when building a generic intranational regional competitiveness index.

Clusters of highly specialized industries tend to engender relatively higher wages and other positive externalities (Delgado *et al.*, 2012). These positive externalities generate numerous other effects on the overall economic performance of that region. Whereas some clusters' perimeters do not correspond with regions' boundaries, clusters still respond to agglomeration forces. Hence, disparities in wage distribution are likely to occur across territories included within the same political boundary even though those territories share comparable legal and monetary frameworks. As higher average and median wages are constituent parts of prosperity and the results of increased productivity, it is decisive to capture the state of cluster development and specialization when measuring regional competitiveness levels. Moreover, specific cluster policies are likely to be implemented at the regional level by regional authorities and/or by public and/or para-public institutions (Porter, 2008). Indeed, cluster policies are expected to be of greater influence if they are tailored to the patterns of specialization of a specific region as long as those policies do not interfere with local competition. Subsequently, the intensity of local competition is also a positive indicator in the context for strategy and rivalry. Consequently, the pillar of cluster development and specialization is composed of 4 sub-pillars: a. extent of cluster development and specialization, b. extent of cluster policy, c. extent of inter-cluster collaboration, and d. state of development of institutions for collaboration.

The extent of cluster development and specialization clearly relates to well-established quantitative measures developed by Delgado, Porter and Stern (2012). It offers an overall assessment of the performances of the corresponding clusters and is distinctively situated on the results side of the causality chain regardless of the dynamic nature of clusters.

The extent of cluster policy obviously aims at measuring the extent and sophistication of policies at the regional level, although in some cases, implementing this indicator might not be relevant.

The extent of inter-cluster collaboration refers to the extent to which clusters located in a specific region and/or close to it and/or partially in it collaborate so that the considered firms can improve their competitive advantage. This indicator can also be measured to some degree on the basis of specialization data.

The state of development of institutions for collaboration captures the impact of those institutions on clusters' performance and roles in the overall business environment "in which mobile investors can accumulate resources and capabilities, yet from which they may find it difficult to exit" (Dunning, 2000a, p. 24).

- XV) The context for strategy and rivalry is also influential at the regional level. Based *inter alia* on chapter 1, Porter (1990a, 1998), and Delgado *et al*. (2012), this pillar is constituted of 7 sub-pillars: a. intensity of local competition, b. presence of local monopoly (monopolies), c. rigidity of employment, d. low market disruption of state enterprises and/or state-related enterprises, e. low distortive effect of taxes/subsidies on competition, f. labour-employer cooperation, and g. local regulatory policy.

The intensity of local competition puts pressure on firms to compete elsewhere but also influences the location's attractiveness. Local competition can be weakened by regional authorities when they favour some competitors to the detriment of others.

The presence of local monopoly (monopolies) relates to some extent to the intensity of local competition (Delgado *et al*., 2012, p. 45) but in a specific segment of causality. The presence of local monopoly (monopolies) has a greater impact on the intensity of local competition at the regional level than at the national level as the local market is usually relatively smaller than the national market, with obvious exceptions. Local monopolies result from either publicly based policies or local market specifications. Whereas local monopolies can rely on relevant economic grounds in specific cases, such as natural monopolies in definite sectors, they tend to have a negative impact on local competition, and even more so when they are legally protected.

Rigidity of employment relates to the beneficiary effects of having a relatively transparent labour market which allows the lessening of state-related potential counter-productive obstructions. The low market disruption of state enterprises and/or state-related enterprises refers to the extent to which state enterprises and/or state-related enterprises generate market disruptions to the detriment of competitors, thus potentially reducing the ability of firms to compete and, *in fine*, to improve their competitive advantages.

Low market disruption of state enterprises and/or state-related enterprises captures the extent to which state enterprises and/or state-related enterprises negatively impact the intensity of local competition. This sub-pillar is highly relevant at the regional level, as regional authorities can be inclined to apply distinctive rules and laws to specific industries in order to partly or fully reduce market access. State enterprises and/or state-related enterprises can potentially benefit from specific advantages that are not necessarily based on the intensity of competition. Hence, assessing the disruption of state enterprises and/or state-related enterprises is a consistent measure not only of market transparency but also of the relative overall condition of the regional business environment.

The low distortive effect of taxes/subsidies on competition addresses the issues of market transparency and efficiency from another angle that captures this condition more generally.

Labour-employer cooperation constitutes another factor that improves the context for strategy and rivalry, as it tends to advance the quality of the business environment by reducing social tensions and enhancing the labour force and labour-market consistency.

Local regulatory quality obviously impacts the intensity of local competition, especially in relatively decentralized countries. It diverges from sub-pillar XIII.b in measuring the overall quality and, most importantly, coherence of local regulatory standards. It also captures the extent to which local regulatory standards further foster competition and fit the specificities of the firms operating in the considered territory.

In conclusion, the 6 pillars constituting microeconomic competitiveness and their corresponding indicators are momentous, as they epitomize the level that constitutes an explanatory variable of productivity levels and, *in fine*, of territorial prosperity. As a result, microeconomic competitiveness should be at the core of the assessment of the overall competitiveness of a territory, whatever the level of centralization of the subject being analysed. However, for the other two levels, normalization and weighting procedures should be approached at a later point in the overall stage of economic development of the case being scrutinized. Hence, the proposed structure exhibited in sub-section 9.7 introduces numerous indicators related to microeconomic competitiveness but cannot recommend generic normalization and weighting preferences over others.

9.4 Step 4: pre-testing the robustness of the pillars and the indicators

Selecting the generic pillars, sub-pillars and corresponding indicators at this stage does not allow definitive causality and correlation tests, as the subsequent selection of the case-related measures will constitute the core of the testing process. It can, however, raise questions regarding causality issues and later responses in terms of weighting methods. Indeed, as expressed by Porter *et al.* (2008, p. 44), “correlation among many of the indicators makes disentangling the impact of individual indicators complex from a statistical standpoint. It is precisely because of these challenges, as well as the fact that most studies highlight a subset of influences rather than seeking a comprehensive model, that the academic literature has not achieved consensus on the causes of productivity”.

Consequently, to address this robustness issue, four major possibilities arise: 1) to build the pillars and select the indicators in a holistic manner only, 2) to build the pillars, sub-pillars and indicators exclusively on the basis of data availability, 3) to combine those proceedings, or 4) to use an existing framework and adapt it to the present scope of analysis. The first possibility allows a greater margin of inventiveness in the process of relating the theoretical framework to the construction process. However, it also implies that extensive tests will be conducted at a later stage of the process on the basis of the data collected in relation to the case being analysed. This process might hamper the overall validity of the structure in *t0* and reduce the representativeness of the measured concept in *t+1*. Regarding the second possibility, as indicated heretofore, it might imply that the authors should consider factors on this basis only, thus decreasing the structural validity of the index measuring a multi-dimensional concept. Hence, the dynamic analysis might suffer from a fundamental bias related to data availability. The third possibility potentially involves botherations of both the first and second possibilities. The fourth possibility obviously might suffer from adaptation issues related either to the measured concept and/or to the scope of analysis. However, that possibility allows an extensive assessment of the results in light of specific problematics such as, in this case, correlation and causality issues among indicators.

We suggest that the fourth possibility is most relevant in relative terms. Indeed, one of the major purposes of this chapter is to propose a generic structure to assess regions constituting a single nation in terms of competitiveness levels. Consequently, it is consistent to rely on an existing framework measuring the same concept, in this case competitiveness of location, and to adapt it to the relevant scope of analysis. Indeed, proposing a generic structure based on an existing framework allows the strengths and potential deficiencies of that framework to be valued and therefore the overall quality of the adjusted structure to be improved. Manifestly, the previously introduced theoretical framework relies extensively on Dunning (1988b, 1998, 2000a, 2000b, 2001, 2009), Dunning and Gugler (2008), Porter (1990a, 2000a, 2000b, 2003, 2008), Porter *et al.* (2008), Rugman (1981, 1985, 2005a, 2005b, 2010), Rugman and D’Cruz (1993), Rugman and Fina (1996), and Rugman and Verbeke (2001a, 2001b, 2003, 2004, 2008a, 2008b, 2009). Moreover, the construction of the pillars and the selection of the indicators predominantly rely on the works of Porter *et al*. (2008) and Delgado *et al*. (2012).

However, as the works of Porter *et al*. (2008) and Delgado *et al*. (2012) aim to compare nations, building a generic structure to compare regions constituting a single nation necessitates thorough adjustments. Many of the adjustments are theoretical and methodological and have been extensively scrutinized above and implemented in the generic structure exhibited further below. Moreover, numerous adjustments are based on the assessment of the findings of Delgado *et al*. (2012).

Indeed, relevant means and standard deviations have been individually assessed. Moreover, the sensitivities of the competitiveness categories have been investigated and re-implemented in the adapted structure (Delgado *et al*., 2012, p. 47). Grouping adequacy has also been more specifically considered by analysing Delgado *et al*.'s findings for 1) the eigenvalues, 2) the proportion of variance explained, and, most importantly, 3) Cronbach's alpha (Delgado *et al*., 2012, p. 46). Cronbach's alpha is used for microeconomic competitiveness factors, as it "is estimated to obtain a measure of reliability of a set of question items". It "refers to the internal consistency as the proportion of the test variance that can be attributed to a group of items, which measures the reliability coefficient alpha" (Boermans and Kattenberg, 2011, p. 2). However, although Delgado *et al*.'s Cronbach's alpha of 0.981 for microeconomic factors suggests relatively high reliability (Delgado *et al*., 2012, p. 46; Boermans and Kattenberg, 2011, p. 2), it should be examined with relative caution because of "its sensitivity to multi-dimensionality" (Boermans and Kattenberg, 2011, p. 2). Nonetheless, levels greater than 0.7 suggest relative reliability (Boermans and Kattenberg, 2011, p. 2). This is especially relevant at the regional level, at which the relative weight of microeconomic competitiveness is manifestly greater than at the national level. Indeed, macroeconomic competitiveness encounters greater potential discrepancies between nations than between regions constituting a single nation, even though this consideration may vary considerably on the basis of each specific case. Likewise, it is mandatory to indicate that factor analysis can serve as a reasoning support more generally when selecting the case-specific weighting and aggregation methods in applying the structure exhibited below.

The pre-testing process therefore follows 3 major sub-steps: 1) to theoretically assess the chosen structure and the subsequent main factors to ensure that they follow the strict process scrutinized above and correspond in every manner to the multi-dimensionality of the measured concept, notably in terms of potential causality issues; 2) to evaluate the previously tested indicators, either at the same or at different scales, and to do so on the basis of quantitative analysis; and 3) to add potential missing indicators, which are relevant because of theoretical, empirical and/or case-specific considerations. These sub-steps are co-dependent and compulsory to pre-examine the generic structure before the in-depth testing procedure, which is conducted on the basis of a case-specific assessment. In other words, the generic structure presented below is likely to be adapted to the case it investigates. As a result, at this stage, it is already mandatory to identify the conceivable limitations of that generic structure in order to facilitate the potential case-specific adaptations that inevitably follow the building of an intranational regional competitiveness index, as we shall see hereafter.

9.5 Step 5: assessment of the conceivable limitations to implement methodological adaptations

For any index, at this stage, it is already feasible to assess the conceivable limitations of the generic structure exhibited below to identify the major case-specific adaptations that are frequently implemented. Indeed, a generic structure is likely to be adapted on the basis of a specific case, notably because of the numerous recurrent considerations, such as 1) the scale of analysis, 2) the institutional distribution of political capabilities, 3) the geographic and political distribution of territories, 4) the state of economic development, and 5) data quality and availability.

Causality and double-counting issues have been taken into account throughout the preceding steeps. However, the relatively sizable number of indicators and subsequently of measure(s) per indicator implies that the technical steps presented above must be implemented comprehensively and that some indicators might consequently be excluded. This aspect is not problematic *per se* because the systemic functioning of the overall structure remains unaffected. Nonetheless, the exclusion of some indicators and not others potentially implies biases that necessitate careful scrutiny and appropriate compensation at various stages of the process.

The favoured option not to disclose specific measures for each sub-pillar or indicator is based on the conclusion that it is not possible to select measures without knowledge of the case analysed and the extent of data availability, *inter alia*. First, as we shall see later in this chapter, some sub-pillars and indicators are not relevant in some cases because of the political structure of the scrutinized case. Second, the specificities of the assessed case might imply substantial differences in how pillars, sub-pillars and indicators are measured. For example, the cultural distance from the central government is not assessed in the same manner in nations where regions have different languages as in nations where the entire population shares the same language. Moreover, in some cases, extensive data exist on local authorities' efficiency or on the soundness of regional public finances and the spending efficiency of public funds, *inter alia*, whereas in others, those factors are not measured and/or are not published.

Consequently, these conclusions imply a margin of interpretation on the configuration of the measure(s) constituting each indicator. It also involves careful scrutiny of the assessed case and, more crucially, the extent of data availability. For that matter, extensive quantitative assessments should be conducted to remain as close as possible to the generic structure, as its systemic functioning relies on a specific theoretical and methodological framework.

However, potential modifications of the generic structure are likely to occur. Therefore, the corresponding modifications should be implemented on the basis of compelling hypotheses related to the methodological steps presented heretofore. In the same manner, the extent of data availability and quality should be evaluated. If the generic structure is to be adjusted because of incomplete data in some areas, estimators are *inter alia* to be used to an extent that does not jeopardize the integrity of the conceptual framework presented above.

The generic structure exhibited in the sub-section to come is specifically designed for intranational comparisons of relatively developed economies. Its complex and systemic structure might therefore necessitate extensive adjustments in 3 major configurations: 1) regions constituting a nation are highly heterogeneous in terms of economic development and/or are not geographically related (e.g., French Guiana and metropolitan France), 2) the national territory is relatively limited and constituted of a small number of regions, and 3) the average state of economic development of the regions constituting a nation is relatively low. Indeed, the generic structure exhibited hereafter is based on a systemic framework that incorporates *inter alia* 1) the influences of dynamic sequences on the inter-related factors and indicators, 2) a certain degree of political autonomy of the regions constituting a nation, and 3) a certain degree of homogeneity in the average economic development of the regions constituting a nation. However, it is a thorough and sound framework for assessing the competitiveness of the regions constituting a nation. Moreover, to address case-specific issues related to relatively more centralized nations, section 9.8 endeavors to examine the full structure to address on a conceptual basis the adjustments to be made following the publication of the full generic structure, as we shall see hereafter.

9.6 The intranational regional competitiveness index: exhibiting the full generic structure

Table 5: Full generic structure for an intranational regional competitiveness index

Endowments pillars

- **I) Relatedness to the capital city**
- **II) Relatedness to central government**
- **III) Relatedness to the biggest economic poles in terms of employment**
- **IV) Availability of expendable land**
- **V) Cultural distance to central government**

Macroeconomic competitiveness pillars, subpillars and indicators at the regional level

- **VI) Health**
- **VII) Political institutions**
    - a. Local authorities' efficiency
    - b. Accessibility to local authorities
    - c. Local authorities' independence
- **VIII) Fiscal policy**
    - a. Regional public finances' soundness and public funds spending efficiency

b. Regional public authorities’ auto-financing capabilities
c. Fiscal policy toward firms
d. Fiscal policy toward workers
    1. Overall taxation burden on individuals
    2. Regional disposable income
e. Fiscal policy toward innovation and R&D
f. Average and median earnings
    1. Average taxable income
    2. Median taxable income

IX) State of order

a. Efficiency of judicial institutions at the regional level
b. Judicial independence at the regional level

Microeconomic competitiveness pillars, subpillars and indicators at the regional level

Pillar correlated to the Diamond

X) Firms’ strategy and internationalization

a. MNEs’ competition effectiveness
    i. Share of employment in MNEs
    ii. Local authorities’ accessibility for MNEs
    iii. Accessibility to international markets
    iv. FDI role in technology transfer
    v. Regulatory easiness for MNEs
b. Strategy effectiveness
    i. Technology absorption of firms

Pillars within the Diamond

XI) Factor conditions

a. Operational infrastructures
    i. Access to international airports
    ii. Accessibility by public transportation
    iii. Accessibility: road network
    iv. Access to internet infrastructures
b. Administrative infrastructures
    i. Ability to start a business
    ii. Burden of regional government regulation
c. Financial infrastructures
    i. Financial market sophistication
    ii. Venture capital availability
    iii. Ease of access to loans
d. Innovation effectiveness
    i. Patenting dynamics
    ii. R&D capabilities and spending

iii. Quality of research institutions
e. Education and labor-market consistency
i. Quality of basic education (obligatory)
ii. Quality of superior education (non-obligatory)
iii. Accessibility to superior education (non-obligatory)
iv. Education and labor-market consistency and labor market quality
v. Tertiary school enrollment
f. Availability of specialized research & training

XII) Supporting and related industries
a. Superior schools and research institutions' dynamics
i. Presence of internationally recognized research institutions
ii. Presence of university/universities of applied sciences
b. Presence and/or efficacy of technological parks
c. Supplier quality
d. Supplier quantity

XIII) Demand conditions
a. Local government procurement of advanced technological products
b. Demanding regulatory standards
c. Sophistication of local demand

XIV) Cluster development and specialization
a. Extent of cluster development and specialization
b. Extent of cluster policy
c. Extent of inter-clusters collaboration
d. State of development of institutions for collaboration

XV) Context for strategy and rivalry
a. Intensity of local competition
b. Presence of local monopoly(ies)
c. Rigidity of employment
d. Low market disruption of state-enterprises and/or state-related enterprises
e. Low distortive effect of taxes/subsidies on competition
f. Labor-employer cooperation
g. Local regulatory quality

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Gugler (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), and Rugman and Verbeke (2001a, 2001b, 2004, 2009).

9.7 The intranational regional competitiveness index: adapting the full structure according to the centralization degree

As indicated *inter alia* in sub-section 9.5, extensive adaptations are to be implemented according to the analysed case. Indeed, the full structure exhibited in sub-section 9.6 corresponds to a relatively decentralized case, and this structure in full is to be extensively modified prior to further adaptations on the basis of 1) the institutional distribution of political capabilities and 2) the geographic and political distribution of territories. However, it is first consistent to build a full version of the generic structure and to dichotomize all theoretical, methodological and technical steps. Thereafter, it is consistent to reduce if necessary the extent of the structure in correlation with the institutional distribution of political capabilities as well as the geographic and political distribution of territories.

It might have been feasible to build a shortened generic structure and only then to add pillars, sub-pillars and/or indicators. Indeed, this procedure might reduce the number of theoretical, methodological and technical steps presented above. However, a reverse process generates two major issues. First, it engenders potential endogenous inconsistencies within the modified structure. Indeed, it is likely that added pillars, sub-pillars and/or indicators are implemented in correlation with the case being analysed. Hence, the conceptual approach to the generic structure might be hampered by case-specific considerations that contribute not to the conceptual validity of the structure but to that of the implemented structure. Second, it generates fundamental weighting issues even before the technical steps are conducted. Indeed, adding a selection of case-specific pillars, sub-pillars and/or indicators dilutes in *t0* the hypotheses that are implemented in *t+1,* while the weighting process is discussed on the basis of the subject being scrutinized. In other words, the generic structure in *t0* must be free of case-specific considerations, and its extent should be assessed in general terms before each level of competitiveness is investigated.

Hence, it is more consistent to exhibit the full generic structure, as it guarantees to a greater extent its fundamental homogeneity, and only then to exclude the pillars, sub-pillars and/or indicators that cannot legitimately be measured on the basis of the factors disclosed above. To facilitate this primarily case-specific process, it is mandatory to consider specific hypothetical cases in general terms to safeguard the integrity of the generic structure. Thus, let us consider 3 hypothetical forms of institutional distribution of political capabilities and, *ergo*, 3 major categories of structural centralization: 1) highly decentralized, 2) intermediately centralized, and 3) centralized. Before scrutinizing those broad categories of structural centralization, it is necessary to investigate the relevance of these hypotheses.

Obviously, numerous forms of structural centralization exist. They are related *inter alia* to the historical backgrounds of nations and their interactions with one another. The structural centralization of a nation can be inconstant and evolve over years (Hutchcroft, 2001). According to Hutchcroft, administration and politics can each be relatively more centralized or decentralized (Hutchcroft, 2001, p. 39). Moreover, the author states that there is “a very important but all too often neglected element of differentiation among political-administrative systems – that between relatively more bureaucratic and relatively more patrimonial administrative systems” (Hutchcroft, 2001, p. 39). Furthermore, even though groups of relatively similar nations can be formed on the basis of relative degrees of similarity, each nation still experiences a certain degree of singularity. Therefore, it is necessary to intricately structure all degrees of hypothetical forms of institutional distribution of political capabilities before determining the actual nation in which competitiveness levels are to be measured. It is, however, feasible to restrict the versions of hypothetical forms of institutional distribution of political capabilities and to consider that later case implementations are to be built and adjusted on the basis of the most appropriate version of the generic structure.

For the 3 abovementioned major categories of structural centralization, the 3 versions of the generic structure are related to evidence that a nation can be relatively decentralized, relatively centralized or a combination of relatively centralized and decentralized factors. Whereas all nations experience a certain degree of centralization factors, the extent of those factors inevitably varies from one case to another. Consequently, it is necessary to consider typical cases and thereafter to implement case-specific adjustments. The two major categories of structural centralization on each side of the scope of analysis are obviously the highly decentralized category and the highly centralized category. The full version of the generic structure exhibited in sub-section 9.6 logically relates to the highly decentralized category, as it acknowledges that a relatively more extensive range of indicators is relevant, as the indicators are related to factors influenced by regionally based actions. On the other side of the scope of analysis, the highly centralized category illustrates the institutional distribution of political capabilities in which the central government benefits from extensive competencies and self-organizes the attributes of its regions. In some cases, it might even modify the territorial integrity of its regions and/or revoke previously granted prerogatives. Consequently, the hypothetical version of the generic structure for centralized cases is considerably shortened, as we shall see henceforth. The third major category, intermediately centralized, represents the case of a nation where numerous fundamental tasks remain within the hands of the central government but the regions benefit from a certain degree of autonomy, notably following decentralization processes described by Hutchcroft (2001). Obviously, it might be a relatively intricate process to capture this category in a hypothetical case, as each nation experiences a singular institutional distribution of political capabilities. However, following the assumption indicated heretofore, this category aims to illustrate a typical hybrid institutional distribution of political capabilities implemented in the generic structure. This implementation subsequently allows case-specific adjustments that might potentially be of greater scope than in the other two categories.

It might have been possible to propose more than 3 categories of hypothetical structural centralization. Indeed, instead of dividing the scope of structural centralization into 3 hypothetical categories, 5 or even 7 versions of the generic structure might have been exhibited. Uneven numbers of divisions related to the scope of analysis are preferred, as they allow a major division at 50% around which other subdivisions might be implemented. However, in this case, it is irrelevant to submit more than 3 categories of hypothetical structural centralization. First, introducing more versions implies potential inconsistencies in the additional chosen hypotheses for each version. Consequently, the more hypothetical versions exist, the more likely that fundamental weighting issues between the pillars, sub-pillars and indicators will hamper the integrity of the structure. Second, it is more likely that the fundamental selection of the closest version of the structure for the case being analysed is relevant if the versions to choose from are relatively distinct from one another. Third, the procedure of evaluating the degree of structural centralization of a nation is relatively difficult and based on non-quantitative measures. Hence, augmenting the number of hypothetical versions of the structure might lead to inconsistent case-related choices. Consequently, it is relevant to limit the versions to 3 and to allow later case-related adjustments to improve the overall condition of the structure.

As indicated above, the full version exhibited in sub-section 9.6 corresponds to a highly decentralized nation. It is generally relevant for nations constituted of relatively independent regions that are congregated in a specific form of union but still endeavour to apply the subsidiarity principle to a certain extent. Consequently, the full version of the generic structure exhibited in sub-section 9.6 is relevant not only for vast nations such as the United States but also for smaller ones such as Switzerland. In those nations, specific prerogatives are usually transferred from the regions to the central government. Hence, other fundamental prerogatives, such as fiscal policy or education, remain in the hands of the regions and are redistributed, partly or comprehensively, to another authority only on the basis of self-determination. As a result, it is relevant to use the full version of the structure and, if necessary, to exclude the indicators that are either inadequate and/or related to powers transferred to the national government, as we shall see through the example implemented in chapter 3.

The second version that must be scrutinized in more detail is the category of highly centralized nations. In contrast to highly decentralized nations, relatively centralized nations do not apply the subsidiarity principle or apply it only for very specific functions determined by the national government. Even though decentralization processes might be conducted at some point, they usually result from national policies. Moreover, the central government might have the authority to implement policies that influence the territorial integrity of its constituting regions. Most importantly, centralized countries such as France and Israel maintain the decisive power to levy taxes and to implement specific fiscal policies except for some local taxes (Panizza, 1999). Interestingly, Panizza finds that "country size, income per capita, ethnic fractionalization, and level of democracy are negatively correlated with the degree of fiscal centralization" (Panizza, 1999, p. 97). Moreover, centralization is related to the "constitutional division of powers across levels of government", with *unitary governments* "based on a constitution, which sets supreme authority to the central government", and *federal governments* "based on a constitution that defines how power is shared between the government institutional units" (Dziobek, Gutierrez Mangas and Kufa, 2010, p. 21). Indeed, *unitary governments* tend to be more centralized than *federal governments* (Dziobek, Gutierrez Mangas and Kufa, 2010, p. 25).

Highly centralized nations axiomatically leave fewer prerogatives to their constituting regions and take responsibility for the distribution of relatively high shares of resources to those regions on the basis of various justifications. Therefore, measuring relative levels of competitiveness among those regions implies restraining the full extent of the generic structure exhibited in sub-section 9.6. Indeed, numerous issues, whatever the consequences, rely on the central government; *ergo*, numerous indicators are irrelevant in order to keep the homogeneity of this specific version of the generic structure to the greatest extent possible. To ensure the relevance of the production process of this version of the generic structure, it is necessary to consider a single hypothetical case for every aspect of that structure. Measuring fiscal decentralization, in terms of either revenue or expenditure, constitutes a relevant measure to capture decentralization processes more broadly and, *mutatis mutandis*, to distinguish the main characteristics of relatively centralized nations. Indeed, fiscality is intrinsically correlated with the political structure of a nation, as the ability to levy taxes and/or the power to manage fiscal revenues are fundamental aspects of regions' autonomy. As indicated by Dziobek, Gutierrez Mangas and Kufa (2010), "fiscal decentralization, also referred to as fiscal federalism can be broadly defined as the study of the structure and functioning of multi-tiered governments" (Dziobek, Gutierrez Mangas and Kufa, 2010, p. 4). Hence, it is consistent to broaden fiscal factors to other institutional and political factors to determine the extent of centralization *per se*. Moreover, as fiscal factors are captured on the basis of quantitative measures, relatively qualitative indicators related to other institutional and political factors can be avoided, thus reducing the risks for relatively subjective hypotheses. Consequently, fiscal decentralization, in terms of either revenue or expenditure, is a convincing instrument for determining the typical structure of a highly centralized nation.

To determine the aspects of the generic structure that are to be removed from the full version, let us consider the overall results of Dziobek, Gutierrez Mangas and Kufa (2010) to determine typical examples of nations that have tended to be continuously relatively centralized. Moreover, it is necessary to analyse nations that are economically relatively advanced, as decentralization tends to be positively correlated with the economic level of advancement (Dziobek, Gutierrez Mangas and Kufa, 2010). Consequently, the structure adapted to relatively centralized nations should be designed on the basis of a relatively centralized hypothetical nation that is concomitantly characterized by a relatively high level of economic development to avoid the dynamic inconsistencies related to the analysis of developing economies.

The next step is therefore to analyse all pillars and sub-pillars of the generic structure in its full version to determine which pillars and/or sub-pillars must be removed from the full version on the basis of the hypotheses indicated heretofore. The most appropriate approach is to move from the broadest level to the most precise to avoid hampering the overall validity of the index. Indeed, preconceived assumptions should be avoided to the greatest extent possible.

First, it is necessary to briefly elaborate on the endowments' level of territorial competitiveness. Endowments are typically given and relevant in all cases. Indeed, regardless of the governing system, *inter alia unitary* or *federal*, endowments have an impact on the constituting regions' ability to build their competitive advantages. This assertion is obvious for less dynamic and objective measures, such as relatedness to the largest economic poles in terms of employment or relatedness to the capital city. Other more dynamic and/or more subjective measures, such as the cultural distance from the central government or the availability of expendable land, are still relevant for most governing structures, including relatively highly centralized systems. Indeed, these components in *t0* provide a picture of fundamental factors that might depend to a certain extent on the functioning of a specific governing structure but, as they materialize, are significant in all forms of governing structure. Consequently, except in rare examples such as city-states, all endowments are admissible in the case of relatively highly centralized nations.

Second, it is mandatory to conduct a detailed analysis of the second level of territorial competitiveness, the macroeconomic level, in the case of a highly centralized nation. The dynamic nature of competitiveness indicators increases *inter alia* in correlation with the level being assessed. Indeed, the macroeconomic level sets the potential for the competitiveness of territories and, as such, is relatively more inter-related with the governing structure of the case being investigated. In other words, the higher the level of competitiveness is, the more case-specific the indicators are and, ultimately, the more case-specific conditions impact the dynamic sequences that lead to higher competitiveness levels.

Let us now consider all pillars of the macroeconomic level in the case of a highly centralized nation:

- First, healthcare services quality is always related to governmental policies. Whatever the institutional intent to offer standardized healthcare services at the national level, endogenous as well as exogenous factors might imply differences in terms of the quality and/or accessibility of healthcare services.
- Second, institutions respond to relatively different approaches, as they are intrinsically related to the institutional distribution of political capabilities between the central government and the nation's constituting regions. Consequently, local authorities' efficiency, accessibility and independence are relatively insignificant in the highly centralized cases. Thus, in terms of institutions, other factors, such as institutional and/or geographical proximity to the central government, are likely to be more relevant. Consequently, the institutions pillar should be removed in the case of a highly centralized nation to avoid hampering the overall validity of the structure; that is, in that case, proximity to the central government is more consistent.
- Third, fiscal policy is a fundamental pillar of macroeconomic competitiveness. As indicated above, it constitutes an essential prerogative of regions in relatively decentralized nations and, *mutatis mutandis*, a *regalian* function of the state in the case of highly centralized nations. Usually, in highly centralized nations, the central government levies taxes and allocates a specific share of the corresponding resources to its regions. Those allocations axiomatically relate, partly or fully, not to economic factors in terms of productivity but to other factors, institutional and/or political. Consequently, the soundness of regional public finances, regional public authorities' auto-financing capabilities, fiscal policies towards firms, workers, innovation, and R&D are likely to be irrelevant when assessing the competitiveness of regions constituting a highly centralized nation. For example, fiscal competition between regions is not feasible if tax rates are fixed at the national level and evenly implemented and/or applied on the basis of national purposes. The soundness of public finances and auto-financing capabilities are intrinsically at least partially related to the ability to levy taxes and to allocate correlated resources. The only indicator that relates to fiscal policy and is potentially relevant in the case of highly centralized nations is average and median earnings. This indicator is obviously of a dynamic nature

yet results from the economic performance of the assessed region. Hence, it is relevant to implement it in the case of highly centralized nations or to use it as a control variable to support the soundness of the overall structure.

- Fourth, the state of order responds to the institutional organization and to the distribution of political capabilities between the central government and the nation's constituting regions. Even in highly centralized nations, the extent of the efficiency of judicial institutions may also vary from one region to another on the basis of resources allocated for law enforcement and on the basis of other exogenous factors related to the judicial system *per se*. Moreover, regardless of the distribution of political capabilities between the central government and the nation's constituting regions, judicial systems tend to be organized in a multi-level and pyramidal manner. Obviously, exceptions might exist according to the specificities of judicial systems in highly centralized political systems. However, as it is intended to apply the structure to a typical case, it is highly relevant to consider that differences in the efficiency of judicial institutions in terms of law enforcement capabilities might occur even in highly centralized nations. Judicial independence at the regional level is relatively less relevant than the aforementioned indicator from a political perspective. However, in all political systems, regional specificities might hamper regional judicial independence. Hence, whereas this indicator is still applicable, adjustments in its weight relative to the previous indicator might be mandatory.

In conclusion, the level of macroeconomic competitiveness requires some fundamental modifications, notably in the fields of institutions and fiscal policy, whereas other pillars, such as labour market-market constancy, healthcare services, and the state of order, are still relevant in the case of a highly centralized nation. These conclusions must be put into perspective, as case-specific intra-weighting adjustments are to be implemented on the basis *inter alia* of the distribution of political capabilities between the central government and the nation's constituting regions in order to adhere to the specificities of the assessed nation.

Third, the microeconomic level should be scrutinized. Its intrinsic nature implies that it captures dynamic indicators that are inter-related and likely in *t-1* to be the causes of other factors in *t0* and again in *t+n*. In other words, the case-based measures, which are designed to correspond to specific indicators, are likely to have an impact on the relevance of retaining or withdrawing those indicators. However, it is mandatory to further scrutinize each pillar constituting the microeconomic level of competitiveness, taking into account the case of a highly centralized nation and considering that case-specific intra-weighting adjustments are to be implemented subsequently.

- First, let us scrutinize firms' strategy and internationalization. This sub-pillar is relevant if the indicators constituting it are appropriately set for relatively highly centralized cases and based on the consistent section of the causality chain. Consequently, the share of employment in MNEs, accessibility of international markets and, in a lesser manner, the role of FDI in technology transfer are pertinent indicators. On the other hand, MNEs' access to local authorities and regulatory ease are likely to be irrelevant in the case of a highly centralized nation, as the role of local authorities in such matters is typically relatively limited, and local authorities usually do not benefit from sufficient regulatory capabilities. Strategy effectiveness is ultimately based on the consequences side and is therefore appropriate even in highly centralized nations.
- Second, the pillar of factor conditions is constituted of numerous sub-pillars and indicators that are related to various sections of the causality chain. Hence, a sub-pillar-by-sub-pillar analysis is mandatory. Operational infrastructures are obviously relevant in measuring a nation's level of centralization. As they mostly measure accessibility to strategic infrastructures, they rely on the results side of causality. On the other hand, administrative infrastructures typically relate to local authorities and thus do not have a high degree of independence in terms of firms' ability to start a business or in terms of the burden of regional government regulation. The case of financial infrastructures is more intricate, as it results from numerous endogenous and exogenous factors. Indeed, the measures related to these indicators must to some extent reflect the case-related centralization level, with the exception of financial market sophistication, which clearly relies on the results side of causality. Whereas the legal framework for obtaining access to loans and venture capital might be set at the national level, the factual evidence might imply discrepancies in those matters among the constituting regions. Consequently, in principle, all indicators related to financial

infrastructures are eligible for highly centralized nations as long as they clearly relate to the results side of causality. Innovation effectiveness is highly correlated with the quality of the specific ecosystem. As a result, it is crucial to measure it at the regional level regardless of the centralization propensities of the national government. Moreover, most indicators related to innovation effectiveness are highly dynamic and thus also relate to some extent to the results side of causality. Education and labour market constancy should be scrutinized more comprehensively. Even if educational standards are set by the central government and resources distributed accordingly, differences in the consequences might still occur due to endogenous and/or exogenous factors. This conclusion is pertinent for all levels of education. Indeed, considering basic education, whereas school programmes might be designed at the national level, the manner in which those programmes are implemented and the resources allocated to do so might be impacted by locational factors. The quality of basic education is ultimately a consequence of the governing structure of a nation and subsequently a cause for potential improvements in territorial competitiveness levels. However, it is relevant to examine the quality of basic education, as it is not the consistency of structural organization but the ultimate quality level of basic education that is measured. Indeed, it is not because educational strategic choices are set at the national level that, consequently, the quality level of basic education is evenly observed across all regions. This hypothesis might imply a bias based on preconceived conclusions that centralization processes endogenously engender benefits for the quality of basic education. The same syllogism is appropriate for the quality of superior education (non-obligatory), for accessibility to superior education (non-obligatory), and for education and labour-market consistency. Nonetheless, considering that those indicators *per se* are relevant even for relatively centralized nations, the measures designed to capture them should consider the governing structure and take note of the related causal chains. For example, accessibility to superior education (non-obligatory) should be understood from a factual point of view and not only or partly on the basis of institutional acknowledgements. In conclusion, exogenous factors to institutional acknowledgements might imply unequal quality levels of basic and superior education and, indeed, uneven access to superior education, all impacting education and labour-market consistency. Hence, it is not because the governing structure does not fully or partly give the regions the power to implement specific policies regarding education that it is not consistent to measure potential differences between them if based on relevant indicators. Ultimately, with regard to the availability of specialized research and training, this sub-pillar obviously relates to the results side of causality and thus is implementable in all cases. Its relevance is relatively high when analysing any territory, and even more so in relatively highly centralized nations where other related factors are not pertinent.

- Third, supporting and related industries have a beneficial impact on the creation of new firms and on the development capabilities of existing ones. As indicated recurrently heretofore, microeconomic competitiveness has the most decisive impact on dynamic sequences, and this conclusion is highly decisive when assessing supporting and related industries. To some degree, superior school and research institution dynamics reflect the way of doing business in a specific territory that is itself highly dependent on the legal framework set at the national level, and more decisively so in the case of a highly centralized nation. However, if the correlated measure(s) is (are) related to the results side of causality, this indicator is relevant even in the case of highly centralized nations. Indeed, superior school and research institution dynamics also noticeably depend on the extent of consistency between the specializations of schools and research institutions and on the specialization of conveniently located industries. Regarding technological parks, it is not possible to axiomatically correlate their presence and/or efficacy with the structural basis of centralization processes. Indeed, whereas highly centralized nations might decide where technological parks should be established and with what specialization, other highly centralized nations might leave a certain margin of action to their constituting regions specifically in such matters. Moreover, numerous technological parks are created by private firms and/or investors, whose localization processes do not necessarily respond to politically related organizational schemes. Consequently, it is methodologically relevant to implement this sub-pillar in all cases. Supplier quality and supplier quantity sufficiently relate to the results side of causality and are also legitimately measured in the case of highly centralized systems.

- Fourth, demand conditions *per se* is a relatively difficult pillar to capture, particularly in the case of a highly centralized nation. Local government procurement of advanced technological products is unlikely to be significant at the regional level. Indeed, even if the procurement of advanced technological products results from exogenous factors, local authorities might still not play an active role. Consequently, the correlated measure is relatively insignificant. This consideration is also relatively obvious for the demanding regulatory standards, which are mostly determined at the national level. However, if the correlated measure(s) relate(s) to the implementation of those standards, capturing their impacts could potentially be relevant. The sophistication of local demand is related to the results side of causality, and it is consistent to measure it in the case of a highly centralized state along with the other types of distribution of political capabilities.
- Fifth, cluster development and specialization constitute one of the most relevant pillars impacting the robustness of a specific business environment. Regarding the other highly dynamic factors of microeconomic competitiveness, in terms of applicability in the case of a highly centralized nation, the measures correlated with those indicators noticeably depend on their relative position on the causality chain. The extent of cluster development and specialization typically relies on measures situated on the results side of causality. Therefore, measuring it, for instance by capturing the average and median location quotients, is clearly also pertinent in a highly centralized nation. This conclusion also applies to the extent of inter-cluster collaboration and the state of development of institutions for collaboration. However, potential regional initiatives might be limited. Regarding the extent of cluster policy, this indicator is typically inadequate in the case of highly centralized states, as it usually relates to regions that benefit from highly independent authorities, institutions and relatively extensive policy implementation capabilities. Consequently, it is likely to be removed from the

generic structure. However, case-by-case analyses of the extent of cluster policy might be necessary.

- Sixth, the context for strategy and rivalry at the regional level is highly correlated not only with the distribution of political capabilities between the central government and its constituting regions but also with the causality chain. Indeed, the indicators related to that context are captured by the measures assessing the potential for strategy and rivalry or by their actual extent. Consequently, in the case of a highly centralized nation, low market disruption of state enterprises and/or state-related enterprises, and a low distortive effect of taxes/subsidies on competition, local regulatory quality is likely to be highly dependent on policies, strategic decisions and structures related directly and/or indirectly to the central government. Conversely, the intensity of local competition and the presence of local monopolies are more clearly related to the results side of causality and thus are also relevant in the case of highly centralized nations. The relevancy of rigidity of employment and labour-employer cooperation depends heavily on the selected correlated measures. Indeed, if rigidity of employment is captured on the basis of regulatory standards, it is likely that this regulation is determined at the national level. However, if such rigidity is relatively more associated with the results side of causality, for example, by indicating the net activity rate, then it might be implemented at the regional level considering that factors exogenous to the legal framework impact it more decisively. For labour-employer cooperation, the aforementioned conclusion also applies. Indeed, labour-employer cooperation is predominantly related to the legal framework, regional economic activity in terms of specialization, and the extent of union-management cooperation. Hence, the relevance of implementing this sub-pillar at the regional level in the case of a highly centralized nation depends *inter alia* on the selected factor(s), its/their specific position(s) on the causality chain and, in the case of numerous measures, the corresponding sequence.

In conclusion, the in-depth analysis of the three levels of competitiveness in the case of a highly centralized nation allows the implementation of the generic structure exhibited heretofore in accordance with the integrity of the overall framework developed in this chapter. The conceptual adjustments specified above concern indicators constituting the following pillars of macroeconomic competitiveness: 1) institutions and 2) fiscal policy. These pillars are fundamental to the ability of a territory to set the potential for competitiveness. Nonetheless, the relevant conceptual adjustments should be made to safeguard the integrity of the structure while taking into consideration the distribution of political capabilities. Microeconomic competitiveness adaptations are to be conducted for some indicators constituting the following pillars: 1) strategy competitiveness, 2) factor conditions, 3) demand conditions, 4) cluster development and specialization, and 5) context for strategy and rivalry. Microeconomic competitiveness is the level at which competitiveness is actually created, and the indicators measuring it are highly dynamic. It implies intricacies in how the corresponding measures are constructed, particularly when considering the distribution of political capabilities.

Conducting an extensive assessment of the hypothetical structure of a highly centralized state is mandatory in considering the case of an intermediately centralized nation. This case usually refers to nations where the constituting regions are endowed with further attributes following decentralization processes (Hutchcroft, 2001). On a conceptual basis, it might be necessary to shape an intricate and unique hypothetical case, as an intermediately centralized nation tends to experience hybrid institutional distributions of political capabilities, thus necessitating distinct adjustments of the generic structure. However, these adjustments axiomatically relate to those applied above in the case of a highly centralized nation where decentralization processes are more relevant while adapting the structure on a conceptual basis. Indeed, the transfer of capabilities from regions to the central state in *federal governments* is “based on a constitution that defines how power is shared between the government institutional units” (Dziobek, Gutierrez Mangas and Kufa, 2010, p. 21). Hence, in considering the constitutional process of centralization. as opposed to the decentralization mechanism, it would be more consistent to withdraw some sub-pillars and/or indicators from the full version of the generic structure on the basis of case-specific proceedings.

Consequently, taking into account a hypothetical case of an intermediately centralized nation, it is necessary to scrutinize the macro- and microeconomic levels of competitiveness with reference to the analysis conducted above and to the findings of Hutchcroft (2001), Panizza (1999), and Dziobek, Gutierrez Mangas and Kufa (2010) regarding *inter alia* decentralization processes. As emphasized above, institutions and fiscal policy are 2 major macroeconomic pillars that necessitate major adjustments in the case of highly centralized nations. In the case of an intermediately centralized nation, it might be relevant to measure both. First, decentralization processes commonly imply the transfer of specific capabilities from the national government to its constituting regions. The local authorities' efficiency, access to local authorities, and local authorities' independence are likely to play more relevant roles, and it is therefore consistent to assess these indicators. Regarding fiscal policy, this major factor of macroeconomic competitiveness obviously depends on the extent of fiscal decentralization, which often embodies the essence of decentralization policies. Indeed, it might allow fiscal competition between regions if the appropriate lawful apparatus is established. Hence, in extensive fiscal decentralization programmes, it might be appropriate to assess fiscal policies in contrast to those of a highly centralized nation.

At the microeconomic level of competitiveness, strategy competitiveness, factor conditions, demand condition, cluster development and specialization, and context for strategy and rivalry are adjusted in the case of a highly centralized nation and, as a matter of course, are also adjusted in the case of an intermediately centralized nation. With reference to strategy and rivalry, local authorities' accessibility for MNEs might be relevant for the same aforementioned reasons. Regarding factor conditions, to some extent, the ability to start a business could be influenced, *inter alia*, by regional administrative infrastructures in the course of decentralization processes. With respect to demand conditions, local government procurement of advanced technological products might be impacted by those processes. To a lesser extent, the same conclusion applies to the demanding regulatory standards, which tend to remain within the hands of the national government. With regard to cluster development and specialization, the extent of cluster policy might be impacted by decentralization strategies in order for regions to implement policies that reflect the level of specialization of the clusters located in them. Regarding the context for strategy and rivalry, the low distortive effect of taxes/subsidies on competition and local regulatory quality might be relevant in the case of an intermediately centralized nation under case-specific conditions, *inter alia*.

In conclusion, considering the cases of the hypothetical forms of 1) a highly centralized state and 2) an intermediately centralized state necessitates relatively more consideration of the weight of the causality chain in relation to the relevance of all indicators and, *in fine*, the integrity of the structure while it is being adapted. The conceptual expertise described above is the first step and is not case-related. Indeed, the next step is obviously to adjust the structure by 1) taking into account the case-specific distribution of political capabilities and 2) correlating all selected indicators with measures that appropriately acknowledge the decisive consequences of causality issues and dynamic sequences. Whereas the potential issues related to causality chains and dynamic sequences have been extensively scrutinized above, their impacts are conceptually augmented in the case of highly and intermediately centralized nations, as the pertinence of numerous indicators increasingly relies on specific causal conditions. Consequently, before conducting the various quantitative tests investigated at the beginning of this chapter in order to address, *inter alia*, causality and double-counting issues, a conceptual analysis of the assessed case on the basis of the distribution of political capabilities is mandatory to avoid hampering the integrity of the structure. Existing academic publications on centralization levels, including those indicated above, can serve as a basis for conceptually determining the extent to which the full version of the structure should be implemented. This exercise is comprehensively conducted in the next chapter in the Swiss case.

9.8 The intranational regional competitiveness index and the corresponding generic structure: synthesis and concluding remarks

The full generic structure exhibited heretofore and the correlated potential adjustments result from a systematic and comprehensive process that is based on section 8 on one hand and sub-sections 9.1, 9.2, 9.3, 9.4, and 9.5 on the other hand. Section 8 allows us to 1) define in a narrow manner the concept measured in the index and indicate to which measure(s) that index will be correlated to and to what extent, 2) delimit the scope of analysis, 3) elaborate on the systemic characteristics of that concept, and 4) theoretically address the issues related to multi-dimensional analysis. It constitutes the systematic basis on which it is relevant to build the generic structure of an intranational regional competitiveness index.

On this basis, section 9 investigates and categorizes a systematized subsequent procedure that allows a technical merger of theoretical and methodological issues with the measured concept, which in this case is intranational regional competitiveness. This procedure has been segmented into 4 steps. First, a definition of intranational regional competitiveness has been introduced. Based on the economic geography approach and the international business approach, the suggested definition of regional competitiveness addresses various theoretical and methodological issues that might subsequently hamper the proper functioning of the index. This definition lays the foundation for the analysis of the key drivers of competitiveness, which are the constituting parts of the structure exhibited at a later stage of this study.

Second, the determinants of intranational regional competitiveness have been investigated to further analyse their impact and function. The endowments are inherited and include*, inter alia*, natural resources and/or location *vis-à-vis* other territories (Porter *et al*., 2008, p. 45). Macroeconomic competitiveness "is driven by a range of institutions, policies, and public good investments that set the context for an entire economy" (Delgado *et al*., 2012, p. 9). It plays an indirect role in firms' ability to improve their productivity levels. Microeconomic competitiveness is the most decisive facet of the framework. Whereas endowments are the basis of prosperity, and macroeconomic competitiveness offers the potential for competitiveness improvements, "microeconomic factors operate directly on firms in affecting productivity" (Porter *et al*., 2008, p. 47). At the regional level, micro-based factors are even more significant, as they are likely to differ across territories constituting a nation, whereas macro-based factors are likely to be more homogeneous. This aspect must be considered in the subsequent structuring of the index.

Third, as the generic structure relies on an existing structure yet is adapted to the scope of analysis, a pre-testing process has been implemented. It follows 4 major sub-steps: 1) to theoretically assess the chosen structure and the subsequent main factors to ensure that the strict process described above is followed and that it corresponds to the multi-dimensionality of the measured concept, notably in terms of potential causality issues; 2) to evaluate the previously tested sub-pillars and indicators, notably on the basis of quantitative analyses; 3) to select the version of the generic structure that is consistent with the level of political and institutional centralization; and 4) to add potentially missing sub-pillars/indicators that are notably relevant because of theoretical, empirical and/or case-specific considerations.

Fourth, the conceivable limitations have been identified to address the main case-specific adaptations to be performed when applying the generic structure. Limitations such as causality and double-counting issues or undisclosed specific measures are likely to require adaptations that comply with the theoretical framework as well as with the quantitative steps and methodological processes presented heretofore.

In conclusion, the full generic structure has been exhibited in sub-section 9.6. The potential adapted versions have been analysed in sub-section 9.7 to conceptually evaluate how to adjust the generic structure in the cases of relatively centralized nations and, most importantly, of highly centralized nations. All versions of the generic structure rely on a comprehensive framework with the main purpose of addressing as many potential issues as possible but also providing a systematic framework for the assessment of the multi-dimensional concept of intranational regional competitiveness.

10 General concluding remarks

The pre-eminent purpose of chapter 2 is to extract the main theoretical findings of chapter 1 and to implement them in order to design and build an intranational regional competitiveness index. Two further purposes of this chapter are to address 1) the conventional quantitative steps for building composite indicators and indexes and 2) the methodologies and findings of the major existing competitiveness indexes at all levels of analysis.

Indeed, section 6 allows the analysis of the 7 main generic quantitative steps necessary to implement to assess the quality of composite indicators and indexes. Whatever the theoretical framework or fundamental methodological assumptions in *t0*, the validity of an index depends *inter alia* on the extent to which decisive technical steps are implemented in *t+1* on the basis of case-related specificities. These steps also strengthen the conceptual validity of the generic index, as their mechanisms reduce the probability of conceptual negative effects on the integrity of the executed structure. Indeed, they constitute an independent process in which implementation is required in any index construction. However, in contrast to most publications on the subject, including the "Handbook on Constructing Composite Indicators" (OECD, 2008), the methodology developed in chapter 2 concludes that data selection occurring during the preceding process generates a fundamental bias while conceptualizing a generic structure. Indeed, most structures are *ad hoc*, that is, case-specific, and *ergo* depend on data availability and/or quality.

This conclusion is corroborated in section 7, which summarizes a selection of existing competitiveness indexes at all levels of analysis. The RCI and GCR, the former based on the latter, rely on a comprehensive theoretical and conceptual framework that essentially builds on Porter's works (Porter, 1990a, 1998; Porter *et al.*, 2008). For the others, the extent of the theoretical and subsequent conceptual frame of reference varies extensively from no disclosure to partial disclosure. These methodological processes do not allow an external pre-assessment of the conceptual validity of the framework, and the aforementioned quantitative steps can only partially compensate for this lack.

As a result, the methodology developed in sections 8 and 9 is built on the theoretical grounds of chapter 1 and translates the main subsequent findings while designing the generic structure. Moreover, one of the most crucial purposes of those sections is to define and organize all the preceding steps and subsequent major steps to build a generic structure in which conceptualization does not intrinsically hamper integrity. As a result, section 8 addresses the preceding process to conceptualize regional competitiveness and measure it in an index. This process is divided into 4 cumulative steps, which allow us to 1) narrowly define the concept measured in the index and indicate which measure(s) that index will be correlated with and to what extent, 2) delimit the scope of analysis, 3) elaborate on the systemic characteristics of that concept, and 4) theoretically address the issues related to multi-dimensional analysis. Moreover, it combines the conceptualization procedure with its application to competitiveness to properly master the examination of a specific multi-dimensional and dynamic concept such as competitiveness. Subsequently, addressing in a preceding process the issues related, *inter alia*, to the mechanism for translating theoretical insights into competitiveness measures or to the delimitation of a statistically significant scope of analysis allows the foundation of a systemic definition of competitiveness on which it is *in fine* relevant to build the index's generic structure for measuring competitiveness at the regional level.

Ultimately, section 9 *inter alia* 1) categorizes the 5 main steps in order to build the generic structure of an intranational regional competitiveness, 2) addresses the conceivable limitations of the procedure, 3) exhibits the structure in its full version, and 4) addresses the potential adjustments to be implemented with regard to the level of centralization of the case being assessed. The 5 main steps are cumulative and not permutable. They are built from broader levels to narrower indicators because the pillars should be divided on the following basis: 1) endowments, 2) macroeconomic competitiveness, and 3) microeconomic competitiveness, as epitomized by Porter (*inter alia* Porter, 1990a, 1998, 2003; Porter *et al.*, 2008) and implemented by Delgado *et al.* (2012). The generic structure is built accordingly, level by level, pillar by pillar, sub-pillar by sub-pillar and, ultimately, indicator by indicator when applicable. Most importantly, the structure relies on existing works, most crucially on Delgado *et al.* (2012), Porter (1990a, 1998, 2003), and Porter *et al.* (2008) but also on Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Rugman (1981), and Rugman and Verbeke (2001a, 2001b, 2004, 2009), and is systematically adapted to the purpose of a generic structure measuring intranational regional competitiveness. With respect to the conceivable limitations of the procedure, they have highlighted *inter alia* that 1) causality and double-counting issues might potentially hamper the integrity of the generic structure despite the proposed counter-measures, 2) the proposed methodology implies a margin of interpretation on the configuration of the measure(s) constituting each indicator, 3) a generic structure inevitably requires extensive case-specific adaptations, and 4) the generic structure is more specifically designed for intranational comparisons of relatively developed economies.

Ultimately, in section 9, the generic structure in its full version has been exhibited, and the potential adjustments to be implemented with regard to the level of centralization of specific cases have been addressed. In reference to those potential adjustments, considering the cases of the hypothetical forms of 1) a highly centralized state and 2) an intermediately centralized state necessitates relatively more consideration of the weight of the causality chain in relation to the relevance of all indicators and, *in fine*, on the integrity of the structure while being adjusted.

In conclusion, chapter 2 sets a framework that endeavours to be relevant in numerous, if not all, conceivable cases. Its purpose is not only to introduce a generic structure that allows the assessment of intranational regional competitiveness through the implementation of an index but also to classify and address all the steps and sub-steps constituting a methodology that guarantees a high degree of suitability for the designed process. Moreover, non-disclosures have been avoided to improve subsequent uses of the generic structure. However, the process of applying and adjusting the generic structure to a specific case induces numerous challenges in order 1) not to hamper the integrity of the structure, 2) to find sufficient data of satisfactory quality, and 3) to design measures that correspond to the theoretical findings at the core of the exhibited indicators. This task shall be the subject of chapter 3 in the case of the Swiss cantons.

Chapter 3 – Implementing the intranational regional competitiveness index's methodology and framework in the case of the Swiss cantons

11 General introductory remarks

Whereas chapter 1 has provided the theoretical insights that are mandatory for consistently acknowledging the causes and impacts of the competitiveness of territories, and chapter 2 has subsequently elaborated on a generic methodological framework to quantify the extent of competitiveness, chapter 3 materially implements these contents in the case of the Swiss cantons. To do so, it is divided into 3 major sections: 1) the conceptual approach related to the competitiveness of territories in the Swiss case, 2) the inter-connection process between the generic structure developed in chapter 2 and the Swiss case, and 3) the presentation of the results of the intranational regional competitiveness index applied to the Swiss case.

First, section 12 of chapter 3 concentrates on the conceptual approach related to the competitiveness of territories in the Swiss case. The multi-dimensional characteristic of territorial competitiveness necessitates further investigation while being implemented. Indeed, the process related to the generic structure developed in the previous chapter addresses this issue but not in relation to a specific subject. Assessing the Swiss cantons' regional competitiveness in a dynamic and multi-dimensional manner requires scrutinizing the overall competitive framework that all cantons share to avoid overly increasing the deltas of scores between regions. Subsequently, it is relevant to adjust the production process of the generic structure to the Swiss case. Indeed, as established in chapter 2, each nation is organized distinctively. Hence, the extent of the structural decentralization for all pillars within each level of competitiveness is assessed.

Second, section 13 of chapter 3 is dedicated to the inter-connection process between the generic structure developed in chapter 2 and the Swiss case. *Ergo*, section 13 implements the methodological and quantitative steps mentioned in the previous chapter. Measures constituting indicators are built, configured and adjusted according to data availability. Subsequently, other methodological and quantitative sub-steps are consistently implemented. Furthermore, quantitative limitations related to the implementation of the generic structure in the Swiss case are examined.

Third, section 14 of chapter 3 exhibits the results of the intranational regional competitiveness index applied to the Swiss cantons. To do so, it is divided into two subsections: 1) the presentation of the general index rankings of the Swiss cantons and 2) the presentation of results charts and tables for all Swiss cantons. Ultimately, the results are discussed from methodological and quantitative perspectives.

12 The concept of regional competitiveness as measured in an index: the case of the Swiss cantons

12.1 Introductory remarks

Switzerland, or the Swiss Confederation, is a federalist nation divided into 26 member states, the cantons. Those states benefit from a relatively high level of independence, as they are each under the rule of a specific constitution. However, the federal constitution is the cornerstone of the Swiss juridical system (FDFA, 2020). Indeed, the cantons' relatively high level of independence evolved over the second half of the nineteenth century and the twentieth century. Today, Switzerland can be considered a federal republic. This shift implies the transfer of distinctive fundamental duties from the member states to the federal state and, indeed, case-specific adjustments of numerous territorial competitiveness measures.

Whereas this centralization process has occurred, the Swiss cantons still benefit from a relatively high level of independence compared not only to other European countries, such as France or Italy, but also to other countries of similar size in terms of population, such as Belgium or Sweden. For example, fiscal policies differ from one canton to another, and tax competition occurs not only among the cantons but also among municipalities (Rossi and Dafflon, 2004). This competition has evolved over the years, and the recent 2017 corporate tax reform has had an extensive effect on the corporate tax regimes of all cantons (FDF, 2017).

The relatively high level of independence of the Swiss cantons does not rely only on fiscal regimes and correlated instruments. Indeed, the Swiss cantons implement their own economic development policies. Development agencies are related to specific canton governments (SECO, 2020a). Thus, their aim is to compete not only with other national and sub-national development agencies but also with other canton development agencies to attract high-value-added activities. Thus, the business structure of a canton, notably the presence of competitive clusters in *t0*, will mechanistically affect development agencies' activities and policies in *t+1* (Gugler *et al*., 2019, pp. 56-60).

Moreover, the Swiss cantons benefit from a relatively high level of autonomy in other fundamental pillars of the generic structure of the intranational regional competitiveness index presented in the previous chapter. Indeed, with the exception of the two federal institutes of technology, universities and universities of applied sciences depend on the cantons. Moreover, basic education is related to canton authorities, even though several aspects are increasingly being normalized across regions. To a lesser extent, infrastructures are still largely influenced by canton authorities. Whereas highways are managed by the federal authorities, other roads are controlled by regional and municipal authorities, as are numerous related projects that affect locations' ability to attract and sustain economic activities. Airports are limited in number due to 1) the overall size of the territory and 2) the relatively small dimensions of the Swiss agglomerations (FSO, 2020b). The railroad network is relatively dense and efficient in Switzerland (WEF, 2019, p. 535). However, it is managed mostly at the federal level, with the exception of more localized railroad companies.

Generally, the overall context in which firms operate is relatively heavily influenced by authorities at the canton level. However, this context also depends on regulations set at the federal level. Furthermore, the cantons also diverge from one another because of their specific endowments, for which potential evolution is materially problematic. Indeed, *inter alia*, geographic position still has an impact on a region's competitiveness improvement capabilities, notably in terms of opportunities related to the existing competitive epicentre(s) of a specific nation. These endowments are also of consequence in the Swiss case, as the nation is *inter alia* divided into numerous linguistic territories and topographically diverse.

In conclusion, even though centralization dynamics occur in Switzerland, the country is still composed of relatively independent cantons that implement specific competitiveness-oriented policies. Therefore, it is relevant not only to consider the Swiss cantons to be statistically significant regions, as scrutinized in the previous chapter, but also to consider that Switzerland is suitable for the full implementation of the generic structure of an intranational regional index, as we shall see henceforth in more detail.

12.2 The multi-dimensional phenomenon of competitiveness measures implemented in the Swiss case

Competitiveness is a dynamic and multi-dimensional phenomenon. Its velocity degree is relatively case-specific and may be diverse. It is multi-dimensional "because of the sheer number and variety of influences on national productivity" (Porter *et al.*, 2008, p. 44). These influences impact location competitiveness in numerous ways in correlation with the considered level of analysis. Hence, as indicated previously, measuring competitiveness is a complex process that is likely to be specific to the subject being analysed. The UBS "Cantonal Competitiveness Indicator" measures a competitiveness gap of 75% between the most and least competitive cantons (Hofer, Holzhey and Skoczek, 2018, p. 4), suggesting relatively significant disparities in terms of location competitiveness. However, as indicated in the previous chapter, for each pillar, the cantons are scored on a 0-100 scale. This methodology implies that the competitiveness levels of the regions should be considered independently of the overall competitive advantages of the nation. Thus, the deltas of the scores might be perceived to be substantial, whereas the average competitiveness levels of the nation are relatively high.

Consequently, in the case of the Swiss cantons, assessing regional competitiveness in a dynamic and multi-dimensional manner also requires considering the overall competitive framework that all cantons share to avoid overly increasing the deltas of scores between regions. As indicated in the previous chapter, a certain degree of homogeneity in terms of the average economic development of the regions constituting the nation implies that attention should be paid to this matter. The potential use of 0-100 scales should be quantitatively mitigated in some manner, particularly in the case of Switzerland. Indeed, the Swiss cantons cover a relatively small territory in geographical terms. They benefit from a relatively stable and solid legal system and are part of a nation that as an entity and at the national level offers a relatively strong macroeconomic framework. These conclusions do not imply that the constituting regions do not benefit from relatively extensive policy tools, even in legal terms. Therefore, applying the generic structure presented in the previous chapter should take into account two aspects: 1) Swiss cantons benefit from a relatively high degree of independence, yet 2) this independence relies on a relatively strong federal entity that embodies a large share of the legal system and indeed of the macroeconomic framework.

In conclusion, multi-dimensionality and dynamic sequences of regional competitiveness must be considered in relation to the case of the Swiss cantons. Hence, the specific ramifications of policy implementation in correlation with the hybrid structure of the cantons in terms of autonomy must be confronted with the transfer of powers and capabilities to the federal state. Hereinafter, this degree of decentralization more generally and, to a certain extent, the manner in which multi-dimensionality and dynamic sequences of regional competitiveness affect the core of each canton's economic environment allow us to select the most sensible option while assessing the potential adjustments that are necessary when implementing the generic structure exhibited in the previous chapter. This choice and the corresponding adjustments are further scrutinized hereafter.

12.3 Adjusting the production process of an intranational regional competitiveness index and the corresponding generic structure to the Swiss case

The adjustment measures developed earlier must be implemented on the basis of the overall assessment of the balance between multi-dimensionality and dynamic sequences of regional competitiveness and the transfer of powers and capabilities from the cantons to the federal state. The previous chapter proposes 3 major categories of structural centralization: 1) highly decentralized, 2) intermediately centralized, and 3) centralized. These categories allow fundamental case-specific differentiations. In addition to this decision, it is mandatory to further adapt the generic structure of the intranational regional competitiveness index, as we shall see further below. Indeed, it is necessary to determine the major category that best suits the case of the Swiss cantons and to explain the correlated motives. This decision is obviously mostly qualitative, that is, each indicator is analysed and added in a relatively systemic manner so as not to weaken the overall scores that will ultimately follow this analysis. Indeed, choosing one category over another and consecutively thoroughly adapting the structure might generate new causality issues.

In the Swiss case, the most appropriate major category is “highly decentralized”, in accordance with the previous chapter exhibiting the generic structure for an intranational regional competitiveness index. In relative terms, the Swiss case corresponds predominantly with this structure in its comprehensive design. To support this determination, it is necessary to follow a two-step procedure: 1) to assess the extent of structural decentralization for all pillars within each level of competitiveness and 2) to collect the results of these assessments and conduct an overall analysis to make the most consistent estimate of the version of the generic structure of an intranational regional competitiveness index likely to necessitate the fewest adjustments. The following sub-sections address this procedure.

12.3.1 Assessing the extent of structural decentralization for all pillars within each level of competitiveness

As indicated heretofore, selecting the most consistent version of the generic structure of an international regional competitiveness index necessitates an in-depth review of all pillars within each level of competitiveness on the basis of the case being analysed. The endowments are either permanent or less dynamic than the macroeconomic and microeconomic levels of competitiveness. Their intrinsic nature is therefore not sufficiently directly related to structural centralization except for pillars II “Relatedness to central government” and IV “Cultural distance to central government”. In the Swiss case, as the country has 4 national languages and does not rely on a single religious or overall cultural background, these questions remain of interest and might have an impact on the endowments. For “Relatedness to central government”, even if the federal capital does not benefit from the same power capabilities as other capital cities, it still plays a significant role in the modelling of the legal framework as well as in financing, the transfer of federal funds, and the development of relatively valuable policies and infrastructures. Hence, the extent to which a canton is related to the federal power is still of consequence. As this relatedness is also dynamic to a certain degree, pre-existing economic structures and levels of competitiveness within a specific canton might also influence federal decision-making processes. Consequently, the endowment level of the generic structure can be applied to the Swiss case with a level of certitude beyond a reasonable doubt. However, a modification must be applied to the relatedness to the most competitive regions of the country. Indeed, it is inconsistent to consider this aspect in *t0,* as the index has not been implemented in *t-1* to assess this measure. As a result, in *t0*, it is relatively more consistent to consider the relatedness of each region to the most important economic poles of the country in terms of employment.

For the indicators constituting the level of macroeconomic competitiveness, it is necessary to conduct a pillar-to-pillar analysis.

- **VI) Health:** Healthcare service accessibility should not be misunderstood. Whereas Switzerland as a nation has one of the most efficient healthcare systems in the world, this system is relatively decentralized (Alessio *et al.*, 2015, p. 5, p. 8). For example, "hospitals are in 70% run by the cantons, and in 30% by private companies" (Alessio *et al.*, 2015, p. 5). Hence, even though universal health insurance is mandatory in the country, accessibility to healthcare services may vary from one region to another in terms of either quality and/or relative distance from healthcare infrastructures. Therefore, it is consistent to consider this aspect in the case of the Swiss cantons.
- **VII) Political institutions:** Political institutions generally might be perceived as difficult to measure, particularly at the regional level. However, the degree of efficiency and independence of local authorities has a strong impact on the manner in which a specific business environment develops. The business environment relies heavily on rules, procedures and policies set by cantonal and municipal authorities. Thus, efficiency, accessibility and independence are of prominent relevance. As Switzerland relies extensively on the subsidiarity principle, these indicators may have relatively effective impacts on firms' capabilities. Therefore, these indicators should be implemented.
- **VIII) Fiscal policy:** Fiscal policy is one of the most crucial prerogatives of the Swiss cantons. The Swiss fiscal system is divided according to the 3 major political levels of governance. However, the most relevant level of authority for taxes is the canton level. Moreover, the Swiss system is characterized by relatively

intensive tax competition among cantons (Rossi and Dafflon, 2004; FSO, 2017a). Competition is relevant not only for corporate taxes but also for individuals. Competition for corporate taxes encountered even stronger developments in 2019 with significant changes in cantonal tax rates due to the cessation of special corporate tax regimes (KPMG, 2019). Hence, the relatively low corporate tax rates experienced by firms in Switzerland are closely related to the relative fiscal sovereignty of the cantons (FSO, 2017a). Fiscal policy towards firms is a relevant indicator of attractiveness in the case of the Swiss cantons. However, other aspects of fiscal policy should also be considered. Indeed, if relatively low corporate tax rates imply high difficulties for authorities in financing decisive infrastructures and institutions, the attractiveness of a territory might be decisively hampered. Consequently, the soundness and spending efficiency of public funds as well as public authorities' auto-financing capabilities should also be scrutinized to obtain a more thorough perspective of the fiscal competitiveness of the Swiss cantons. As these conditions are intrinsically related to fiscal policies set at the cantonal level, it is pertinent to keep the generic structure in this regard. Furthermore, two other aspects of fiscal policy should be considered at the cantonal level. First is fiscal policy towards innovation and R&D. As indicated in the first chapter, specific policies oriented towards innovation, also in terms of fiscal incentives, have a positive impact on current average productivity levels but also on territorial attractiveness, which *in fine* improves location competitiveness. Hence, as the fiscal sovereignty of cantons includes *inter alia* fiscal tools dedicated to innovation (Gugler *et al.*, 2019, p. 39), this aspect is also relevant in implementing the generic structure in the Swiss case. Second, fiscal policy towards workers is of decisive importance for the competitiveness of a region. Indeed, if relatively high wages are undermined by relatively high taxes on individuals, it might be difficult to attract relatively specialized and productive workers. Moreover, the demand condition might be weakened. The cantons are also the most significant authority in terms of fiscal policy for individuals (FTA, 2019). Hence, relatively sizable differences are noticeable not only among the Swiss cantons but also among the municipalities of those cantons. For example, if we take a gross revenue of CHF 150,000 for a married couple raising two children, the cantonal and local tax burden will represent approximately 2,2% in the canton of Zug and approximately 12% in the half-canton of Basel (FSO, 2017a). These discrepancies result *inter alia* from tax competition among Swiss cantons but also from the existing productivity levels of firms located there, which have an impact on fiscal capabilities and on the ability of those cantons to compete in fiscal terms. In conclusion, fiscal policy in general is one of the most fundamental prerogatives of Swiss cantons and therefore justifies the implementation of that section of the generic structure.

- **IX) State of order:** The state of order is usually a responsibility of the central government, as it responds to the content of a constitution. However, the governing structures have a strong impact on the manner in which this state of order is indeed administered. Hence, *inter alia*, the efficiency of judicial institutions at the regional level as well as judicial independence at the regional level might differ from one region to another due to these administrative structures. In the Swiss case, "the responsibility for law and order basically lies with the cantons" (OSCEPOLIS, 2020). Hence, whereas numerous laws are established at the federal level, others are generated by cantonal authorities. Moreover, law enforcement more generally is predominantly under the rule of the Swiss cantons. Therefore, it is consistent to analyse this matter in the case of the Swiss cantons.

In conclusion, in the case of the Swiss cantons, all indicators of macroeconomic competitiveness at the regional level can be implemented on the basis of the generic structure. Indeed, whereas the Swiss cantons tend to experience power transfers to the federal state, fundamental prerogatives related to macroeconomic competitiveness are still under their authority. Regarding potential causality issues related to the dynamic sequences that each canton specifically experiences in terms of macroeconomic competitiveness, the fact that comprehensive measures are evenly and fully implemented for all factors rationally diminishes the impact of this problem. In addition, it is conspicuous that additional tests must be conducted at a later stage, as has been comprehensively indicated in the second chapter. Although adjustments might subsequently be necessary, the indicators are inter-related to various extents and impact one another at various stages of the dynamic sequences and not axiomatically in the same order. Whatever the potential issue for macroeconomic competitiveness, the generic structure is relevant in the Swiss case.

As indicated in the previous chapters, microeconomic competitiveness is the most significant level at which value is created. As a result, the sub-structure of that aspect is relatively deepened compared to that of the other two levels. Generally, microeconomic competitiveness indicators are further related to the activities of firms and are therefore less correlated with the formal governing structure of the subject being analysed. Whereas endowments are definitive relative to macro- and microeconomic competitiveness, and macroeconomic competitiveness captures the potential for competitiveness, microeconomic competitiveness is further oriented towards dynamic sequences *per se*. Therefore, it builds on correlated causes and consequences that work together systemically. Indeed, their identities and roles might be dynamically inter-convertible. Consequently, whereas causality analysis between the levels of competitiveness might be considered, microeconomic competitiveness has a more universal nature than endowments and macroeconomic competitiveness. Regardless of this conclusion, it is mandatory to examine whether the generic structure with reference to microeconomic competitiveness in its comprehensive form is relevant, fully or to a large extent, in the case of the Swiss cantons. This examination relates only to the indicators, which necessitate case-specific justifications.

- **X) Firms' strategy effectiveness and internationalization:** Firms' strategy and internationalization encompass MNEs' attractiveness and strategy effectiveness *per se*. In Switzerland, MNEs' attractiveness differs from one canton to another (FSO, 2017b). Indeed, the cantons of Zurich, Geneva, and Vaud experience high shares of employment resulting from MNEs, whereas other cantons experience less (FSO, 2017b). The cantons play a relevant role in MNEs' oriented policies. Indeed, whereas the Swiss Confederation plays a role complementary to that of the cantons in promoting economic development, the cantons are effectively in charge of their own development agencies and policies (Federal Council, 2019, p. 2344). Therefore, the overall business environment of each canton is influenced by multiple factors, as indicated in the first chapter, including location-specific policies. As a result, it is relevant to consider attractiveness to MNEs when measuring their levels of competitiveness, not only because of region-specific advantages but also because of each canton's responsibility for coordinating the appropriate set of policies for MNEs within the framework imposed by federal authorities.

Strategy effectiveness *per se* consists of variables that result *inter alia* from attractiveness to MNEs but most importantly from the overall quality and advancement of the business environment of the canton. It goes far beyond MNEs' activities and encompasses local market efficiency. Whereas these measures might be perceived as consequences of multiple factors, they are components to a certain extent of dynamic sequences and are by degrees location specific. Consequently, strategy effectiveness is maintained while implementing the regional competitiveness index in the Swiss case.

- **XI) Factor conditions:** Factor conditions constitute a fundamental pillar of the generic structure presented in the second chapter. Operational infrastructures obviously vary from one region to another regardless of the governing structure in place as a critical overall size is reached. Access to internet infrastructures necessitates further analysis. Overall access to internet infrastructures is satisfactory in Switzerland (WEF, 2019, p. 536). However, "ICT adoption" (WEF, 2019, p. 536) *per se* might differ across the territory even if overall access to internet infrastructures is relatively satisfactory. As a result, at this stage, it is not possible to withdraw that indicator. For administrative infrastructures, the relatively high level of governing decentralization experienced by the Swiss cantons implies legal and institutional differences among regions, thus supporting the implementation of these indicators. Financial infrastructures might imply further scrutiny. Indeed, the general effectiveness of the financial system is relatively high (WEF, 2019, p. 537). Moreover, the financial industry is still a fundamental component of the Swiss GDP (SIF, 2019, p. 2). As Switzerland is relatively small, access to a high-quality financial system is potentially achievable throughout the country. However, considering Porter's theory on clusters (2008), immediate proximity to financial industry clusters is likely to generate positive externalities for other industries and institutions, thus improving the overall competitiveness of the territories of concern. Consequently, because all regions in Switzerland potentially benefit from the relatively high quality of the financial system in general terms, relative proximity might influence the extent of this advantage. The same is true for venture capital availability, particularly as this aspect can be influenced by cantonal policies (Kyora and Heimann, 2020). Therefore, it is consistent to consider these indicators in the Swiss case. Innovation effectiveness can be dealt with more straightforwardly. Indeed, some indicators are relatively more common on the results side of the causality chain. The others, such as the presence of internationally recognized universities and the presence and/or efficacy of technological parks, in the Swiss case result predominantly from decisions and policies set at the regional level, with the exception of two polytechnical schools that are directly related to the Swiss Confederation. Education and labour-market consistency is constituted of 5 indicators. The quality of basic education is especially relevant in the Swiss case, as education is still a prerogative of the cantonal governments. Whereas there is a tendency for a certain degree of harmonization among the linguistic territories of the country, education laws and guidance, *inter alia*, are still distinct among the cantons. As a result, among other causes, that prerogative influences the quality of basic education in the Swiss cantons. This assertion is notably illustrated by the "Programme for International Student Assessment" (PISA), which is conducted not only among countries but also among the regions of a country (PISA, 2018). In the Swiss case, even though the overall level is relatively high, the scores for different cantons, even when they are part of the same linguistic territories, are relatively divergent (Nidegger, 2014). Consequently, this indicator is relevant when implementing the generic structure in the Swiss cantons, particularly as relative differences in scores are also related to exogenous factors and not only to the specific governing structure of the Swiss system. Regarding the quality of superior education, colleges, universities and universities of applied sciences, *inter alia*, are the responsibility of the Swiss cantons with the exception of two polytechnical schools that are directly related to the Swiss Confederation. Those educational institutions collaborate extensively with one another and with numerous companies that are active in several clusters (Gugler *et al*., 2019; SERI, 2006). Whatever the extent of these collaboration networks, the Swiss cantons play a fundamental role in the manner in which superior educational institutions operate and, most importantly, in the manner in which they are financed and to what extent. Consequently, it is consistent to consider this indicator relevant. Accessibility to superior education and labour-market consistency are also relevant in the case of the Swiss cantons. Indeed, these indicators respond partially to policies set at the cantonal level (SERI, 2006) and most importantly to structural discrepancies among regions. Hence, this section in full is pertinent in the Swiss case.

- **XII) Supporting and related industries:** The sub-pillar of supporting and related industries essentially relates to the results side of the causality chain with potential effects on dynamic sequences. Hence, this sub-pillar is relatively generic. However, superior school and research institution quality and dynamics also relate to case-specific political distributions of governing capabilities. In the Swiss case, as indicated hitherto, as education at all levels remains predominantly a prerogative of the cantons, it is especially cogent to implement this indicator. The same motive is theoretically legitimate for the presence and/or efficacy of technological parks, which are to some extent associated with governmental policy decisions in terms of fiscal advantages, specific convenience, or even direct financing, contributions and/or ownership shares.
- **XIII) Demand condition:** Regarding the demand condition, implementing the generic structure might be more difficult. Whereas the local government procurement of advanced technological products and the complexity of local demand are evidently determined at the regional level, strictness of environmental regulation and demanding regulatory standards might necessitate further analysis. First, the strictness of environmental regulation might result from central government regulations. Indeed, "in its various federal acts and their ordinances, the Confederation sets out both the goals of environmental protection and the instruments and measures that are used to achieve these goals" (FOEN, 2013, p. 10). However, the implementation of these regulations lies in the hands of the cantons under the supervision of the Confederation (FOEN, 2013, p. 10). Hence, whereas the cantons play a role in the extent to which these regulations are

implemented, environmental regulation *per se* is highly related by the Confederation. Thus, this indicator is not sufficiently compelling and shall be removed from the index. Second, demanding regulatory standards also require supplementary investigation. Regulatory standards also predominantly result from federal regulations (SECO, 2020b). Regulatory standards in general are relatively stringent in Switzerland (WEF, 2019, pp. 536-537). However, in specific regulatory domains, such as building standards, the cantons benefit from a certain margin. Hence, it is consistent to keep this indicator inasmuch as the considered fields are clearly expressed. Consequently, with the exception of the strictness of environmental regulation, the indicators constituting the demand conditions pillar can be used in the Swiss case.

- **XIV) Cluster development and specialization:** The pillar of cluster development and specialization is crucial when measuring competitiveness at the regional level, as indicated in the previous chapter. Indeed, cluster development and specialization are substantial enhancers of locations' average productivity levels and have a decisive impact on correlated business environments. As noted in the first chapter, specialization in general terms determines the capabilities of a location to improve its competitive advantages. Consequently, the pillar of cluster development and specialization directly relates to a specific location. The extent of cluster policy is quite intricate. Some countries tend to centralize these policies, and others leave them to the regions. In Switzerland, these policies are directly or indirectly implemented by the cantons, as each possesses its own business-focused policies and development agencies (SECO, 2020a). Hence, all sub-pillars constituting the pillar of cluster development and specialization can be implemented in the Swiss case.
- **XV) Context for strategy and rivalry:** In the case of the context for strategy and rivalry, whereas some indicators, such as local regulatory quality and prevalence of foreign ownership, do not necessitate further analysis, as they are obviously relevant in Switzerland, other indicators require additional scrutiny. First, it is arguable that measuring the intensity of local competition is relevant only when the overall market reaches a critical size. Switzerland is considered to have a relatively small market size (WEF, 2019, p. 537). However, some Swiss cantons

seem to perform better than others in terms of competitiveness (Hofer, Holzhey and Skoczek, 2018). This conclusion is corroborated by the relative deltas in terms of GDP/capita and GDP/employment in FTE positions among the Swiss cantons (Gugler *et al.*, 2019). Hence, those deltas suggest that discrepancies in economic performance are due to differences in local market efficiencies and local competition intensity, *inter alia*. Whatever the relevance of this hypothesis, it is pertinent at this stage to consider this indicator and, if necessary, to withdraw it at a later stage if the results suggest relatively high similarities among cantons. Second, the rigidity of employment must be scrutinized. In many cases, most regulations related to employment are set at the national level. In Switzerland, whereas the Confederation sets the fundamental rules and requirements, the cantons are relatively autonomous in how these rules and requirements are implemented (Steiger, 2007). Moreover, most of the rules are negotiated in industry- and/or branch-specific agreements that may vary from one region to another (SECO, 2020c). Moreover, employment rigidity might also be influenced by the configuration of specialization patterns occurring in a location, thus impacting the corresponding agreements and the rigidity of employment. Therefore, it this indicator is applicable in the case of the Swiss cantons. The same justification can be applied to labour-employer cooperation. Along with the evidence presented above, other external differences, such as the cultural distance in this specific field, might have an impact on labour-employer cooperation among the Swiss cantons even though this factor is potentially difficult to measure. Third, the low market disruption of state enterprises and/or state-related enterprises must be scrutinized. In Switzerland, whereas the Swiss Confederation owns state-related enterprises, so do the cantons to various extents (Rutz *et al.*, 2016). Generally, numerous companies in Switzerland are still owned, run and/or related in some way to the cantons and/or to the Confederation (Rutz *et al.*, 2016). Consequently, it is necessary to find measures to capture these disruptions among cantons, as they potentially hamper competition and, *in fine*, firms' capabilities to improve their productivity. Fourth, similarly, taxes/subsidies on competition might also have disruptive effects. For numerous other aspects of governing capabilities, the Swiss cantons benefit from a relatively high degree of responsibility (Ladner *et al.*, 2019). Taxes might be used as a tool not only to orientate comportment but also to augment fiscal revenues. Moreover, subsidies might be used for many reasons with the risk of disruptive effects on competition and potential negative externalities on firms' capability of competing elsewhere. Therefore, considering the governing structures of Swiss cantons, it is relevant to include this aspect.

In conclusion, this sub-section has allowed us to assess the extent of structural decentralization for all pillars within each level of competitiveness. Whereas some indicators are less case related, others necessitate specific analysis to assess whether they are conceptually relevant in the case of the Swiss cantons. Generally, the extensive version of the generic structure of the intranational regional competitiveness index is relevant in the Swiss case. As observed above, with the exception of very few components, the implementation of all pillars is largely consistent with the relatively high level of decentralization determining the political and institutional structures of the country. Whereas this procedure might appear difficult to conduct, it is a decisive step not only in implementing the appropriate version of the generic structure but also in withdrawing the indicator(s) that may not be admissible in specific cases. Consequently, potential structural alterations are attenuated, and later quantitative tests are strengthened because the interpretation of these tests might lead to more definite measures. Hence, it is possible to consistently implement the generic structure, to make it specific to the Swiss case, and, most importantly, to select the relevant data that correspond to the appropriate measures.

12.4 Concluding remarks

This section contains an exhaustive conceptual analysis of regional competitiveness measured by an index in the case of the Swiss cantons. The examination results indicate that Switzerland is highly decentralized in political, institutional, and structural terms. This determination is based on an evaluation of the political, institutional, and structural configurations of the Swiss cantons in conjunction with fractional assessments of the pillars, sub-pillars and indicators of the generic structure presented in the previous chapter. Under these circumstances, it is consistent to select the comprehensive version of the generic structure that corresponds to a highly decentralized case with minor modifications.

Moreover, in terms of multi-dimensionality, as indicated above, regional competitiveness relies not only on dynamic sequences of economic development but also on policies and other macro-based conditions and multi-level consistencies. Hence, whereas the degree of decentralization is relatively high, the condition of the overall Swiss framework signifies potential adjustments at a later stage to capture the fact that the standard of living in Switzerland is generally high, as is the average quality of the business environment.

In conclusion, as the generic structure in its extensive version has been accommodated to the Swiss specifications, it is relevant to go one step further. Indeed, considering the various indicators implemented in the case of the Swiss cantons, the arduous task is subsequently to materialize these indicators on the basis of suitable databases, as we shall see in the next section. However, whereas this procedure is usually conducted at an earlier stage, it is more useful to select these databases while each implemented indicator is thoroughly scrutinized and accurately discerned. Consequently, the various processes presented above constitute necessary preceding steps, as in chapter 2, for conducting data selection on the basis of a relatively sound theoretical and methodological framework.

13 Relating the generic structure of the intranational regional competitiveness index to the Swiss case

13.1 Introductory remarks

Section 13 of chapter 3 constitutes the juncture at which the actual substance to the intranational regional competitiveness index is implemented in the Swiss case. Indeed, it is at this stage that the theoretical, conceptual and methodological frameworks comprehensively investigated in previous chapters, sections and sub-sections are essentialized in light of the case being assessed. This section consists of 2 major steps: 1) data selection, construction, configuration, and adjustments of the measure(s) constituting each indicator and 2) the implementation of the methodological and quantitative sub-steps presented in the previous chapter and correspondingly executed.

The first step consists of highly inter-related sub-steps. The order exhibited might be accommodated on the basis of these inter-relations. Indeed, some selected databases might be adjusted at later stages on the basis of the constituted indicators and the measures' associations. The second step, that is, the implementation of the other quantitative steps, strictly follows the procedure presented in the second chapter and depends not only on the quality of the methodological and theoretical framework but also on the quality of the databases and the measures to which they are related. Most importantly, this procedure might necessitate new structural adjustments, notably on the basis of correlation analyses between indicators.

In conclusion, before presenting the results of the intranational regional competitiveness index applied to the Swiss cantons, it is imperative to elaborate on the quantitative limitations that are axiomatically associated with this exercise, as are the theoretical and methodological issues. This exercise is crucial, as data deficits and/or data limitations might potentially hamper the structure and correlated balance of the index if compensatory measures are not implemented. Moreover, these limitations serve as a protective device against potential inappropriate interpretations of the results. Indeed, if the structure has been modified to accommodate data-based issues, these modifications must not only be quantitatively compensated for but also clearly indicated. Finally, all major aspects of this section will be summarized in the concluding remarks.

13.2 Data selection, construction, configuration, and adjustments of the measure(s) constituting each indicator

Data selection in the Swiss case begins with an overall review of the official major databases available at the Federal Statistical Office (FSO) for problematics, which relate to varying degrees to the index structure as exhibited and adjusted previously. As the FSO is not part of the EU system, it is not covered by Eurostat but is designed to be EU compatible in terms of statistics (Sigma, 2020, p. 42). The 1992 Federal Statistical Law "involves a coordinating role for the SFSO as the central Federal statistical body, the preparation of a multi-annual overall planning programme for national statistics and the establishment of an advisory body, the Federal Statistical Commission, to the Federal Council" (Sigma, 2020, p. 41). As Switzerland is a federal state, as indicated heretofore, the Swiss cantons also have their own statistical offices, which work in coordination with the FSO.

Although substantial progress has been achieved over the years, numerous databases, notably in order to properly measure productivity, are still, partly or fully missing data. This implies a need to find alternative instruments when possible to measure *inter alia* competitiveness of territories (e.g., in Gugler *et al*., 2019). It also involves ensuring that all databases not related to the FSO or to the cantons meet certain standards of quality and are comprehensively relevant in relation to the measured indicators. Whatever these considerations the compilation of all relevant databases and potential compensatory instruments relative to missing/problematic data should not jeopardize the integrity of the disclosed index structure.

The FSO proposes a catalogue of databases that are categorized on the basis of 1) the theme, 2) the inquiry, and 3) the spatial division. Moreover, it is possible to build interactive tables on STAT-TAB (FSO, 2020c) that allow the selection of multiple variables and definite periods of time. However, the topics cover various fields in an uncategorized manner. Hence, selecting the relevant data for each indicator is a relatively intricate process, as cross-instruments might need to be implemented subsequently.

On the basis of those preliminary remarks, we will endeavour to cover the implementable indicators of each sub-pillar and of each pillar. The most appropriate manner to do so is to exhibit the structure implemented in the Swiss case and to produce the correlated measures. Ultimately, after doing so, it is necessary to 1) evaluate to what extent the implemented measure covers the structure and 2) elaborate on the potential limits of the selected data.

Table 6: Structure of the intranational regional competitiveness in the case of the Swiss cantons

Endowments

I) Relatedness to the capital city

i. Average travel time by public transportation and by road to the capital city from the biggest economic pole of each canton in terms of employment

This indicator is constituted from two specific measures related to physical distances latter averaged. The biggest economic pole of each canton is considered as such on the basis of labor market areas calculated by the FSO (2019a).

This indicator is built on a normalized model given by:

$$RC = \left\{ \frac{\left[(200 - DP_c)tW_{dp} + (200 - DR_c)t\, W_{dr}\right]}{A_h} \right\} W_s \tag{3.1}$$

Where: RC: relatedness to the capital city; DP_c: distance by public transportation; DR_c: distance by road; t: time measured in minutes; W_{dp}: weighting coefficient for DP_c; W_{dr}: weighting coefficient for DR_c; A_h: averaging factor; W_s : weighting coefficient for the subpillar level.

II) Relatedness to central government

III) Relatedness to the biggest economic poles in terms of employment

IV) Availability of expendable land

i. Expendable building zones per capita and per employment and in absolute value

Based on the "Bauzonenstatistik Schweiz" (FSO, 2017c), this indicator assesses the availability of expendable land 1) for all types of use and 2) for economic and mixed activities. It is thereupon weighted considering the size of each canton in terms 1) of capita and 2) of employment.

This indicator is built on a normalized model given by:

$$AE = \left\{ \frac{[(LA_c W_{la}) + (LE_c W_{le})]}{[\bar{X} = \; S_c S_e]} \right\} W_s \tag{3.2}$$

Where: AE: availability of expendable land; LA_c: surface for all types of use; W_{la} weighting coefficient for LA_c; LE_c: surface for economic and mixed activities; W_{le}: weighting coefficient for LE_c; $\bar{X} = \; S_c S_e$: averaged and weighted size of each subject in terms 1) of capita and 2) of employment; W_s: weighting coefficient for the subpillar level.

V) Cultural distance to central government

i. Linguistic proximity with the most-widely spoken language in Switzerland (80%, 90%, 100%)

Within a territory constituting a nation, it is arduous to quantitatively capture cultural distance to central government without generating subjective considerations up to a critical point. Yet, linguistic proximity is a relatively objective measure of cultural distance. The correlated hypothesis relies on the concept that speaking to the largest extent the same language predominantly spoken by the central government, either government officials or political decision-makers, reduces by 100% the cultural distance to that government. This share diminishes to 90% in cantons where another language is predominantly spoken but where the language of the central government is also spoken by a significant share of the population. As for the cantons where another language is spoken than that of the central government by a highly significant share of the population, the share diminishes to 80%. These shares are in percentage in order to fit with the overall normalization process of the index and do not alter to a nonrealistic extent the overall scores of the subjects.

This indicator is built on a normalized model given by:

$$LP = \left(\frac{D_c}{100}\right) W_s \tag{3.3}$$

Where: LP: linguistic proximity; D_c: level of proximity; W_s: weighting coefficient for the subpillar level.

Macroeconomic competitiveness indicators at the regional level

VI) Health

a. Healthcare service accessibility

1. Hospital beds/1000 inhabitants
2. Density of doctors active in hospitals care services/1'000 inhabitants
3. Density of doctors active in ambulatory services/1000 inhabitants

Healthcare service accessibility (1., 2., 3.) can be characterized by the density of doctors active either in hospitals or in ambulatory services. As for the concentration of hospital beds, it reflects the presence of hospitals in a region yet in a relatively indirect manner as some strategic orientations of that region's health policy and specialization in the sector also influence healthcare service accessibility. As those measures relate to the size of each canton in terms of the extent of the considered population, they are weighted accordingly.

This indicator is built on a normalized model based on FSO (2020a) given by:

$$HSA = \left[\frac{\left(\frac{HB_c W_{hb}}{S_i}\right) + \left(\frac{DH_c W_{dh}}{S_i}\right) + \left(\frac{DA_c W_{da}}{S_i}\right)}{A_i}\right] W_s \tag{3.4}$$

Where: HSA: healthcare service accessibility; HB_c: number of hospital beds; W_{hb}: weighting coefficient for HB_c; DH_c: density of doctors active in hospitals care services; W_{dh}: weighting coefficient for DH_c; DA_c: density of doctors active in ambulatory services; W_{da}: weighting coefficient for DA_c; S_i: weighting coefficient according to the population size; A_i: averaging factor; W_s: weighting coefficient for the subpillar level.

VII) Political institutions

a. Local authorities' efficiency

1. Control of running expenses per capita

The measure of running expenses per capita captures the ability of the cantons to fulfill public tasks without repeatedly augmenting these expenses considering the correlated size in terms of population dynamics. As this measure relates to the size of each canton in terms of the extent of the corresponding population, it is weighted accordingly.

This indicator is built on a normalized model based on IDHEAP (2018) given by:

$$LAE = \left(\frac{RE_c}{S_i}\right) W_s \tag{3.5}$$

Where: LAE: local authorities' efficiency; RE_c: running expenses for each subject; S_i: weighting factor according to the population size; W_s: weighting coefficient for the subpillar level.

b. Accessibility to local authorities

c. Local authorities' independence

VIII) Fiscal policy

a. Regional public finances' soundness and public funds spending efficiency

1. Social security rate
2. Gross debt in % of revenues

Those measures aim at exhibiting the ability of each canton to spend public funds in an efficient manner. The social security rate epitomizes the share of people benefiting from social benefits thus not participating, or only marginally, to an economic activity, thus not contributing to public revenues and diminishing these revenues. As for the second measure, it directly relates to cantonal authorities' spending efficiency by exhibiting the ratio between the gross debt and the corresponding revenues. The lower the ratio is, the most efficient is supposed to be the corresponding spending efficiency. As the debt brake is a constituting part of the Swiss cantons' fiscal policy, using this ratio in order to capture public finances' soundness is appropriate and further tests tend to confirm it.

This indicator is built on a normalized model based on IDHEAP (2018) given by:

$$RPFE = \left\{ \frac{\left[100 - \left(\frac{SS_c W_{ss}}{S_j}\right)\right] + \left[100 - \left(\frac{GD_c W_{gd}}{R_c}\right)\right]}{A_j} \right\} W_s \tag{3.6}$$

Where: $RPFE$: regional public finances' efficiency; SS_c: social security expenditures; W_{ss}: weighting coefficient for SS_c; S_j: weighting coefficient according to the permanent population size; GD_c: gross debt; W_{gd}: weighting coefficient for GD_c; R_c: revenues; A_j: averaging factor; W_s: weighting coefficient for the subpillar level.

b. Regional public authorities' auto-financing capabilities

1. Auto-financing rate

The auto-financing rate of a canton gives an insight not only into that canton's flexibility in terms of financing capabilities but also of into its potential propensity to invest notably in infrastructures, which will allow for the sustainability and potential improvement of other competitive factors. This indicator more specifically captures the auto-financing rate in relation with the correlated net investment. It relies on the hypothesis that a canton with relatively higher auto-financing capabilities has higher potential margins in order to undertake numerous and relatively costly investments.

This indicator is built on a normalized model based on IDHEAP (2018) given by:

$$AFR = \left(\frac{AF_c}{I_c}\right) W_s \tag{3.7}$$

Where: AFR: auto-financing rate; AF_c: auto-financing capability; I_c: correlated net investment; W_s: weighting coefficient for the subpillar level.

c. Fiscal policy toward firms
   1. Overall taxation burden on firms

Taxation burden on firms has a decisive impact on firms' localization processes. Swiss cantons have different corporate tax regimes, which must all correspond to the federal legislation. Following a fundamental tax reform at the federal level in 2019, cantons had to adapt their own corporate tax regimes. As a result, overall taxation burden on firms has changed extensively. The indicator is based on a prominent example but yet does not reflect all types of firms' specific situations. This is due to the complexity of tax regimes. Yet, it aims at comparing these regimes.

This indicator is built on a normalized model based on Credit Suisse (2019) and on FCA (2020) given by:

$$FPF = \left(\frac{T_f}{A_j}\right) W_s \tag{3.8}$$

Where: FPF: fiscal policy toward firms; T_f: taxation burden on firms; A_j: averaging factor; W_s: weighting coefficient for the subpillar level.

d. Fiscal policy toward workers
   1. Overall taxation burden on individuals
   2. Regional disposable income

Fiscal policy toward workers has an impact on the demand condition but ultimately on people's localization processes and, *in fine*, on firms' localization choices. A competitive fiscal policy on workers tend to improve public funds spending efficiency and attracting specific taxpayers tends to enlarge the tax base with potential positive consequences on public finances' soundness. The measure is completed by the related regional disposable income, which also takes into account other expenses, which ultimately modify the purchasing power of workers.

This indicator is built on a normalized model based on Credit Suisse (2019) and on FCA (2020) given by:

$$FPW = \left(\frac{TW_c W_{tw} + RDI_c W_{rdi}}{A_k}\right) W_s \quad (3.9)$$

Where: FPW: fiscal policy toward workers; TW_c: taxation burden on workers; W_{tw}: weighting coefficient for TW_c; RDI_c: regional disposable income; W_{rdi}: weighting coefficient for RDI_c; A_k: averaging factor; W_s: weighting coefficient for the subpillar level.

e. Fiscal policy toward innovation and R&D
f. Average and median earnings
    1. Average taxable income
    2. Median taxable income

Average and median taxable income give a complementary insight into public finances' soundness and spending efficiency. It also reflects to some extent tendencies in terms of productivity. Most importantly, it manifests the tax base of each canton, its average and median levels and the correlated public magnitude in terms of fiscal policy.

This indicator is built on a normalized model based on FCA (2020) and on FSO (2017a) given by:

$$AME = \left(\frac{ATI_c W_{ati} + MTI_c W_{mti}}{A_l}\right) W_s \quad (3.10)$$

Where: AME: average and median earnings; ATI_c: average taxable income; W_{ati}: weighting coefficient for ATI_c; MTI_c: median taxable income; W_{mti}: weighting coefficient for MTI_c; A_l: averaging factor; W_s: weighting coefficient for the subpillar level.

IX) State of order

a. Efficiency of judicial institutions at the regional level
    1. Violation of the penal code in ‰ of the population

It is complex to quantitively measure the state of order. Indeed, it does not axiomatically reflect the efficiency of judicial institutions at the regional level. Moreover, cantons constituted from larger cities and/or city-cantons obviously face relatively higher shares of violation of the penal code in ‰ of the population as violation of the penal code tends to occur more regularly in highly urbanized areas. Whatever these considerations, the share of violation of the penal code in ‰ of the population gives an insight of the security environment.

This indicator is built on a normalized model based on FSO (2020a) given by:

$$EJI = \left(\frac{VPC_c}{S_i}\right) W_s \tag{3.11}$$

Where: EJI: efficiency of judicial institutions; VPC_c: violation of the penal code; S_i: weighting factor according to the population size; W_s: weighting coefficient for the subpillar level.

b. Judicial independence at the regional level

Microeconomic competitiveness indicators at the regional level

Pillar correlated to the Diamond

X) Firms' strategy and internationalization

a. MNEs' competition effectiveness
   i. Share of employment in MNEs
      1. Foreign MNEs share of employment
      2. Swiss MNEs share of employment

MNEs' competition effectiveness can be measured by analyzing the existing extent of internationalization of firms. It relates to the results' side of the causality chain yet shows highly dynamic characteristics. In order to properly capture MNEs' competition effectiveness, it is necessary not only to measure foreign MNEs' share of employment but also Swiss MNEs' share of employment in each canton.

This indicator is built on a normalized model based on FSO (2020a, 2020c) given by:

$$MCE = \left[\frac{\left(\frac{FM_c W_{fm}}{TE_c}\right) + \left(\frac{SM_c W_{sm}}{TE_c}\right)}{A_m}\right] W_s \tag{3.12}$$

Where: MCE: multinationals' competition effectiveness; FM_c: foreign MNEs employment; W_{fm}: weighting coefficient for FM_c; SM_c: Swiss MNEs employment; W_{sm}: weighting coefficient for SM_c; TE_c: weighting factor according the total employment size; A_m: averaging factor; W_s: weighting coefficient for the subpillar level.

   ii. Local authorities' accessibility for MNEs
   iii. Accessibility to international markets
      1. Exports/canton in value (CHF)/employment in FTE

Exports/canton in value (CHF) weighted by the size of each canton in terms of employment in FTE constitute a relevant indicator of accessibility to international markets. The decision has been taken to select the exports without precious metals, precious stones and gems, works of art and antiques in order to capture as genuinely as possible the accessibility to international markets and the correlated strengths of each canton in terms of exports capacity. The exports/canton are also weighted according to the size of each canton in terms of employment in FTE and in terms of capita in order to capture the actual economic size of each canton.

This indicator is built on a normalized model based on FCA (2019) given by:

$$AIM = \left[\frac{\left(\frac{X_c W_c}{TE_c}\right) + \left(\frac{X_c W_c}{S_i}\right)}{A_n} \right] W_s \qquad (3.13)$$

Where: AIM: accessibility to international markets; X_c: exports/ canton in value (CHF); W_c weighting coefficient for X_c; TE_c: weighting factor according the total employment size; S_i: weighting factor according to the population size; A_n: averaging factor; W_s: weighting coefficient for the subpillar level.

iv. FDI role in technology transfer
v. Regulatory easiness for MNEs

b. Strategy effectiveness
i. Technology absorption of firms

Pillars within the Diamond

XI) Factor conditions

a. Operational infrastructures
i. Access to international airports
1. Shortest travel time by road and/or by public transportation to an international airport from the biggest economic pole of each region in terms of employment

The access to an international airport still constitutes an important factor for companies and more specifically so for those importing/exporting and/or for those internationalizing. It also generates other positive externalities and contributes to the overall business environment. Considering the biggest economic pole of each canton and not axiomatically cantons' capitals allows for a more relevant perception of the most strategically significant zone of each canton in economic terms. The selection of each pole relies on FSO data (2018a). It measures time both by public transportation and by road from the epicenters of each economic pole to the nearest actual international airport, in Switzerland or close to the border. Specific roadworks and line interruptions were not taken into account in order to allow for relevant distances' comparisons.

This indicator is built on a normalized model based on FSO (2018a), on SBB timetables (2020), and on Google Maps (2020) given by:

$$AIA = \left\{\frac{[(200 - DP_c)tW_{dp} + (200 - DR_c)tW_{dr}]}{A_0}\right\} W_s \qquad (3.14)$$

Where: AIA : access to an international airport; DP_c: distance by public transportation; DR_c: distance by road; t: time measured in minutes; W_{dp}: weighting coefficient for DP_c; W_{dr}: weighting coefficient for DR_c; A_0: averaging factor; W_s : weighting coefficient for the subpillar level.

ii. Accessibility by public transportation
   1. Relatedness to the 5 biggest economic poles: public transportation

The accessibility of the biggest economic pole of each canton to the 5 biggest economic poles in Switzerland relies on the same assumption as the previous indicator. Indeed, cantons' capitals are not axiomatically the biggest economic poles of the cantons. Consequently, in terms of operational infrastructures, it is more relevant to capture accessibility using any mean of transportation from an economic point of view. Yet, the 5 economic poles are weighted in accordance with their specific economic gravity. This indicator responds to the hypothesis according to which accessibility to the strategic economic poles of the country has an impact on agglomeration forces, on localization processes and overall on the development of firms' competitive advantages. It is separated into two specific indicators on the contrary to the previous one as accessibility *per se* is highly significant.

This indicator is built on a normalized model based on FSO (2018a), on SBB timetables (2020) given by:

$$APT = \left\{\frac{[(200 - DP_1)tW_{dp1}][(200 - DP_2)tW_{dp2}][(200 - DP_3)tW_{dp3}][(200 - DP_4)tW_{dp4}][(200 - DP_5)tW_{dp5}]}{A_p}\right\} W_s \quad (3.15)$$

Where: APT: accessibility by public transport; $DP_{1,2,3,4,5}$: corresponding distances by road to the 5 biggest economic poles in terms of employment; t: time measured in minutes; $W_{dp\ 1,2,3,4,5}$: corresponding weighting coefficients for $DP_{1,2,3,4,5}$; A_p: averaging factor; W_s : weighting coefficient for the subpillar level.

iii. Accessibility: road network

1. Relatedness to the 5 biggest economic poles: road network

This indicator is based on the same assumption as the previous one. It reflects the fact that some cantons have easier access by road and other better access by public transportation. As a result, it is necessary to mitigate all means of transport accordingly in order to measure in a constant manner the accessibility of each canton in economic terms.

This indicator is built on a normalized model based on FSO (2018a) and on Google Maps (2020) given by:

$$ARD = \left\{\frac{[(200 - DR_1)tW_{dr1}][(200 - DR_2)tW_{dr2}][(200 - DR_3)tW_{dr3}][(200 - DR_4)tW_{dr4}][(200 - DR_5)tW_{dr5}]}{A_q}\right\} W_s \quad (3.16)$$

Where: ARD: accessibility by road network; $DR_{1,2,3,4,5}$: corresponding distances by road to the 5 biggest economic poles in terms of employment; t: time measured in minutes; $W_{dr\ 1,2,3,4,5}$: corresponding weighting coefficients for $DR_{1,2,3,4,5}$; A_q: averaging factor; W_s : weighting coefficient for the subpillar level.

iv. Access to internet infrastructures

b. Administrative infrastructures

i. Ability to start a business

ii. Burden of regional government regulation

c. Financial infrastructures

i. Financial market sophistication

1. Degree of specialization of firms active in the financial markets

Quantitatively assessing the degree of specialization of firms active in the financial markets is a challenging process. Indeed, this degree is related to specialization *per se* and to the size of the financial sector in absolute terms. As a result, this indicator is based on two main factors: 1) the specialization of financial industries (3 digits) in terms of location quotients (LQ) in each canton, and 2) the size of those industries in terms of employment (3 digits) on an absolute basis. This methodology allows for the contraction of overestimated LQs related to the economic size of each canton and for the attention that needs to be given to the critical size those industries have to reach in order to specialize.

This indicator is built on a normalized model based on FSO (2017d) given by:

$$FMS = \left\{ \frac{\left[\frac{\left(\frac{E_{(i1,i2,i3,in),r} / E_r}{E_{(i1,i2,i3,in),n} / E_n} \right)}{A_{sf}} W_e + SI_{(i1,i2,i3,in),r} W_{si} \right]}{A_r} \right\} W_s \tag{3.17}$$

Where: FMS: financial market sophistication; E: workforce in terms of employment; i: specific industries specialized in financial services; r: a specific region located within nation n; A_{sf}: location quotients' averaging factor; W_e: weighting coefficient for E; SI: size of the financial sector in absolute terms for each region; W_{si}: weighting coefficient for SI; A_r: averaging factor; W_s: weighting coefficient for the subpillar level.

ii. Venture capital availability
iii. Ease of access to loans

d. Innovation effectiveness
   i. Patenting dynamics
      1. Patents/10'000 FTE (EPO)

Even if they only reflect a share of the innovation processes, patenting dynamics constitute a relevant indicator of cantons' performances in terms of innovation. OECD data selection's methodology is based on Tinguely (2013). Patents registered at the European Patent Office (EPO) are measured on a 4 years' basis in order to avoid potential year-to-year unrelated discrepancies. Patents are then weighted according to the economic size of each canton in terms of employment.

This indicator is built on a normalized model based on OECD (2019) and on FSO (2017d) given by:

$$PD = \left[\frac{\left(\frac{P_{y1,y2,y3,y4}}{TE_{c_{y1,y2,y3,y4}}} \right)}{A_s} \right] W_s \tag{3.18}$$

Where: PD: patenting dynamics; P: patents registered; TE_c: weighting factor according the total employment size; y: specific year; A_s: averaging factor; W_s: weighting coefficient for the subpillar level.

ii. R&D capabilities and spending
iii. Quality of research institutions
   1. Ranking of research institutions

Whereas the presence of research institutions is a constituting part of the supporting and related industries' pillar, their actual quality plays a decisive role on innovation effectiveness. Assessing the quality of research institutions is a challenging process. As a result, this indicator is based on the Scimago Institutions Rankings, which assess on the basis of international criteria the quality of internationally recognized institutions (SIR, 2020). Each institution is then ranked at the Swiss level on the basis of its relative ranking at the international level and scores are distributed accordingly when these institutions have departments located in different cantons. When a single research institution has different departments, scores are weighted on the basis of their corresponding sizes.

This indicator is built on a normalized model based on (SIR, 2020) given by:

$$QRI = \left[\frac{\left(R_{c1} W_{Lo_1} + R_{cn} W_{Lo_n} \right)}{A_t} \right] W_s \tag{3.19}$$

Where: QRI: quality of research institutions; R_{c1}: relative ranking for the potential institution 1; W_{Lo_1} : unit weighting factor for the potential institution 1; R_{cn}: relative rankings for the other potential institution(s); W_{Lo_n}: unit weighting factors for the other potential institution(s); A_t: averaging factor; W_s: weighting coefficient for the subpillar level.

e. Education and labor-market consistency
   i. Quality of basic education (obligatory)
   ii. Quality of superior education (non-obligatory)
      1. Average international rankings of Universities

The quality of superior education has a decisive impact on factor conditions and on the labor-market consistency. As for the previous indicator, the quality of these universities is not to be confused with the fact that they are located in specific cantons. It is based on a joint assessment of 3 internationally recognized rankings: 1) the QS World University Rankings, 2) the Times Higher Education World University Rankings, and 3) the Academic Ranking of World Universities (Study.eu, 2020). In specific cases where universities are co-financed, scores are allocated on the basis of the corresponding financing shares. Cantons without any ranked university are *de facto* allocated with a minimum score in order not to hamper the normalization process.

This indicator is built on a normalized model based on Study.eu (2020) given by:

$$ARU = \left\{ \frac{\left[\left(\frac{R_{c1_1} + R_{c1_2} + R_{c13}}{A_{r_1}}\right) W_{i1}\right] + \left[\left(\frac{R_{cn_1} + R_{cn_2} + R_{cn_3}}{A_{r_n}}\right) W_{in}\right]}{A_u} \right\} W_s \qquad (3.20)$$

Where: ARU: average rankings of universities; R_{c1_1}: relative ranking for the institution 1 according to ranking 1; R_{c1_2}: relative ranking for the institution 1 according to ranking 2; R_{c1_3}: relative ranking for the institution 1 according to ranking 3; W_{i1}: unit weighting factor for institution 1; A_{r_1}: averaging factor for institution 1; R_{cn_1}, R_{cn_2}, R_{cn_3}: relative rankings for the other potential institution(s); A_{r_n}: averaging factor for the other potential institution(s); W_{in}: unit weighting factor for the other potential institution(s); A_u: averaging factor; W_s: weighting coefficient for the subpillar level.

   iii. Accessibility to superior education (non-obligatory)
      1. Rate of graduates from universities and tertiary colleges

Accessible superior education is an important prerogative in order to improve factor conditions. As Switzerland relies extensively on the apprenticeship system, this indicator includes tertiary colleges.

Consequently, high specialization in terms of education is captured not only through the academic system but also through tertiary education in general. The rate is calculated in % of the population aged 15 and more.

This indicator is built on a normalized model based on FSO (2017e) given by:

$$RGUT = \left(\frac{R_{c_g}}{S_{is}}\right) W_s \tag{3.21}$$

Where: $RGUT$: rate of graduates from universities and tertiary colleges; R_{c_g}: quantity of graduates from universities and tertiary colleges; S_{is}: weighting factor according to the population size aged 15 and more; W_s: weighting coefficient for the subpillar level.

iv. Education and labor-market consistency and labor market quality

1. Share of unemployed 15-24 y.o. in the active population of the same age

Education and labor-market consistency are decisive factor conditions. Having highly skilled graduates specialized in fields correlated to the highly specialized industries of a territory fosters productivity. Calculating the share of the unemployed (15-24 y.o.) in the active population of the same age reflects to some extent education and labor-market consistency without even elaborating on the other positive externalities of relatively low youth unemployment.

This indicator is built on a normalized model based on FSO (2018b) given by:

$$SU_{15-24y.o.} = \left(\frac{100 - \frac{U_{c_{15-24y.o.}}}{S_{is_{15-24y.o.}}}}{A_v}\right) W_s \tag{3.22}$$

Where: $SU_{15-24y.o.}$: Share of unemployed 15-24 y.o.; $U_{c_{15-24y.o.}}$: quantity of unemployed aged 15-24 y.o.; $S_{is_{15-24y.o.}}$: active population aged 15-24 y.o.; A_v: averaging factor; W_s: weighting coefficient for the subpillar level.

v. Tertiary school enrollment

1. Rate of enrollment in tertiary schools

   As suggested by this indicator, tertiary school enrollment is measured assuming that higher shares of tertiary school graduates lead to higher potentials in terms of productivity. It measures the net entry rate of people in tertiary schools relative to their class of age in each canton. It takes into account the legal residence of students. Consequently, cantons with numerous tertiary schools do not get higher scores in relation with that indication *per se*.

   This indicator is built on a normalized model based on FSO (2018c) given by:

$$TSE = \left(\frac{NE_{c_a}}{S_{is_a}}\right) W_s \tag{3.23}$$

   Where: TSE: tertiary school enrollment; NE_{c_a}: entry rate of people in tertiary schools; S_{is_a}: relative class of age; W_s: weighting coefficient for the subpillar level.

f. Availability of specialized research & training

   1. Rate of people without any post-obligatory degree

      The availability of specialized research and training is a decisive factor condition for firms. Specialization also depends on firms' ability to hire highly skilled professionals. In order to capture in broader terms this factor, it is possible to analyze the rate of people without any post-obligatory degree. It gives an insight on the state of the labor market in terms of intrinsic skills.

      This indicator is built on a normalized model based on FSO (2020a) given by:

$$ASRT = \left(\frac{100 - \dfrac{W_{c_{npd}}}{S_{is_{ac}}}}{A_w}\right) W_s \tag{3.24}$$

      Where: $ASRT$: availability of specialized research and training; $W_{c_{npd}}$: people without any post-obligatory degree; $S_{is_{ac}}$: corresponding active population. A_w: averaging factor; W_s: weighting coefficient for the subpillar level.

XII) Supporting and related industries

a. Superior schools and research institutions' dynamics

i. Presence of internationally recognized research institutions

1. Presence of internationally recognized research institution(s)

As indicated above for indicator XI.d.iii, the quality of internationally recognized research institution(s) should not be confused with the actual presence on a territory of these institutions. Indeed, this presence plays a significant role on supporting and related industries' networks. Also based on SIR (2020), this indicator captures the actual location(s) of research institution(s) and scores are correlatively distributed when research institution(s) possess(es) different sites on the basis of the corresponding sizes or, subsidiarily, when these institution(s) is/are co-financed. Research institutions are considered as such when they are registered in the SIR ranking.

This indicator is built on a normalized model based on SIR (2020) given by:

$$PIRI = \left[\frac{\left(RI_{c_1}LC_1F_1 + RI_{c_n}LC_nF_n\right)}{A_x}\right]W_s \tag{3.25}$$

Where: $PIRI$: presence of internationally recognized research institution(s); RI_{c_1}: potential research institution 1; LC_1: location coefficient for the potential research institution 1; F_1: financial coefficient for the potential research institution 1; RI_{c_n}: other potential institution(s); LC_n: location coefficient(s) for the other potential institution(s); F_n: financial coefficient(s) for the other potential institution(s); A_x: averaging factor; W_s: weighting coefficient for the subpillar level.

ii. Presence of universities and/or universities of applied sciences

1. Presence of universities and/or of universities of applied sciences

As indicated above for indicator XI.e.ii, the quality of superior education should be differentiated from the decisive advantages of having a strong network of universities and universities of applied sciences allowing for the overall business environment to be improved. Universities or universities of applied sciences, which possess 2 or more sites, have been attributed scores that are correlatively distributed on the basis of the corresponding sizes or, subsidiarily, when these universities or universities or applied sciences are co-financed. Indeed, for example, in some cantons, only specific sites of universities or universities of applied sciences are located there and not the corresponding headquarters. Yet, these specific sites also play a role in the network of supporting and related industries and are thence captured accordingly. In general terms, cantons possessing a federal institute of technology, an internationally ranked cantonal university and at least one university of applied sciences and/or a corresponding site obtain a multiplication factor of 4, cantons possessing an internationally ranked cantonal university and at least one university of applied sciences and/or a corresponding site obtain multiplication factor of 3, cantons possessing at least one university of applied sciences and/or a corresponding site obtain a multiplication factor of 2, and cantons with neither of those a multiplication factor of 1.

This indicator is built on a normalized model based on Credit Suisse (2016) and on FCA (2020) given by:

$$PUUAS = \left[\frac{\left(UU_{c_1}LC_1F_1MF_1 + UU_{c_n}LC_nF_nMF_n\right)}{A_y}\right]W_s \tag{3.26}$$

Where: $PUUAS$: presence of universities and/or of universities of applied sciences; UU_{c_1}: potential university or university of applies sciences 1; LC_1: location coefficient for the potential university or university of applies sciences 1; F_1: financial coefficient for the potential university or university of applies sciences 1; MF_1: multiplication factor related to the potential corresponding type of university or university of applies sciences 1; UU_{c_n}: other potential university(ies) and/or university(ies) of applied sciences; LC_n: location coefficient(s) for the other potential university(ies) and/or university(ies) of applied sciences; F_n: financial coefficient(s) for the other potential university(ies) and/or university(ies) of applied sciences; MF_n: multiplication factor(s) related to the potential corresponding type(s) of university(ies) and/or university(ies) of applied sciences; A_y: averaging factor; W_s: weighting coefficient for the subpillar level.

b. Presence and/or efficacy of technological parks
c. Supplier quality
d. Supplier quantity

XIII) Demand conditions

a. Local government procurement of advanced technological products
b. Demanding regulatory standards
c. Sophistication of local demand

1. Disposable revenue per housework

Capturing sophistication of local demand *per se* in quantitative terms is an arduous process. Considering that the level of disposable revenue per housework is relatively correlated to its sophistication level, it is feasible to implement it as an indirect measure. Yet, it only captures sophistication of housework demand and not of other economic agents such as firms. However, it is the only significant measure available.

This indicator is built on a normalized model based on Credit Suisse (2016) given by:

$$DRH = \left(\frac{DR_c}{H_c}\right) W_s \tag{3.27}$$

Where: DRH: disposable revenue per housework; DR_c: disposable revenue; H_c: housework; W_s: weighting coefficient for the subpillar level.

XIV) Cluster development and specialization

a. Extent of cluster development and specialization

1. Relatively specialized clusters

The state of cluster development on a territory's ability to prosper is highly significant. This indicator must take into account various measures in order to capture the extent of development of the relevant clusters. For that matter, average and median location quotients are weighted on the basis of complementary measures (correlated employments in FTE in absolute terms, the locational Gini coefficients and the specialization coefficients). This method allows for two decisive factors to be considered: 1) smaller territories tend to exhibit higher relative location quotients even if actual specialization is not axiomatically higher, and 2) clusters' dynamic sequences tend to improve when they reach a certain size in absolute terms.

This indicator is built on a normalized model based on FSO (2017d) and on Delgado, Porter and Stern (2014) given by:

$$RSC = \left\{\left[\left(\sigma = \frac{LQ_{c_{(in)m}} W_m}{A_{sf}}\right) + \left(\bar{X} = \frac{LQ_{c_{(in)a}} W_a}{A_{sf}}\right)\right] W_{emp} W_{lqgc} W_{sp}\right\} W_s \quad (3.28)$$

Where: RSC: relatively specialized clusters; σ: median; $LQ_{c_{(in)m}}$: location quotients m; W_m: weighting coefficient for $LQ_{c_{(in)m}}$; A_{sf}: location quotients' averaging factors; $\bar{X}$: average; $LQ_{c_{(in)a}}$: location quotients a; W_a: weighting coefficient for $LQ_{c_{(in)a}}$; W_{emp}: weighting coefficient for employment size; W_{lqgc}: weighting coefficient related to locational gini coefficients in terms of employment; W_{sp}: weighting coefficient for specialization dynamics; W_s: weighting coefficient for the subpillar level.

b. Extent of cluster policy
c. Extent of inter-clusters collaboration
d. State of development of institutions for collaboration

XV) Context for strategy and rivalry

a. Intensity of local competition
b. Presence of local monopoly(ies)
c. Rigidity of employment
    1. Net activity rate (15-64 y. o.)
    2. Unemployment rate

The rigidity of employment diminishes the agility of firms in order for them to be as resilient as possible. This agility therefore contributes to the context for strategy and rivalry and *in fine* to the ability to build a competitive business environment. Even though indicators such as the net activity rate or the unemployment rate are also influenced by federal laws and by a shared context to some extent, cantons still experience discrepancies notably because they benefit from considerable autonomy and most importantly because they experience specific specialization processes which, *in fine*, have an impact on those measures. This indicator is built not only on unemployment rate but also on the net activity rate. This assumption is related to the fact that a more flexible labor market allows for more part-time employments and for more workers to participate to the labor pool thus bringing additional skills and higher productivity levels. It also acknowledges to some extent the relative strength of the assessed labor market. Consequently, it is relevant to use both the net activity rate and the unemployment rate in order to measure the rigidity of employment in consistent manner.

This indicator is built on a normalized model based on FSO (2020a) given by:

$$RE = \left\{ \frac{[(100 - UN_c)W_{un}] + \left(NA_{c_{15-64y.o.}} W_{na}\right)}{A_z} \right\} W_s \qquad (3.29)$$

Where: RE: rigidity of employment; UN_c: unemployment rate; W_{un}: weighting coefficient for UN_c; $NA_{c_{15-64y.o.}}$: net activity rate (15-64 y.o.); W_{na}: weighting coefficient for $NA_{c_{15-64y.o.}}$; A_z: averaging factor; W_s: weighting coefficient for the subpillar level.

d. Low market disruption of state-enterprises and/or state-related enterprises
e. Low distortive effect of taxes/subsidies on competition
f. Labor-employer cooperation
g. Local regulatory quality

Source: personal elaboration based on Delgado *et al.* (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al.* (2008), Rugman (1981), and on Rugman and Verbeke (2001a, 2001b, 2004, 2009).

Table 6 not only assembles all relevant databases to measure the competitiveness levels of the cantons on the basis of the generic structure in its full version but also allows the elaboration of all available indicators on the basis of the corresponding measures. It purposefully brings together all quantitative steps to exhibit the measures and indicators, which are sufficiently significant to overcome the various quantitative tests. Subsection 13.3 elaborates extensively on this matter.

However, at this stage, it is mandatory to elaborate on the coverage level of Table 6. All three components of competitiveness are measured. At the pillar level, all but two pillars are captured. The two remaining pillars are located within the endowments: 1) relatedness to the central government and 2) relatedness to the largest economic poles in terms of employment. As endowments are relatively stable and do not contribute as significantly to territorial competitiveness as the macro- and, most importantly, the micro-level, the absence of relevant databases is not problematic *per se*. Moreover, relatedness to the largest economic poles in terms of employment is indirectly measured in pillar XI, which consequently implies double-counting issues.

It is at the sub-pillar and indicator levels that most complications arise. Indeed, the methodology used for this index allows the computation of 29 relevant indicators based on 36 corresponding measures. This implies that 20 sub-pillars and indicators could not be investigated quantitatively, and 8 measures related to indicators consequently could be only partly assessed. In other words, coverage reached 59,18% at the sub-pillar level, which constitutes the most relevant level of analysis in quantitative terms, as we shall see further below in this chapter. Obviously, covering only 59,18% of the potential measures raises fundamental concerns regarding the consistency of the final results. Indeed, the generic structure has been developed with the purpose of introducing a comprehensive framework allowing the exhaustive assessment of regions' competitiveness levels. However, as implemented in this chapter in the Swiss case, numerous and critical indicators are not complete. Moreover, some pillars are comprehensively implemented, while others are executed only on the basis of very few indicators. Therefore, the only way to prove that implementing the generic structure in the Swiss case is of significance is to conduct correlation analyses with productivity measures, as examined in the previous chapter. These analyses, among other quantitative tests, are exhibited in the appendix, whereas the most critical evidence related to this process is detailed in the following sub-section.

13.3 Implementation of other methodological and quantitative sub-steps

As scrutinized in chapter 2, implementing a competitiveness index requires submitting the structure and data to quantitative tests and, most importantly, to 1) multivariate analysis, 2) normalization, 3) weighting and aggregation, 4) robustness and sensitivity analyses, and 5) correlation analysis. Multivariate analysis and robustness and sensitivity analyses, among ordinary statistical tests, allow numerous adjustments in the implementation of the indicators, notably for the normalization procedure and for weighting and aggregation choices. Correlation analysis between indicators allows indicator-specific improvements in the weighting strategy to properly capture indicators capturing relatively similar competitiveness factors to a great extent, but on a different section of the causality chain. The tables and figures related to the technical implementation of the quantitative sub-steps leading to various quantitative adjustments are exhibited in the appendix to ensure the full transparency of the process. The purpose of this section is to further investigate the methodological and technical choices related to the quantitative sub-steps that have a conclusive influence on the structural integrity of the index and the correlated results: 1) the normalization procedure, 2) the weighting and aggregation strategy, and 3) the correlation analysis between the multi-dimensional concept captured in the index, in this case the competitiveness levels of the cantons, and the associated measure, in this case productivity.

First, the normalization process discussed in chapter 2 (see sub-section 6.1.3) is imperative to ensure relevant comparisons between factors. For the purpose of this chapter, all measures have been converted into percentages in relative terms. Indeed, percentages allow a relatively high degree of accuracy while computing and exhibiting the results. They are calculated on the basis of the following procedure divided into 2 phases:

I) Phase I at the indicator level: 1) all measures have been weighted to build equipotential indicators, 2) all indicators have been subsequently ranked, and 3) all indicators have been converted into percentages, with the most highly ranked achieving a score of 100% and the others being scored equipotentially with the relative discrepancies being incorporated into all levels of the structure.

II) Phase II at the sub-pillar level: 1) all indicators within each sub-pillar have been tested, if necessary weighted at this level, averaged considering these weights, and retested, and 2) all sub-pillars comprising those indicators have been subsequently converted into percentages, with the most highly ranked achieving a score of 100%.

Consequently, the normalization process used in the implementation of the intranational regional competitiveness index in the case of the Swiss cantons purposively relies on both relative and absolute scores. Indeed, equipotential differences between cantons for all indicators have been relevantly materialized, and the subsequent scores in percentages exhibit not only the quantitative distances between all subjects but also the discrepancies between the best subject and the others. Moreover, the normalization process is designed to avoid elementary computation issues such as indicators measuring factors experiencing inconsistent discrepancies related to idiosyncratic hypotheses.

Second, the weighting and aggregation strategy implemented in the case of Swiss cantons has a significant impact on the final rankings of the index. As a result, it has to rely on strong assumptions. As indicated in chapter 2, either theoretical or methodological reasoning can lead to the implementation of weighting processes that will ultimately influence the relative measures of all indicators. Consequently, the weighting and aggregation method used in the case of the Swiss cantons relies on the following assumptions:

I) At the indicator level, all indicators are allocated equal weights within each sub-pillar when implementable. However, the number of indicators within each sub-pillar may vary, notably due to data limitations, thus implying axiomatically different weights in relative terms between indicators constituting different sub-pillars. However, all indicators were tested and, if necessary, adjusted to avoid inconsistent weight attributions to the utmost degree possible. Moreover, indicators composed of more than one measure were weighted accordingly and averaged at the indicator level.

II) At the sub-pillar level, all sub-pillars are allocated equal weights. At the indicator level, the number of sub-pillars within each pillar may vary, notably due to data limitations but also to theoretical and methodological choices. However, in contrast to the indicator level, as we ascend the arborescence of the structure, the assumption that equal weight should be allocated to all sub-pillars is related to the methodological hypotheses developed in chapter 2. Indeed, the sub-pillars constitute the core of the generic structure. The fact that the 3 levels of competitiveness are composed of varying numbers of sub-pillars also corresponds to Porter's conclusions on the necessity of capturing the relative weights of these levels in relation to territorial competitiveness (Porter, 1990a, 1998, 2003). Moreover, note that indicators related to the endowments are weighted equally to the sub-pillars constituting the macroeconomic and microeconomic levels. This assumption is related to the level of granularity specific to endowments to avoid excessively allocating gravity to them *vis-a-vis* the pillars constituting the other levels of competitiveness.

Consequently, it is consistent to allocate equal weights to all sub-pillars even if some are composed of more sub-pillars than others. This assumption is also necessary as a result of data limitations to avoid attributing relatively high levels of gravity to some pillars to the detriment of others.

III) At the pillar level, the weighting procedure is similar to that at the sub-pillar level. Indeed, the assumption that equal weights should be allocated to all sub-pillars with the specificities indicated above for endowment indicators axiomatically signifies that pillars have distinctive weights according to their constituting sub-pillars. Consequently, some pillars, such as fiscal policy, factor conditions or context for strategy and rivalry, have higher relative weights than others, such as the state of order or any endowment pillar. This method responds not only to the theoretical and methodological assumptions indicated in chapter 2 and heretofore but also to correlation tests, as we shall see henceforth.

IV) At the competitiveness, macroeconomic, and microeconomic levels, which are the upper echelons of the arborescence, the weighting procedure also automatically connects with the equal weights method used at the sub-pillar level with the same logic as that for the pillar level. Therefore, considering the methodological assumption related to the weighting of the endowments, the conclusions of chapter 1 on the relative impacts of competitiveness levels are relevantly taken into consideration with subsequent quantitative corroborations.

Consequently, the weighting procedure chosen in the implementation of the generic structure is consistent with the theoretical and mythological assumptions detailed in chapter 1 and chapter 2, as equal weights are comprehensively allocated at the sub-pillar level. Regarding the aggregation method, at the sub-pillar level, an *ad hoc* geometric aggregation method has been implemented to avoid potential compensatory logic at all levels of the arborescence (OECD, 2008, p. 33) and to allow indicator relative assessments.

Third, the correlation analysis between the multi-dimensional concept captured in the index, in this case the competitiveness levels of the cantons, and the associated measure, in this case productivity, is the ultimate quantitative test proving the relative consistency of an implemented index on the basis of a generic structure. This analysis should not be confused with correlation tests between the indicators and/or between sub-pillars to avoid double-counting issues, *inter alia*. As indicated above, these tests have been conducted, and adjustments in either structural or weighting and aggregation terms have been implemented.

Indeed, as mentioned above, correlation analysis between the multi-dimensional concept captured in the index and the associated measure is decisive in assessing the index's consistency when implemented. Two correlation tests have been conducted with regard to the associated measure, in this case productivity. As indicated in chapter 2, competitiveness is ultimately determined by productivity measured *inter alia* by 1) GDP/capita and GDP/employment in full-time equivalent positions. Regarding the final results of competitiveness levels captured in the index, 8 different overall scores were tested: 1) the average scores at the endowment level, 2) the average scores at the macroeconomic level, 3) the average scores at the microeconomic level, 4) the average scores at the macroeconomic and microeconomic levels, 5) the average scores at the endowment, macroeconomic and microeconomic levels, 6) the average scores at the pillar level, 7) the theoretical scores, and 8) the scores at the sub-pillar level. These scores were correlated with 1) the corresponding GDP/capita and 2) the GDP/employment in full-time equivalent positions. It is necessary at this stage to note that it is not possible to find convincing data on GDP in purchasing power parity among the Swiss cantons. As a result, this factor was not implemented, and only GDP *per se* was used. The theoretical and methodological framework suggests that the sub-pillar level is the most relevant for calculating the final scores and corresponding ranks. This conclusion was corroborated in conducting the correlation analysis:

I) **Correlation with GDP/capita:** GDP/capita is widely used to capture the wealth produced in a specific territory sized on the basis of the corresponding population. However, this measure tends to be less relevant at the regional level than at the national level, as workers' mobility is relatively high between regions, thus hampering the validity of the measure in assessing relative productivity. The standard deviation while correlating the final scores at the sub-pillar level and the inter-related GDP/capita averaged 21,72%, which is relatively high. Obviously, this result relates not only to the correlation measure *per se* but also to other factors, such as data limitations leading to unimplemented indicators.

II) **Correlation with the GDP/employment in full-time equivalent:** This measure aims to capture the average productivity by calculating the average wealth created by each worker in a full-time equivalent position in a specific territory. Hence, mobility issues are captured consistently to examine as accurately as possible the productivity of a given territory leveraged by its size in economic terms. The standard deviation when correlating the final scores at the sub-pillar level and the inter-related GDP/employment in full-time equivalent positions averaged 5,03%, which is comparatively low. This result is relatively satisfactory for 3 main reasons: 1) it validates the overall validity of the structure even though numerous indicators could not be implemented, 2) it tends to demonstrate that the implemented indicators are relatively consistent and fittingly coordinated, and 3) it demonstrates the soundness of GDP/employment in full-time equivalent positions as a relevant measurement of productivity.

Consequently, correlation analysis between the multi-dimensional concept captured in the index and the associated measure allows a quantitative corroboration of the structure's integrity. In this case, numerous indicators could not be implemented due to data limitations, thus axiomatically hampering the potential validity of the results. However, the relatively high degree of correlation between the final scores at the sub-pillar level and the inter-related GDP/employment in full-time equivalent positions suggests that the structure as implemented is still pertinent, as competitiveness scores are relatively highly correlated with productivity levels.

In conclusion, submitting the structure and data to quantitative tests is mandatory to ensure the soundness of the implemented index. In the case of the Swiss cantons, 3 major matters emerged from the completed quantitative sub-steps: 1) all indicators and sub-pillars were converted into percentages, with the most highly ranked achieving a score of 100% and the others being scored equipotentially, therefore allowing relative discrepancies to be incorporated at all levels of the structure; 2) all sub-pillars were allocated equal weights since this level is the most relevant in aggregating scores, as epitomized in chapter 2 and as quantitively demonstrated heretofore; and 3) whereas the final scores were not correlated to a satisfactory degree with GDP/capita, they were nonetheless relatively strongly correlated with GDP/employment in full-time equivalent positions and, *in fine*, with the corresponding productivity levels.

13.4 Relating the generic structure of the intranational regional competitiveness index to the Swiss case: limitations and concluding remarks

This section materializes the conceptual framework developed in chapter 2 considering all methodological and quantitative issues related to transparent and consistent implementation in the case of the Swiss cantons. Section 13 divides the process into two major steps: 1) data selection, construction, configuration, and adjustments of the measure(s) constituting each indicator and 2) the implementation of the methodological and quantitative sub-steps presented in the previous chapter and executed for the subject of the analysis.

The first step echoes the issue of database quality and availability, resulting in the development of an *ad hoc* methodology in chapter 2 because this issue should not affect the generic structure. However, at this stage, relating that generic structure to the case of the Swiss cantons implies an overall revision of the framework to determine the measures that can ultimately be completed on the basis of data availability and quality. The corresponding measures are therefore configured, and equations are created to encompass as many indicators as possible. Regardless of this attempt, the methodology used for this index allowed the computation of 29 relevant indicators based on 36 corresponding measures. This implies that 20 indicators could not be quantitatively investigated, and 8 measures related to indicators consequently could be only partly assessed. In other words, coverage reaches 59,18% at the indicator level. Consequently, the remaining 40,82% could hypothetically lead to alternative results and correspondingly different scores. Hence, the reader should always be cognizant of this conclusion.

The second step submits the structure and data to quantitative tests. With regard to the aforementioned limitations related to data quality and availability, the correlation analysis implemented in this second step between the multi-dimensional concept captured in the index and the associated measure demonstrates that the standard deviation in correlating the final scores at the sub-pillar level and the inter-related GDP/employment in full-time equivalent positions averages 5,03%. Consequently, while coverage reaches only 59,18%, the correlation tests indicate that the implemented indicators are still sufficiently relevant to ensure the structural soundness of the index.

In conclusion, the purpose of section 13 is not only to elaborate on the technical and quantitative issues but also to provide extensive knowledge on the manner in which the methodology developed in chapter 2 can actually be implemented in a specific case. The conclusions specified above should be given due consideration when investigating and assessing the results and final scores exhibited in the next section of chapter 3. To do so, the results, scores and rankings should be exhibited consistently and completely, as we shall endeavour to achieve in the coterminous section.

14 Presentation of the results of the intranational regional competitiveness index applied to the Swiss cantons

14.1 General index rankings of the Swiss cantons

The presentation of general index rankings consistently precedes subject-specific charts and tables. The intrinsic feature of an index is to rank subjects on the basis of the multi-dimensional concept it aims to measure, in this case competitiveness. On the basis of the aforementioned methodological and quantitative conclusions, the general rankings are built on the basis of results computed at the sub-pillar level.

Table 7 constitutes the leading and primary ranking, as it aggregates the general results for all levels of competitiveness. It exhibits 1) the general rank of each canton, 2) the overall score of each canton, 3) the corresponding standard deviation in %, and 4) the related median and average scores. It also axiomatically indicates the relative differences among all subjects. The standard deviations express the extent to which the overall scores diverge from the correlation measure, in this case GDP/employment in full-time equivalent positions.

Table 8 exhibit the ranks and corresponding scores of all Swiss cantons but considers the pillars and sub-pillars only at the microeconomic level of competitiveness. Indeed, as specified repeatedly in chapter 1 and chapter 2, productivity is created at the microeconomic level. Therefore, it is consistent to rank all subjects only at this level of competitiveness to exhibit the case-specific scores and to compute the average and median scores.

Table 9, Table 10, and Table 11 display in more detail the various scores for 1) the endowment level, 2) the macroeconomic level, and 3) the microeconomic level of competitiveness. For all sub-pillars, average and median scores were calculated to make indicator-specific comparisons among cantons. When a canton's sub-pillar scores 100%, which sets the maximum point of reference for other subjects, this score is coloured yellow to indicate case-specific relative strength. Indeed, highly ranked cantons do not axiomatically experience scores of 100% for all sub-pillars. That is, cantons with relatively lower general scores, even in the lower ranks, may happen to score highly for specific sub-pillars.

Consequently, this sub-section exhibits the following general index rankings: 1) the general ranking in % of the Swiss cantons at the sub-pillar level and the corresponding standard deviations in %, 2) the general ranking in % of the Swiss cantons at the microeconomic level of competitiveness, 3) the general scores in % of the Swiss cantons at the endowment level of competitiveness, 4) the general scores in % of the Swiss cantons at the macroeconomic level of competitiveness, and 5) the general scores in % of the Swiss cantons at the microeconomic level of competitiveness.

Table 7: General ranking in % of the Swiss cantons at the subpillar level and the corresponding standard deviations in %

	General rank	Average subpillar-based in %	Standard deviation in %
ZH	1	81,93	4,54
AG	2	76,44	7,82
BS	3	75,69	17,19
VD	4	73,86	7,57
BE	5	73,70	3,78
ZG	6	73,51	11,33
LU	7	71,63	7,91
SG	8	71,60	3,88
TG	9	70,79	4,06
FR	10	70,59	2,20
NW	11	70,24	0,34
SH	12	69,97	8,33
BL	13	69,89	1,80
UR	14	68,68	7,45
SO	15	67,82	0,43
AI	16	67,47	3,68
GL	17	67,39	0,10
OW	18	67,34	3,93
GE	19	67,28	2,97
SZ	20	67,22	2,97
NE	21	67,06	7,01
GR	22	66,90	5,38
AR	23	66,67	2,48
VS	24	66,55	7,00
TI	25	65,55	0,91
JU	26	65,40	5,81
	Average	70,05	5,03
	Median	69,29	4,00

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Table 8: General ranking in % of the Swiss cantons at the microeconomic level of competitiveness

	General rank	Average /microeconomic level-based in %
ZH	1	87,20
BS	2	78,50
VD	3	72,55
AG	4	71,06
BE	5	70,68
GE	6	70,39
ZG	7	68,03
SG	8	67,37
BL	9	67,27
LU	10	65,96
NE	11	65,53
SH	12	64,20
FR	13	64,15
SO	14	63,55
NW	15	62,99
TG	16	62,79
TI	17	62,41
UR	18	60,18
SZ	19	59,22
JU	20	58,75
OW	21	58,32
AI	22	58,00
AR	23	57,92
VS	24	57,66
GL	25	57,08
GR	26	56,78
	Average	64,94
	Median	63,85

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Table 9: General scores in % of the Swiss cantons at the endowments level of competitiveness

	Endowments		
	Relatedness to the capital city	**Availability of expendable land**	**Cultural distance to central government**
	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	Expendable building zones per capita and per employment and in absolute value	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)
ZH	81,33	86,40	100
AG	81,50	82,96	100
BS	79,83	13,39	100
VD	77,33	84,74	80
BE	100,00	86,13	100
ZG	70,17	21,53	100
LU	77,00	50,78	100
SG	54,50	61,18	100
TG	65,00	74,24	100
FR	91,33	68,16	90
NW	71,33	30,65	100
SH	63,67	48,38	100
BL	74,83	45,21	100
UR	61,50	41,12	100
SO	88,67	57,27	100
AI	45,00	37,21	100
GL	56,33	45,73	100
OW	71,17	36,80	100
GE	65,67	32,66	80
SZ	65,67	40,16	100
NE	86,67	46,23	80
GR	50,83	57,15	100
AR	45,00	44,05	100
VS	69,17	100,00	90
TI	34,33	57,55	80
JU	78,50	74,36	80
Average	69,47	54,77	95,38
Median	70,67	49,58	100,00

Source: personal elaboration based on Delgado *et al.* (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al.* (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Table 10: General scores in % of the Swiss cantons at the macroeconomic level of competitiveness

	Macrolevel							
	Health	**Political Institutions**	**Fiscal policy**					**State of order**
	Healthcare service accessibility	Local authorities' efficiency	Regional public finances' soundness and public funds spending efficiency	Regional public authorities' auto-financing capabilities	Fiscal policy toward firms	Fiscal policy toward workers	Average and median earnings	Efficiency of judicial institutions at the regional level
ZH	66,30	65,43	83,38	77,63	62,61	73,54	78,82	69,27
AG	62,36	100,00	88,63	78,54	78,06	87,05	74,62	86,95
BS	100,00	94,83	52,48	92,50	88,89	56,65	72,80	33,75
VD	68,22	61,10	76,94	87,43	90,94	70,19	71,15	68,34
BE	66,47	66,21	76,38	82,42	77,78	75,51	63,66	78,30
ZG	62,40	63,77	92,39	76,12	100,00	89,76	100,00	88,96
LU	62,44	74,70	87,48	81,07	89,56	88,13	69,61	81,93
SG	64,79	69,59	91,04	75,50	84,00	85,77	65,93	87,64
TG	64,02	67,83	91,78	83,49	92,33	91,11	69,47	88,26
FR	56,40	74,96	92,56	77,33	84,72	83,54	67,00	84,32
NW	54,27	57,62	93,79	83,34	95,83	95,93	82,35	93,51
SH	59,95	76,88	87,38	72,66	98,17	86,99	67,41	80,08
BL	61,92	62,26	72,24	55,57	93,06	70,48	80,13	89,42
UR	51,62	65,86	97,16	85,02	90,28	100,00	66,12	100,00
SO	56,55	48,60	77,24	56,85	97,89	88,06	68,22	75,68
AI	51,32	64,60	100,00	87,96	98,61	95,89	70,70	99,61
GL	58,58	84,02	90,93	86,49	90,67	94,44	64,36	96,68
OW	51,44	67,32	98,80	72,41	85,39	96,63	85,72	88,34
GE	75,00	64,59	42,23	81,14	88,17	49,73	75,20	38,38
SZ	53,09	48,83	95,10	69,94	93,33	91,18	87,23	94,98
NE	63,02	67,08	54,69	65,26	90,28	73,98	62,45	71,27
GR	67,32	78,43	94,95	100,00	74,28	88,87	62,04	89,27
AR	72,38	66,41	89,63	76,28	91,67	90,81	66,83	93,67
VS	60,42	59,14	89,45	87,77	78,44	86,92	52,27	90,73
TI	66,83	67,70	72,97	77,83	65,94	79,61	61,29	86,25
JU	60,49	66,49	80,65	77,80	69,44	79,94	57,66	90,12
Averages	62,98	68,62	83,47	78,78	86,55	83,49	70,89	82,53
Median	62,38	66,45	89,04	78,19	89,92	87,02	68,84	87,95

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Table 11: General scores in % of the Swiss cantons at the microeconomic level of competitiveness

	Microlevel									
	Firms' strategy and internationalization	**Factor conditions**				**Supporting and related industries**		**Demand conditions**	**Cluster development and specialization**	**Context for strategy and rivalry**
	MNEs' competition effectiveness	Operational infrastructures	Financial infrastructures	Innovation effectiveness	Education and labor-market consistency	Superior schools and research institutions' quality and dynamics	Availability of specialized research & training	Sophistication of local demand	Extent of cluster development and specialization	Rigidity of employment
ZH	58,54	97,07	100,00	100,00	90,29	70,55	97,82	66,67	100,00	91,11
AG	54,10	89,90	33,91	88,29	63,05	42,42	94,60	86,23	69,54	88,54
BS	100,00	97,22	51,14	79,11	89,02	100,00	93,45	30,43	61,05	83,54
VD	47,09	91,84	44,71	73,22	93,64	70,84	88,97	62,32	71,84	81,04
BE	38,19	82,76	58,16	50,44	90,55	54,30	95,75	72,46	71,20	92,96
ZG	71,30	80,72	46,97	43,58	78,17	38,00	100,00	76,09	54,11	91,35
LU	37,50	77,51	47,74	40,43	64,42	55,43	94,02	84,20	64,58	93,80
SG	49,27	64,85	49,30	44,29	83,09	54,38	92,64	82,61	61,23	92,01
TG	41,60	82,13	39,24	36,00	61,21	25,50	93,91	91,74	65,15	91,47
FR	36,10	75,53	35,22	45,36	86,73	53,49	85,75	81,45	54,25	87,65
NW	42,22	66,41	35,55	44,57	73,93	25,50	95,29	88,41	60,26	97,74
SH	65,33	76,96	36,39	46,45	58,40	38,00	94,14	82,90	57,65	85,74
BL	54,10	87,80	39,71	43,04	99,34	45,19	97,01	63,77	51,98	90,76
UR	39,22	54,99	30,92	36,65	71,81	25,50	86,09	100,00	60,17	96,49
SO	53,62	83,52	30,62	37,71	61,94	41,57	92,87	87,68	54,56	91,35
AI	18,03	45,11	39,19	42,67	71,66	25,50	92,99	91,30	56,32	97,26
GL	34,14	57,28	29,16	35,37	59,52	25,50	87,01	97,10	52,01	93,69

OW	30,03	63,61	32,75	40,48	64,69	25,50	89,43	92,03	44,70	100,00
GE	60,42	100,00	61,85	63,90	100,00	63,37	87,82	26,38	63,05	77,10
SZ	36,29	65,61	43,42	36,67	66,21	25,50	88,39	85,51	48,91	95,65
NE	71,40	78,34	25,50	55,56	80,19	62,58	85,06	65,36	50,88	80,44
GR	28,98	45,85	37,85	35,28	57,53	43,11	92,87	86,96	43,59	95,83
AR	32,01	55,62	22,49	50,23	70,69	25,50	92,99	84,78	50,77	94,15
VS	28,19	56,05	39,79	35,23	66,58	43,97	83,56	88,70	49,10	85,39
TI	46,31	37,98	40,15	43,08	88,24	56,30	88,74	81,16	60,74	81,35
JU	40,12	82,31	15,03	34,09	72,96	52,66	83,10	79,71	45,65	81,87
Average	46,70	72,96	41,03	49,30	75,53	45,78	91,32	78,31	58,59	89,93
Median	41,91	77,24	39,21	43,33	72,38	43,54	92,87	83,55	56,99	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2 Results charts for all Swiss cantons

The results specific to all Swiss cantons are presented using two types of charts: 1) a radar chart, which exhibits the 21 sub-pillars and the 13 pillars of the structure in comparison with the corresponding averages at the Swiss level, and 2) a results chart composed of a table that summarizes all results in comparison with the corresponding average and median values at the Swiss level.

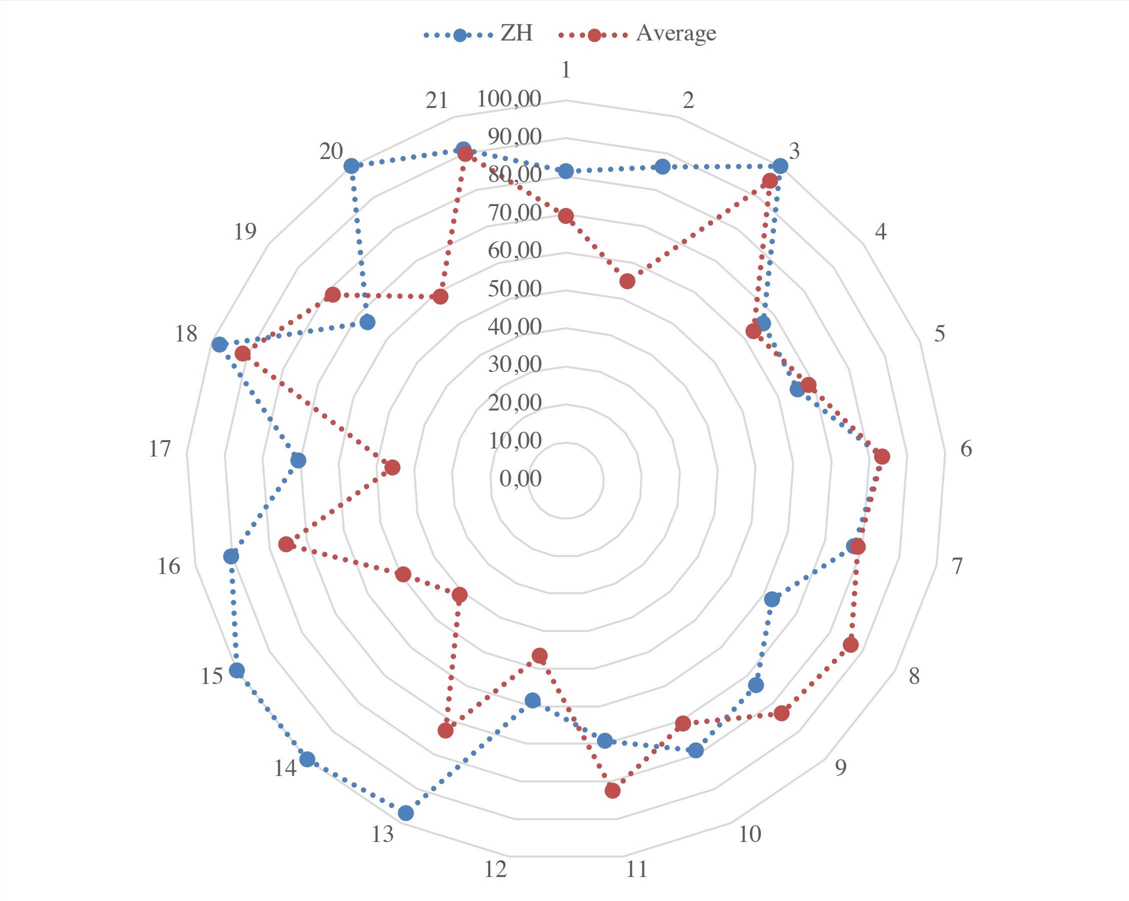
The radar chart offers a visual understanding of the variations among cantons and in comparison with the corresponding averages at the Swiss level. Hence, it is possible to identify the specific pattern of each subject while considering the normative average pattern. The radar charts are logically scaled in percentages to translate the overall results of the general index. When expedient, even if the results correspond to the sub-pillar level in structural and quantitative terms and are therefore consistent and equipotential, the pillar level is indicated in the notices following the tables if and only if one sub-pillar constitutes one pillar. Indeed, nomenclatures at the pillar level are often more generic and therefore satisfactory for the analysis of radar charts.

The results chart adopts the overall structure of the index and exhibits the corresponding results for each subject and the corresponding average and median values at the Swiss level. Hence, it is possible to implement an exhaustive overview of the results in conformity with the structural determinations scrutinized above and to compare these results with the correlated results at the Swiss level. When a sub-pillar's result is 100%, which sets the maximum point of reference for other subjects, it is coloured yellow to indicate case-specific relative strength. Hence, even if a subject has a relatively undistinguished ranking, it can still experience sub-pillar-specific maximum result(s).

Consequently, the following sub-section exhibits the results specific to all cantons (26) on the basis of the two types of charts described above. The order of the 26 cantons complies with the general ranking revealed above at the sub-pillar level, from the highest rank to the lowest rank.

14.2.1 Zurich

Figure 6: Radar chart in % for the canton of Zurich (1/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firm's strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

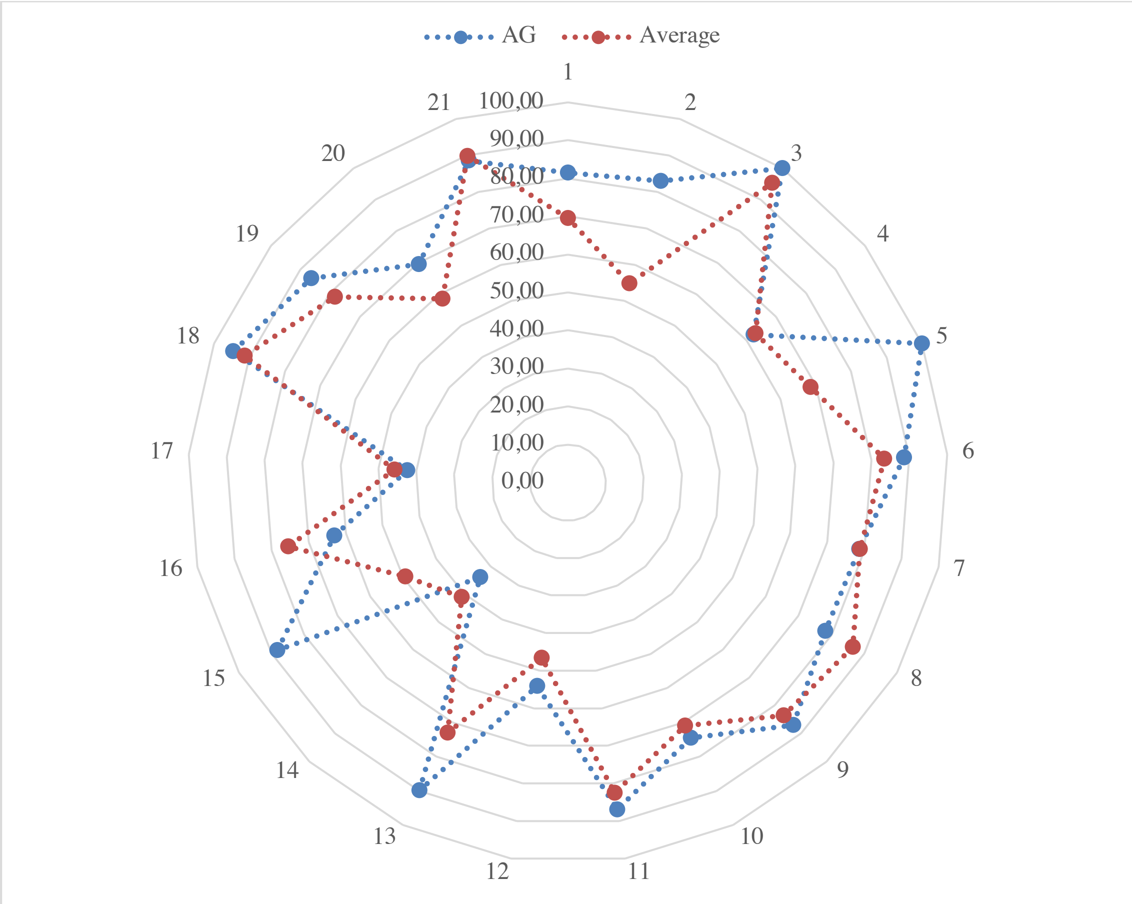
Table 12: Results' chart in % for the canton of Zurich (1/26) and the average and median scores at the Swiss level

			ZH	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	81,33	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	86,40	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	66,30	62,98	62,38
	Political institutions	Local authorities' efficiency	65,43	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	83,38	83,47	89,04
		Regional public authorities' auto-financing capabilities	77,63	78,78	78,19
		Fiscal policy toward firms	62,61	86,55	89,92
		Fiscal policy toward workers	73,54	83,49	87,02
		Average and median earnings	78,82	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	69,27	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	58,54	46,70	41,91
	Factor conditions	Operational infrastructures	97,07	72,96	77,24
		Financial infrastructures	100,00	41,03	39,21
		Innovation effectiveness	100,00	49,30	43,33
		Education and labor-market consistency	90,29	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	70,55	45,78	43,54
		Availability of specialized research & training	97,82	91,32	92,87
	Demand conditions	Sophistication of local demand	66,67	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	100,00	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	91,11	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.2 Aargau

Figure 7: Radar chart in % for the canton of Aargau (2/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

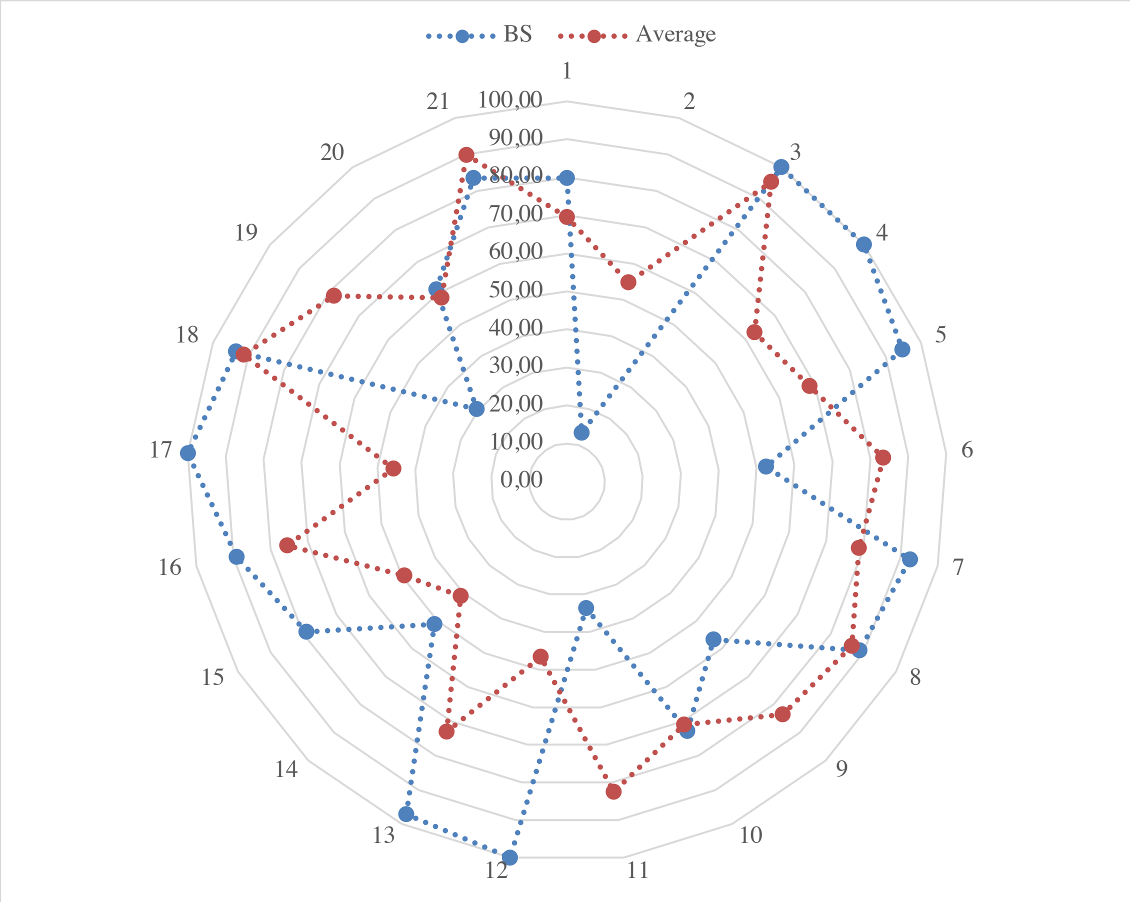
Table 13: Results' chart in %for the canton of Aargau (2/26) and the average and median scores at the Swiss level

			AG	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	81,50	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	82,96	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	62,36	62,98	62,38
	Political institutions	Local authorities' efficiency	100,00	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	88,63	83,47	89,04
		Regional public authorities' auto-financing capabilities	78,54	78,78	78,19
		Fiscal policy toward firms	78,06	86,55	89,92
		Fiscal policy toward workers	87,05	83,49	87,02
		Average and median earnings	74,62	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	86,95	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	54,10	46,70	41,91
	Factor conditions	Operational infrastructures	89,90	72,96	77,24
		Financial infrastructures	33,91	41,03	39,21
		Innovation effectiveness	88,29	49,30	43,33
		Education and labor-market consistency	63,05	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	42,42	45,78	43,54
		Availability of specialized research & training	94,60	91,32	92,87
	Demand conditions	Sophistication of local demand	86,23	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	69,54	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	88,54	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.3 Basel-Stadt

Figure 8: Radar chart in % for the canton of Basel-Stadt (3/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms^ strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

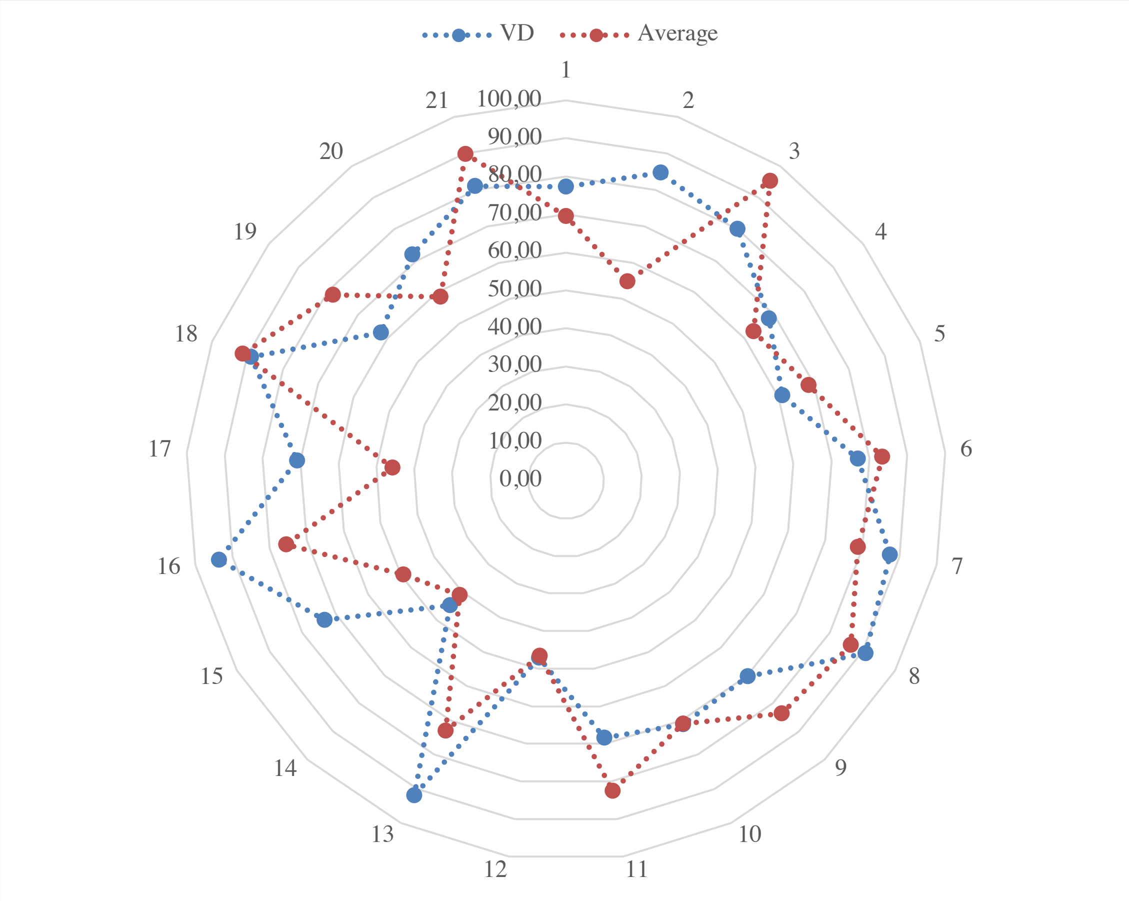
Table 14: Results' chart in % for the canton of Basel-Stadt (3/26) and the average and median scores at the Swiss level

			BS	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	79,83	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	13,39	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	100,00	62,98	62,38
	Political institutions	Local authorities' efficiency	94,83	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	52,48	83,47	89,04
		Regional public authorities' auto-financing capabilities	92,50	78,78	78,19
		Fiscal policy toward firms	88,89	86,55	89,92
		Fiscal policy toward workers	56,65	83,49	87,02
		Average and median earnings	72,80	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	33,75	82,53	87,95
Microlevel	**Firms' strategy and internationaliz ation**	MNEs' competition effectiveness	100,00	46,70	41,91
	Factor conditions	Operational infrastructures	97,22	72,96	77,24
		Financial infrastructures	51,14	41,03	39,21
		Innovation effectiveness	79,11	49,30	43,33
		Education and labor-market consistency	89,02	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	100,00	45,78	43,54
		Availability of specialized research & training	93,45	91,32	92,87
	Demand conditions	Sophistication of local demand	30,43	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	61,05	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	83,54	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.4 Vaud

Figure 9: Radar chart in % for the canton of Vaud (4/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

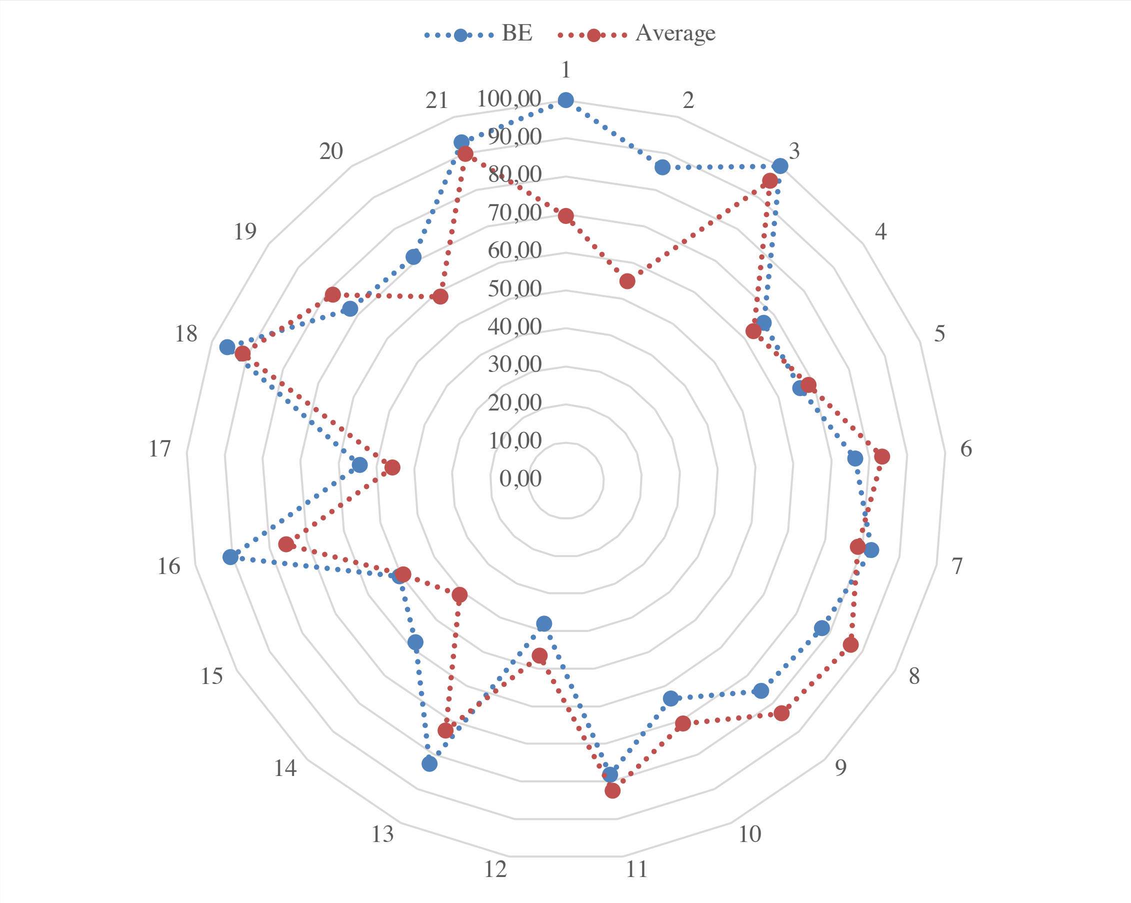
Table 15: Results' chart in % for the canton of Vaud (4/26) and the average and median scores at the Swiss level

			VD	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	77,33	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	84,74	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	80	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	68,22	62,98	62,38
	Political institutions	Local authorities' efficiency	61,10	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	76,94	83,47	89,04
		Regional public authorities' auto-financing capabilities	87,43	78,78	78,19
		Fiscal policy toward firms	90,94	86,55	89,92
		Fiscal policy toward workers	70,19	83,49	87,02
		Average and median earnings	71,15	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	68,34	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	47,09	46,70	41,91
	Factor conditions	Operational infrastructures	91,84	72,96	77,24
		Financial infrastructures	44,71	41,03	39,21
		Innovation effectiveness	73,22	49,30	43,33
		Education and labor-market consistency	93,64	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	70,84	45,78	43,54
		Availability of specialized research & training	88,97	91,32	92,87
	Demand conditions	Sophistication of local demand	62,32	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	71,84	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	81,04	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.5 Bern

Figure 10: Radar chart in % for the canton of Bern (5/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

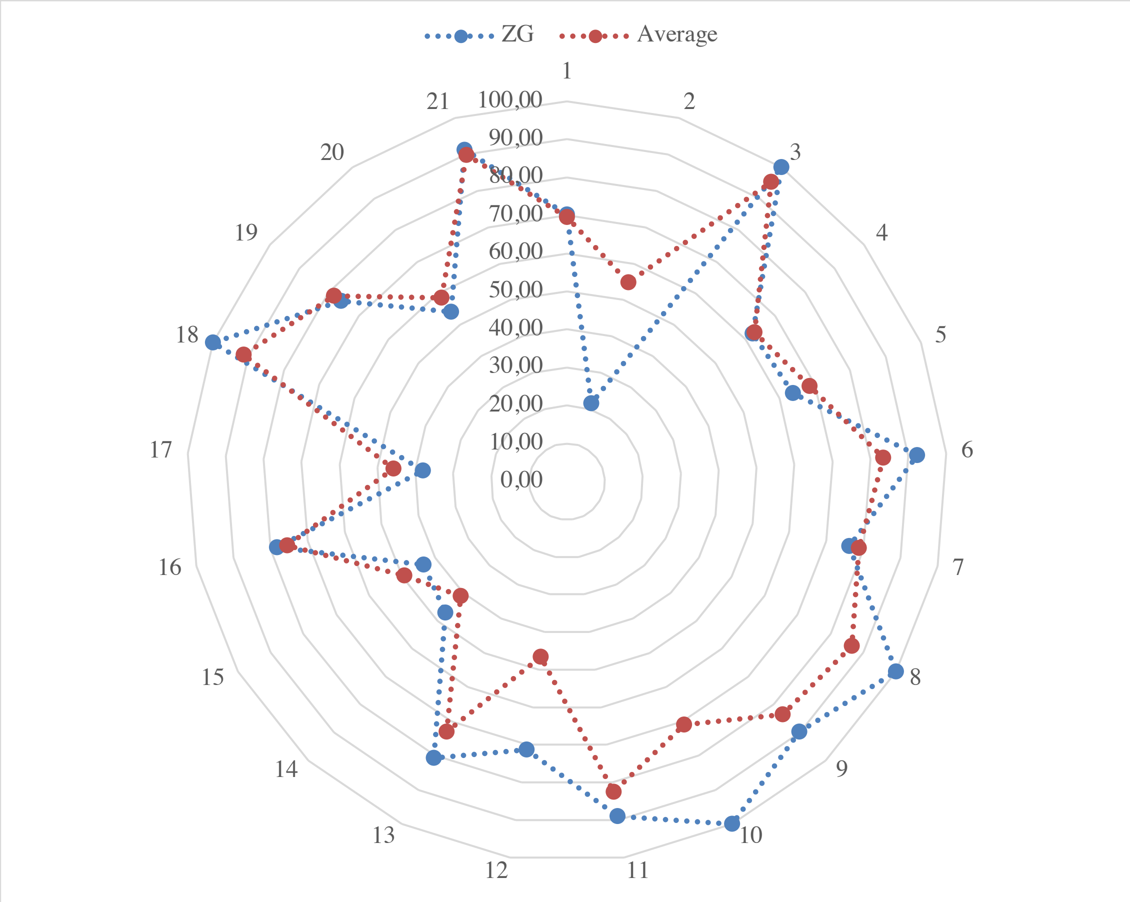
Table 16: Results' chart in % for the canton of Bern (5/26) and the average and median scores at the Swiss level

			BE	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	100,00	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	86,13	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	66,47	62,98	62,38
	Political institutions	Local authorities' efficiency	66,21	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	76,38	83,47	89,04
		Regional public authorities' auto-financing capabilities	82,42	78,78	78,19
		Fiscal policy toward firms	77,78	86,55	89,92
		Fiscal policy toward workers	75,51	83,49	87,02
		Average and median earnings	63,66	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	78,30	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	38,19	46,70	41,91
	Factor conditions	Operational infrastructures	82,76	72,96	77,24
		Financial infrastructures	58,16	41,03	39,21
		Innovation effectiveness	50,44	49,30	43,33
		Education and labor-market consistency	90,55	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	54,30	45,78	43,54
		Availability of specialized research & training	95,75	91,32	92,87
	Demand conditions	Sophistication of local demand	72,46	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	71,20	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	92,96	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.6 Zug

Figure 11: Radar chart in % for the canton of Zug (6/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

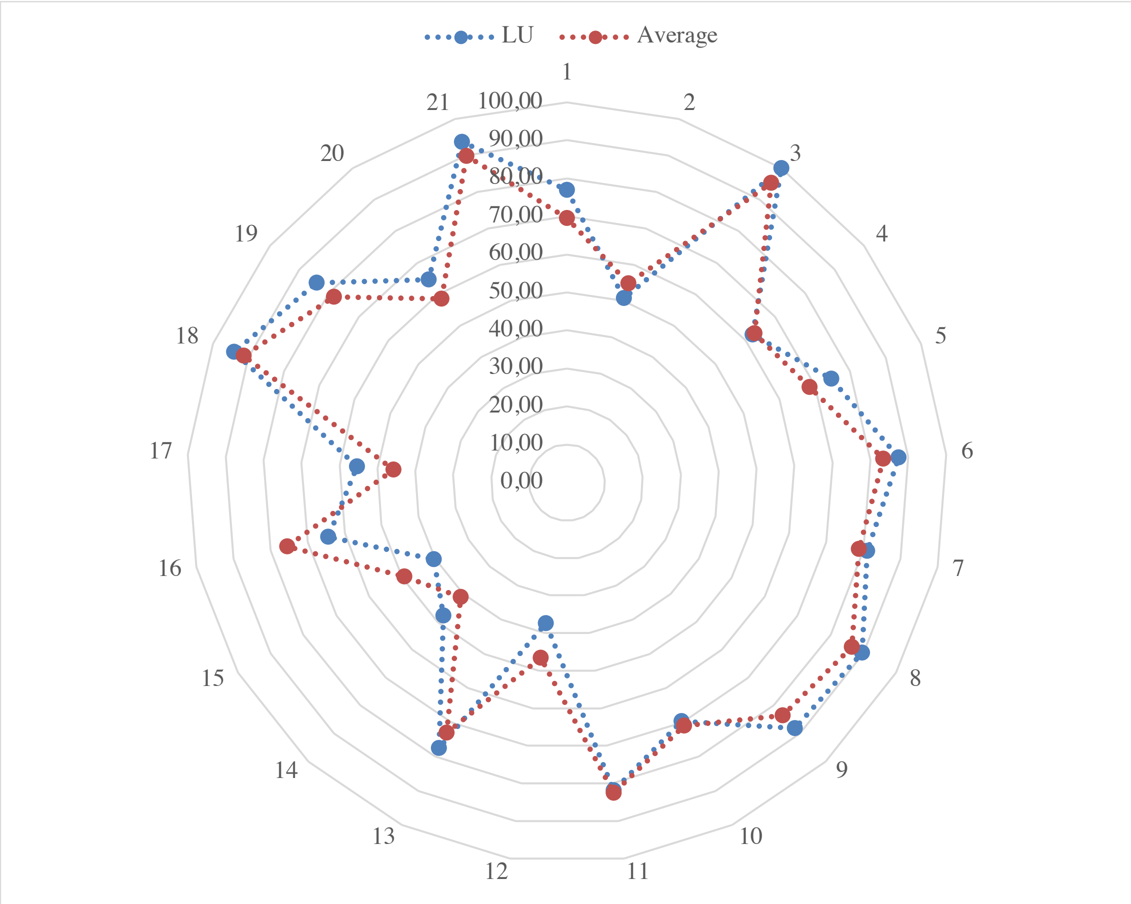
Table 17: Results' chart in % for the canton of Zug (6/26) and the average and median scores at the Swiss level

			ZG	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	70,17	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	21,53	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	62,40	62,98	62,38
	Political institutions	Local authorities' efficiency	63,77	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	92,39	83,47	89,04
		Regional public authorities' auto-financing capabilities	76,12	78,78	78,19
		Fiscal policy toward firms	100,00	86,55	89,92
		Fiscal policy toward workers	89,76	83,49	87,02
		Average and median earnings	100,00	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	88,96	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	71,30	46,70	41,91
	Factor conditions	Operational infrastructures	80,72	72,96	77,24
		Financial infrastructures	46,97	41,03	39,21
		Innovation effectiveness	43,58	49,30	43,33
		Education and labor-market consistency	78,17	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	38,00	45,78	43,54
		Availability of specialized research & training	100,00	91,32	92,87
	Demand conditions	Sophistication of local demand	76,09	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	54,11	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	91,35	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.7 Luzern

Figure 12: Radar chart in % for the canton of Luzern (7/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

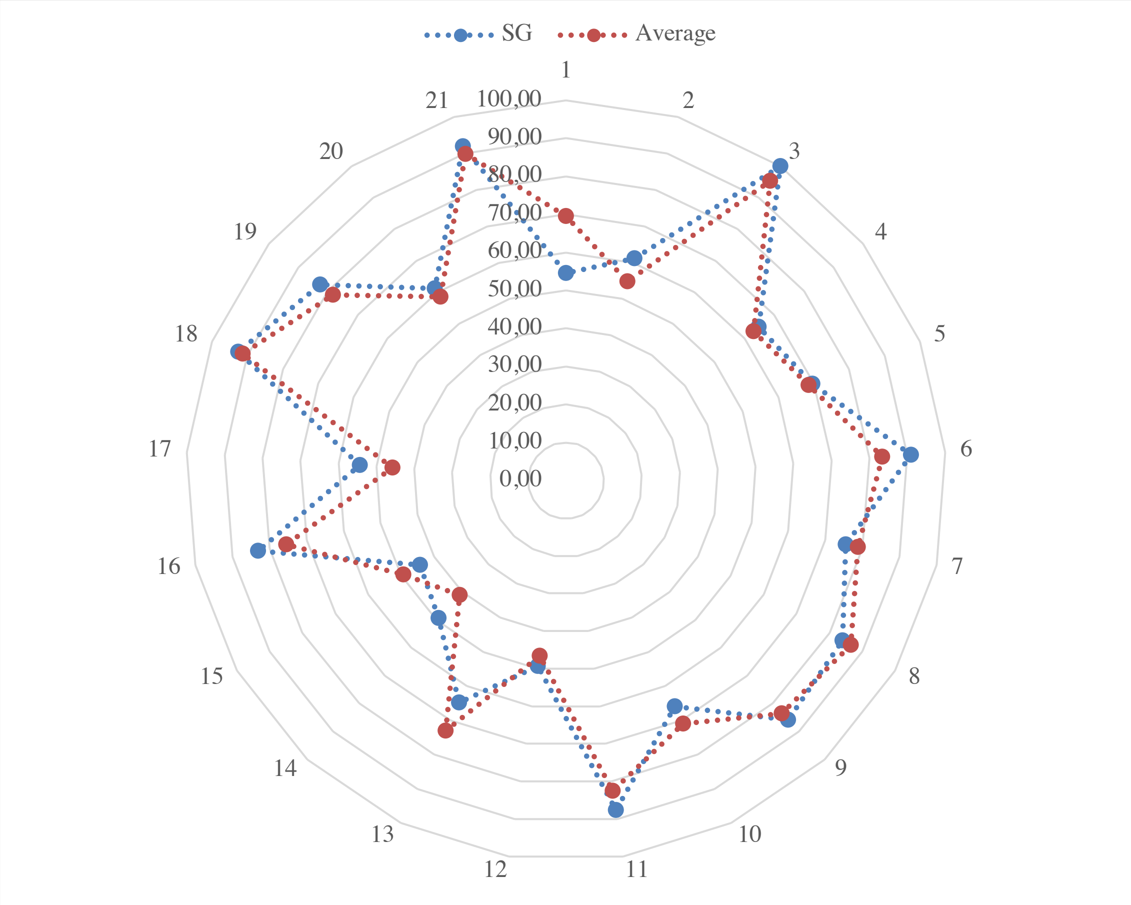
Table 18: Results' chart in % for the canton of Luzern (7/26) and the average and median scores at the Swiss level

			LU	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	77,00	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	50,78	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	62,44	62,98	62,38
	Political institutions	Local authorities' efficiency	74,70	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	87,48	83,47	89,04
		Regional public authorities' auto-financing capabilities	81,07	78,78	78,19
		Fiscal policy toward firms	89,56	86,55	89,92
		Fiscal policy toward workers	88,13	83,49	87,02
		Average and median earnings	69,61	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	81,93	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	37,50	46,70	41,91
	Factor conditions	Operational infrastructures	77,51	72,96	77,24
		Financial infrastructures	47,74	41,03	39,21
		Innovation effectiveness	40,43	49,30	43,33
		Education and labor-market consistency	64,42	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	55,43	45,78	43,54
		Availability of specialized research & training	94,02	91,32	92,87
	Demand conditions	Sophistication of local demand	84,20	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	64,58	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	93,80	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.8 St. Gallen

Figure 13: Radar chart in % for the canton of St. Gallen (8/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

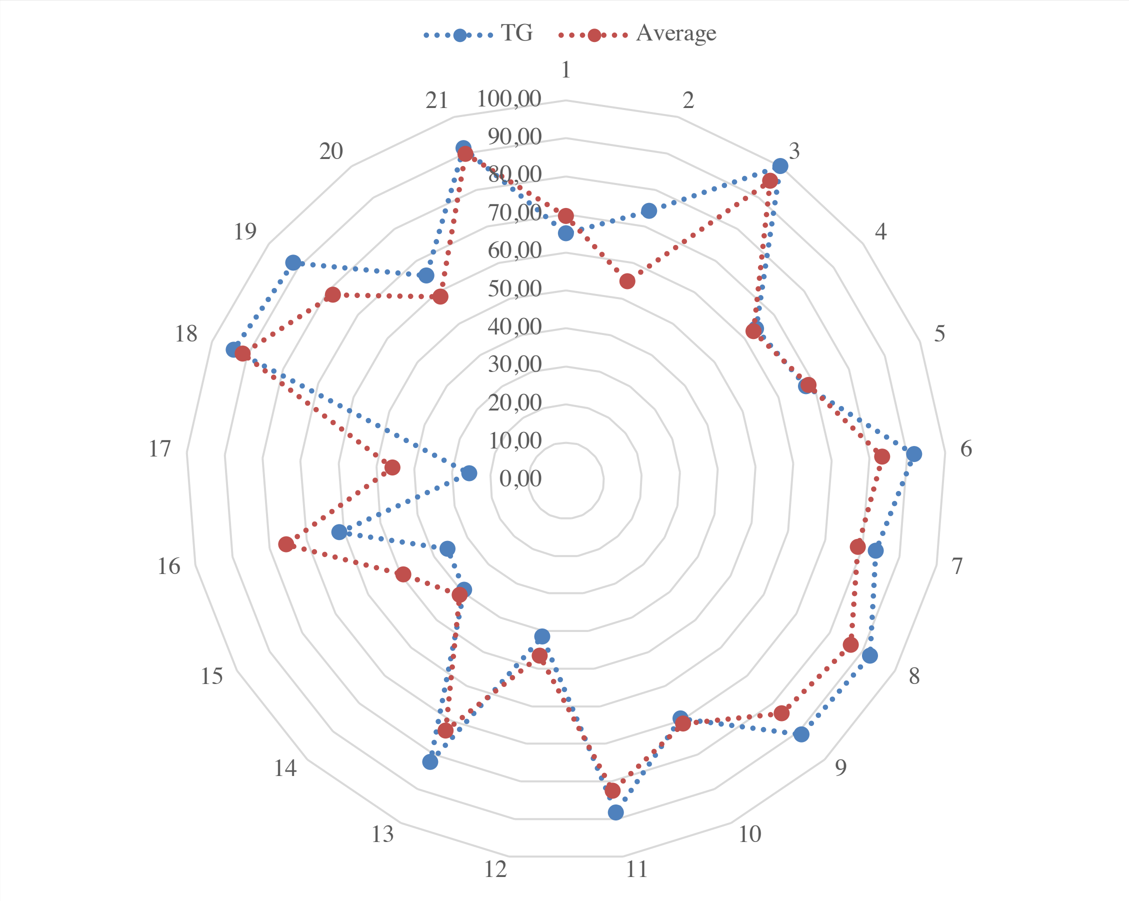
Table 19: Results' chart in % for the canton of St. Gallen (8/26) and the average and median scores at the Swiss level

			SG	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	54,50	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	61,18	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	64,79	62,98	62,38
	Political institutions	Local authorities' efficiency	69,59	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	91,04	83,47	89,04
		Regional public authorities' auto-financing capabilities	75,50	78,78	78,19
		Fiscal policy toward firms	84,00	86,55	89,92
		Fiscal policy toward workers	85,77	83,49	87,02
		Average and median earnings	65,93	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	87,64	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	49,27	46,70	41,91
	Factor conditions	Operational infrastructures	64,85	72,96	77,24
		Financial infrastructures	49,30	41,03	39,21
		Innovation effectiveness	44,29	49,30	43,33
		Education and labor-market consistency	83,09	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	54,38	45,78	43,54
		Availability of specialized research & training	92,64	91,32	92,87
	Demand conditions	Sophistication of local demand	82,61	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	61,23	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	92,01	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.9 Thurgau

Figure 14: Radar chart in % for the canton of Thurgau (9/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

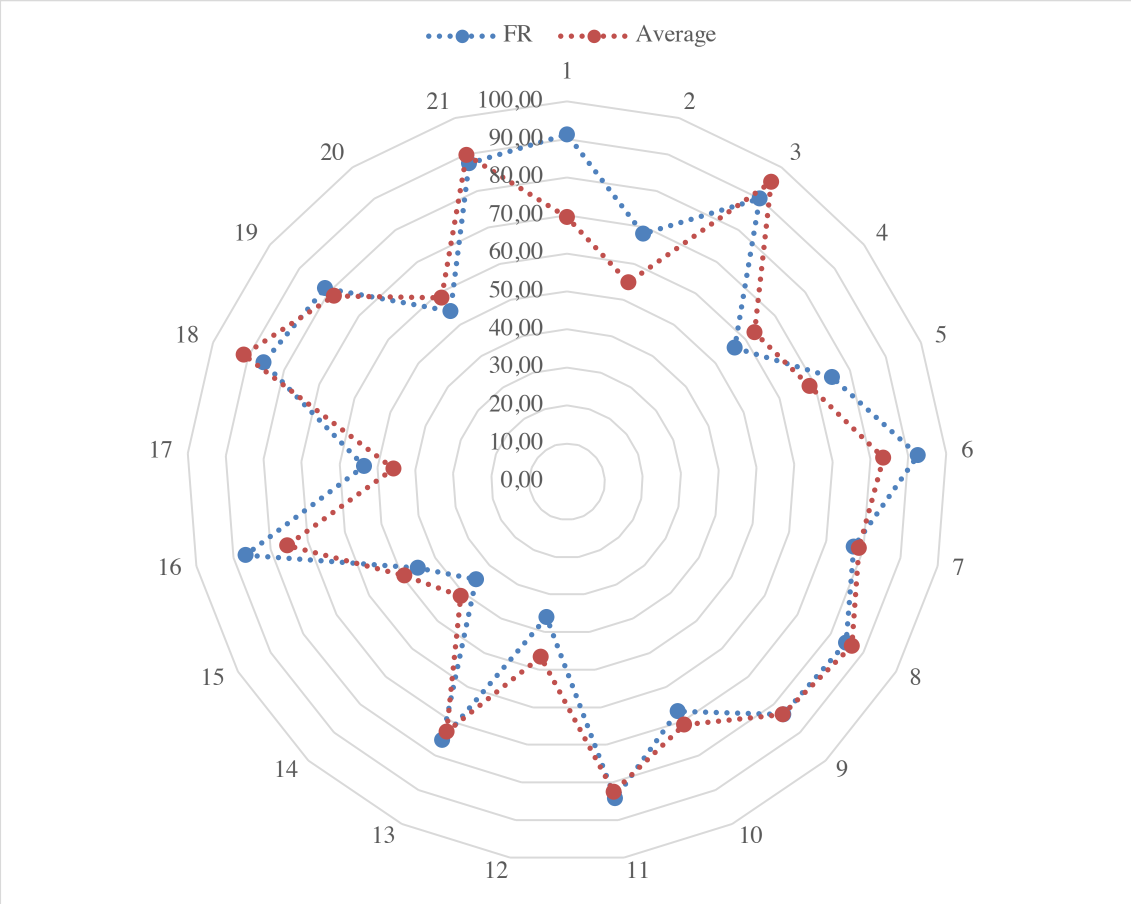
Table 20: Results' chart in % for the canton of Thurgau (9/26) and the average and median scores at the Swiss level

			TG	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	65,00	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	74,24	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	64,02	62,98	62,38
	Political institutions	Local authorities' efficiency	67,83	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	91,78	83,47	89,04
		Regional public authorities' auto-financing capabilities	83,49	78,78	78,19
		Fiscal policy toward firms	92,33	86,55	89,92
		Fiscal policy toward workers	91,11	83,49	87,02
		Average and median earnings	69,47	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	88,26	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	41,60	46,70	41,91
	Factor conditions	Operational infrastructures	82,13	72,96	77,24
		Financial infrastructures	39,24	41,03	39,21
		Innovation effectiveness	36,00	49,30	43,33
		Education and labor-market consistency	61,21	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	93,91	91,32	92,87
	Demand conditions	Sophistication of local demand	91,74	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	65,15	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	91,47	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.10 Fribourg

Figure 15: Radar chart in % for the canton of Fribourg (10/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

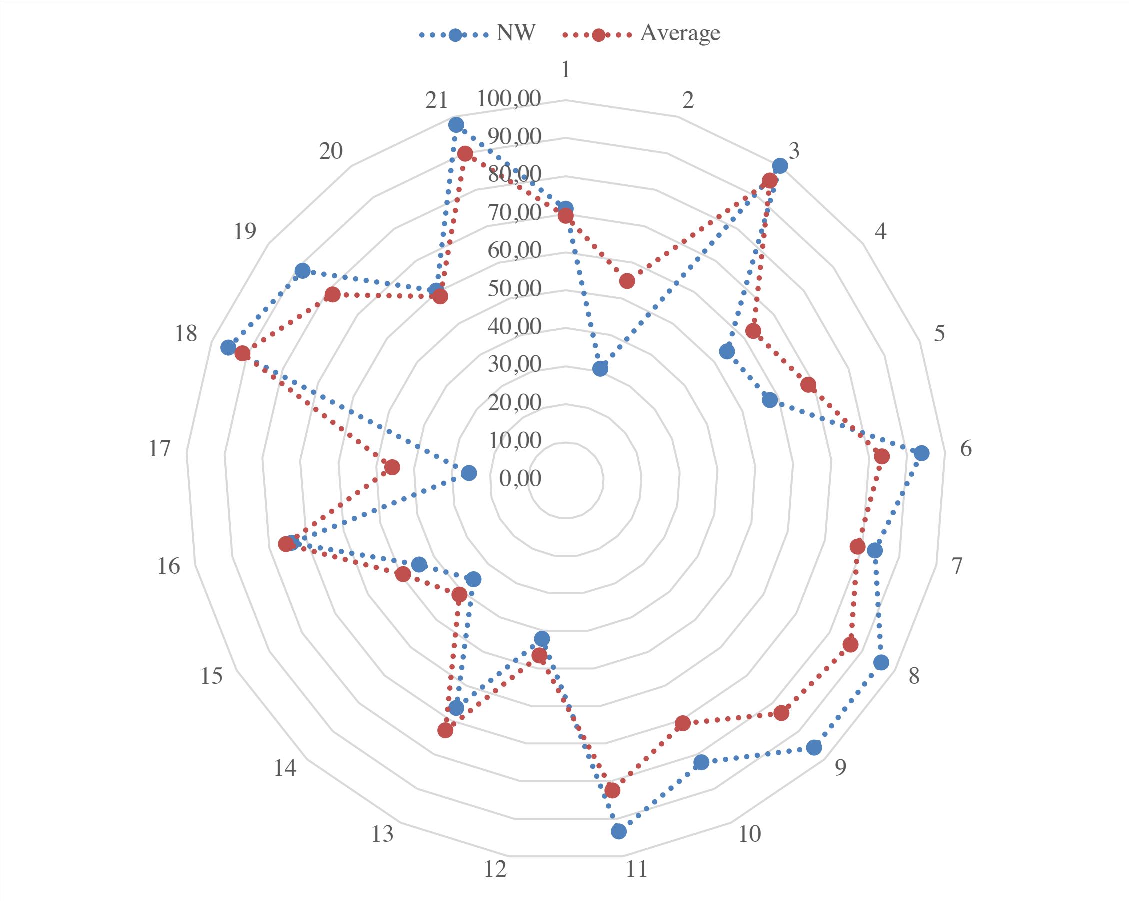
Table 21: Results' chart in % for the canton of Fribourg (10/26) and the average and median scores at the Swiss level

			FR	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	91,33	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	68,16	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	90	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	56,40	62,98	62,38
	Political institutions	Local authorities' efficiency	74,96	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	92,56	83,47	89,04
		Regional public authorities' auto-financing capabilities	77,33	78,78	78,19
		Fiscal policy toward firms	84,72	86,55	89,92
		Fiscal policy toward workers	83,54	83,49	87,02
		Average and median earnings	67,00	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	84,32	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	36,10	46,70	41,91
	Factor conditions	Operational infrastructures	75,53	72,96	77,24
		Financial infrastructures	35,22	41,03	39,21
		Innovation effectiveness	45,36	49,30	43,33
		Education and labor-market consistency	86,73	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	53,49	45,78	43,54
		Availability of specialized research & training	85,75	91,32	92,87
	Demand conditions	Sophistication of local demand	81,45	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	54,25	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	87,65	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.11 Nidwalden

Figure 16: Radar chart in % for the canton of Nidwalden (11/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

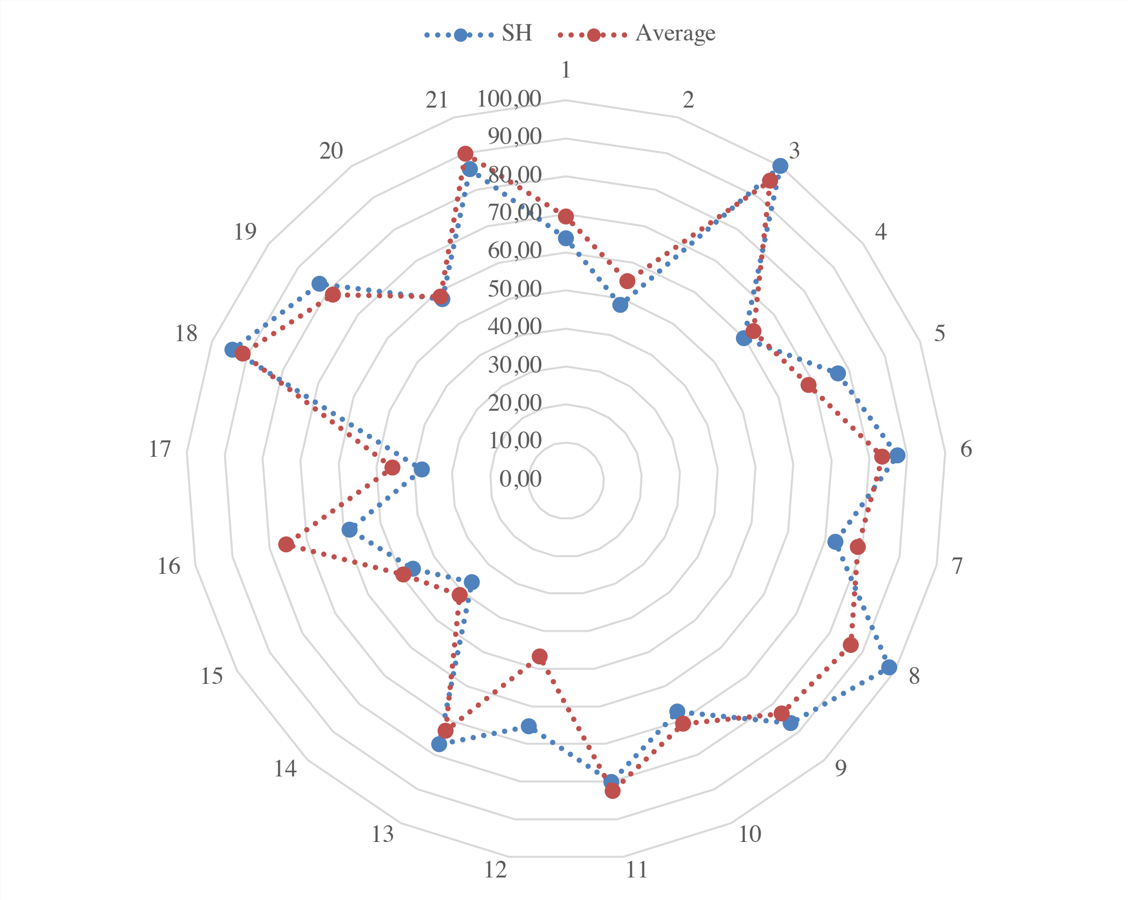
Table 22: Results' chart in % for the canton of Nidwalden (11/26) and the average and median scores at the Swiss level

			NW	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	71,33	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	30,65	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	54,27	62,98	62,38
	Political institutions	Local authorities' efficiency	57,62	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	93,79	83,47	89,04
		Regional public authorities' auto-financing capabilities	83,34	78,78	78,19
		Fiscal policy toward firms	95,83	86,55	89,92
		Fiscal policy toward workers	95,93	83,49	87,02
		Average and median earnings	82,35	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	93,51	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	42,22	46,70	41,91
	Factor conditions	Operational infrastructures	66,41	72,96	77,24
		Financial infrastructures	35,55	41,03	39,21
		Innovation effectiveness	44,57	49,30	43,33
		Education and labor-market consistency	73,93	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	95,29	91,32	92,87
	Demand conditions	Sophistication of local demand	88,41	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	60,26	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	97,74	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.12 Schaffhausen

Figure 17: Radar chart in % for the canton of Schaffhausen (12/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

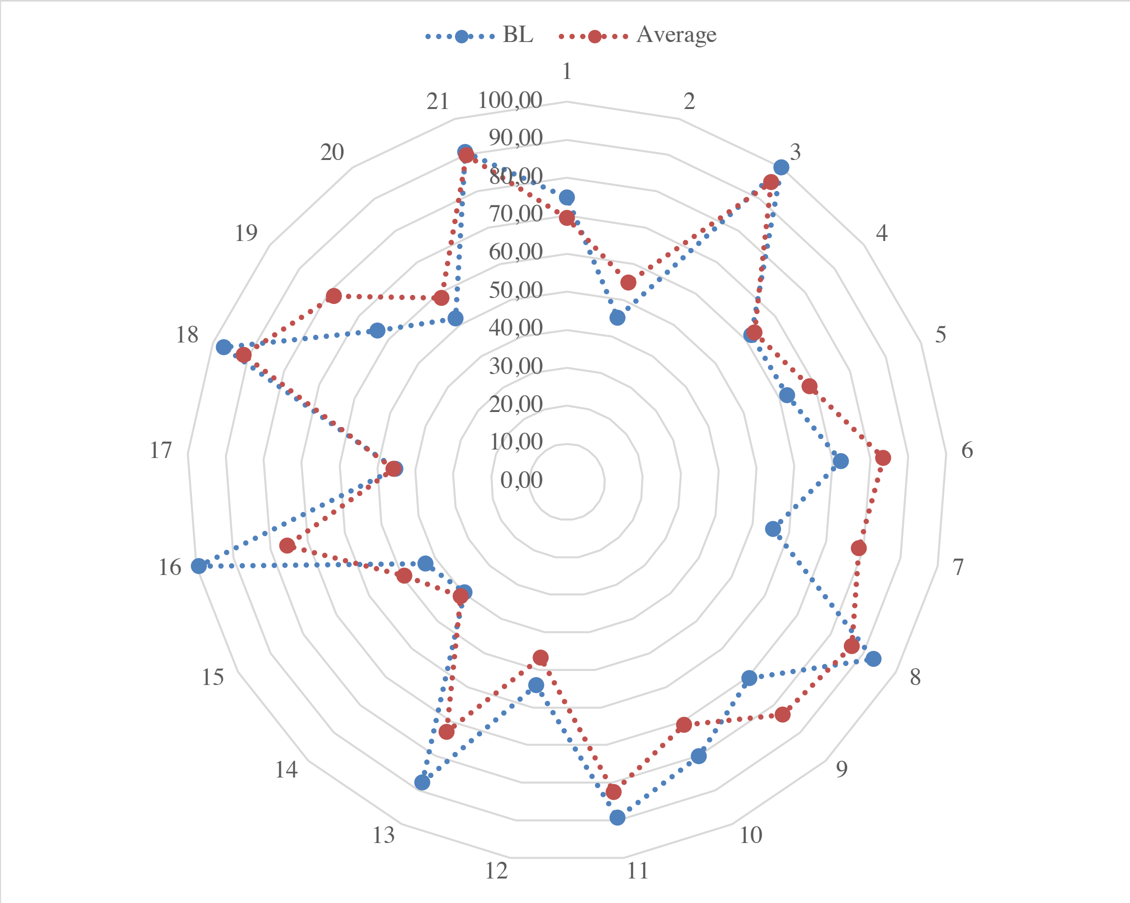
Table 23: Results' chart in % for the canton of Schaffhausen (12/26) and the average and median scores at the Swiss level

			SH	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	63,67	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	48,38	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	59,95	62,98	62,38
	Political institutions	Local authorities' efficiency	76,88	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	87,38	83,47	89,04
		Regional public authorities' auto-financing capabilities	72,66	78,78	78,19
		Fiscal policy toward firms	98,17	86,55	89,92
		Fiscal policy toward workers	86,99	83,49	87,02
		Average and median earnings	67,41	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	80,08	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	65,33	46,70	41,91
	Factor conditions	Operational infrastructures	76,96	72,96	77,24
		Financial infrastructures	36,39	41,03	39,21
		Innovation effectiveness	46,45	49,30	43,33
		Education and labor-market consistency	58,40	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	38,00	45,78	43,54
		Availability of specialized research & training	94,14	91,32	92,87
	Demand conditions	Sophistication of local demand	82,90	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	57,65	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	85,74	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.13 Basel-Land

Figure 18: Radar chart in % for the canton of Basel-Land (13/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

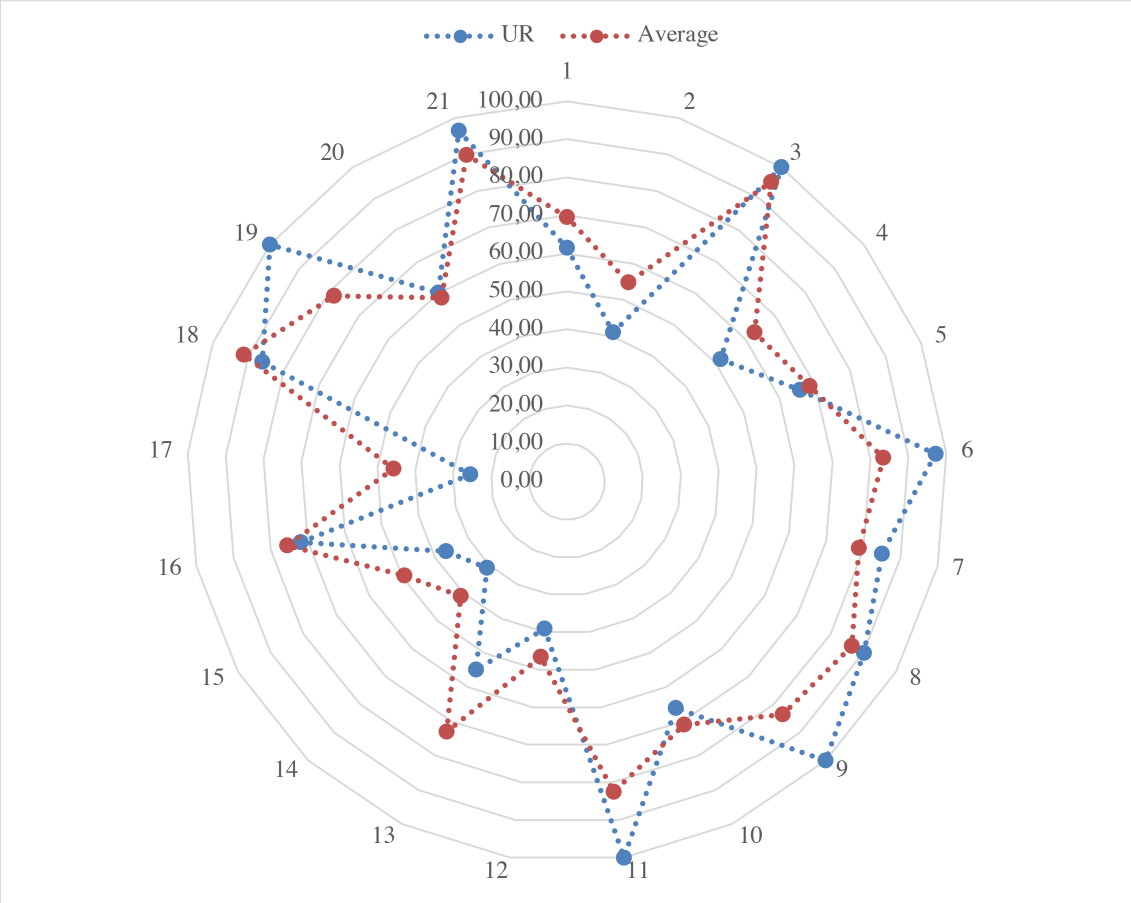
Table 24: Results' chart in % for the canton of Basel-Land (13/26) and the average and median scores at the Swiss level

			BL	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	74,83	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	45,21	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	61,92	62,98	62,38
	Political institutions	Local authorities' efficiency	62,26	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	72,24	83,47	89,04
		Regional public authorities' auto-financing capabilities	55,57	78,78	78,19
		Fiscal policy toward firms	93,06	86,55	89,92
		Fiscal policy toward workers	70,48	83,49	87,02
		Average and median earnings	80,13	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	89,42	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	54,10	46,70	41,91
	Factor conditions	Operational infrastructures	87,80	72,96	77,24
		Financial infrastructures	39,71	41,03	39,21
		Innovation effectiveness	43,04	49,30	43,33
		Education and labor-market consistency	99,34	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	45,19	45,78	43,54
		Availability of specialized research & training	97,01	91,32	92,87
	Demand conditions	Sophistication of local demand	63,77	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	51,98	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	90,76	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.14 Uri

Figure 19: Radar chart in % for the canton of Uri (14/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

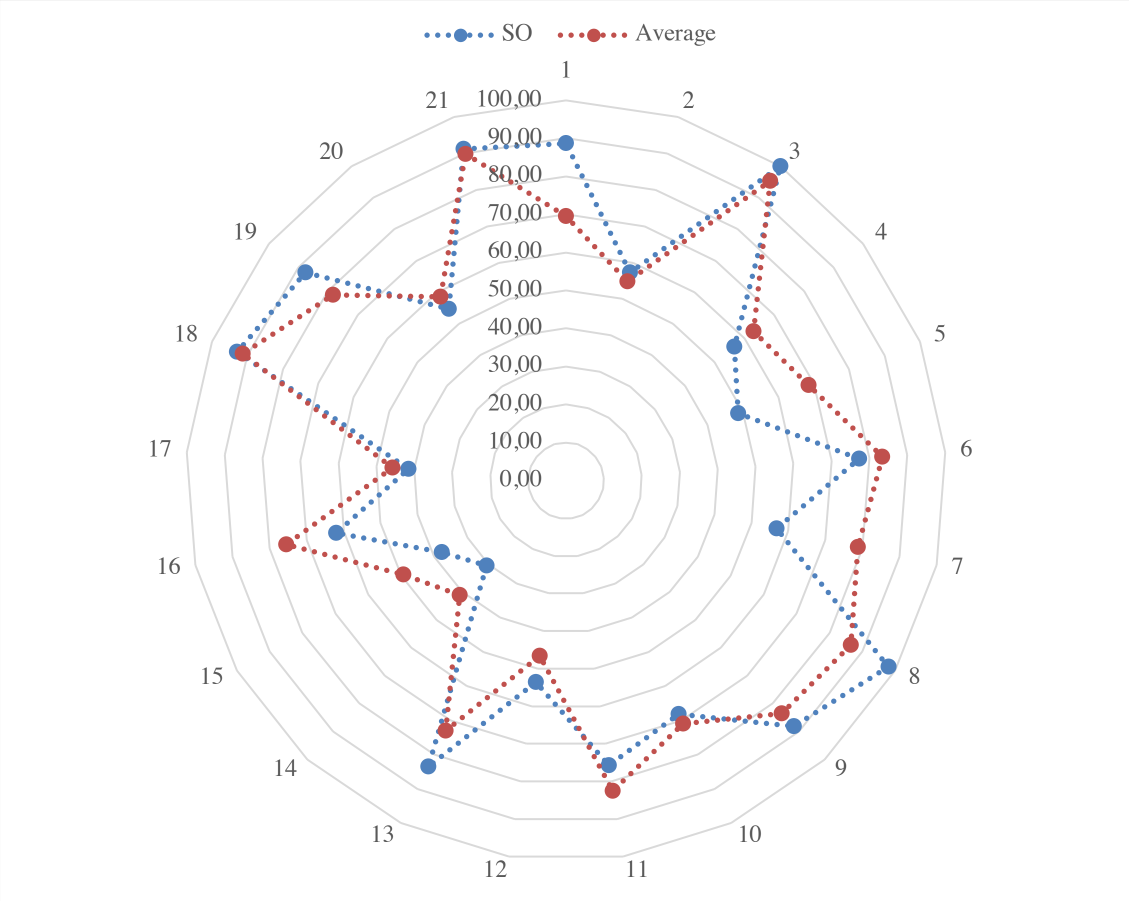
Table 25: Results' chart in % for the canton of Uri (14/26) and the average and median scores at the Swiss level

			UR	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	61,50	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	41,12	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	51,62	62,98	62,38
	Political institutions	Local authorities' efficiency	65,86	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	97,16	83,47	89,04
		Regional public authorities' auto-financing capabilities	85,02	78,78	78,19
		Fiscal policy toward firms	90,28	86,55	89,92
		Fiscal policy toward workers	100,00	83,49	87,02
		Average and median earnings	66,12	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	100,00	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	39,22	46,70	41,91
	Factor conditions	Operational infrastructures	54,99	72,96	77,24
		Financial infrastructures	30,92	41,03	39,21
		Innovation effectiveness	36,65	49,30	43,33
		Education and labor-market consistency	71,81	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	86,09	91,32	92,87
	Demand conditions	Sophistication of local demand	100,00	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	60,17	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	96,49	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.15 Solothurn

Figure 20: Radar chart in % for the canton of Solothurn (15/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

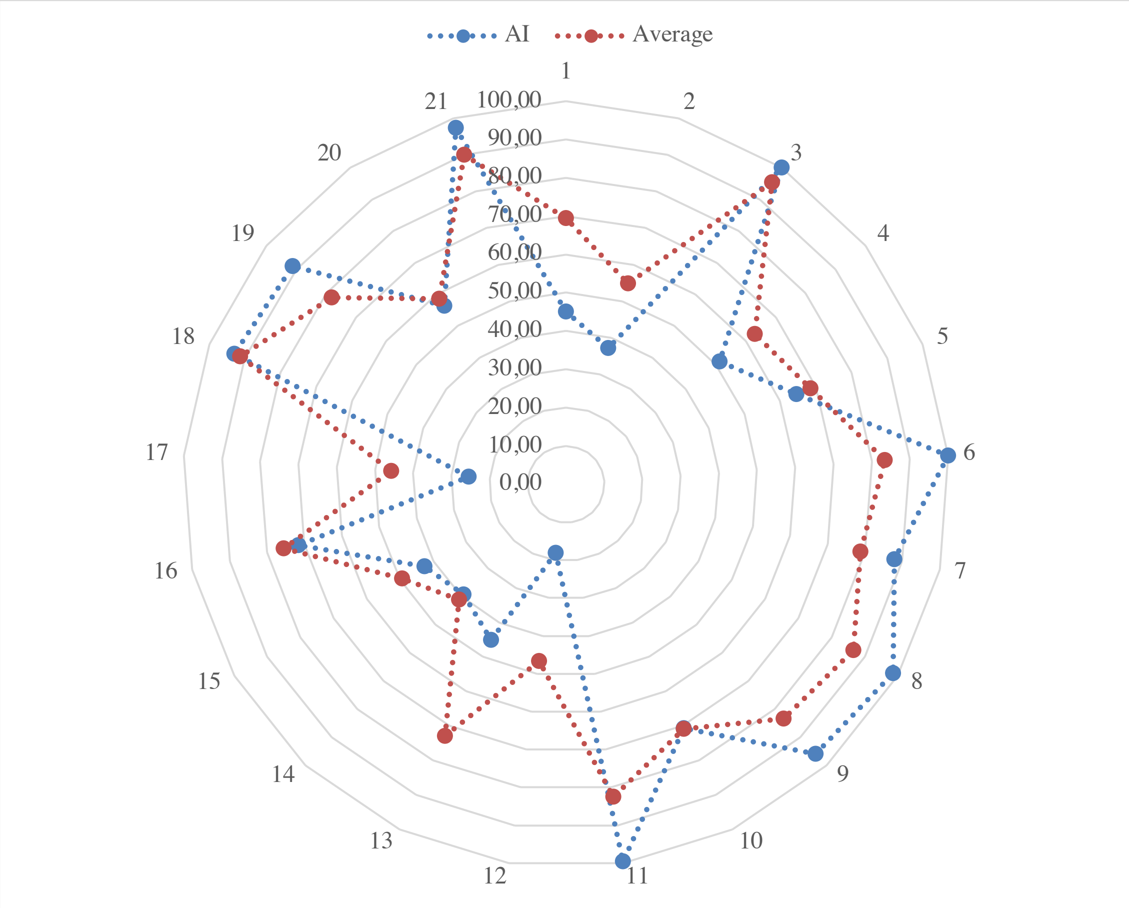
Table 26: Results' chart in % for the canton of Solothurn (15/26) and the average and median scores at the Swiss level

			SO	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	88,67	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	57,27	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	56,55	62,98	62,38
	Political institutions	Local authorities' efficiency	48,60	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	77,24	83,47	89,04
		Regional public authorities' auto-financing capabilities	56,85	78,78	78,19
		Fiscal policy toward firms	97,89	86,55	89,92
		Fiscal policy toward workers	88,06	83,49	87,02
		Average and median earnings	68,22	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	75,68	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	53,62	46,70	41,91
	Factor conditions	Operational infrastructures	83,52	72,96	77,24
		Financial infrastructures	30,62	41,03	39,21
		Innovation effectiveness	37,71	49,30	43,33
		Education and labor-market consistency	61,94	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	41,57	45,78	43,54
		Availability of specialized research & training	92,87	91,32	92,87
	Demand conditions	Sophistication of local demand	87,68	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	54,56	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	91,35	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.16 Appenzell Innerrhoden

Figure 21: Radar chart in % for the canton of Appenzell Innerrhoden (16/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

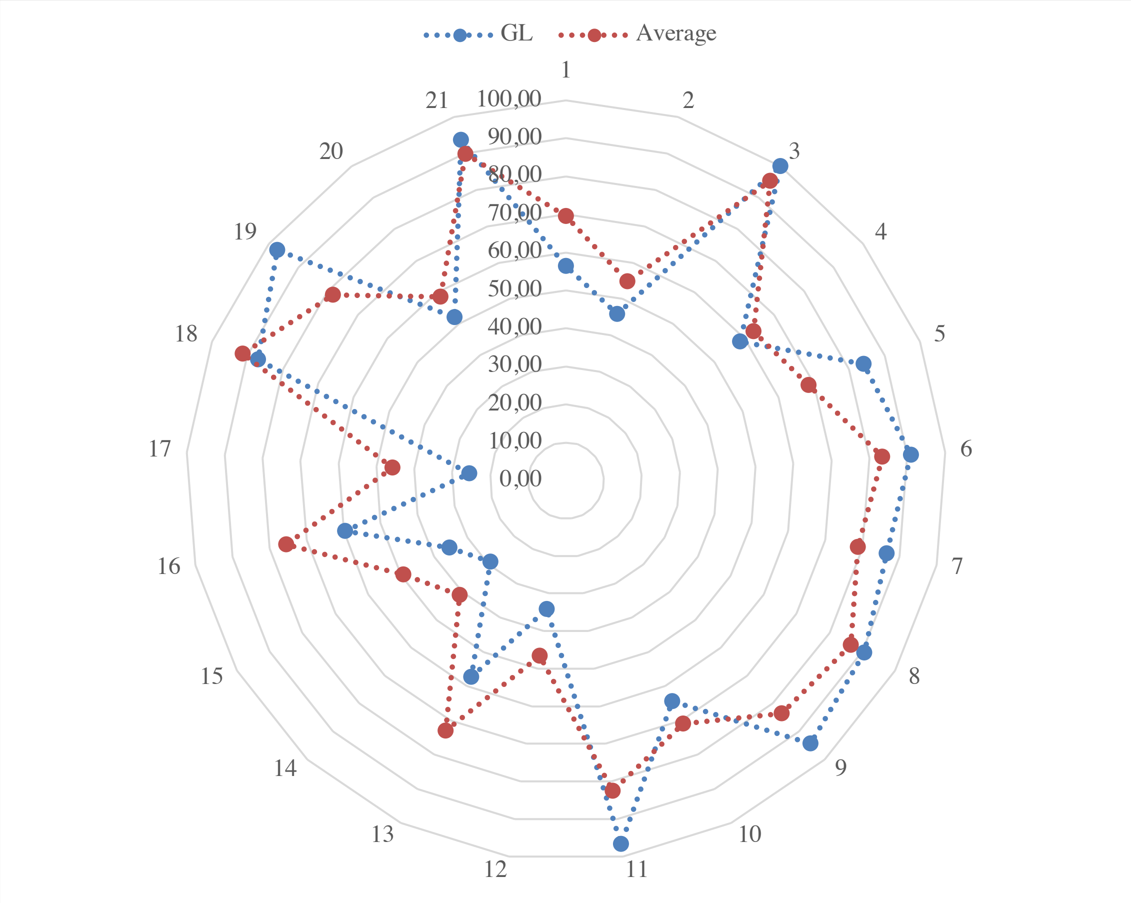
Table 27: Results' chart in % for the canton of Appenzell Innerrhoden (16/26) and the average and median scores at the Swiss level

			AI	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	45,00	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	37,21	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	51,32	62,98	62,38
	Political institutions	Local authorities' efficiency	64,60	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	100,00	83,47	89,04
		Regional public authorities' auto-financing capabilities	87,96	78,78	78,19
		Fiscal policy toward firms	98,61	86,55	89,92
		Fiscal policy toward workers	95,89	83,49	87,02
		Average and median earnings	70,70	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	99,61	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	18,03	46,70	41,91
	Factor conditions	Operational infrastructures	45,11	72,96	77,24
		Financial infrastructures	39,19	41,03	39,21
		Innovation effectiveness	42,67	49,30	43,33
		Education and labor-market consistency	71,66	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	92,99	91,32	92,87
	Demand conditions	Sophistication of local demand	91,30	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	56,32	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	97,26	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.17 Glarus

Figure 22: Radar chart in % for the canton of Glarus (17/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

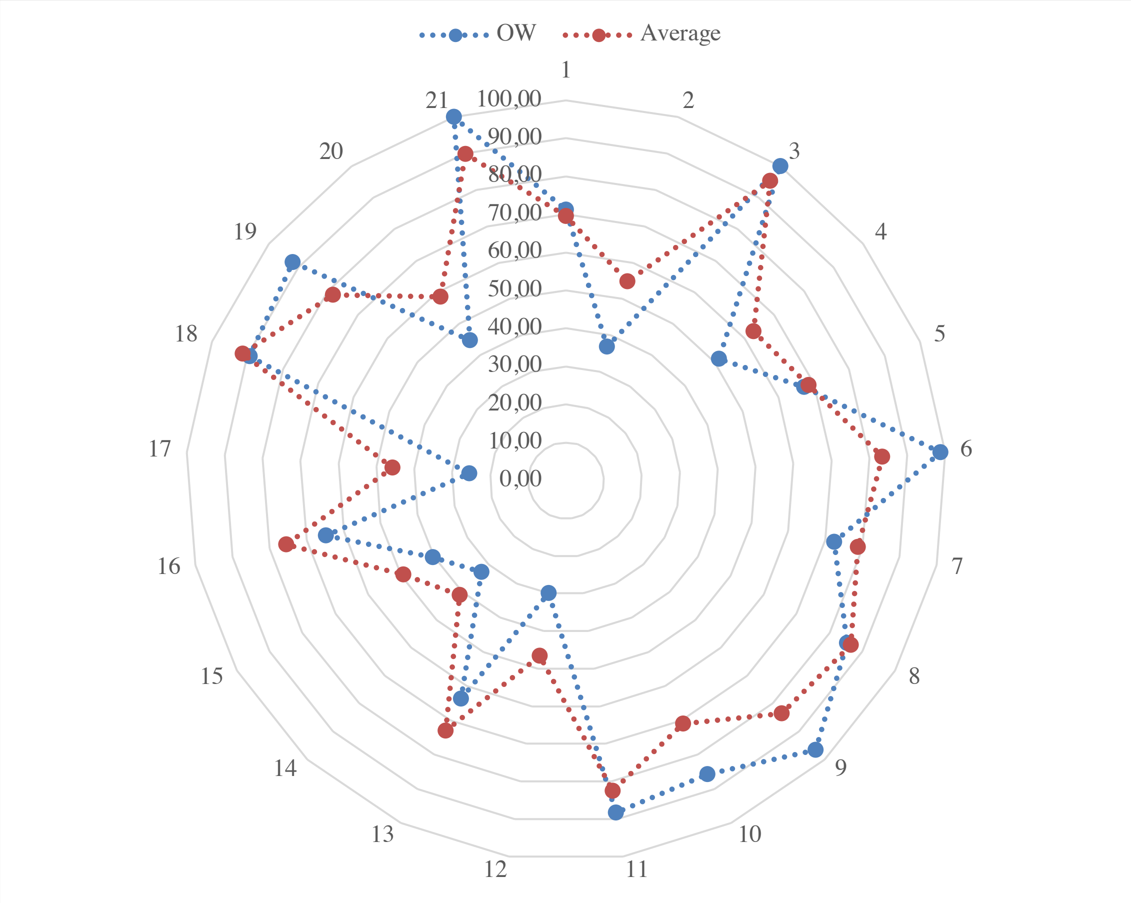
Table 28: Results' chart in % for the canton of Glarus (17/26) and the average and median scores at the Swiss level

			GL	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	56,33	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	45,73	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	58,58	62,98	62,38
	Political institutions	Local authorities' efficiency	84,02	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	90,93	83,47	89,04
		Regional public authorities' auto-financing capabilities	86,49	78,78	78,19
		Fiscal policy toward firms	90,67	86,55	89,92
		Fiscal policy toward workers	94,44	83,49	87,02
		Average and median earnings	64,36	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	96,68	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	34,14	46,70	41,91
	Factor conditions	Operational infrastructures	57,28	72,96	77,24
		Financial infrastructures	29,16	41,03	39,21
		Innovation effectiveness	35,37	49,30	43,33
		Education and labor-market consistency	59,52	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	87,01	91,32	92,87
	Demand conditions	Sophistication of local demand	97,10	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	52,01	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	93,69	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.18 Obwalden

Figure 23: Radar chart in % for the canton of Obwalden (18/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

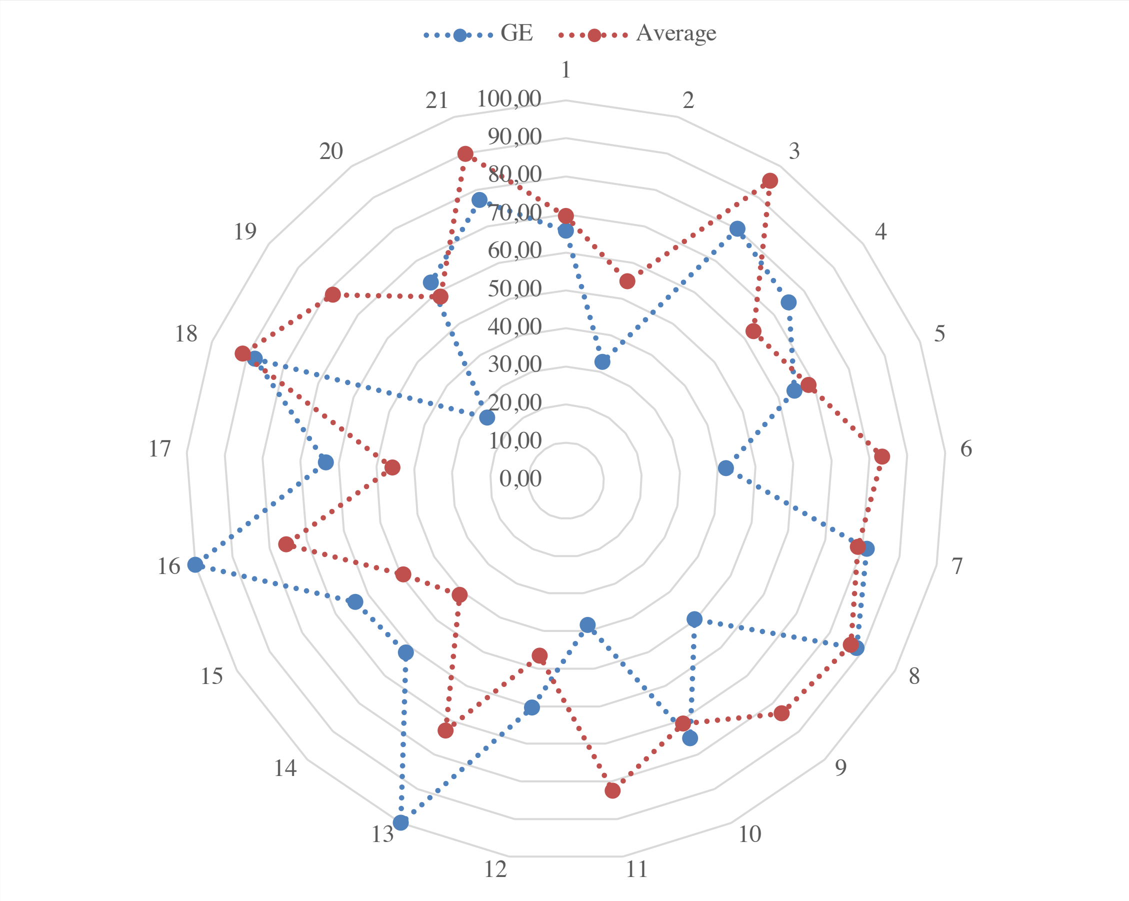
Table 29: Results' chart in % for the canton of Obwalden (18/26) and the average and median scores at the Swiss level

			OW	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	71,17	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	36,80	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	51,44	62,98	62,38
	Political institutions	Local authorities' efficiency	67,32	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	98,80	83,47	89,04
		Regional public authorities' auto-financing capabilities	72,41	78,78	78,19
		Fiscal policy toward firms	85,39	86,55	89,92
		Fiscal policy toward workers	96,63	83,49	87,02
		Average and median earnings	85,72	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	88,34	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	30,03	46,70	41,91
	Factor conditions	Operational infrastructures	63,61	72,96	77,24
		Financial infrastructures	32,75	41,03	39,21
		Innovation effectiveness	40,48	49,30	43,33
		Education and labor-market consistency	64,69	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	89,43	91,32	92,87
	Demand conditions	Sophistication of local demand	92,03	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	44,70	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	100,00	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.19 Geneva

Figure 24: Radar chart in % for the canton of Geneva (19/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

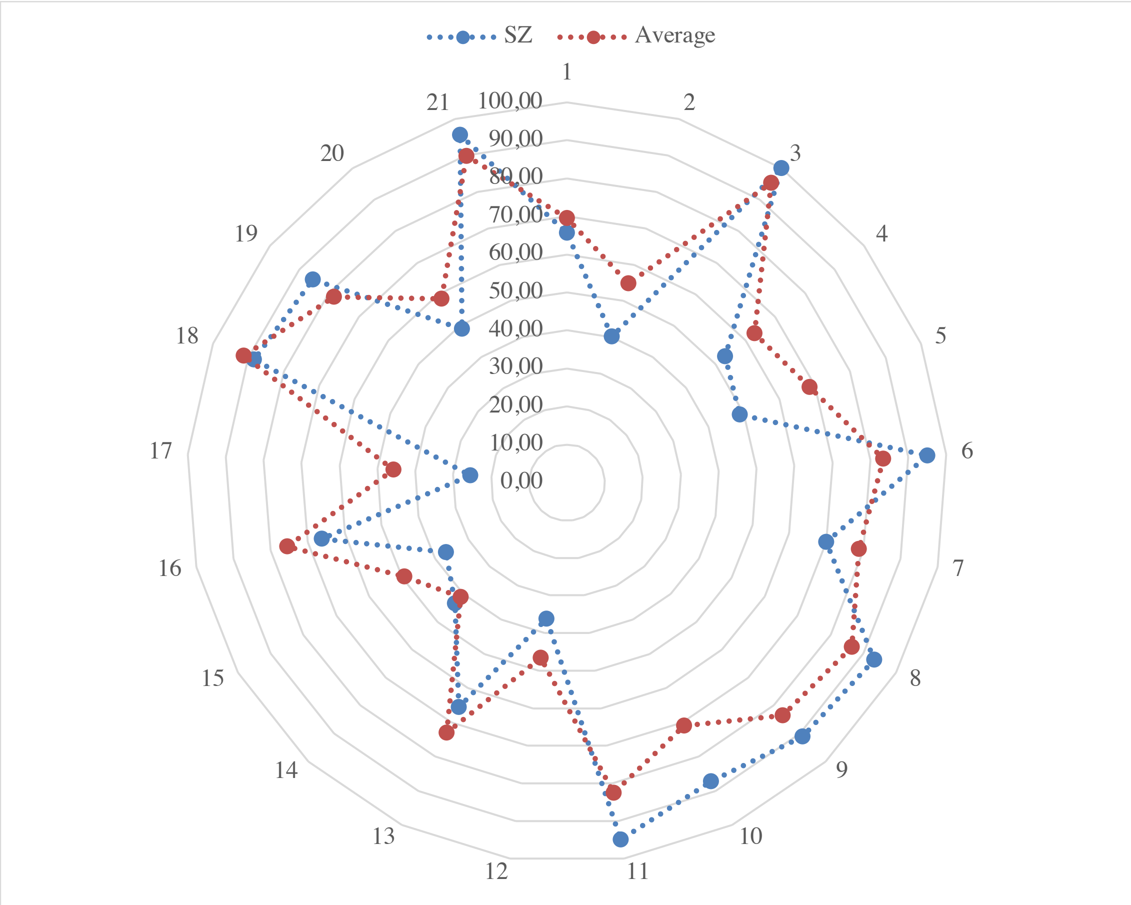
Table 30: Results' chart in % for the canton of Geneva (19/26) and the average and median scores at the Swiss level

			GE	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	65,67	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	32,66	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	80	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	75,00	62,98	62,38
	Political institutions	Local authorities' efficiency	64,59	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	42,23	83,47	89,04
		Regional public authorities' auto-financing capabilities	81,14	78,78	78,19
		Fiscal policy toward firms	88,17	86,55	89,92
		Fiscal policy toward workers	49,73	83,49	87,02
		Average and median earnings	75,20	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	38,38	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	60,42	46,70	41,91
	Factor conditions	Operational infrastructures	100,00	72,96	77,24
		Financial infrastructures	61,85	41,03	39,21
		Innovation effectiveness	63,90	49,30	43,33
		Education and labor-market consistency	100,00	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	63,37	45,78	43,54
		Availability of specialized research & training	87,82	91,32	92,87
	Demand conditions	Sophistication of local demand	26,38	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	63,05	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	77,10	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.20 Schwyz

Figure 25: Radar chart in % for the canton of Schwyz (20/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

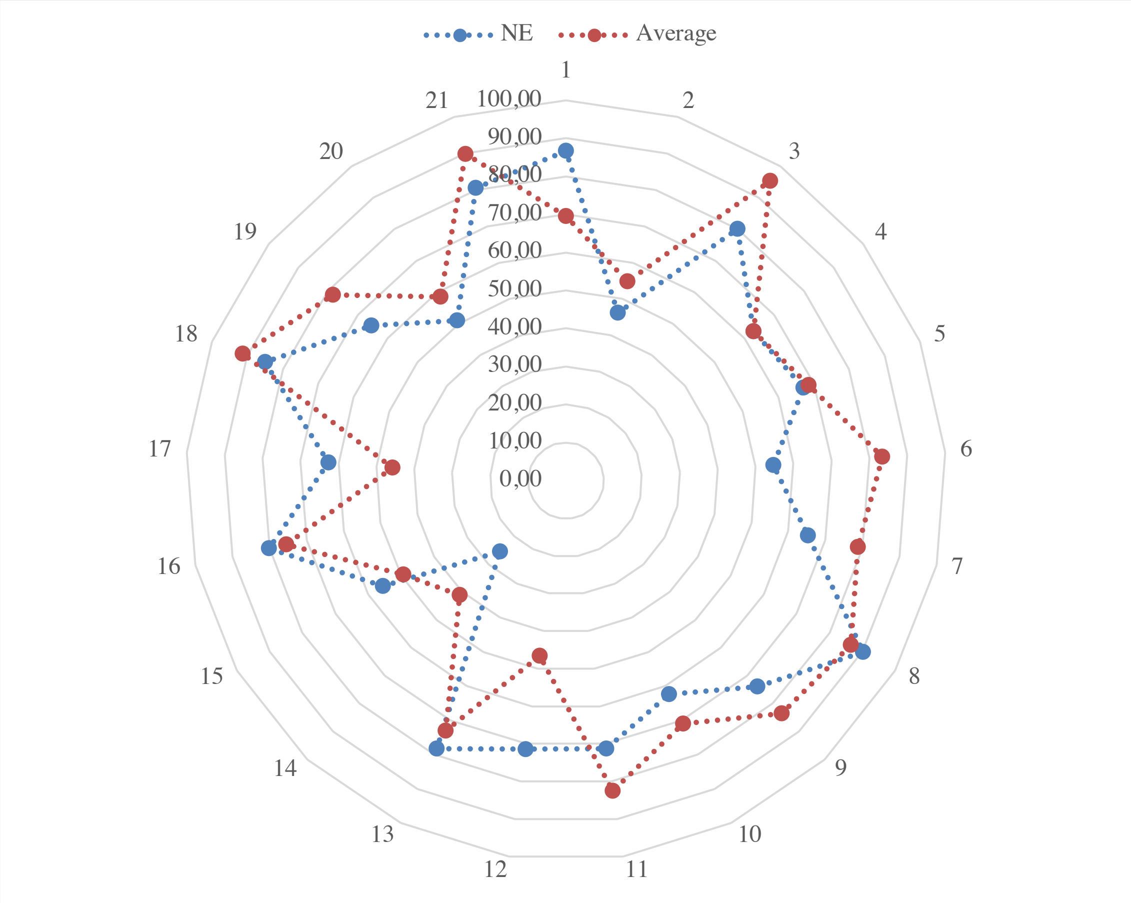
Table 31: Results' chart in % for the canton of Schwyz (20/26) and the average and median scores at the Swiss level

			SZ	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	65,67	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	40,16	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	53,09	62,98	62,38
	Political institutions	Local authorities' efficiency	48,83	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	95,10	83,47	89,04
		Regional public authorities' auto-financing capabilities	69,94	78,78	78,19
		Fiscal policy toward firms	93,33	86,55	89,92
		Fiscal policy toward workers	91,18	83,49	87,02
		Average and median earnings	87,23	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	94,98	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	36,29	46,70	41,91
	Factor conditions	Operational infrastructures	65,61	72,96	77,24
		Financial infrastructures	43,42	41,03	39,21
		Innovation effectiveness	36,67	49,30	43,33
		Education and labor-market consistency	66,21	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	88,39	91,32	92,87
	Demand conditions	Sophistication of local demand	85,51	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	48,91	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	95,65	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.21 Neuchâtel

Figure 26: Radar chart in % for the canton of Neuchâtel (21/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

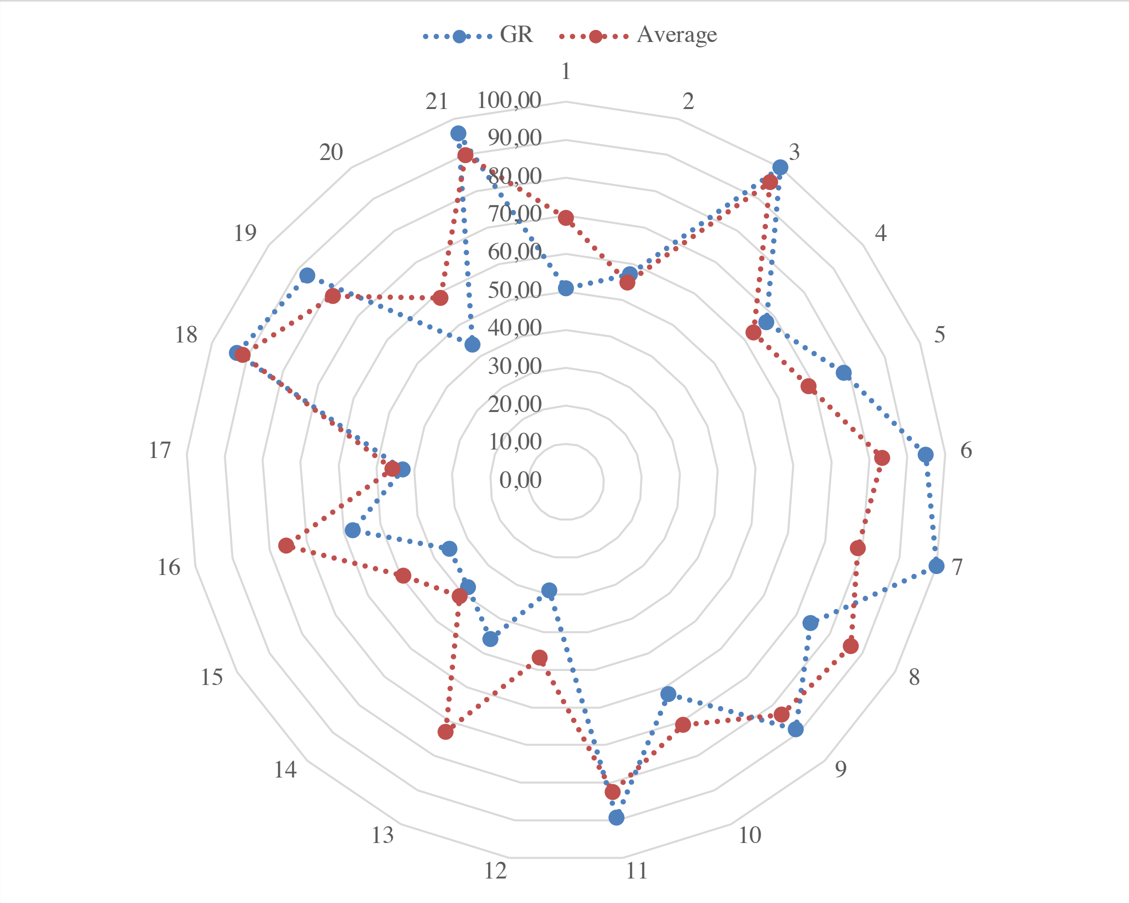
Table 32: Results' chart in % for the canton of Neuchâtel (21/26) and the average and median scores at the Swiss level

			NE	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	86,67	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	46,23	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	80	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	63,02	62,98	62,38
	Political institutions	Local authorities' efficiency	67,08	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	54,69	83,47	89,04
		Regional public authorities' auto-financing capabilities	65,26	78,78	78,19
		Fiscal policy toward firms	90,28	86,55	89,92
		Fiscal policy toward workers	73,98	83,49	87,02
		Average and median earnings	62,45	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	71,27	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	71,40	46,70	41,91
	Factor conditions	Operational infrastructures	78,34	72,96	77,24
		Financial infrastructures	25,50	41,03	39,21
		Innovation effectiveness	55,56	49,30	43,33
		Education and labor-market consistency	80,19	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	62,58	45,78	43,54
		Availability of specialized research & training	85,06	91,32	92,87
	Demand conditions	Sophistication of local demand	65,36	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	50,88	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	80,44	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.22 Graubünden

Figure 27: Radar chart in % for the canton of Graubünden (22/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

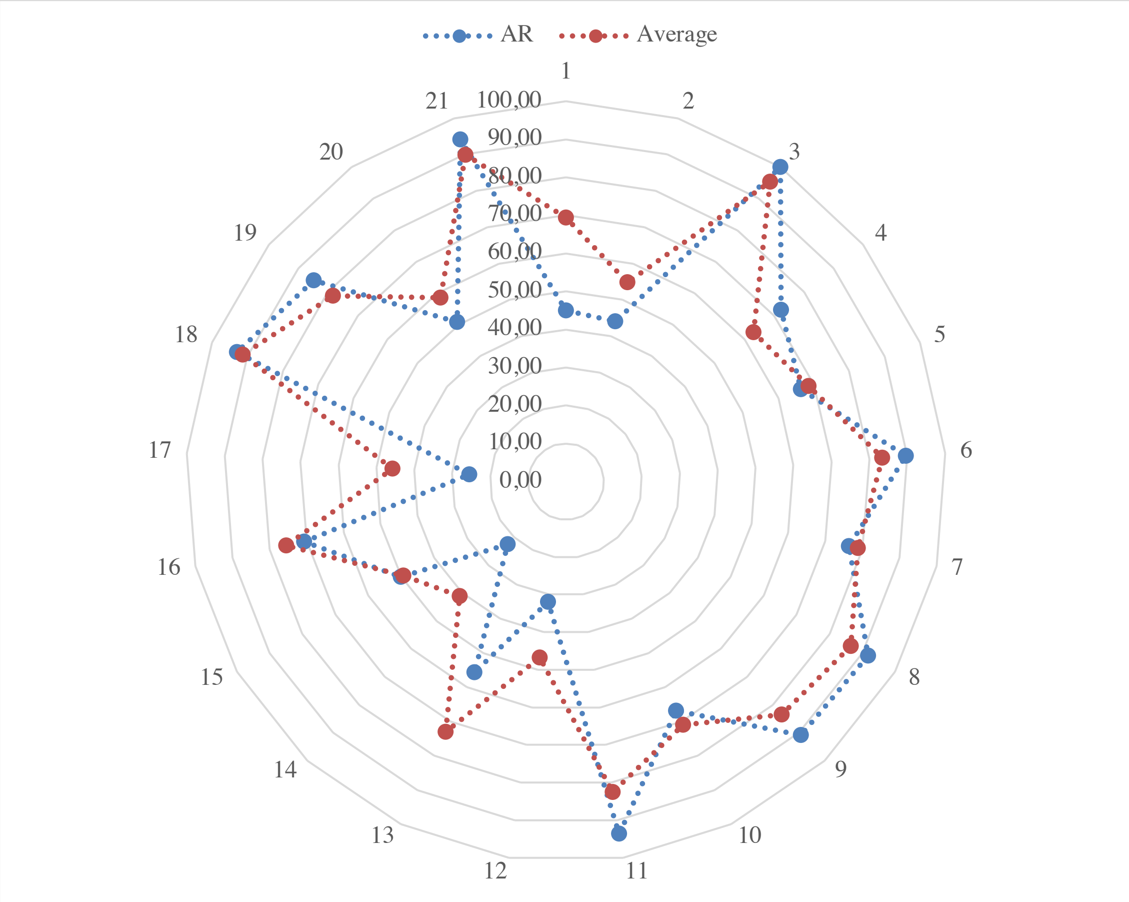
Table 33: Results' chart in % for the canton of Graubünden (22/26) and the average and median scores at the Swiss level

			GR	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	50,83	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	57,15	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	67,32	62,98	62,38
	Political institutions	Local authorities' efficiency	78,43	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	94,95	83,47	89,04
		Regional public authorities' auto-financing capabilities	100,00	78,78	78,19
		Fiscal policy toward firms	74,28	86,55	89,92
		Fiscal policy toward workers	88,87	83,49	87,02
		Average and median earnings	62,04	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	89,27	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	28,98	46,70	41,91
	Factor conditions	Operational infrastructures	45,85	72,96	77,24
		Financial infrastructures	37,85	41,03	39,21
		Innovation effectiveness	35,28	49,30	43,33
		Education and labor-market consistency	57,53	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	43,11	45,78	43,54
		Availability of specialized research & training	92,87	91,32	92,87
	Demand conditions	Sophistication of local demand	86,96	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	43,59	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	95,83	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.23 Appenzell Ausserrhoden

Figure 28: Radar chart in % for the canton of Appenzell Ausserrhoden (23/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

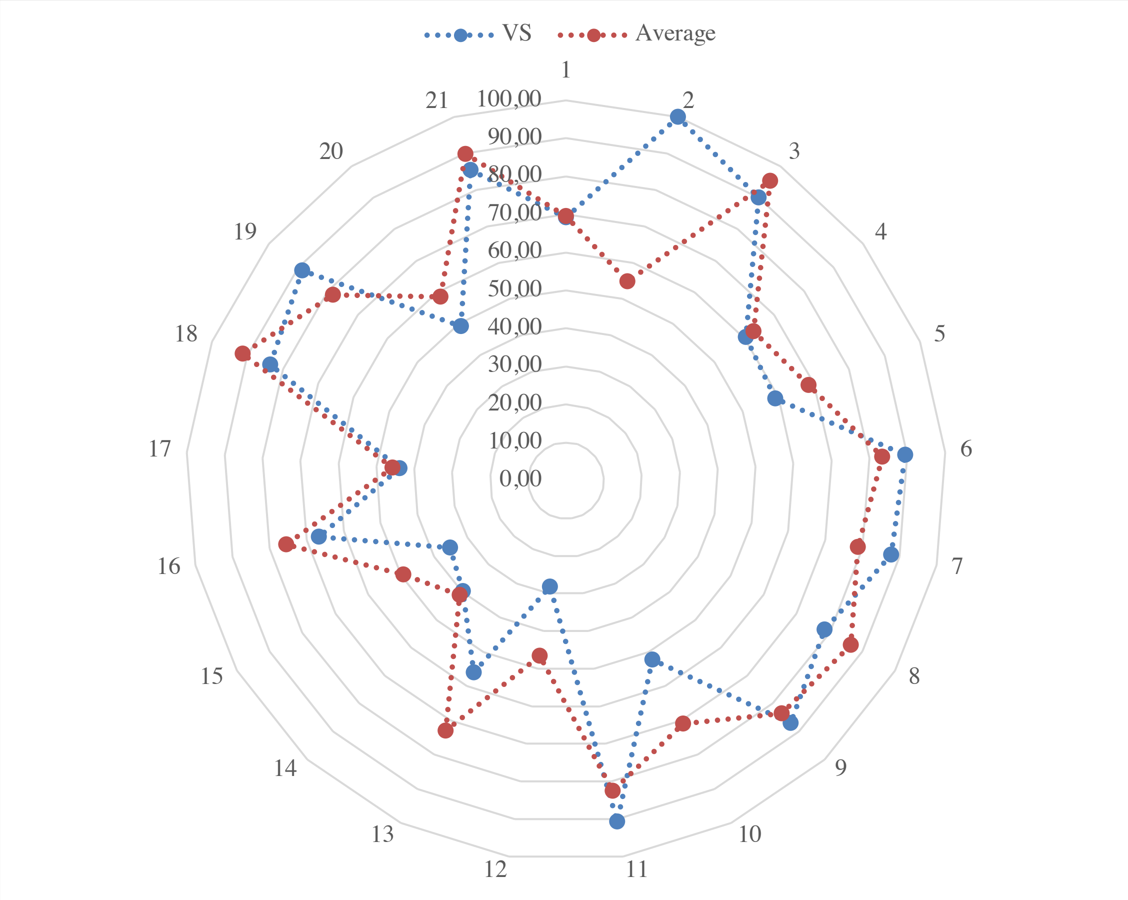
Table 34: Results' chart in % for the canton of Appenzell Ausserrhoden (23/26) and the average and median scores at the Swiss level

			AR	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	45,00	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	44,05	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	100	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	72,38	62,98	62,38
	Political institutions	Local authorities' efficiency	66,41	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	89,63	83,47	89,04
		Regional public authorities' auto-financing capabilities	76,28	78,78	78,19
		Fiscal policy toward firms	91,67	86,55	89,92
		Fiscal policy toward workers	90,81	83,49	87,02
		Average and median earnings	66,83	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	93,67	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	32,01	46,70	41,91
	Factor conditions	Operational infrastructures	55,62	72,96	77,24
		Financial infrastructures	22,49	41,03	39,21
		Innovation effectiveness	50,23	49,30	43,33
		Education and labor-market consistency	70,69	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	25,50	45,78	43,54
		Availability of specialized research & training	92,99	91,32	92,87
	Demand conditions	Sophistication of local demand	84,78	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	50,77	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	94,15	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.24 Valais

Figure 29: Radar chart in % for the canton of Valais (24/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

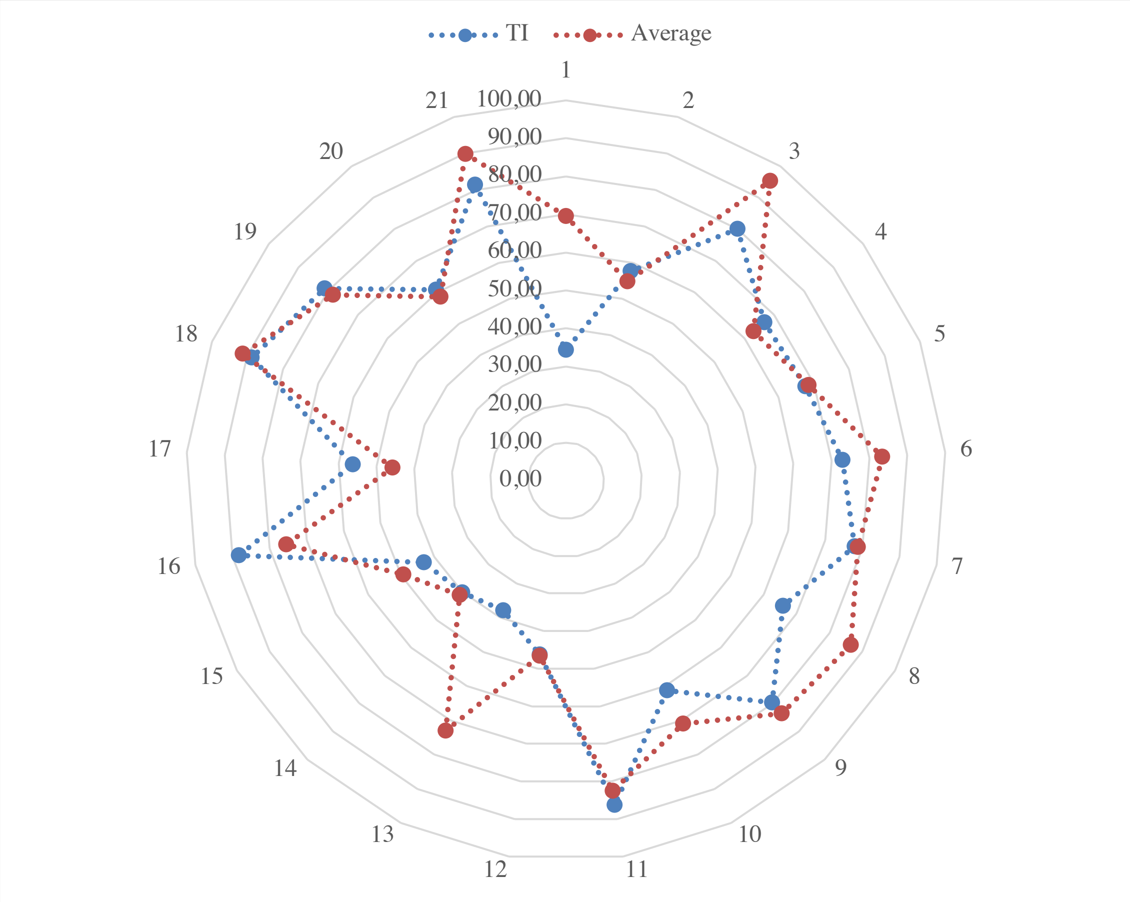
Table 35: Results' chart in % for the canton of Valais (24/26) and the average and median scores at the Swiss level

			VS	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	69,17	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	100,00	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	90	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	60,42	62,98	62,38
	Political institutions	Local authorities' efficiency	59,14	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	89,45	83,47	89,04
		Regional public authorities' auto-financing capabilities	87,77	78,78	78,19
		Fiscal policy toward firms	78,44	86,55	89,92
		Fiscal policy toward workers	86,92	83,49	87,02
		Average and median earnings	52,27	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	90,73	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	28,19	46,70	41,91
	Factor conditions	Operational infrastructures	56,05	72,96	77,24
		Financial infrastructures	39,79	41,03	39,21
		Innovation effectiveness	35,23	49,30	43,33
		Education and labor-market consistency	66,58	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	43,97	45,78	43,54
		Availability of specialized research & training	83,56	91,32	92,87
	Demand conditions	Sophistication of local demand	88,70	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	49,10	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	85,39	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.25 Ticino

Figure 30: Radar chart in % for the canton of Ticino (25/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

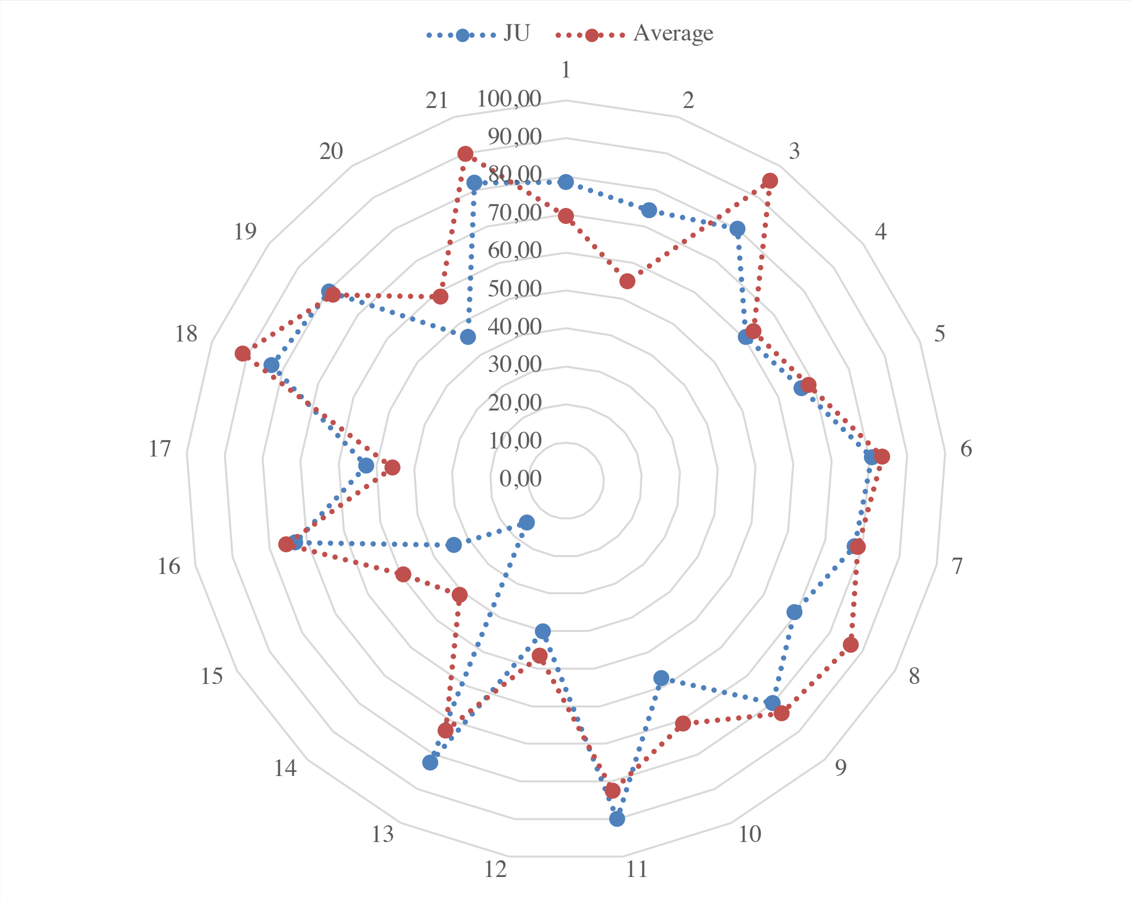
Table 36: Results' chart in % for the canton of Ticino (25/26) and the average and median scores at the Swiss level

			TI	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	34,33	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	57,55	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	80	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	66,83	62,98	62,38
	Political institutions	Local authorities' efficiency	67,70	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	72,97	83,47	89,04
		Regional public authorities' auto-financing capabilities	77,83	78,78	78,19
		Fiscal policy toward firms	65,94	86,55	89,92
		Fiscal policy toward workers	79,61	83,49	87,02
		Average and median earnings	61,29	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	86,25	82,53	87,95
Microlevel	**Firms' strategy and internationaliz ation**	MNEs' competition effectiveness	46,31	46,70	41,91
	Factor conditions	Operational infrastructures	37,98	72,96	77,24
		Financial infrastructures	40,15	41,03	39,21
		Innovation effectiveness	43,08	49,30	43,33
		Education and labor-market consistency	88,24	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	56,30	45,78	43,54
		Availability of specialized research & training	88,74	91,32	92,87
	Demand conditions	Sophistication of local demand	81,16	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	60,74	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	81,35	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.2.26 Jura

Figure 31: Radar chart in % for the canton of Jura (26/26) and the average scores at the Swiss level



Note: 1) Relatedness to the capital city; 2) Availability of expendable land; 3) Cultural distance to central government; 4) Health; 5) Political institutions; 6) Regional public finances' soundness and public funds spending efficiency; 7) Regional public authorities' auto-financing capabilities; 8) Fiscal policy toward firms; 9) Fiscal policy toward workers; 10) Average and median earnings; 11) State of order; 12) Firms' strategy and internationalization; 13) Operational infrastructures; 14) Financial infrastructures; 15) Innovation effectiveness; 16) Education and labor-market consistency; 17) Superior schools and research institutions' quality and dynamics; 18) Availability of specialized research & training; 19) Demand conditions; 20) Cluster development and specialization; 21) Context for strategy and rivalry.

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Table 37: Results' chart in % for the canton of Jura (26/26) and the average and median scores at the Swiss level

			JU	Average	Median
Endowments	**Relatedness to the capital city**	Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	78,50	69,47	70,67
	Availability of expendable land	Expendable building zones per capita and per employment and in absolute value	74,36	54,77	49,58
	Cultural distance to central government	Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	80	95,38	100,00
Macrolevel	**Health**	Healthcare service accessibility	60,49	62,98	62,38
	Political institutions	Local authorities' efficiency	66,49	68,62	66,45
	Fiscal policy	Regional public finances' soundness and public funds spending efficiency	80,65	83,47	89,04
		Regional public authorities' auto-financing capabilities	77,80	78,78	78,19
		Fiscal policy toward firms	69,44	86,55	89,92
		Fiscal policy toward workers	79,94	83,49	87,02
		Average and median earnings	57,66	70,89	68,84
	State of order	Efficiency of judicial institutions at the regional level	90,12	82,53	87,95
Microlevel	**Firms' strategy and internationalization**	MNEs' competition effectiveness	40,12	46,70	41,91
	Factor conditions	Operational infrastructures	82,31	72,96	77,24
		Financial infrastructures	15,03	41,03	39,21
		Innovation effectiveness	34,09	49,30	43,33
		Education and labor-market consistency	72,96	75,53	72,38
	Supporting and related industries	Superior schools and research institutions' quality and dynamics	52,66	45,78	43,54
		Availability of specialized research & training	83,10	91,32	92,87
	Demand conditions	Sophistication of local demand	79,71	78,31	83,55
	Cluster development and specialization	Extent of cluster development and specialization	45,65	58,59	56,99
	Context for strategy and rivalry	Rigidity of employment	81,87	89,93	91,35

Source: personal elaboration based on Delgado *et al*. (2012), Dunning (1981, 1988b, 1998), Dunning and Lundan (2008), Porter (1990a, 1998, 2003), Porter *et al*. (2008), Rugman (1981), Rugman and Verbeke (2001a, 2001b, 2004, 2009), FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

14.3 Comments related to the results and concluding remarks

The numerous tables and figures exhibited above potentially provide diverse relevant observations. As the main intention of this chapter is to consistently implement the generic structure designed in chapter 2, the general discussion will elaborate not on policy-oriented considerations but on the methodological and quantitative conclusions related to the results. Consequently, this sub-section will concentrate on 1) the general index rankings of Swiss cantons and 2) the results charts for all the Swiss cantons.

First, let us consider the general index rankings of the Swiss cantons. Table 7 exhibits the general ranking in % of the Swiss cantons at the sub-pillar level and the corresponding standard deviations in %. As mentioned above, the average standard deviation is 5,03%. However, some cantons' standard deviations are significantly higher (e.g., Basel-Stadt, 17,19%; Zug, 11,33%), whereas those of others are significantly lower (e.g., Nidwalden, 0,34%; Solothurn, 0,43%; Glarus, 0,10%; Ticino, 0,91%). Hence, in the case of significantly higher standard deviations, the results should be scrutinized with even greater attention. Numerous hypotheses can be formulated, such as the relative weight of commuting on scores related to GDP/employment in full-time equivalent positions. Moreover, the agglomeration processes of relatively small yet highly competitive territories such as Basel-Stadt and Zug engender side issues on the correlation measure and on specific sub-pillars of the index. Indeed, even if consistently weighted, sub-pillars such as 1) expendable building zones per capita and per employment and in absolute value or to a lesser extent 2) financial infrastructures are still influenced by the sizes of the cantons in absolute terms. Table 38 concentrates on the general ranking in % of the Swiss cantons at the microeconomic level of competitiveness. As indicated in chapter 1 and chapter 2, productivity is indeed created at the microeconomic level. Hence, as this level is highly conclusive, it is relevant to exhibit it specifically. Moreover, it allows us to compare the ranking specific to the microeconomic level with the general ranking in % of the Swiss cantons, which captures all levels of competitiveness. Whereas the rankings are similar for some cantons, such as Zurich, Basel-Stadt and Bern, others are noticeably divergent, such as Geneva, Ticino and Neuchâtel. Indeed, for the rankings of Geneva, Ticino and Neuchâtel at the microeconomic level are noticeably higher than the general ranking in % of the Swiss cantons, which captures all levels of competitiveness. These discrepancies suggest relative weaknesses for those subjects at the endowment and macroeconomic levels and relative strengths at the microeconomic level, whereas other cantons, such as Valais, Graubünden and Appenzell Ausserrhoden, score relatively lower at all levels of competitiveness.

Table 9, Table 10, and Table 11 exhibit in full the general scores in % of the Swiss cantons at the endowment level, the macroeconomic level and the microeconomic level of competitiveness with corresponding median and average scores. The sub-pillar-level analysis allows the assertion of the aforementioned discrepancies but also for the detailed investigation of the cantons' relative strengths and weaknesses. For instance, in the case of Geneva, the relatively high disparity between the ranking at the microeconomic level and the ranking for all levels of competitiveness is related to the relatively lower scores at the endowment level and the macroeconomic level of competitiveness. For example, the scores for the sub-pillars of 1) expendable building zones per capita and per employment and in absolute value, 2) the soundness of regional public finances and the spending efficiency of public funds, 3) fiscal policy towards workers, and 4) the efficiency of judicial institutions at the regional level noticeably prejudice the general ranking of the canton, whereas its ranking at the microeconomic level is relatively high (6th). Moreover, Table 9, Table 10, and Table 11 also demonstrate that some cantons might experience concomitantly relatively low general rankings and high sub-pillar-specific scores. In this regard, for example, Graubünden has the highest regional public authorities' auto-financing capabilities but ranks 22nd in Table 7.

Second, let us consider the results charts for all the Swiss cantons. The radar charts allow the analysis of canton patterns relative to the pattern representing the average scores. Indeed, it illustrates the cantons' strengths and weaknesses relative to the corresponding average scores. It provides seminal insights into the magnitude of canton discrepancies relative to these averages. Moreover, whether the cantons fall below or above the average scores, their patterns can either relatively converge or diverge from the average pattern. For instance, Basel-Stadt's above-average, pattern does not fit extensively with the average pattern, whereas Bern converges considerably. Jura's below-average pattern fits the average pattern relatively better than that of Geneva. This conclusion demonstrates that some cantons experience greater discrepancies relative to the average scores than others, which tend to follow national trends. Furthermore, it relates to the reasoning formerly mentioned according to which some cantons score relatively well at the microeconomic level but not in a similar manner at the endowment and macroeconomic levels. The results chart in % for all cantons and the average and median scores at the Swiss level allow a detailed analysis of each canton's scores in comparison with the corresponding average and median values. The median scores are also interesting, as they consider more extensively the issues related to case-specific disparities relative to other subjects. Moreover, it is an obvious way to detect at the sub-pillar level where a canton ranks relative to the corresponding middle score.

In conclusion, the various figures and tables presented heretofore allow analyses of numerous sorts. The comments formulated above concentrate only on the methodological and quantitative conclusions related to the results and not on the policy-oriented considerations these results might help to develop. Indeed, this exercise would necessitate a complete methodological framework to categorize those policy recommendations consistently. As the ambition of this chapter is to implement the generic structure developed in chapter 2 in a specific case, it is pertinent to stick to the abovementioned methodological and quantitative conclusions. Three major conclusions emerge from this sub-section: 1) even if the average standard deviation equals 5,03%, some cantons' standard deviations are significantly higher (e.g., Basel-Stadt, 17,19%; Zug, 11,33%); 2) some cantons' rankings at the microeconomic level diverge significantly from their corresponding rankings capturing all levels of competitiveness; and 3) some cantons experience greater discrepancies in the average scores than others, which tend to follow national trends.

15 General concluding remarks

The preeminent purpose of chapter 3 is to implement the generic structure conceived in chapter 2 in the case of the Swiss cantons. It elaborates on the manner in which the methodological and quantitative steps and procedures should be mastered to safeguard the consistency of the aforementioned generic structure while adjusting it to a specific example. To do so, section 12 and section 13 concentrate on the conceptual, methodological and quantitative procedures needed to adjust the structure to the Swiss case, whereas section 14 exhibits and elaborates on the relevant results of the index.

First, section 12 allows the accommodation of the generic structure in its extensive version to Switzerland's specifications. With regard to the multi-dimensional competitiveness of territories, whereas Switzerland is relatively highly decentralized in political, institutional, and structural terms, the relatively high condition of the Swiss overall framework signifies that it is consistent to implement specific normalization and weighting strategies to capture the fact that the standards of living in Switzerland in general are relatively high, as is the average quality of the business environment. However, as demonstrated in sub-section 12.3.1, Switzerland's relative decentralization requires the selection of the comprehensive version of the generic structure, which corresponds to a highly decentralized case with minor modifications.

Second, section 13 gives effect to the conceptual framework developed in chapter 2 by dividing the considered process into two major steps: 1) data selection, construction, configuration, and adjustments of the measure(s) constituting each indicator and 2) the implementation of the methodological and quantitative sub-steps presented in the previous chapter and executed for the subject of the analysis. The first step is related to database quality and availability, requiring the development of an *ad hoc* methodology on the basis of the aforementioned generic structure. The second step quantitively tests the structure to ensure its relevance and to acknowledge technical limitations before the presentation of the results. The correlation tests implemented in subsection 13.3 between the competitiveness of the cantons and GDP/employment in full-time equivalent positions averages 5,03%. Hence, even if overall coverage reaches only 59,18%, this coverage appears to be relatively homogeneous.

Third, section 14 exhibits all the relevant results related to the implementation of the abovementioned generic structure to the measure and comparison of Swiss cantons' competitiveness levels. To do so, it is divided into two major sub-sections: 1) the general index rankings of the Swiss cantons and 2) the charts of the results for all the Swiss cantons. Whereas the general ranking in % of the Swiss cantons at the sub-pillar level shows an average standard deviation of 5,03%, some cantons' standard deviations are significantly higher, suggesting relative weighting issues in specific cases. Hence, the segmented general rankings in % of the Swiss cantons at each level of competitiveness allow *inter alia* a relative assessment of the results exhibited in the general ranking in % of the Swiss cantons at the sub-pillar level. The results charts for all the Swiss cantons allow the analysis of 1) canton patterns relative to the pattern representing the average values and 2) canton-specific scores relative to the corresponding average and median values. Hence, both pattern-based and structure-based investigations are implementable to achieve a comprehensive inquiry regarding each canton's strengths and weaknesses.

In conclusion, chapter 3 provides numerous insights into the manner in which it is consistent to implement the numerous steps and procedures developed in chapter 2 and, *in fine*, to rightly use the aforementioned generic structure. Chapter 3 also elaborates on the quantitative tests and limitations axiomatically associated with the construction of an index based on various databases. Most importantly, it comprehensively exhibits the general index rankings at the Swiss level and the results charts for all Swiss cantons. These rankings and results might subsequently serve as a legitimate basis for formulating policy recommendations. This arduous task could constitute the core of a publication specifically dedicated to this matter.

General concluding remarks

The conceptualization, construction and subsequent implementation of an intranational regional competitiveness index require compliance with strict processes in theoretical, methodological and quantitative terms. Consequently, the three chapters constituting this thesis investigate those processes with the main purpose of introducing a relevant framework to measure the competitiveness levels of regions constituting a single nation. Indeed, the major purposes of this thesis are as follows: 1) to theoretically investigate the leading theories examining location competitiveness, either directly or indirectly; 2) to subsequently conceptualize and build a generic structure that consistently measures intranational regional competitiveness; and 3) to ultimately implement this structure in the case of the Swiss cantons.

First, chapter 1 explores location competitiveness primarily from the standpoints of seminal authors such as Adam Smith (1776), David Ricardo (1971) and John Maynard Keynes (2007). At a deeper level, endogenous growth theorists such as Arrow (1962), Sidrauski (1967), Uzawa (1965), Lucas (1988), and Romer (1986, 1990, 2000) are scrutinized, as their inclusion of technological progress and human capital in their models indirectly captures the factors of the uneven distribution of productive economic activities with the correlated effects on agglomeration forces and location competitiveness. However, to comprehensively capture location competitiveness from a conceptual frame of reference, chapter 1 focuses primarily on two major theoretical perspectives: 1) the economic geography perspective (Krugman, 1991; Krugman and Venables, 1995; Marshall, 1920; Porter, 1990a, 2000a, 2000b, 2003, 2008; Porter *et al.*, 2008) and 2) the international business perspective (Dunning, 1981, 1988a, 1998, 2000a, 2000b, 2001; Dunning and Gugler, 2008; Dunning and Lundan 2008; Rugman and D'Cruz, 1993; Rugman and Fina, 1996; Rugman and Girod, 2003; Rugman and Verbeke, 2001a, 2001b, 2003, 2004, 2008a, 2008b, 2009).

Second, extracting the main theoretical findings of chapter 1 on location competitiveness, chapter 2 endeavours 2.1) to investigate the major quantitative steps in the construction of a composite index, 2.2) to review major competitiveness indexes at various levels of analysis, 2.3) to scrutinize the preceding process in relation to the construction of an intranational regional competitiveness index, 2.4) to define the major methodological steps in order to build this indicator, 2.5) to subsequently build a generic structure allowing the assessment of regional competitiveness and to acknowledge the correlated notional limitations, and 2.6) to address the conceptual adaptations to be considered with reference to the distribution of political capabilities of the analysed subject.

With regard to the main findings related to the steps preceding the construction of the generic structure, 2 major conclusions are indicated. First, competitiveness is a dynamic and multi-dimensional concept. Consequently, any territory experiences a sequence of competitiveness input factors generating competitiveness outputs. Crucially, these outputs might in return impact competitiveness inputs in *t-1,* whereas those inputs are considered as such in *t0*. Therefore, causality issues should be dealt with not only in quantitative steps at later stages of the process but also when designing the generic structure. Second, comparing regions implies defining statistically significant regions. Indeed, the characteristics of the parameters included in the assessment should be delineated consistently to allow pertinent comparisons to be made and apposite policy recommendations to be formulated on the basis of case-specific results.

Following the theoretical conclusions of chapter 1 and the preceding steps extensively scrutinized in chapter 2, including those mentioned heretofore, regional competitiveness as measured in an intranational regional competitiveness index is defined as follows, based on Dunning, (1981, 1988a, 1998, 2009), Dunning and Lundan (2008), Porter (1980, 1990a, 1998, 2002), Porter *et al.* (2008), and Rugman and Verbeke (2001a, 2001b, 2009):

> "Regional competitiveness consists of the ability of a region to build its competitive advantages on the basis of its endowments, its political institutions and subsequent policies, its fiscal policies, its capital resources, and its human capital and to constitute a set of determinants that enhances the creation of new firms and the attraction of firms located elsewhere or part of their activities and allows the firms located in that territory to improve their productivity and thus the average standard of living of the society. Competitiveness is ultimately determined by productivity as measured *inter alia* by 1) GDP/capita in purchasing power parity and GDP/employment in full time equivalent positions in purchasing power parity. A region is considered as such if its boundaries correspond to the

jurisdiction of a ruler and it is a constituent part of a nation, along with other regions with which it competes. Regional competitiveness is considered a multi-dimensional and systemic concept that is determined at three levels categorized on the basis of their corresponding outcomes: 1) endowments, 2) macroeconomic competitiveness and 3) microeconomic competitiveness (Porter *et al.*, 2008, p. 45)" (personal elaboration based on Dunning, 1981, 1988b, 1998, 2009; Dunning and Lundan, 2008; Porter 1980, 1990a, 1998, 2002; Porter *et al.*, 2008; and Rugman and Verbeke, 2001b, 2009).

This fundamental definition constitutes the substructure on which it is relevant to conceptualize and build the generic structure exhibited in chapter 2. This structure is composed of 1) three major levels corresponding to the aforementioned levels of competitiveness, 2) 15 pillars, and 3) 37 sub-pillars. The structure's arborescence follows the abovementioned systematic framework with the objective of avoiding conceptual biases as much as possible. However, conceivable limitations have been addressed. First, the relatively sizable number of indicators and subsequently of measure(s) per indicator might still potentially engender causality and double-counting issues. Second, the favoured option not to disclose at this stage specific measures for each sub-pillar or indicator in relation to data availability might cause difficulties in properly implementing the generic structure in a specific case. *Ergo*, it is of the utmost importance to 1) comprehensively conduct the quantitative tests scrutinized in chapter 2 when applying the generic structure, 2) properly analyse the correlated results and, if necessary, 3) adjust the structure in a relevant manner. Moreover, adjustments might also occur as a consequence of case-specific degree of centralization, as the unabridged version of the structure is designed for relatively decentralized nations. Chapter 2 correspondingly investigates the sub-steps and steps mandatory for conceptualizing and subsequently building a sound and consistent generic structure but also addresses the potential limitations to be considered when applying the methodology to a concrete subject.

Third, chapter 3 serves as a prototype for the consistent implementation of the generic structure in the case of the Swiss cantons. To do so, chapter 3 is divided into 3 major sections: 1) the conceptual approach related to the competitiveness of territories in the Swiss case, 2) the inter-connection process between the generic structure developed in chapter 2 and the Swiss case, and 3) the presentation of the results of the intranational regional competitiveness index applied to the Swiss case.

With regard to the first section, taking into consideration the dynamic and multi-dimensional characteristics of competitiveness when adjusting the structure requires scrutinizing the overall competitive framework that all the cantons share to avoid inconsistently the deltas of scores among regions. Indeed, an assessment *inter alia* of the extent of the structural decentralization for all pillars at each level of competitiveness is mandatory. In addition, implementing the generic structure presented in the previous chapter must take into account the two following aspects: 1) the Swiss cantons benefit from a relatively high degree of independence, yet 2) this independence relies on a relatively strong federal entity that embodies a large part of the legal system and indeed of the macroeconomic framework. Consequently, whereas it is relevant to use the unabridged version of the generic structure for the Swiss case with minor conceptual adjustments, as the cantons constitute a relatively decentralized nation, the quantitative steps and sub-steps must also consider the overall competitiveness context of that nation, which influences the economic performances of the cantons in a relatively meaningful manner.

With regard to the second aforementioned section, the inter-connection process between the generic structure developed in chapter 2 and the Swiss case is the core of chapter 3. Most importantly, this section exhibits the implemented structure with the indicators and measures built on the basis of data availability and quality. Apposite indicators and measures are described, and correlated model equations are disclosed. In this setting, 29 relevant indicators based on 36 corresponding measures are computed. Twenty indicators as well as 8 measures related to indicators could not be quantitatively investigated. Consequently, coverage only reaches 59,18% at the sub-pillar level. However, the quantitative tests suggest that the overall validity of the implemented index is relatively convincing. This conclusion seems to be asserted by the correlation tests between the sub-pillar level and productivity measured by GDP/employment in full-time equivalent positions. Additionally, the standard deviation in correlating the final scores at the sub-pillar level and the inter-related GDP/employment in full-time equivalent positions averages 5,03%, which is relatively low. This result is sufficiently satisfactory for 3 main reasons: 1) it confirms the overall validity of the structure, even though numerous indicators could not be implemented; 2) it tends to demonstrate that the implemented indicators and measures are relatively consistent and fittingly coordinated; and 3) it demonstrates the soundness of GDP/employment in full-time equivalent positions as a relevant measurement of productivity, thus supporting the definition of regional competitiveness above.

With regard to the third aforementioned section, the presentation of the results of the intranational regional competitiveness index applied to the Swiss cantons allows conclusive observations. First, the general ranking in % of the Swiss cantons at the sub-pillar level demonstrates that the cantons experience various levels of standard deviation in % as a result of structural discrepancies. Nonetheless, the normalization and weighting procedures used for this study also imply that the relatively homogeneous competitiveness context at the national level is acknowledged in quantitative terms. Therefore, regarding the general ranking and the corresponding scores, the maximal disparity between the most competitive canton (Zurich, 81,93%) and the least competitive canton (Jura, 65,40%) does not exceed 16,53%. Second, the comparison between the general ranking and the ranking specific to the microeconomic level in % is symptomatic of the configurational dissimilarities between the cantons *inter alia* in terms of fiscal policies or state of order. Consequently, whereas the rankings mentioned hitherto remain similar for some cantons, such as Zurich, Basel-Stadt and Bern, others, such as Geneva, Ticino or Neuchâtel, are noticeably divergent. As "wealth is actually created at the microeconomic level of the economy" (Porter, 2008, p. 29), it is important to consider and continuously compare both rankings to avoid formulating fallacious conclusions, particularly at the regional level.

In conclusion, each location experiences a succession of dynamic sequences of economic development analogous to an extended tree diagram. The manner in which these dynamic sequences follow one another and their relative velocities provide valuable insights into the intrinsic determinants of location competitiveness, the effects of those determinants on productivity and related economic performance. However, whereas it is relatively unproblematic to measure economic performance in terms of GDP for a given location, assessing the correlated levels of competitiveness is an arduous task because of its multi-dimensional character. Nonetheless, it is imperative to a great extent to estimate location competitiveness levels to focus not only on the results side of causality but also on the causes side. This is even more conclusive at the regional level, as the relative influence of microeconomic factors on competitiveness levels is greater than that at the national level. Similarly, public policies at the regional level tend to be relatively more micro-oriented than those at the national level and subsequently more case distinctive and complex to implement. Consequently, measuring the competitiveness levels of regions constituting a nation is a demanding yet strategic task for policy makers. A sound competitiveness index comparing regions can be useful for private and semi-private economic institutions and most crucially for firms that constantly adjust their localization processes.

When rightfully managed, economic prosperity serves society in every respect. Consequently, the understanding of the causes of economic prosperity has perpetually captured the interest of academics. Within this frame of reference, the ultimate ambition of this thesis is to contribute humbly to this incessant quest, that is, to follow the odyssey of Adam Smith in his "Inquiry into the Nature and Causes of the Wealth of Nations" (1776).

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Appendix

Appendix I: Principal component analysis

Appendix I.1: Correlation matrix (Pearson (n))

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment (1)	**1**	0,285	-0,037	0,051	0,006	-0,283	-0,285	-0,016	-0,320	0,102	-0,359	0,332	**0,732**	0,181	0,322	0,227	**0,390**	0,057	-0,283	0,265	-0,174
Expendable building zones per capita and per employment and in absolute value (2)	0,285	**1**	-0,229	-0,139	-0,033	0,144	0,082	**-0,583**	-0,008	**-0,512**	0,151	-0,329	0,102	0,166	0,172	-0,009	0,119	-0,179	0,218	0,370	-0,205
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%) (3)	-0,037	-0,229	**1**	-0,142	0,151	**0,552**	0,007	0,320	**0,506**	0,366	0,326	-0,098	-0,106	0,133	-0,081	**-0,436**	**-0,422**	**0,642**	**0,390**	0,066	**0,819**
Healthcare service accessibility (4)	0,051	-0,139	-0,142	**1**	**0,452**	**-0,671**	0,305	-0,179	**-0,739**	-0,096	**-0,778**	**0,648**	**0,414**	0,313	**0,515**	**0,428**	**0,758**	0,178	**-0,770**	0,237	**-0,500**
Local authorities' efficiency (5)	0,006	-0,033	0,151	**0,452**	**1**	-0,094	**0,410**	-0,212	-0,140	-0,162	-0,229	0,301	0,125	-0,035	**0,393**	-0,122	0,299	0,096	-0,143	0,109	-0,134
Regional public finances' soundness and public funds spending efficiency (6)	-0,283	0,144	**0,552**	**-0,671**	-0,094	**1**	0,160	0,090	**0,909**	0,123	**0,848**	**-0,673**	**-0,555**	-0,216	**-0,414**	**-0,621**	**-0,731**	0,119	**0,879**	-0,161	**0,771**
Regional public authorities' auto-financing capabilities (7)	-0,285	0,082	0,007	0,305	**0,410**	0,160	**1**	-0,238	0,030	-0,268	-0,074	-0,206	-0,261	0,131	0,085	-0,126	0,119	-0,104	-0,008	0,108	0,049
Fiscal policy toward firms (8)	-0,016	**-0,583**	0,320	-0,179	-0,212	0,090	-0,238	**1**	0,229	**0,397**	0,068	0,112	0,051	-0,324	-0,299	-0,200	-0,376	0,196	0,059	-0,321	0,247
Fiscal policy toward workers (9)	-0,320	-0,008	**0,506**	**-0,739**	-0,140	**0,909**	0,030	0,229	**1**	0,044	**0,881**	**-0,624**	**-0,657**	**-0,443**	**-0,560**	**-0,763**	**-0,842**	0,013	**0,960**	-0,319	**0,757**
Average and median earnings (10)	0,102	**-0,512**	0,366	-0,096	-0,162	0,123	-0,268	**0,397**	0,044	**1**	-0,041	0,268	0,303	0,295	0,202	0,134	-0,161	**0,562**	-0,148	0,123	0,332
Efficiency of judicial institutions at the regional level (11)	-0,359	0,151	0,326	**-0,778**	-0,229	**0,848**	-0,074	0,068	**0,881**	-0,041	**1**	**-0,722**	**-0,679**	**-0,459**	**-0,602**	**-0,532**	**-0,821**	-0,045	**0,916**	-0,349	**0,631**
MNEs' competition effectiveness (12)	0,332	-0,329	-0,098	**0,648**	0,301	**-0,673**	-0,206	0,112	**-0,624**	0,268	**-0,722**	**1**	**0,646**	0,274	**0,533**	0,387	**0,654**	0,280	**-0,698**	0,266	**-0,526**
Operational infrastructures (13)	**0,732**	0,102	-0,106	**0,414**	0,125	**-0,555**	-0,261	0,051	**-0,657**	0,303	**-0,679**	**0,646**	**1**	**0,413**	**0,612**	**0,431**	**0,562**	0,270	**-0,663**	**0,484**	**-0,434**
Financial infrastructures (14)	0,181	0,166	0,133	0,313	-0,035	-0,216	0,131	-0,324	**-0,443**	0,295	**-0,459**	0,274	**0,413**	**1**	**0,605**	**0,482**	**0,466**	**0,456**	**-0,451**	**0,798**	-0,053
Innovation effectiveness (15)	0,322	0,172	-0,081	**0,515**	**0,393**	**-0,414**	0,085	-0,299	**-0,560**	0,202	**-0,602**	**0,533**	**0,612**	**0,605**	**1**	**0,449**	**0,617**	0,305	**-0,571**	**0,748**	-0,347
Education and labor-market consistency (16)	0,227	-0,009	**-0,436**	**0,428**	-0,122	**-0,621**	-0,126	-0,200	**-0,763**	0,134	**-0,532**	0,387	**0,431**	**0,482**	**0,449**	**1**	**0,635**	0,071	**-0,734**	**0,399**	**-0,482**
Superior schools and research institutions' quality and dynamics (17)	**0,390**	0,119	**-0,422**	**0,758**	0,299	**-0,731**	0,119	-0,376	**-0,842**	-0,161	**-0,821**	**0,654**	**0,562**	**0,466**	**0,617**	**0,635**	**1**	-0,005	**-0,796**	**0,415**	**-0,677**
Availability of specialized research & training (18)	0,057	-0,179	**0,642**	0,178	0,096	0,119	-0,104	0,196	0,013	**0,562**	-0,045	0,280	0,270	**0,456**	0,305	0,071	-0,005	**1**	-0,084	**0,426**	0,374
Sophistication of local demand (19)	-0,283	0,218	**0,390**	**-0,770**	-0,143	**0,879**	-0,008	0,059	**0,960**	-0,148	**0,916**	**-0,698**	**-0,663**	**-0,451**	**-0,571**	**-0,734**	**-0,796**	-0,084	**1**	-0,275	**0,653**
Extent of cluster development and specialization (20)	0,265	0,370	0,066	0,237	0,109	-0,161	0,108	-0,321	-0,319	0,123	-0,349	0,266	**0,484**	**0,798**	**0,748**	**0,399**	**0,415**	**0,426**	-0,275	**1**	-0,122
Rigidity of employment (21)	-0,174	-0,205	**0,819**	**-0,500**	-0,134	**0,771**	0,049	0,247	**0,757**	0,332	**0,631**	**-0,526**	**-0,434**	-0,053	-0,347	**-0,482**	**-0,677**	0,374	**0,653**	-0,122	**1**

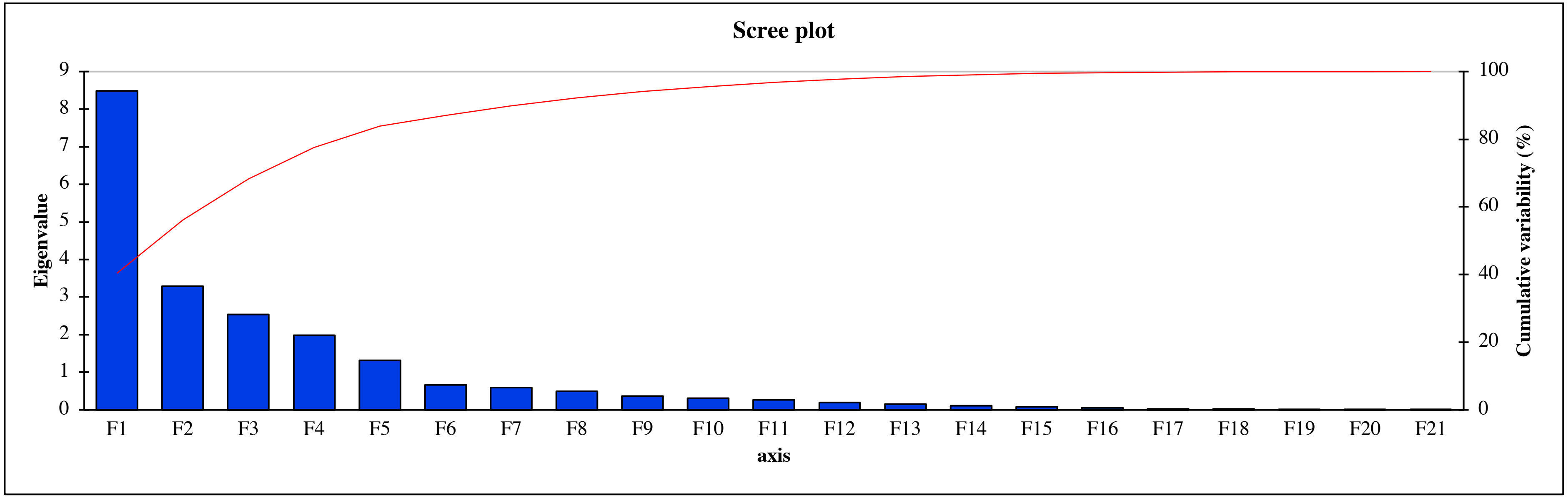
Note: bold values are different from 0 in a significant level of alpha=0,05.
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.2 : Analysis in principal components

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21
Eigenvalue	8,486	3,294	2,542	1,979	1,321	0,669	0,590	0,502	0,370	0,314	0,275	0,191	0,150	0,118	0,084	0,048	0,032	0,021	0,010	0,003	0,001
Variability (%)	40,408	15,686	12,106	9,425	6,289	3,184	2,812	2,389	1,761	1,497	1,308	0,908	0,715	0,564	0,401	0,229	0,152	0,098	0,048	0,014	0,007
Cumulative %	40,408	56,094	68,200	77,624	83,914	87,098	89,909	92,299	94,060	95,557	96,865	97,773	98,487	99,051	99,452	99,681	99,832	99,931	99,979	99,993	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.3: Scree plot



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.4: Eigenvalue

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,143	0,094	0,026	-0,369	0,505
Expendable building zones per capita and per employment and in absolute value	-0,010	-0,198	0,459	-0,304	0,191
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,143	0,419	0,088	0,176	0,154
Healthcare service accessibility	-0,265	-0,007	-0,010	0,368	0,001
Local authorities' efficiency	-0,084	0,006	0,158	0,483	0,427
Regional public finances' soundness and public funds spending efficiency	0,295	0,127	0,208	0,007	0,026
Regional public authorities' auto-financing capabilities	0,001	-0,103	0,281	0,470	-0,116
Fiscal policy toward firms	0,083	0,219	-0,433	0,019	0,094
Fiscal policy toward workers	0,326	0,079	0,071	0,016	0,101
Average and median earnings	-0,012	0,437	-0,183	-0,087	-0,168
Efficiency of judicial institutions at the regional level	0,315	-0,010	0,092	-0,101	-0,024
MNEs' competition effectiveness	-0,259	0,147	-0,200	0,103	0,195
Operational infrastructures	-0,257	0,178	-0,033	-0,225	0,317
Financial infrastructures	-0,184	0,247	0,307	-0,081	-0,335
Innovation effectiveness	-0,249	0,161	0,242	0,027	0,070
Education and labor-market consistency	-0,247	-0,007	-0,027	-0,175	-0,388
Superior schools and research institutions' quality and dynamics	-0,311	-0,082	0,075	0,061	0,035
Availability of specialized research & training	-0,035	0,471	0,086	0,070	-0,049
Sophistication of local demand	0,320	-0,012	0,151	-0,062	0,136
Extent of cluster development and specialization	-0,171	0,210	0,400	-0,130	-0,097
Rigidity of employment	0,250	0,302	0,090	0,059	-0,053

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.5: Variables' contributions

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,417	0,171	0,041	-0,519	0,580
Expendable building zones per capita and per employment and in absolute value	-0,030	-0,359	0,731	-0,428	0,220
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,416	0,761	0,140	0,247	0,177
Healthcare service accessibility	-0,771	-0,013	-0,016	0,518	0,001
Local authorities' efficiency	-0,243	0,011	0,252	0,680	0,490
Regional public finances' soundness and public funds spending efficiency	0,860	0,230	0,332	0,009	0,030
Regional public authorities' auto-financing capabilities	0,003	-0,187	0,448	0,662	-0,134
Fiscal policy toward firms	0,243	0,398	-0,691	0,027	0,108
Fiscal policy toward workers	0,950	0,144	0,113	0,022	0,116
Average and median earnings	-0,034	0,792	-0,292	-0,122	-0,193
Efficiency of judicial institutions at the regional level	0,918	-0,018	0,147	-0,142	-0,027
MNEs' competition effectiveness	-0,754	0,267	-0,319	0,145	0,224
Operational infrastructures	-0,748	0,324	-0,052	-0,317	0,365
Financial infrastructures	-0,535	0,447	0,490	-0,114	-0,385
Innovation effectiveness	-0,727	0,293	0,386	0,037	0,081
Education and labor-market consistency	-0,720	-0,012	-0,043	-0,246	-0,445
Superior schools and research institutions' quality and dynamics	-0,905	-0,148	0,119	0,086	0,040
Availability of specialized research & training	-0,101	0,854	0,137	0,098	-0,057
Sophistication of local demand	0,932	-0,022	0,241	-0,087	0,156
Extent of cluster development and specialization	-0,498	0,381	0,638	-0,183	-0,112
Rigidity of employment	0,727	0,548	0,144	0,082	-0,061

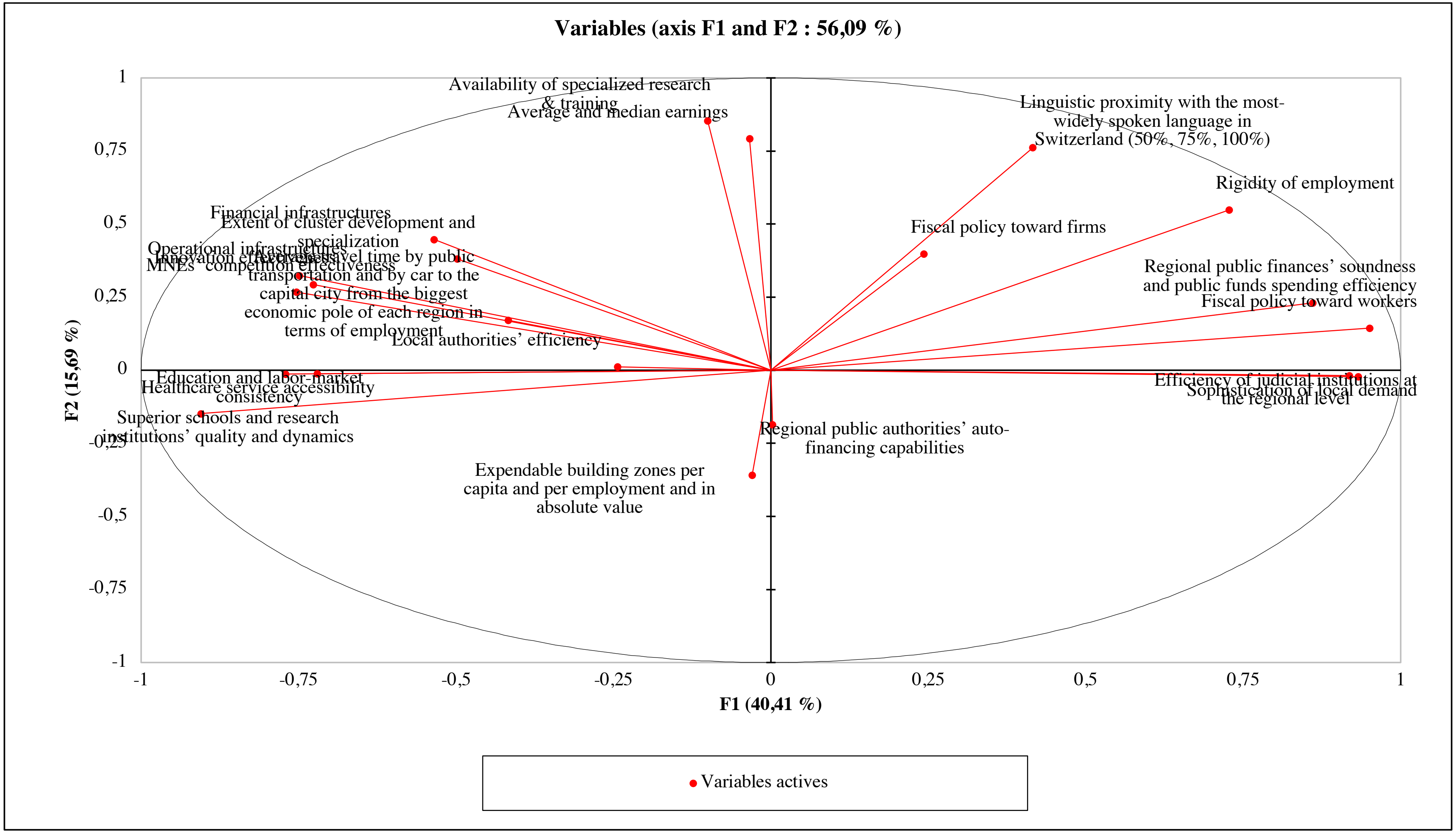
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.6: Correlation between variables and factors

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,417	0,171	0,041	-0,519	0,580
Expendable building zones per capita and per employment and in absolute value	-0,030	-0,359	0,731	-0,428	0,220
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,416	0,761	0,140	0,247	0,177
Healthcare service accessibility	-0,771	-0,013	-0,016	0,518	0,001
Local authorities' efficiency	-0,243	0,011	0,252	0,680	0,490
Regional public finances' soundness and public funds spending efficiency	0,860	0,230	0,332	0,009	0,030
Regional public authorities' auto-financing capabilities	0,003	-0,187	0,448	0,662	-0,134
Fiscal policy toward firms	0,243	0,398	-0,691	0,027	0,108
Fiscal policy toward workers	0,950	0,144	0,113	0,022	0,116
Average and median earnings	-0,034	0,792	-0,292	-0,122	-0,193
Efficiency of judicial institutions at the regional level	0,918	-0,018	0,147	-0,142	-0,027
MNEs' competition effectiveness	-0,754	0,267	-0,319	0,145	0,224
Operational infrastructures	-0,748	0,324	-0,052	-0,317	0,365
Financial infrastructures	-0,535	0,447	0,490	-0,114	-0,385
Innovation effectiveness	-0,727	0,293	0,386	0,037	0,081
Education and labor-market consistency	-0,720	-0,012	-0,043	-0,246	-0,445
Superior schools and research institutions' quality and dynamics	-0,905	-0,148	0,119	0,086	0,040
Availability of specialized research & training	-0,101	0,854	0,137	0,098	-0,057
Sophistication of local demand	0,932	-0,022	0,241	-0,087	0,156
Extent of cluster development and specialization	-0,498	0,381	0,638	-0,183	-0,112
Rigidity of employment	0,727	0,548	0,144	0,082	-0,061

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.7: Variables



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.8: Variables' contributions

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	2,053	0,888	0,065	13,602	25,505
Expendable building zones per capita and per employment and in absolute value	0,011	3,921	21,045	9,245	3,667
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	2,039	17,593	0,767	3,085	2,363
Healthcare service accessibility	7,004	0,005	0,010	13,579	0,000
Local authorities' efficiency	0,698	0,004	2,497	23,330	18,212
Regional public finances' soundness and public funds spending efficiency	8,725	1,611	4,340	0,005	0,069
Regional public authorities' auto-financing capabilities	0,000	1,061	7,910	22,124	1,350
Fiscal policy toward firms	0,694	4,807	18,785	0,036	0,877
Fiscal policy toward workers	10,643	0,630	0,499	0,025	1,024
Average and median earnings	0,014	19,065	3,343	0,752	2,814
Efficiency of judicial institutions at the regional level	9,940	0,010	0,845	1,015	0,056
MNEs' competition effectiveness	6,694	2,168	4,007	1,061	3,787
Operational infrastructures	6,599	3,183	0,107	5,083	10,078
Financial infrastructures	3,369	6,077	9,427	0,652	11,245
Innovation effectiveness	6,223	2,607	5,853	0,071	0,497
Education and labor-market consistency	6,115	0,005	0,074	3,065	15,017
Superior schools and research institutions' quality and dynamics	9,660	0,668	0,561	0,376	0,124
Availability of specialized research & training	0,119	22,152	0,734	0,485	0,244
Sophistication of local demand	10,244	0,015	2,292	0,381	1,842
Extent of cluster development and specialization	2,926	4,412	16,020	1,686	0,943
Rigidity of employment	6,231	9,118	0,817	0,343	0,286

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.9: Squared cosine values

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	0,174	0,029	0,002	0,269	**0,337**
Expendable building zones per capita and per employment and in absolute value	0,001	0,129	**0,535**	0,183	0,048
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,173	**0,580**	0,020	0,061	0,031
Healthcare service accessibility	**0,594**	0,000	0,000	0,269	0,000
Local authorities’ efficiency	0,059	0,000	0,063	**0,462**	0,241
Regional public finances’ soundness and public funds spending efficiency	**0,740**	0,053	0,110	0,000	0,001
Regional public authorities’ auto-financing capabilities	0,000	0,035	0,201	**0,438**	0,018
Fiscal policy toward firms	0,059	0,158	**0,478**	0,001	0,012
Fiscal policy toward workers	**0,903**	0,021	0,013	0,000	0,014
Average and median earnings	0,001	**0,628**	0,085	0,015	0,037
Efficiency of judicial institutions at the regional level	**0,843**	0,000	0,021	0,020	0,001
MNEs’ competition effectiveness	**0,568**	0,071	0,102	0,021	0,050
Operational infrastructures	**0,560**	0,105	0,003	0,101	0,133
Financial infrastructures	**0,286**	0,200	0,240	0,013	0,149
Innovation effectiveness	**0,528**	0,086	0,149	0,001	0,007
Education and labor-market consistency	**0,519**	0,000	0,002	0,061	0,198
Superior schools and research institutions’ quality and dynamics	**0,820**	0,022	0,014	0,007	0,002
Availability of specialized research & training	0,010	**0,730**	0,019	0,010	0,003
Sophistication of local demand	**0,869**	0,000	0,058	0,008	0,024
Extent of cluster development and specialization	0,248	0,145	**0,407**	0,033	0,012
Rigidity of employment	**0,529**	0,300	0,021	0,007	0,004

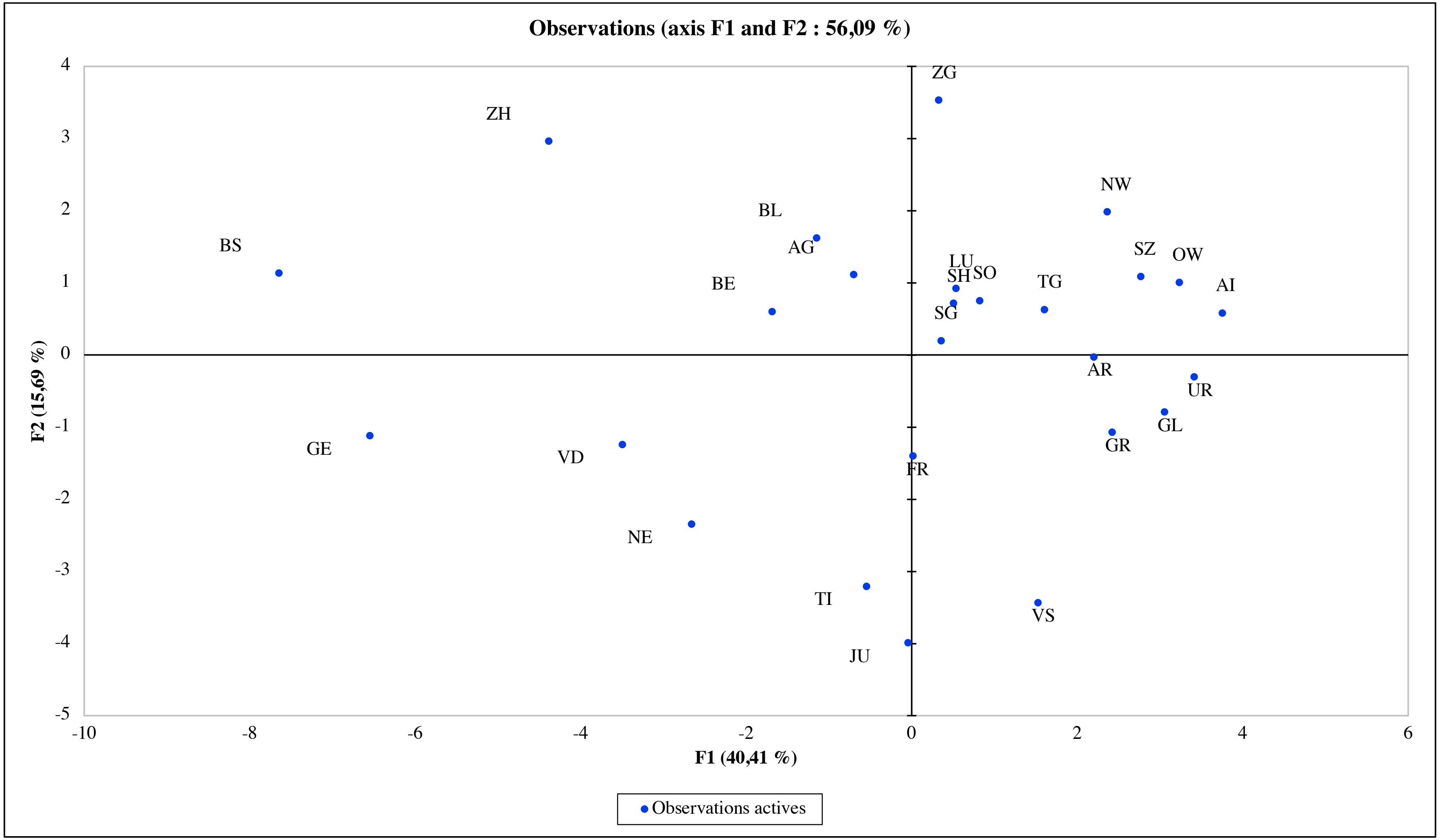
Note : bold values correspond to each factor's variable for which cosine-squared is the highest.
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.10: Coordinate variables

	F1	F2	F3	F4	F5
ZH	-4,386	2,965	4,692	-1,654	-1,159
AG	-0,702	1,115	2,327	0,600	2,839
BS	-7,647	1,137	-1,361	3,995	0,977
VD	-3,498	-1,237	0,756	-1,186	-0,471
BE	-1,689	0,603	2,142	-1,282	0,271
ZG	0,327	3,536	-2,009	0,094	-0,541
LU	0,533	0,923	0,647	0,361	0,683
SG	0,352	0,200	0,717	0,332	-0,743
TG	1,600	0,632	0,743	0,064	0,670
FR	0,015	-1,397	0,298	-1,139	0,918
NW	2,364	1,984	-0,647	-0,197	-0,645
SH	0,507	0,718	-0,890	0,626	1,354
BL	-1,149	1,627	-2,079	-1,723	-0,487
UR	3,411	-0,299	0,136	0,298	-0,252
SO	0,819	0,757	-1,790	-2,316	1,377
AI	3,754	0,587	0,110	0,968	-1,639
GL	3,054	-0,787	0,077	1,699	0,710
OW	3,231	1,008	-0,799	-0,328	0,102
GE	-6,546	-1,115	-1,981	-0,027	-1,865
SZ	2,765	1,090	-1,406	-1,289	-0,948
NE	-2,664	-2,341	-2,390	-1,126	1,116
GR	2,421	-1,068	1,443	2,865	-0,346
AR	2,199	-0,023	-0,627	1,349	-0,621
VS	1,527	-3,428	1,460	-0,594	0,078
TI	-0,550	-3,202	0,614	0,709	-2,472
JU	-0,047	-3,985	-0,182	-1,101	1,094

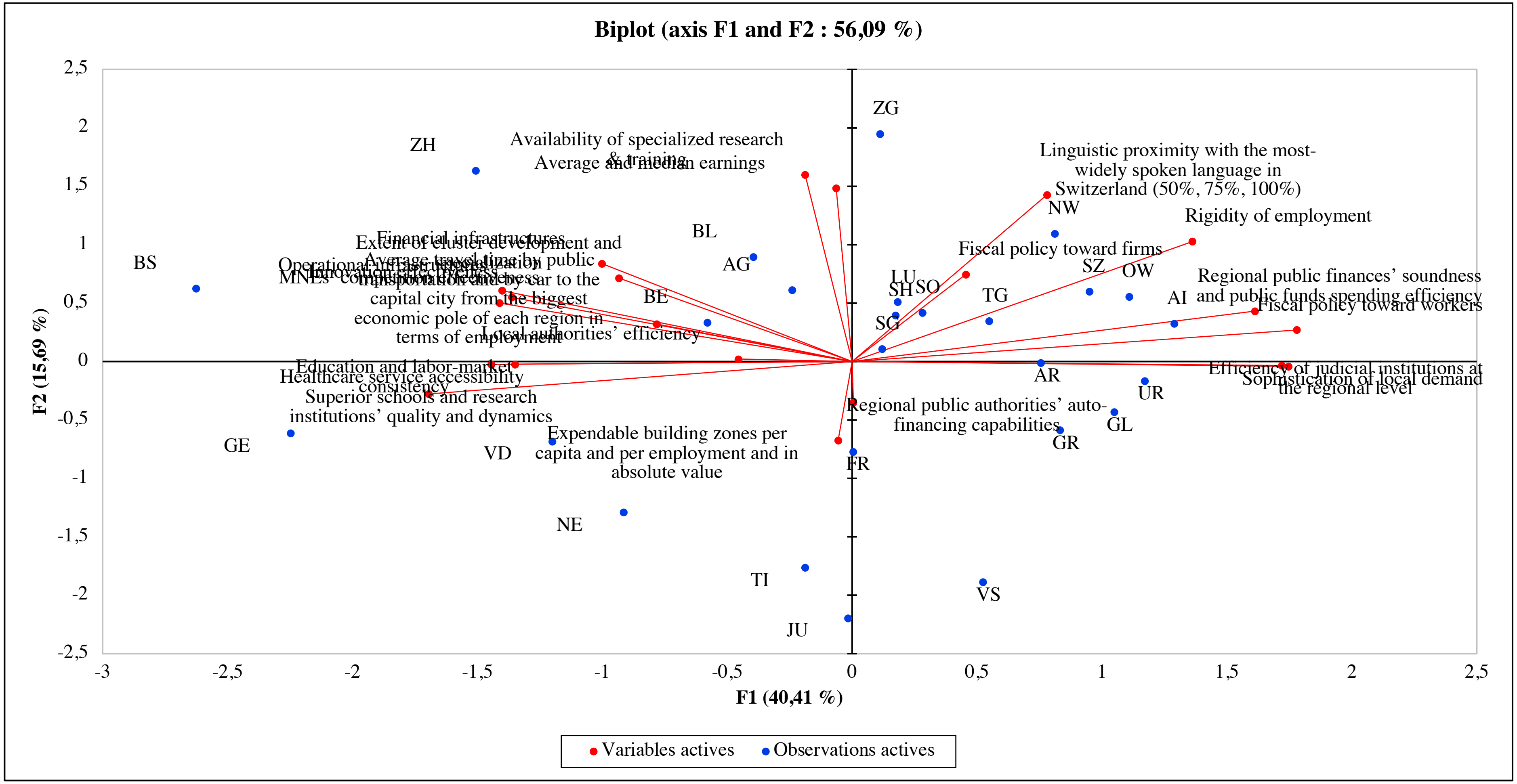
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.11: Observations



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.12: Biplot



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.13: Variables' contributions

	F1	F2	F3	F4	F5
ZH	8,718	10,263	33,305	5,314	3,914
AG	0,223	1,452	8,196	0,700	23,471
BS	26,507	1,510	2,802	31,012	2,777
VD	5,546	1,786	0,865	2,732	0,647
BE	1,293	0,425	6,939	3,194	0,215
ZG	0,048	14,598	6,108	0,017	0,853
LU	0,129	0,995	0,633	0,253	1,357
SG	0,056	0,047	0,779	0,214	1,607
TG	1,160	0,466	0,836	0,008	1,309
FR	0,000	2,280	0,135	2,519	2,454
NW	2,533	4,598	0,634	0,075	1,210
SH	0,116	0,601	1,199	0,761	5,336
BL	0,598	3,091	6,542	5,768	0,691
UR	5,273	0,104	0,028	0,172	0,185
SO	0,304	0,670	4,849	10,424	5,522
AI	6,386	0,402	0,018	1,822	7,825
GL	4,228	0,723	0,009	5,612	1,467
OW	4,733	1,187	0,966	0,209	0,031
GE	19,423	1,451	5,937	0,001	10,125
SZ	3,464	1,386	2,989	3,227	2,618
NE	3,217	6,399	8,645	2,463	3,625
GR	2,656	1,331	3,148	15,948	0,348
AR	2,192	0,001	0,595	3,535	1,122
VS	1,057	13,722	3,224	0,687	0,018
TI	0,137	11,972	0,571	0,978	17,790
JU	0,001	18,540	0,050	2,354	3,483

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix I.14: Squared cosine observations

	F1	F2	F3	F4	F5
ZH	0,344	0,157	**0,394**	0,049	0,024
AG	0,024	0,060	0,261	0,017	**0,388**
BS	**0,728**	0,016	0,023	0,199	0,012
VD	**0,564**	0,071	0,026	0,065	0,010
BE	0,193	0,025	**0,310**	0,111	0,005
ZG	0,005	**0,599**	0,193	0,000	0,014
LU	0,066	**0,198**	0,097	0,030	0,108
SG	0,033	0,011	0,136	0,029	**0,146**
TG	**0,341**	0,053	0,074	0,001	0,060
FR	0,000	**0,253**	0,012	0,168	0,109
NW	**0,453**	0,319	0,034	0,003	0,034
SH	0,034	0,068	0,105	0,052	**0,244**
BL	0,077	0,154	**0,252**	0,173	0,014
UR	**0,773**	0,006	0,001	0,006	0,004
SO	0,043	0,036	0,204	**0,341**	0,120
AI	**0,692**	0,017	0,001	0,046	0,132
GL	**0,635**	0,042	0,000	0,197	0,034
OW	**0,635**	0,062	0,039	0,007	0,001
GE	**0,775**	0,022	0,071	0,000	0,063
SZ	**0,486**	0,076	0,126	0,106	0,057
NE	**0,310**	0,239	0,250	0,055	0,054
GR	0,288	0,056	0,102	**0,404**	0,006
AR	**0,419**	0,000	0,034	0,158	0,033
VS	0,122	**0,614**	0,111	0,018	0,000
TI	0,013	**0,440**	0,016	0,022	0,262
JU	0,000	**0,764**	0,002	0,058	0,058

Note: bold values correspond to each factor's observation for which cosine-squared is the highest.
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II: Factor analysis

Appendix II.1: Descriptive statistics

Variable	Observations	Obs. w/ missing information	Obs. w/o missing information	Minimum	Maximum	Average	Standard deviation
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	26	0	26	34,333	100,000	69,474	15,524
Expendable building zones per capita and per employment and in absolute value	26	0	26	13,393	100,000	54,772	21,965
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	26	0	26	80,000	100,000	95,385	8,115
Healthcare service accessibility	26	0	26	51,319	100,000	62,984	9,781
Local authorities' efficiency	26	0	26	48,602	100,000	68,625	11,569
Regional public finances' soundness and public funds spending efficiency	26	0	26	42,227	100,000	83,470	14,712
Regional public authorities' auto-financing capabilities	26	0	26	55,566	100,000	78,782	9,863
Fiscal policy toward firms	26	0	26	62,611	100,000	86,551	10,143
Fiscal policy toward workers	26	0	26	49,730	100,000	83,488	12,139
Average and median earnings	26	0	26	52,270	100,000	70,887	10,218
Efficiency of judicial institutions at the regional level	26	0	26	33,745	100,000	82,527	16,112
MNEs' competition effectiveness	26	0	26	18,026	100,000	46,696	17,378
Operational infrastructures	26	0	26	37,978	100,000	72,960	17,224
Financial infrastructures	26	0	26	15,028	100,000	41,029	15,890
Innovation effectiveness	26	0	26	34,093	100,002	49,296	17,480
Education and labor-market consistency	26	0	26	57,530	100,000	75,532	13,237
Superior schools and research institutions' quality and dynamics	26	0	26	25,500	100,000	45,776	18,635
Availability of specialized research & training	26	0	26	83,103	100,000	91,317	4,539
Sophistication of local demand	26	0	26	26,377	100,000	78,305	17,644
Extent of cluster development and specialization	26	0	26	43,587	100,000	58,588	11,540
Rigidity of employment	26	0	26	77,102	100,000	89,934	6,177

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.2: Correlation matrix (Pearson (n))

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment (1)	**1**	0,285	-0,037	0,051	0,006	-0,283	-0,285	-0,016	-0,320	0,102	-0,359	0,332	0,732	0,181	0,322	0,227	0,390	0,057	-0,283	0,265	-0,174
Expendable building zones per capita and per employment and in absolute value (2)	0,285	**1**	-0,229	-0,139	-0,033	0,144	0,082	-0,583	-0,008	-0,512	0,151	-0,329	0,102	0,166	0,172	-0,009	0,119	-0,179	0,218	0,370	-0,205
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%) (3)	-0,037	-0,229	**1**	-0,142	0,151	0,552	0,007	0,320	0,506	0,366	0,326	-0,098	-0,106	0,133	-0,081	-0,436	-0,422	0,642	0,390	0,066	0,819
Healthcare service accessibility (4)	0,051	-0,139	-0,142	**1**	0,452	-0,671	0,305	-0,179	-0,739	-0,096	-0,778	0,648	0,414	0,313	0,515	0,428	0,758	0,178	-0,770	0,237	-0,500
Local authorities' efficiency (5)	0,006	-0,033	0,151	0,452	**1**	-0,094	0,410	-0,212	-0,140	-0,162	-0,229	0,301	0,125	-0,035	0,393	-0,122	0,299	0,096	-0,143	0,109	-0,134
Regional public finances' soundness and public funds spending efficiency (6)	-0,283	0,144	0,552	-0,671	-0,094	**1**	0,160	0,090	0,909	0,123	0,848	-0,673	-0,555	-0,216	-0,414	-0,621	-0,731	0,119	0,879	-0,161	0,771
Regional public authorities' auto-financing capabilities (7)	-0,285	0,082	0,007	0,305	0,410	0,160	**1**	-0,238	0,030	-0,268	-0,074	-0,206	-0,261	0,131	0,085	-0,126	0,119	-0,104	-0,008	0,108	0,049
Fiscal policy toward firms (8)	-0,016	-0,583	0,320	-0,179	-0,212	0,090	-0,238	**1**	0,229	0,397	0,068	0,112	0,051	-0,324	-0,299	-0,200	-0,376	0,196	0,059	-0,321	0,247
Fiscal policy toward workers (9)	-0,320	-0,008	0,506	-0,739	-0,140	0,909	0,030	0,229	**1**	0,044	0,881	-0,624	-0,657	-0,443	-0,560	-0,763	-0,842	0,013	0,960	-0,319	0,757
Average and median earnings (10)	0,102	-0,512	0,366	-0,096	-0,162	0,123	-0,268	0,397	0,044	**1**	-0,041	0,268	0,303	0,295	0,202	0,134	-0,161	0,562	-0,148	0,123	0,332
Efficiency of judicial institutions at the regional level (11)	-0,359	0,151	0,326	-0,778	-0,229	0,848	-0,074	0,068	0,881	-0,041	**1**	-0,722	-0,679	-0,459	-0,602	-0,532	-0,821	-0,045	0,916	-0,349	0,631
MNEs' competition effectiveness (12)	0,332	-0,329	-0,098	0,648	0,301	-0,673	-0,206	0,112	-0,624	0,268	-0,722	**1**	0,646	0,274	0,533	0,387	0,654	0,280	-0,698	0,266	-0,526
Operational infrastructures (13)	0,732	0,102	-0,106	0,414	0,125	-0,555	-0,261	0,051	-0,657	0,303	-0,679	0,646	**1**	0,413	0,612	0,431	0,562	0,270	-0,663	0,484	-0,434
Financial infrastructures (14)	0,181	0,166	0,133	0,313	-0,035	-0,216	0,131	-0,324	-0,443	0,295	-0,459	0,274	0,413	**1**	0,605	0,482	0,466	0,456	-0,451	0,798	-0,053
Innovation effectiveness (15)	0,322	0,172	-0,081	0,515	0,393	-0,414	0,085	-0,299	-0,560	0,202	-0,602	0,533	0,612	0,605	**1**	0,449	0,617	0,305	-0,571	0,748	-0,347
Education and labor-market consistency (16)	0,227	-0,009	-0,436	0,428	-0,122	-0,621	-0,126	-0,200	-0,763	0,134	-0,532	0,387	0,431	0,482	0,449	**1**	0,635	0,071	-0,734	0,399	-0,482
Superior schools and research institutions' quality and dynamics (17)	0,390	0,119	-0,422	0,758	0,299	-0,731	0,119	-0,376	-0,842	-0,161	-0,821	0,654	0,562	0,466	0,617	0,635	**1**	-0,005	-0,796	0,415	-0,677
Availability of specialized research & training (18)	0,057	-0,179	0,642	0,178	0,096	0,119	-0,104	0,196	0,013	0,562	-0,045	0,280	0,270	0,456	0,305	0,071	-0,005	**1**	-0,084	0,426	0,374
Sophistication of local demand (19)	-0,283	0,218	0,390	-0,770	-0,143	0,879	-0,008	0,059	0,960	-0,148	0,916	-0,698	-0,663	-0,451	-0,571	-0,734	-0,796	-0,084	**1**	-0,275	0,653
Extent of cluster development and specialization (20)	0,265	0,370	0,066	0,237	0,109	-0,161	0,108	-0,321	-0,319	0,123	-0,349	0,266	0,484	0,798	0,748	0,399	0,415	0,426	-0,275	**1**	-0,122
Rigidity of employment (21)	-0,174	-0,205	0,819	-0,500	-0,134	0,771	0,049	0,247	0,757	0,332	0,631	-0,526	-0,434	-0,053	-0,347	-0,482	-0,677	0,374	0,653	-0,122	**1**

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.3: Maximum communalities changes for each iteration

Iteration	Maximum change
9	0,0025
10	0,0017
11	0,0011
12	0,0008
13	0,0005
14	0,0003
15	0,0002
16	0,0002
17	0,0001
18	0,0001

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.4: Matrix of correlation coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment (1)	0,604	0,272	-0,078	0,074	0,013	-0,289	-0,304	-0,015	-0,313	0,109	-0,316	0,364	0,692	0,171	0,358	0,206	0,315	0,112	-0,260	0,307	-0,269
Expendable building zones per capita and per employment and in absolute value (2)	0,272	0,913	-0,257	-0,192	0,011	0,134	0,096	-0,571	0,015	-0,458	0,135	-0,302	0,094	0,172	0,190	0,005	0,142	-0,244	0,234	0,385	-0,174
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%) (3)	-0,078	-0,257	0,842	-0,193	0,163	0,576	0,046	0,302	0,543	0,450	0,339	-0,081	-0,086	0,091	-0,013	-0,421	-0,432	0,591	0,406	0,099	0,730
Healthcare service accessibility (4)	0,074	-0,192	-0,193	0,856	0,504	-0,653	0,278	-0,177	-0,717	-0,051	-0,770	0,635	0,395	0,337	0,557	0,414	0,736	0,109	-0,759	0,277	-0,514
Local authorities' efficiency (5)	0,013	0,011	0,163	0,504	0,658	-0,103	0,379	-0,156	-0,132	-0,193	-0,278	0,275	0,117	0,014	0,309	-0,139	0,312	0,097	-0,147	0,117	-0,109
Regional public finances' soundness and public funds spending efficiency (6)	-0,289	0,134	0,576	-0,653	-0,103	0,894	0,093	0,086	0,891	0,045	0,820	-0,663	-0,578	-0,207	-0,423	-0,629	-0,759	0,139	0,881	-0,140	0,782
Regional public authorities' auto-financing capabilities (7)	-0,304	0,096	0,046	0,278	0,379	0,093	0,473	-0,300	0,023	-0,282	-0,012	-0,107	-0,303	0,091	0,105	-0,099	0,117	-0,033	0,040	0,092	0,015
Fiscal policy toward firms (8)	-0,015	-0,571	0,302	-0,177	-0,156	0,086	-0,300	0,563	0,218	0,415	0,117	0,123	0,016	-0,295	-0,278	-0,177	-0,334	0,188	0,074	-0,364	0,277
Fiscal policy toward workers (9)	-0,313	0,015	0,543	-0,717	-0,132	0,891	0,023	0,218	0,958	0,024	0,876	-0,671	-0,635	-0,440	-0,586	-0,725	-0,856	0,034	0,935	-0,363	0,773
Average and median earnings (10)	0,109	-0,458	0,450	-0,051	-0,193	0,045	-0,282	0,415	0,024	0,671	-0,062	0,249	0,270	0,292	0,112	0,114	-0,131	0,557	-0,133	0,158	0,342
Efficiency of judicial institutions at the regional level (11)	-0,316	0,135	0,339	-0,770	-0,278	0,820	-0,012	0,117	0,876	-0,062	0,872	-0,745	-0,664	-0,402	-0,609	-0,602	-0,812	-0,100	0,897	-0,344	0,654
MNEs' competition effectiveness (12)	0,364	-0,302	-0,081	0,635	0,275	-0,663	-0,107	0,123	-0,671	0,249	-0,745	0,763	0,695	0,266	0,508	0,416	0,608	0,245	-0,749	0,231	-0,434
Operational infrastructures (13)	0,692	0,094	-0,086	0,395	0,117	-0,578	-0,303	0,016	-0,635	0,270	-0,664	0,695	0,956	0,405	0,621	0,451	0,600	0,286	-0,633	0,476	-0,424
Financial infrastructures (14)	0,171	0,172	0,091	0,337	0,014	-0,207	0,091	-0,295	-0,440	0,292	-0,402	0,266	0,405	0,894	0,646	0,524	0,449	0,477	-0,446	0,788	-0,058
Innovation effectiveness (15)	0,358	0,190	-0,013	0,557	0,309	-0,423	0,105	-0,278	-0,586	0,112	-0,609	0,508	0,621	0,646	0,717	0,441	0,647	0,335	-0,573	0,659	-0,314
Education and labor-market consistency (16)	0,206	0,005	-0,421	0,414	-0,139	-0,629	-0,099	-0,177	-0,725	0,114	-0,602	0,416	0,451	0,524	0,441	0,686	0,589	0,050	-0,709	0,392	-0,508
Superior schools and research institutions' quality and dynamics (17)	0,315	0,142	-0,432	0,736	0,312	-0,759	0,117	-0,334	-0,856	-0,131	-0,812	0,608	0,600	0,449	0,647	0,589	0,852	-0,006	-0,808	0,444	-0,702
Availability of specialized research & training (18)	0,112	-0,244	0,591	0,109	0,097	0,139	-0,033	0,188	0,034	0,557	-0,100	0,245	0,286	0,477	0,335	0,050	-0,006	0,670	-0,096	0,407	0,388
Sophistication of local demand (19)	-0,260	0,234	0,406	-0,759	-0,147	0,881	0,040	0,074	0,935	-0,133	0,897	-0,749	-0,633	-0,446	-0,573	-0,709	-0,808	-0,096	0,973	-0,321	0,675
Extent of cluster development and specialization (20)	0,307	0,385	0,099	0,277	0,117	-0,140	0,092	-0,364	-0,363	0,158	-0,344	0,231	0,476	0,788	0,659	0,392	0,444	0,407	-0,321	0,795	-0,080
Rigidity of employment (21)	-0,269	-0,174	0,730	-0,514	-0,109	0,782	0,015	0,277	0,773	0,342	0,654	-0,434	-0,424	-0,058	-0,314	-0,508	-0,702	0,388	0,675	-0,080	0,840

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.5: Matrix of correlation residuals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment (1)	0,396	0,012	0,041	-0,023	-0,006	0,006	0,019	-0,001	-0,006	-0,007	-0,043	-0,032	0,040	0,010	-0,036	0,021	0,075	-0,055	-0,023	-0,042	0,095
Expendable building zones per capita and per employment and in absolute value (2)	0,012	0,087	0,028	0,053	-0,044	0,010	-0,014	-0,012	-0,024	-0,054	0,016	-0,027	0,008	-0,007	-0,018	-0,014	-0,023	0,065	-0,016	-0,014	-0,031
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%) (3)	0,041	0,028	0,158	0,051	-0,012	-0,024	-0,039	0,018	-0,037	-0,084	-0,013	-0,017	-0,020	0,042	-0,068	-0,015	0,010	0,051	-0,016	-0,033	0,088
Healthcare service accessibility (4)	-0,023	0,053	0,051	0,144	-0,052	-0,019	0,028	-0,002	-0,022	-0,045	-0,008	0,013	0,018	-0,024	-0,042	0,014	0,021	0,069	-0,012	-0,040	0,014
Local authorities' efficiency (5)	-0,006	-0,044	-0,012	-0,052	0,342	0,009	0,031	-0,056	-0,009	0,032	0,049	0,027	0,008	-0,049	0,084	0,017	-0,013	-0,001	0,004	-0,008	-0,025
Regional public finances' soundness and public funds spending efficiency (6)	0,006	0,010	-0,024	-0,019	0,009	0,106	0,067	0,004	0,018	0,078	0,028	-0,009	0,023	-0,009	0,009	0,008	0,028	-0,019	-0,003	-0,021	-0,012
Regional public authorities' auto-financing capabilities (7)	0,019	-0,014	-0,039	0,028	0,031	0,067	0,527	0,062	0,007	0,014	-0,062	-0,099	0,042	0,040	-0,019	-0,027	0,002	-0,071	-0,047	0,016	0,034
Fiscal policy toward firms (8)	-0,001	-0,012	0,018	-0,002	-0,056	0,004	0,062	0,437	0,010	-0,019	-0,049	-0,011	0,035	-0,029	-0,021	-0,022	-0,042	0,008	-0,015	0,043	-0,030
Fiscal policy toward workers (9)	-0,006	-0,024	-0,037	-0,022	-0,009	0,018	0,007	0,010	0,042	0,019	0,005	0,047	-0,022	-0,004	0,026	-0,038	0,014	-0,021	0,025	0,045	-0,016
Average and median earnings (10)	-0,007	-0,054	-0,084	-0,045	0,032	0,078	0,014	-0,019	0,019	0,329	0,021	0,019	0,034	0,003	0,090	0,020	-0,030	0,006	-0,015	-0,035	-0,010
Efficiency of judicial institutions at the regional level (11)	-0,043	0,016	-0,013	-0,008	0,049	0,028	-0,062	-0,049	0,005	0,021	0,128	0,024	-0,015	-0,058	0,007	0,070	-0,009	0,055	0,019	-0,005	-0,023
MNEs' competition effectiveness (12)	-0,032	-0,027	-0,017	0,013	0,027	-0,009	-0,099	-0,011	0,047	0,019	0,024	0,237	-0,049	0,007	0,025	-0,028	0,046	0,035	0,051	0,035	-0,093
Operational infrastructures (13)	0,040	0,008	-0,020	0,018	0,008	0,023	0,042	0,035	-0,022	0,034	-0,015	-0,049	0,044	0,008	-0,009	-0,020	-0,038	-0,017	-0,030	0,008	-0,010
Financial infrastructures (14)	0,010	-0,007	0,042	-0,024	-0,049	-0,009	0,040	-0,029	-0,004	0,003	-0,058	0,007	0,008	0,106	-0,041	-0,042	0,017	-0,021	-0,005	0,010	0,005
Innovation effectiveness (15)	-0,036	-0,018	-0,068	-0,042	0,084	0,009	-0,019	-0,021	0,026	0,090	0,007	0,025	-0,009	-0,041	0,283	0,008	-0,031	-0,030	0,002	0,089	-0,032
Education and labor-market consistency (16)	0,021	-0,014	-0,015	0,014	0,017	0,008	-0,027	-0,022	-0,038	0,020	0,070	-0,028	-0,020	-0,042	0,008	0,314	0,046	0,021	-0,025	0,007	0,025
Superior schools and research institutions' quality and dynamics (17)	0,075	-0,023	0,010	0,021	-0,013	0,028	0,002	-0,042	0,014	-0,030	-0,009	0,046	-0,038	0,017	-0,031	0,046	0,148	0,001	0,012	-0,029	0,025
Availability of specialized research & training (18)	-0,055	0,065	0,051	0,069	-0,001	-0,019	-0,071	0,008	-0,021	0,006	0,055	0,035	-0,017	-0,021	-0,030	0,021	0,001	0,330	0,012	0,019	-0,013
Sophistication of local demand (19)	-0,023	-0,016	-0,016	-0,012	0,004	-0,003	-0,047	-0,015	0,025	-0,015	0,019	0,051	-0,030	-0,005	0,002	-0,025	0,012	0,012	0,027	0,046	-0,021
Extent of cluster development and specialization (20)	-0,042	-0,014	-0,033	-0,040	-0,008	-0,021	0,016	0,043	0,045	-0,035	-0,005	0,035	0,008	0,010	0,089	0,007	-0,029	0,019	0,046	0,205	-0,042
Rigidity of employment (21)	0,095	-0,031	0,088	0,014	-0,025	-0,012	0,034	-0,030	-0,016	-0,010	-0,023	-0,093	-0,010	0,005	-0,032	0,025	0,025	-0,013	-0,021	-0,042	0,160

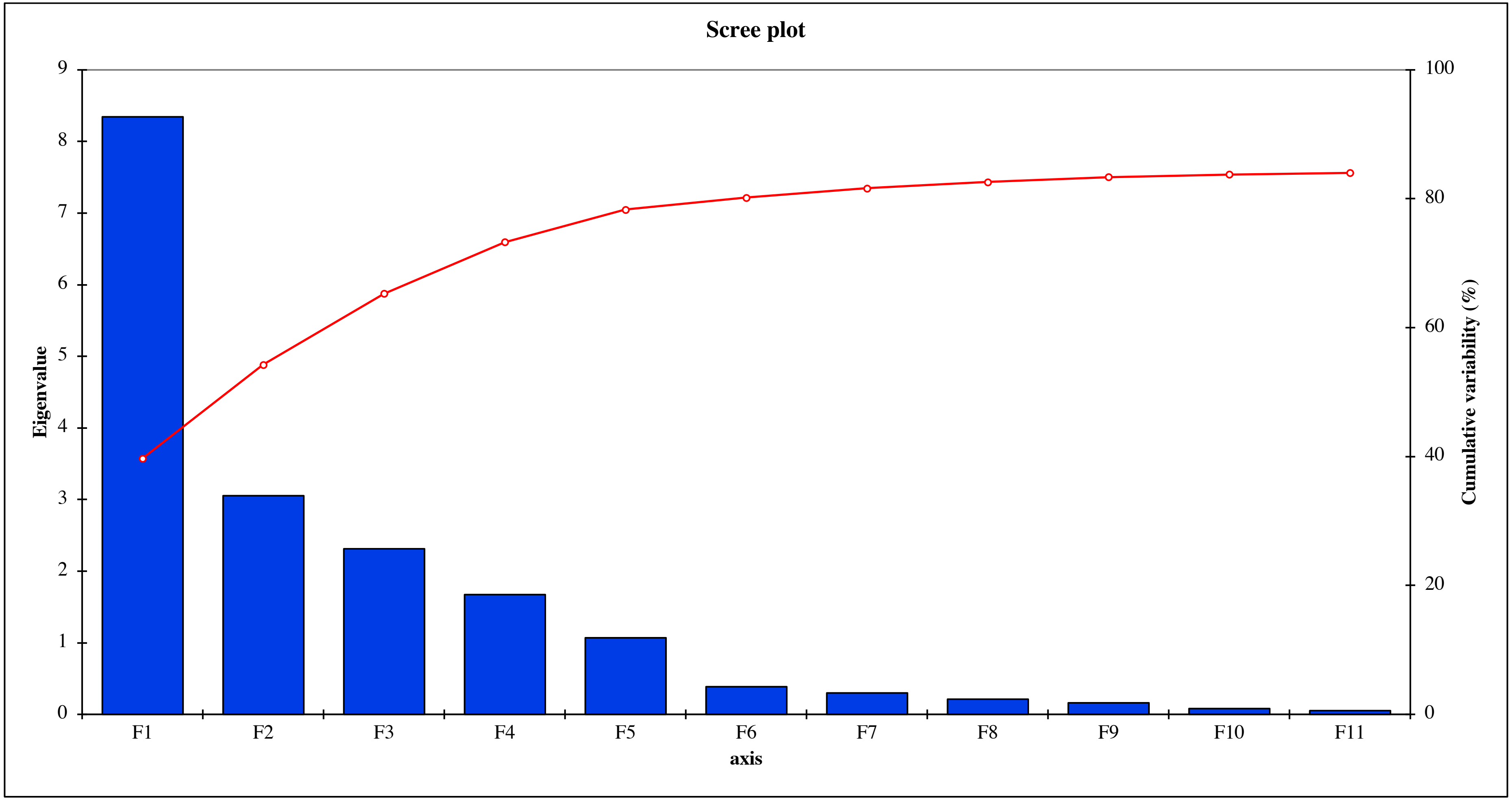
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.6: Eigenvalues

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Eigenvalue	8,341	3,055	2,312	1,675	1,068	0,387	0,300	0,209	0,162	0,082	0,051
Variability (%)	39,719	14,547	11,010	7,976	5,084	1,845	1,430	0,996	0,770	0,393	0,244
Cumulative %	39,719	54,266	65,276	73,253	78,337	80,182	81,612	82,608	83,378	83,771	84,015

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.7: Scree plot



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.8: Eigen vector

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,139	0,088	0,051	-0,352	0,440	0,283	-0,177	-0,240	0,236	-0,003	-0,145
Expendable building zones per capita and per employment and in absolute value	-0,010	-0,195	0,524	-0,260	0,211	0,139	0,218	0,088	-0,320	0,164	0,087
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,143	0,434	0,049	0,192	0,164	0,353	0,239	-0,010	0,063	-0,180	0,070
Healthcare service accessibility	-0,265	-0,003	-0,038	0,400	0,018	0,214	0,242	0,047	-0,236	0,269	-0,134
Local authorities' efficiency	-0,081	0,015	0,111	0,488	0,404	-0,252	-0,097	-0,280	-0,050	-0,238	0,128
Regional public finances' soundness and public funds spending efficiency	0,297	0,138	0,205	0,033	0,028	-0,071	-0,230	-0,162	-0,118	0,525	-0,076
Regional public authorities' auto-financing capabilities	0,001	-0,081	0,216	0,448	-0,090	0,152	-0,451	0,111	-0,134	0,147	-0,174
Fiscal policy toward firms	0,080	0,192	-0,407	-0,054	0,090	0,073	-0,121	0,386	-0,181	0,010	-0,403
Fiscal policy toward workers	0,330	0,085	0,065	0,027	0,116	-0,181	-0,068	0,152	0,258	0,215	-0,241
Average and median earnings	-0,011	0,418	-0,192	-0,129	-0,151	-0,270	-0,265	-0,223	-0,109	0,241	0,218
Efficiency of judicial institutions at the regional level	0,316	-0,010	0,099	-0,093	-0,029	-0,215	0,234	-0,322	-0,209	0,039	-0,069
MNEs' competition effectiveness	-0,256	0,142	-0,209	0,073	0,206	-0,290	0,276	0,092	0,299	0,257	0,059
Operational infrastructures	-0,260	0,187	-0,019	-0,278	0,382	0,072	-0,247	0,079	-0,302	0,076	0,079
Financial infrastructures	-0,184	0,269	0,316	-0,048	-0,382	0,151	-0,090	0,190	0,282	0,125	0,401
Innovation effectiveness	-0,245	0,168	0,229	0,055	0,074	-0,392	-0,153	-0,053	-0,041	-0,242	-0,045
Education and labor-market consistency	-0,242	-0,008	-0,009	-0,173	-0,370	-0,024	0,078	-0,420	-0,124	-0,077	-0,417
Superior schools and research institutions' quality and dynamics	-0,311	-0,079	0,081	0,084	0,037	0,111	0,074	-0,253	0,400	0,349	-0,289
Availability of specialized research & training	-0,033	0,459	0,053	0,068	-0,036	-0,016	0,420	0,000	-0,265	0,112	-0,046
Sophistication of local demand	0,325	-0,010	0,165	-0,044	0,156	-0,169	0,171	0,108	0,258	0,019	-0,089
Extent of cluster development and specialization	-0,169	0,225	0,405	-0,085	-0,100	-0,236	-0,011	0,331	0,047	-0,241	-0,411
Rigidity of employment	0,249	0,313	0,064	0,070	-0,065	0,343	-0,102	-0,274	0,130	-0,254	-0,120

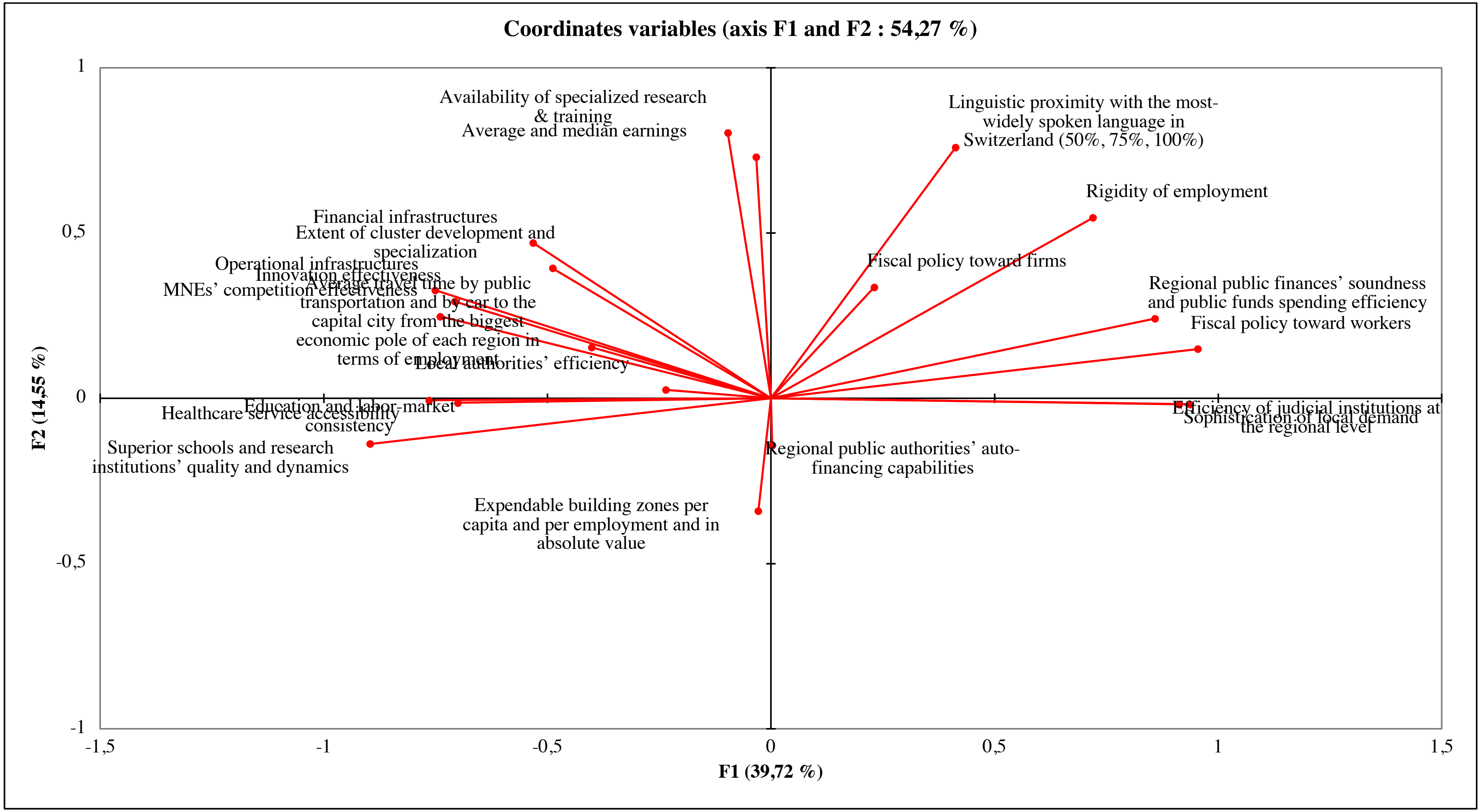
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.9: Factorial coordinates

	F1	F2	F3	F4	F5	Initial communality	Final communality	Specific variance
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,401	0,154	0,077	**-0,455**	0,454	0,918	0,604	0,396
Expendable building zones per capita and per employment and in absolute value	-0,028	-0,341	**0,797**	-0,336	0,218	0,975	0,913	0,087
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,413	**0,759**	0,075	0,248	0,170	0,981	0,842	0,158
Healthcare service accessibility	**-0,765**	-0,006	-0,057	0,517	0,018	0,948	0,856	0,144
Local authorities' efficiency	-0,235	0,026	0,169	**0,632**	0,417	0,872	0,658	0,342
Regional public finances' soundness and public funds spending efficiency	**0,858**	0,241	0,311	0,043	0,029	0,983	0,894	0,106
Regional public authorities' auto-financing capabilities	0,003	-0,142	0,329	**0,580**	-0,093	0,908	0,473	0,527
Fiscal policy toward firms	0,231	0,336	**-0,619**	-0,070	0,093	0,838	0,563	0,437
Fiscal policy toward workers	**0,954**	0,149	0,098	0,034	0,120	0,990	0,958	0,042
Average and median earnings	-0,033	**0,730**	-0,292	-0,167	-0,156	0,932	0,671	0,329
Efficiency of judicial institutions at the regional level	**0,913**	-0,018	0,151	-0,121	-0,030	0,955	0,872	0,128
MNEs' competition effectiveness	**-0,739**	0,248	-0,318	0,094	0,213	0,964	0,763	0,237
Operational infrastructures	**-0,750**	0,327	-0,028	-0,359	0,395	0,981	0,956	0,044
Financial infrastructures	**-0,531**	0,470	0,481	-0,062	-0,395	0,974	0,894	0,106
Innovation effectiveness	**-0,707**	0,293	0,348	0,071	0,076	0,965	0,717	0,283
Education and labor-market consistency	**-0,700**	-0,013	-0,014	-0,224	-0,382	0,959	0,686	0,314
Superior schools and research institutions' quality and dynamics	**-0,897**	-0,138	0,123	0,109	0,038	0,955	0,852	0,148
Availability of specialized research & training	-0,097	**0,803**	0,081	0,088	-0,037	0,832	0,670	0,330
Sophistication of local demand	**0,938**	-0,018	0,251	-0,057	0,161	0,991	0,973	0,027
Extent of cluster development and specialization	-0,488	0,393	**0,616**	-0,109	-0,103	0,984	0,795	0,205
Rigidity of employment	**0,720**	0,546	0,097	0,091	-0,067	0,985	0,840	0,160

Note : bold values correspond to each factor's variable for which cosine squared is the highest.
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.10: Coordinates variables



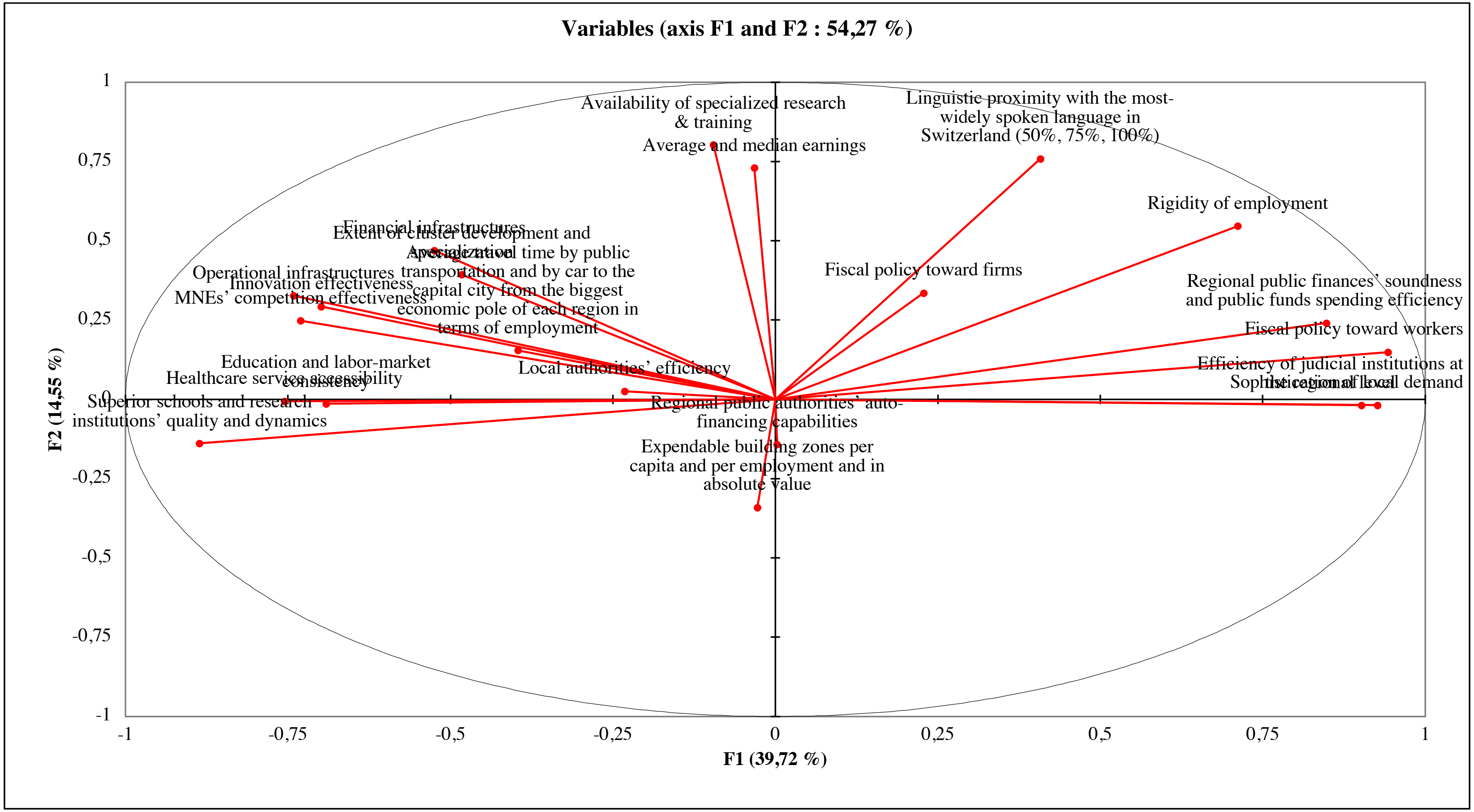
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.11: Correlation between variables and factors

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,396	0,154	0,077	-0,428	0,334
Expendable building zones per capita and per employment and in absolute value	-0,028	-0,341	0,795	-0,316	0,160
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,408	0,759	0,075	0,233	0,125
Healthcare service accessibility	-0,755	-0,006	-0,057	0,486	0,014
Local authorities' efficiency	-0,232	0,026	0,169	0,594	0,307
Regional public finances' soundness and public funds spending efficiency	0,848	0,241	0,311	0,040	0,021
Regional public authorities' auto-financing capabilities	0,003	-0,142	0,328	0,544	-0,068
Fiscal policy toward firms	0,228	0,336	-0,618	-0,065	0,068
Fiscal policy toward workers	0,943	0,149	0,098	0,032	0,088
Average and median earnings	-0,032	0,730	-0,291	-0,156	-0,114
Efficiency of judicial institutions at the regional level	0,902	-0,018	0,151	-0,113	-0,022
MNEs' competition effectiveness	-0,730	0,248	-0,317	0,089	0,157
Operational infrastructures	-0,741	0,327	-0,028	-0,338	0,290
Financial infrastructures	-0,525	0,470	0,480	-0,058	-0,291
Innovation effectiveness	-0,699	0,293	0,347	0,066	0,056
Education and labor-market consistency	-0,691	-0,013	-0,014	-0,210	-0,281
Superior schools and research institutions' quality and dynamics	-0,886	-0,138	0,123	0,102	0,028
Availability of specialized research & training	-0,095	0,803	0,081	0,083	-0,027
Sophistication of local demand	0,927	-0,018	0,251	-0,054	0,119
Extent of cluster development and specialization	-0,482	0,393	0,615	-0,103	-0,076
Rigidity of employment	0,712	0,546	0,097	0,085	-0,050

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II. 12: Variables



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.13: Coefficient of factorial model

	F1	F2	F3	F4	F5
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	-0,068	-0,372	0,023	1,084	-2,089
Expendable building zones per capita and per employment and in absolute value	-0,918	-0,764	0,713	0,581	-1,773
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	0,416	0,721	-1,252	-0,833	4,443
Healthcare service accessibility	0,214	0,029	0,520	0,859	-0,859
Local authorities' efficiency	-0,348	-0,240	0,436	0,903	-1,329
Regional public finances' soundness and public funds spending efficiency	-0,563	-0,881	0,563	2,699	-5,998
Regional public authorities' auto-financing capabilities	0,446	0,319	-0,166	-1,113	2,559
Fiscal policy toward firms	-0,022	-0,134	0,391	0,060	-0,841
Fiscal policy toward workers	-0,235	1,775	-1,368	-0,656	4,363
Average and median earnings	-0,229	-0,301	-0,147	0,221	-0,011
Efficiency of judicial institutions at the regional level	-0,301	-0,142	0,059	0,523	-1,909
MNEs' competition effectiveness	-0,639	-0,505	0,514	0,720	-2,951
Operational infrastructures	0,936	1,701	-0,193	-3,366	6,480
Financial infrastructures	0,788	1,032	0,824	-1,430	1,604
Innovation effectiveness	0,834	0,793	0,067	-1,565	3,219
Education and labor-market consistency	0,777	0,903	-0,169	-1,939	3,988
Superior schools and research institutions' quality and dynamics	-0,127	0,172	-0,269	-0,838	2,518
Availability of specialized research & training	0,235	0,393	-0,100	-0,384	0,650
Sophistication of local demand	3,733	1,549	1,180	-6,168	11,612
Extent of cluster development and specialization	-1,447	-1,285	0,056	3,127	-5,979
Rigidity of employment	-0,911	-0,700	1,380	1,034	-4,897

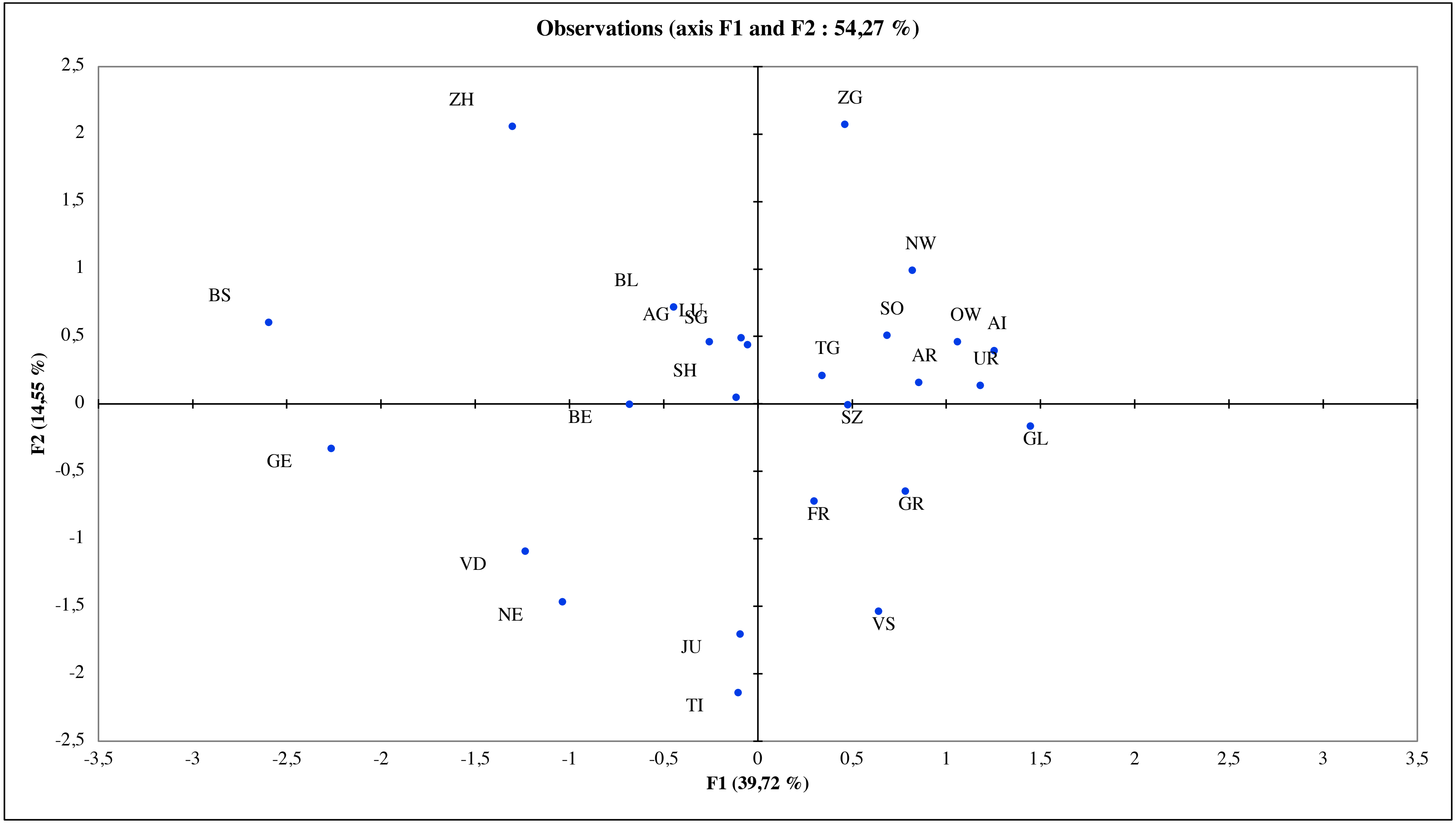
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.14: Coordinate observations

Observation	F1	F2	F3	F4	F5
ZH	-1,303	2,058	**2,824**	-0,943	-0,825
AG	-0,258	0,464	1,045	0,278	**2,909**
BS	-2,596	0,606	-1,292	**2,823**	0,930
VD	**-1,235**	-1,091	1,142	-1,150	-0,073
BE	-0,682	-0,001	1,251	0,073	**-1,357**
ZG	0,460	**2,073**	-1,266	-0,724	0,775
LU	-0,090	0,494	0,320	**0,676**	0,012
SG	-0,056	0,442	**0,793**	-0,091	0,124
TG	0,341	0,214	**0,896**	0,008	0,198
FR	0,298	**-0,718**	0,443	-0,100	-0,044
NW	0,818	**0,992**	-0,949	-0,191	-0,587
SH	-0,117	0,051	-0,551	**1,208**	-1,099
BL	-0,448	0,719	-1,043	**-1,679**	0,074
UR	**1,179**	0,139	-0,263	-0,123	0,443
SO	0,684	0,510	-1,027	-2,253	**3,344**
AI	**1,253**	0,398	-0,344	0,391	-0,980
GL	1,445	-0,161	0,343	0,189	**1,662**
OW	**1,058**	0,462	-0,267	-0,171	-0,049
GE	**-2,266**	-0,326	-1,434	-0,642	-0,784
SZ	0,477	-0,005	-0,640	0,241	**-2,849**
NE	-1,037	**-1,465**	-0,828	-0,594	-0,854
GR	0,783	-0,643	0,725	**1,465**	-0,551
AR	0,852	0,160	-0,483	**1,710**	-0,890
VS	0,641	**-1,534**	0,970	-0,543	0,988
TI	-0,105	-2,136	0,335	1,159	**-2,160**
JU	-0,094	**-1,703**	-0,699	-1,018	1,641

Note: bold values correspond to each factor's variable for which squared cosine is the highest.
Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix II.15: Observations



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix III: Multiple correspondence analysis

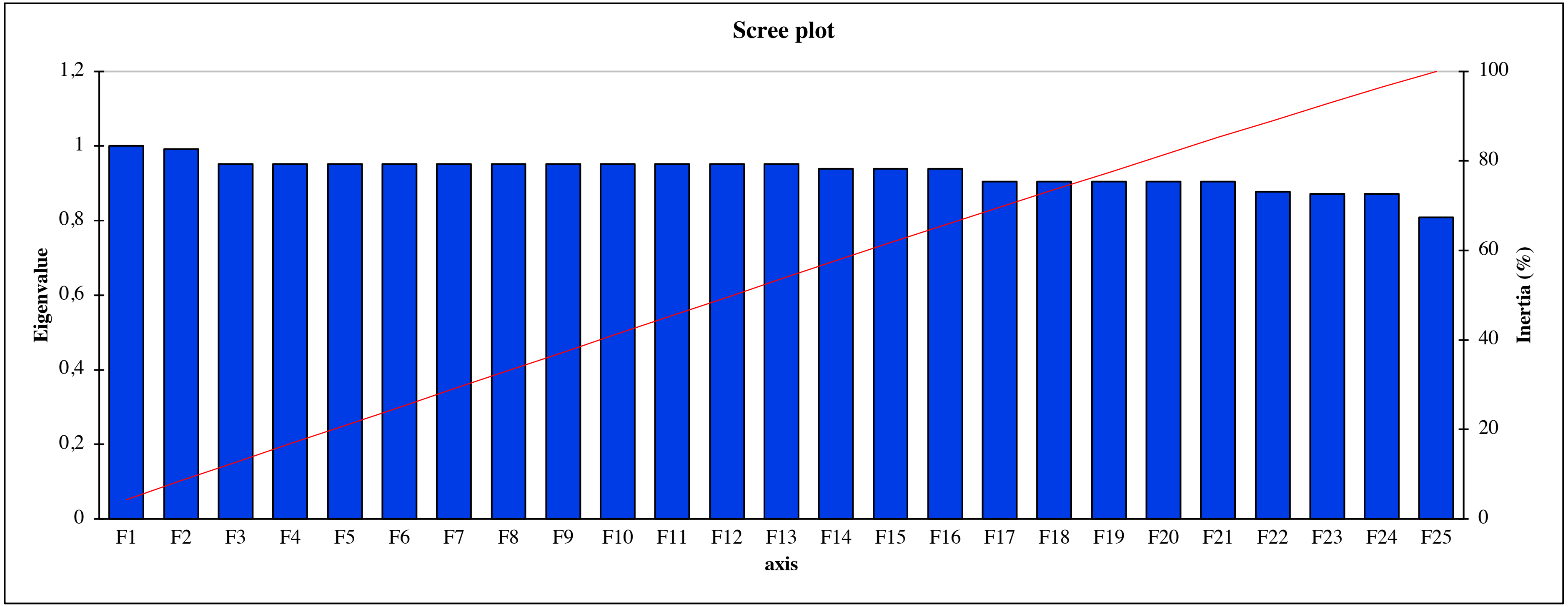
Appendix III.1: Eigenvalues

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
Eigenvalue	1,000	0,993	0,952	0,952	0,952	0,952	0,952	0,952	0,952	0,952	0,952	0,952	0,952
Variability (%)	4,303	4,272	4,098	4,098	4,098	4,098	4,098	4,098	4,098	4,098	4,098	4,098	4,098
Cumulative %	4,303	8,575	12,673	16,772	20,870	24,968	29,067	33,165	37,264	41,362	45,460	49,559	53,657

	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23	F24	F25
Eigenvalue	0,939	0,938	0,938	0,905	0,905	0,905	0,905	0,905	0,878	0,871	0,871	0,810
Variability (%)	4,041	4,038	4,038	3,893	3,893	3,893	3,893	3,893	3,778	3,749	3,749	3,484
Cumulative %	57,698	61,736	65,774	69,668	73,561	77,455	81,348	85,242	89,019	92,768	96,516	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix III.2: Scree Plot



Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix III.3: Results for the observations

Primary coordinates (Observations)

	F1	F2	F3	F4	F5
ZH	-0,289	-0,611	-3,653	-0,031	0,583
AG	-0,289	-0,611	0,243	-0,512	2,092
BS	-0,289	-0,611	0,393	-1,318	-0,515
VD	-0,289	2,321	1,798	0,531	-1,224
BE	-0,289	-0,611	0,815	2,302	-1,159
ZG	-0,289	-0,611	-0,299	-0,058	-0,728
LU	-0,289	-0,611	-0,726	1,315	-0,678
SG	-0,289	-0,611	1,634	-1,078	2,754
TG	-0,289	-0,490	0,287	-0,217	-0,012
FR	3,464	0,000	0,127	2,463	1,557
NW	-0,289	-0,490	0,287	-0,217	-0,012
SH	-0,289	-0,611	-0,299	-0,058	-0,728
BL	-0,289	-0,611	0,191	1,288	-0,072
UR	-0,289	-0,081	0,287	-0,217	-0,012
SO	-0,289	-0,611	-0,299	-0,058	-0,728
AI	-0,289	-0,490	0,287	-0,217	-0,012
GL	-0,289	-0,490	0,287	-0,217	-0,012
OW	-0,289	-0,490	0,287	-0,217	-0,012
GE	-0,289	1,429	0,287	-0,217	-0,012
SZ	-0,289	-0,081	0,287	-0,217	-0,012
NE	-0,289	1,429	0,287	-0,217	-0,012
GR	-0,289	-0,611	-0,299	-0,058	-0,728
AR	-0,289	-0,490	0,287	-0,217	-0,012
VS	3,464	0,000	-0,127	-2,463	-1,557
TI	-0,289	2,321	-1,343	0,032	-0,132
JU	-0,289	2,321	-1,029	-0,130	1,379

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Standard coordinates (Observations)

	F1	F2	F3	F4	F5
ZH	-0,289	-0,613	-3,743	-0,032	0,597
AG	-0,289	-0,613	0,249	-0,525	2,144
BS	-0,289	-0,613	0,403	-1,351	-0,527
VD	-0,289	2,330	1,843	0,544	-1,254
BE	-0,289	-0,613	0,836	2,358	-1,187
ZG	-0,289	-0,613	-0,306	-0,060	-0,746
LU	-0,289	-0,613	-0,743	1,348	-0,695
SG	-0,289	-0,613	1,674	-1,105	2,822
TG	-0,289	-0,492	0,294	-0,222	-0,012
FR	3,464	0,000	0,130	2,524	1,596
NW	-0,289	-0,492	0,294	-0,222	-0,012
SH	-0,289	-0,613	-0,306	-0,060	-0,746
BL	-0,289	-0,613	0,196	1,319	-0,074
UR	-0,289	-0,081	0,294	-0,222	-0,012
SO	-0,289	-0,613	-0,306	-0,060	-0,746
AI	-0,289	-0,492	0,294	-0,222	-0,012
GL	-0,289	-0,492	0,294	-0,222	-0,012
OW	-0,289	-0,492	0,294	-0,222	-0,012
GE	-0,289	1,434	0,294	-0,222	-0,012
SZ	-0,289	-0,081	0,294	-0,222	-0,012
NE	-0,289	1,434	0,294	-0,222	-0,012
GR	-0,289	-0,613	-0,306	-0,060	-0,746
AR	-0,289	-0,492	0,294	-0,222	-0,012
VS	3,464	0,000	-0,130	-2,524	-1,596
TI	-0,289	2,330	-1,376	0,033	-0,135
JU	-0,289	2,330	-1,054	-0,133	1,414

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Contributions (Observations)

	F1	F2	F3	F4	F5
ZH	0,321	1,446	53,879	0,004	1,371
AG	0,321	1,446	0,239	1,061	17,674
BS	0,321	1,446	0,623	7,015	1,070
VD	0,321	20,879	13,059	1,140	6,050
BE	0,321	1,446	2,685	21,392	5,422
ZG	0,321	1,446	0,360	0,014	2,139
LU	0,321	1,446	2,126	6,987	1,856
SG	0,321	1,446	10,781	4,695	30,628
TG	0,321	0,931	0,333	0,189	0,001
FR	46,154	0,000	0,065	24,495	9,796
NW	0,321	0,931	0,333	0,189	0,001
SH	0,321	1,446	0,360	0,014	2,139
BL	0,321	1,446	0,148	6,696	0,021
UR	0,321	0,025	0,333	0,189	0,001
SO	0,321	1,446	0,360	0,014	2,139
AI	0,321	0,931	0,333	0,189	0,001
GL	0,321	0,931	0,333	0,189	0,001
OW	0,321	0,931	0,333	0,189	0,001
GE	0,321	7,913	0,333	0,189	0,001
SZ	0,321	0,025	0,333	0,189	0,001
NE	0,321	7,913	0,333	0,189	0,001
GR	0,321	1,446	0,360	0,014	2,139
AR	0,321	0,931	0,333	0,189	0,001
VS	46,154	0,000	0,065	24,495	9,796
TI	0,321	20,879	7,287	0,004	0,070
JU	0,321	20,879	4,276	0,068	7,685

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Squared cosine (Observations)

	F1	F2	F3	F4	F5
ZH	0,003	0,016	0,560	0,000	0,014
AG	0,003	0,016	0,002	0,011	0,184
BS	0,003	0,016	0,006	0,073	0,011
VD	0,003	0,224	0,135	0,012	0,062
BE	0,003	0,016	0,028	0,222	0,056
ZG	0,004	0,017	0,004	0,000	0,023
LU	0,003	0,016	0,022	0,073	0,019
SG	0,003	0,016	0,112	0,049	0,318
TG	0,004	0,011	0,004	0,002	0,000
FR	0,492	0,000	0,001	0,249	0,099
NW	0,004	0,011	0,004	0,002	0,000
SH	0,004	0,016	0,004	0,000	0,023
BL	0,003	0,016	0,002	0,070	0,000
UR	0,004	0,000	0,004	0,002	0,000
SO	0,004	0,017	0,004	0,000	0,023
AI	0,004	0,011	0,004	0,002	0,000
GL	0,004	0,011	0,004	0,002	0,000
OW	0,004	0,011	0,004	0,002	0,000
GE	0,004	0,087	0,004	0,002	0,000
SZ	0,004	0,000	0,004	0,002	0,000
NE	0,004	0,087	0,004	0,002	0,000
GR	0,004	0,016	0,004	0,000	0,023
AR	0,004	0,011	0,004	0,002	0,000
VS	0,492	0,000	0,001	0,249	0,099
TI	0,003	0,224	0,075	0,000	0,001
JU	0,003	0,224	0,044	0,001	0,079

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix IV: Discriminant function analysis

Appendix IV.1: Endowments

Variable	Values	Size	%
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	34,3333333333333	1	4,000
	45	2	8,000
	50,8333333333333	1	4,000
	54,5	1	4,000
	56,3333333333333	1	4,000
	61,5	1	4,000
	63,6666666666667	1	4,000
	65	1	4,000
	65,6666666666667	2	8,000
	69,1666666666667	1	4,000
	70,1666666666667	1	4,000
	71,1666666666667	1	4,000
	71,3333333333333	1	4,000
	74,8333333333333	1	4,000
	77	1	4,000
	77,3333333333333	1	4,000
	79,8333333333333	1	4,000
	81,3333333333333	1	4,000
	81,5	1	4,000
	86,6666666666667	1	4,000
	88,6666666666667	1	4,000
	91,3333333333333	1	4,000
	100	1	4,000
Expendable building zones per capita and per employment and in absolute value	13,3926337285238	1	4,000
	21,5266360820782	1	4,000
	30,6521597404539	1	4,000
	32,6582157228065	1	4,000
	36,797992939863	1	4,000
	37,2148623558565	1	4,000
	40,155960646126	1	4,000
	41,1234466194354	1	4,000
	44,0537014101064	1	4,000
	45,2143228256686	1	4,000
	45,7345370955581	1	4,000

	46,2277329911903	1	4,000
	48,3794568835264	1	4,000
	50,7816175817303	1	4,000
	57,1518333893364	1	4,000
	57,2706452199376	1	4,000
	57,5526289777574	1	4,000
	61,1830586171845	1	4,000
	68,1628337891244	1	4,000
	74,2400843725722	1	4,000
	82,9607996288333	1	4,000
	84,7389375335044	1	4,000
	86,1268644317987	1	4,000
	86,4036934278332	1	4,000
	100,000000000632	1	4,000
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	80	4	16,000
	90	2	8,000
	100	19	76,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix IV.2: Macroeconomic

Variable	Values	Size	%
Healthcare service accessibility	51,3185759273153	1	4,000
	51,4441037146027	1	4,000
	51,6197229509124	1	4,000
	53,0931586835642	1	4,000
	54,2664376712393	1	4,000
	56,3996712483095	1	4,000
	56,5529684598861	1	4,000
	58,5751937113319	1	4,000
	59,9496588134624	1	4,000
	60,4232062342808	1	4,000
	61,9199802846106	1	4,000
	62,3607010964517	1	4,000
	62,3958828689429	1	4,000
	62,436527649585	1	4,000
	63,019550285169	1	4,000
	64,021056687988	1	4,000

	64,7865680758453	1	4,000
	66,2988362578637	1	4,000
	66,4715158755017	1	4,000
	66,8256939667925	1	4,000
	67,320741359689	1	4,000
	68,2151103683732	1	4,000
	72,3797106305283	1	4,000
	75,0039333658686	1	4,000
	100	1	4,000
Local authorities' efficiency	48,6022282569034	1	4,000
	48,827828374152	1	4,000
	57,6220912313136	1	4,000
	59,1391820684026	1	4,000
	61,101470464818	1	4,000
	62,2578444630454	1	4,000
	63,7667683088924	1	4,000
	64,5910613012474	1	4,000
	64,6025445565499	1	4,000
	65,4266716286517	1	4,000
	65,8561984639382	1	4,000
	66,206970497602	1	4,000
	66,4130807339512	1	4,000
	67,0763113284822	1	4,000
	67,3178883434224	1	4,000
	67,6970907570792	1	4,000
	67,8336075274398	1	4,000
	69,5918130683085	1	4,000
	74,7033898518254	1	4,000
	74,9577008000622	1	4,000
	76,8757719672904	1	4,000
	78,4343449227722	1	4,000
	84,0159183742707	1	4,000
	94,8287998958815	1	4,000
	100,000000003516	1	4,000
Regional public finances' soundness and public funds spending efficiency	42,2267529048045	1	4,000
	52,4761847892525	1	4,000
	54,6867966610208	1	4,000
	72,2380344436566	1	4,000
	72,9713274539599	1	4,000

	76,3799246364884	1	4,000
	76,9433830427349	1	4,000
	77,237684231843	1	4,000
	83,3807958677398	1	4,000
	87,375839070487	1	4,000
	87,4788284312162	1	4,000
	88,6275427835057	1	4,000
	89,4454516385807	1	4,000
	89,6250972291414	1	4,000
	90,9298126548391	1	4,000
	91,0360826231335	1	4,000
	91,777689749885	1	4,000
	92,3930850357163	1	4,000
	92,559577956766	1	4,000
	93,7935228295018	1	4,000
	94,9506261248783	1	4,000
	95,0958185254376	1	4,000
	97,1552944331148	1	4,000
	98,7951100681355	1	4,000
	99,999999995052	1	4,000
Regional public authorities' auto-financing capabilities	55,5657323287458	1	4,000
	56,8509956157328	1	4,000
	65,2599206046321	1	4,000
	69,942355091805	1	4,000
	72,413406146126	1	4,000
	72,6564411265547	1	4,000
	75,5000984917965	1	4,000
	76,1242758546697	1	4,000
	76,27975395157	1	4,000
	77,3298159354792	1	4,000
	77,6293009973373	1	4,000
	77,8315421235621	1	4,000
	78,5408459449049	1	4,000
	81,0671147728104	1	4,000
	81,1361120225588	1	4,000
	82,4212386289754	1	4,000
	83,3354324239528	1	4,000
	83,4859978544961	1	4,000
	85,0174635661109	1	4,000

	86,4916969538779	1	4,000
	87,4314764482787	1	4,000
	87,7718229841626	1	4,000
	87,9601916928438	1	4,000
	92,498374033226	1	4,000
	100,000000003399	1	4,000
Fiscal policy toward firms	62,6111111111111	1	4,000
	65,9444444444444	1	4,000
	74,2777777777778	1	4,000
	77,7777777777778	1	4,000
	78,0555555555556	1	4,000
	78,4444444444444	1	4,000
	84	1	4,000
	84,7222222222222	1	4,000
	85,3888888888889	1	4,000
	88,1666666666667	1	4,000
	88,8888888888889	1	4,000
	89,5555555555555	1	4,000
	90,2777777777778	2	8,000
	90,6666666666667	1	4,000
	90,9444444444444	1	4,000
	91,6666666666667	1	4,000
	92,3333333333333	1	4,000
	93,0555555555556	1	4,000
	93,3333333333333	1	4,000
	95,8333333333333	1	4,000
	97,8888888888889	1	4,000
	98,1666666666667	1	4,000
	98,6111111111111	1	4,000
	100	1	4,000
Fiscal policy toward workers	49,7298753265388	1	4,000
	56,6516570967438	1	4,000
	70,185777932879	1	4,000
	70,4845416658755	1	4,000
	73,5447998076515	1	4,000
	73,9766414162375	1	4,000
	75,5082267104816	1	4,000
	79,6124923027953	1	4,000
	83,5364336617433	1	4,000

	85,7692714032544	1	4,000
	86,9150622039248	1	4,000
	86,987492659742	1	4,000
	87,0514142026157	1	4,000
	88,0594443702377	1	4,000
	88,1317986836572	1	4,000
	88,8656020059432	1	4,000
	89,760751068967	1	4,000
	90,8112306233097	1	4,000
	91,1065298772106	1	4,000
	91,1806164301779	1	4,000
	94,4441747738272	1	4,000
	95,8891671262809	1	4,000
	95,9286659950905	1	4,000
	96,626320714066	1	4,000
	100,000000000397	1	4,000
Average and median earnings	52,2698583262471	1	4,000
	61,2864783292063	1	4,000
	62,0423953120872	1	4,000
	62,4513846888503	1	4,000
	63,6640600916861	1	4,000
	64,3610813684211	1	4,000
	65,9319382645049	1	4,000
	66,1228844868637	1	4,000
	66,8349709235507	1	4,000
	67,0028177792297	1	4,000
	67,4124978015208	1	4,000
	68,2177005215228	1	4,000
	69,4699753579493	1	4,000
	69,6119348200011	1	4,000
	70,6993425727044	1	4,000
	71,1523487882052	1	4,000
	72,8014431001958	1	4,000
	74,6209014890663	1	4,000
	75,2017016633416	1	4,000
	78,8160505439115	1	4,000
	80,1291803387976	1	4,000
	82,3454472983028	1	4,000
	85,7249294446525	1	4,000

	87,2267699513726	1	4,000
	100	1	4,000
Efficiency of judicial institutions at the regional level	33,7451737451737	1	4,000
	38,3783783783784	1	4,000
	68,3397683397683	1	4,000
	69,2664092664093	1	4,000
	71,2741312741313	1	4,000
	75,6756756756757	1	4,000
	78,3011583011583	1	4,000
	80,0772200772201	1	4,000
	81,9305019305019	1	4,000
	84,3243243243243	1	4,000
	86,2548262548263	1	4,000
	86,949806949807	1	4,000
	87,6447876447876	1	4,000
	88,2625482625483	1	4,000
	88,3397683397683	1	4,000
	88,957528957529	1	4,000
	89,2664092664093	1	4,000
	89,4208494208494	1	4,000
	90,7335907335907	1	4,000
	93,5135135135135	1	4,000
	93,6679536679537	1	4,000
	94,980694980695	1	4,000
	96,6795366795367	1	4,000
	99,6138996138996	1	4,000
	100	1	4,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix IV.3: Microeconomic

Variable	Values	Size	%
MNEs' competition effectiveness	18,0260539436163	1	4,000
	28,1895221002294	1	4,000
	28,9759422464904	1	4,000
	30,0259056693515	1	4,000
	32,0096733953154	1	4,000
	34,1368310601732	1	4,000
	36,09688629162	1	4,000

	36,2861458881422	1	4,000
	37,4959583213884	1	4,000
	38,1894911614735	1	4,000
	39,218829237692	1	4,000
	41,6031126866423	1	4,000
	42,2189125231752	1	4,000
	46,3136467352564	1	4,000
	47,092332259881	1	4,000
	49,2715190820934	1	4,000
	53,6239923005082	1	4,000
	54,095864905546	1	4,000
	54,1033600031136	1	4,000
	58,5398490400103	1	4,000
	60,4204879471485	1	4,000
	65,3312210890505	1	4,000
	71,2988509452972	1	4,000
	71,4046158046918	1	4,000
	100,000000000028	1	4,000
Operational infrastructures	37,9780678816526	1	4,000
	45,1060561313986	1	4,000
	45,8539120782342	1	4,000
	54,9860607897545	1	4,000
	55,6181805308786	1	4,000
	56,0460475282074	1	4,000
	57,2846753922402	1	4,000
	63,6111862254704	1	4,000
	64,8510979506178	1	4,000
	65,6076077280835	1	4,000
	66,4054616823592	1	4,000
	75,5301365963335	1	4,000
	76,9593544304191	1	4,000
	77,5113472544899	1	4,000
	78,3373972929837	1	4,000
	80,7243095639528	1	4,000
	82,1291145380022	1	4,000
	82,7591400360646	1	4,000
	83,5240547984036	1	4,000
	87,8013541099508	1	4,000
	89,8970624503522	1	4,000

	91,8425074906346	1	4,000
	97,071593510372	1	4,000
	97,2176422544107	1	4,000
	100,000000003538	1	4,000
Financial infrastructures	22,4867547619851	1	4,000
	25,5044673327792	1	4,000
	29,1582051050555	1	4,000
	30,6177153368371	1	4,000
	30,9156265445112	1	4,000
	32,7531632212411	1	4,000
	33,9136714545764	1	4,000
	35,2156868500149	1	4,000
	35,5485365525315	1	4,000
	36,3937573163534	1	4,000
	37,8452437771712	1	4,000
	39,1935596039826	1	4,000
	39,2358622391417	1	4,000
	39,7131402755067	1	4,000
	39,7850408042686	1	4,000
	40,1546850197859	1	4,000
	43,4207224139257	1	4,000
	44,7132100913934	1	4,000
	46,9660838373668	1	4,000
	47,7390703352489	1	4,000
	49,301456210367	1	4,000
	51,1384006433987	1	4,000
	58,1632031879711	1	4,000
	61,8489070445172	1	4,000
	99,9999999935858	1	4,000
Innovation effectiveness	35,2301314637123	1	4,000
	35,2834108390524	1	4,000
	35,3711604095563	1	4,000
	35,9968714448237	1	4,000
	36,651023890785	1	4,000
	36,665244596132	1	4,000
	37,7054804220469	1	4,000
	40,4303604187773	1	4,000
	40,476393629124	1	4,000
	42,6663822525597	1	4,000

	43,039118644342	1	4,000
	43,0842869143392	1	4,000
	43,5765073947668	1	4,000
	44,2914666435931	1	4,000
	44,5719567690557	1	4,000
	45,3613528691131	1	4,000
	46,4490898748578	1	4,000
	50,2317974971559	1	4,000
	50,4442010278842	1	4,000
	55,5601549856817	1	4,000
	63,8953091138857	1	4,000
	73,22213138673	1	4,000
	79,1057254752612	1	4,000
	88,2925245154994	1	4,000
	100,001990898749	1	4,000
Education and labor-market consistency	57,5297287489721	1	4,000
	58,3995231134341	1	4,000
	59,5239114628977	1	4,000
	61,2099444485865	1	4,000
	61,940596308721	1	4,000
	63,0473350708512	1	4,000
	64,416739282536	1	4,000
	64,6897806393831	1	4,000
	66,2062025872483	1	4,000
	66,5782777612264	1	4,000
	70,6918859533629	1	4,000
	71,6575466473603	1	4,000
	71,8106186114674	1	4,000
	73,9264663070983	1	4,000
	78,1679518189272	1	4,000
	80,191999839663	1	4,000
	83,0877319758318	1	4,000
	86,7258477496195	1	4,000
	88,2374253740659	1	4,000
	89,0165813418022	1	4,000
	90,286492000524	1	4,000
	90,5520834853476	1	4,000
	93,6360955633909	1	4,000
	99,3435108936202	1	4,000

	100,000000000026	1	4,000
Superior schools and research institutions' quality and dynamics	25,5	8	32,000
	38	2	8,000
	41,5731738862005	1	4,000
	42,422243503827	1	4,000
	43,1092966829486	1	4,000
	43,9704200646402	1	4,000
	45,1867902935938	1	4,000
	53,4914270056121	1	4,000
	54,3006430738718	1	4,000
	54,3835857476671	1	4,000
	55,4340014536031	1	4,000
	56,2985069276407	1	4,000
	62,5842993120347	1	4,000
	63,3671017858573	1	4,000
	70,5477914941888	1	4,000
	70,8440603277836	1	4,000
	100	1	4,000
Availability of specialized research & training	83,5632183908046	1	4,000
	85,0574712643678	1	4,000
	85,7471264367816	1	4,000
	86,0919540229885	1	4,000
	87,0114942528736	1	4,000
	87,816091954023	1	4,000
	88,3908045977012	1	4,000
	88,7356321839081	1	4,000
	88,9655172413793	1	4,000
	89,4252873563218	1	4,000
	92,6436781609195	1	4,000
	92,8735632183908	2	8,000
	92,9885057471265	2	8,000
	93,448275862069	1	4,000
	93,9080459770115	1	4,000
	94,0229885057471	1	4,000
	94,1379310344828	1	4,000
	94,5977011494253	1	4,000
	95,2873563218391	1	4,000
	95,7471264367816	1	4,000
	97,0114942528736	1	4,000

	97,816091954023	1	4,000
	100	1	4,000
Sophistication of local demand	26,3768115942029	1	4,000
	30,4347826086957	1	4,000
	62,3188405797101	1	4,000
	63,768115942029	1	4,000
	65,3623188405797	1	4,000
	66,6666666666667	1	4,000
	72,463768115942	1	4,000
	76,0869565217391	1	4,000
	81,1594202898551	1	4,000
	81,4492753623188	1	4,000
	82,6086956521739	1	4,000
	82,8985507246377	1	4,000
	84,2028985507246	1	4,000
	84,7826086956522	1	4,000
	85,5072463768116	1	4,000
	86,231884057971	1	4,000
	86,9565217391304	1	4,000
	87,6811594202898	1	4,000
	88,4057971014493	1	4,000
	88,695652173913	1	4,000
	91,304347826087	1	4,000
	91,7391304347826	1	4,000
	92,0289855072464	1	4,000
	97,1014492753623	1	4,000
	100	1	4,000
Extent of cluster development and specialization	43,5867018914077	1	4,000
	44,7022900221604	1	4,000
	48,9114691543992	1	4,000
	49,1017277037621	1	4,000
	50,774938389231	1	4,000
	50,8824933155199	1	4,000
	51,9767076695427	1	4,000
	52,0073903351969	1	4,000
	54,1061840238412	1	4,000
	54,2468464216666	1	4,000
	54,5643422240911	1	4,000
	56,3229652182296	1	4,000

	57,6523384295656	1	4,000
	60,1656083276114	1	4,000
	60,2553734585479	1	4,000
	60,7446164873789	1	4,000
	61,0521764998459	1	4,000
	61,2303938180461	1	4,000
	63,0499208389592	1	4,000
	64,5837465853115	1	4,000
	65,1501575828115	1	4,000
	69,5428649495493	1	4,000
	71,1982503547018	1	4,000
	71,8436508823632	1	4,000
	100	1	4,000
Rigidity of employment	77,1017487467952	1	4,000
	80,4385260016072	1	4,000
	81,0354723912295	1	4,000
	81,3549917728542	1	4,000
	83,5418819117591	1	4,000
	85,3920330616462	1	4,000
	85,7402517889259	1	4,000
	87,6535414992538	1	4,000
	88,5432212145563	1	4,000
	90,7607239888264	1	4,000
	91,1089427161061	1	4,000
	91,353843799028	2	8,000
	91,4724677610684	1	4,000
	92,0101021696705	1	4,000
	92,9590938659932	1	4,000
	93,6861439559178	1	4,000
	93,7971147591168	1	4,000
	94,1529866452378	1	4,000
	95,6549190678452	1	4,000
	95,8328550109057	1	4,000
	96,4852868021276	1	4,000
	97,2563425553897	1	4,000
	97,742318141813	1	4,000
	100	1	4,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V: Univariate partitioning

Appendix V.1: Descriptive statistics

Variable	Observations	Obs. w/ missing information	Obs. w/o missing information	Minimum	Maximum	Average	Standard deviation
Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	26	0	26	34,333	100,000	69,474	15,524
Expendable building zones per capita and per employment and in absolute value	26	0	26	13,393	100,000	54,772	21,965
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	26	0	26	80,000	100,000	95,385	8,115
Healthcare service accessibility	26	0	26	51,319	100,000	62,984	9,781
Local authorities' efficiency	26	0	26	48,602	100,000	68,625	11,569
Regional public finances' soundness and public funds spending efficiency	26	0	26	42,227	100,000	83,470	14,712
Regional public authorities' auto-financing capabilities	26	0	26	55,566	100,000	78,782	9,863
Fiscal policy toward firms	26	0	26	62,611	100,000	86,551	10,143
Fiscal policy toward workers	26	0	26	49,730	100,000	83,488	12,139
Average and median earnings	26	0	26	52,270	100,000	70,887	10,218
Efficiency of judicial institutions at the regional level	26	0	26	33,745	100,000	82,527	16,112
MNEs' competition effectiveness	26	0	26	18,026	100,000	46,696	17,378
Operational infrastructures	26	0	26	37,978	100,000	72,960	17,224
Financial infrastructures	26	0	26	15,028	100,000	41,029	15,890
Innovation effectiveness	26	0	26	34,093	100,002	49,296	17,480
Education and labor-market consistency	26	0	26	57,530	100,000	75,532	13,237
Superior schools and research institutions' quality and dynamics	26	0	26	25,500	100,000	45,776	18,635
Availability of specialized research & training	26	0	26	83,103	100,000	91,317	4,539
Sophistication of local demand	26	0	26	26,377	100,000	78,305	17,644
Extent of cluster development and specialization	26	0	26	43,587	100,000	58,588	11,540
Rigidity of employment	26	0	26	77,102	100,000	89,934	6,177

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.2: Definition's table for subsequent appendices

Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment	(1)
Expendable building zones per capita and per employment and in absolute value	(2)
Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)	(3)
Healthcare service accessibility	(4)
Local authorities' efficiency	(5)
Regional public finances' soundness and public funds spending efficiency	(6)
Regional public authorities' auto-financing capabilities	(7)
Fiscal policy toward firms	(8)
Fiscal policy toward workers	(9)
Average and median earnings	(10)
Efficiency of judicial institutions at the regional level	(11)
MNEs' competition effectiveness	(12)
Operational infrastructures	(13)
Financial infrastructures	(14)
Innovation effectiveness	(15)
Education and labor-market consistency	(16)
Superior schools and research institutions' quality and dynamics	(17)
Availability of specialized research & training	(18)
Sophistication of local demand	(19)
Extent of cluster development and specialization	(20)
Rigidity of employment	(21)

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.3: Average travel time by public transportation and by car to the capital city from the biggest economic pole of each region in terms of employment

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619	78,619
2	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667	91,667
3	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729	67,729
4	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792	55,792
5	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444	41,444

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	13,048	10,890	22,827	37,175
2	13,048	0	23,938	35,875	50,222
3	10,890	23,938	0	11,938	26,285
4	22,827	35,875	11,938	0	14,347
5	37,175	50,222	26,285	14,347	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs26)	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500	78,500
2 (Obs10)	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333	91,333
3 (Obs24)	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167	69,167
4 (Obs17)	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333	56,333
5 (Obs16)	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs26)	2 (Obs10)	3 (Obs24)	4 (Obs17)	5 (Obs16)
1 (Obs26)	0	12,833	9,333	22,167	33,500
2 (Obs10)	12,833	0	22,167	35,000	46,333
3 (Obs24)	9,333	22,167	0	12,833	24,167
4 (Obs17)	22,167	35,000	12,833	0	11,333
5 (Obs16)	33,500	46,333	24,167	11,333	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.4: Expendable building zones per capita and per employment and in absolute value

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046	88,046
2	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557	24,557
3	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568	43,568
4	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290	58,290
5	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256	72,256

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	63,489	44,478	29,757	15,790
2	63,489	0	19,011	33,732	47,699
3	44,478	19,011	0	14,721	28,688
4	29,757	33,732	14,721	0	13,966
5	15,790	47,699	28,688	13,966	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404	86,404
2 (Obs6)	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527	21,527
3 (Obs23)	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054	44,054
4 (Obs25)	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553	57,553
5 (Obs9)	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240	74,240

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs6)	3 (Obs23)	4 (Obs25)	5 (Obs9)
1 (Obs1)	0	64,877	42,350	28,851	12,164
2 (Obs6)	64,877	0	22,527	36,026	52,713
3 (Obs23)	42,350	22,527	0	13,499	30,186
4 (Obs25)	28,851	36,026	13,499	0	16,687
5 (Obs9)	12,164	52,713	30,186	16,687	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.5: Linguistic proximity with the most-widely spoken language in Switzerland (50%, 75%, 100%)

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
3	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3
1	0	20,000	10,000
2	20,000	0	10,000
3	10,000	10,000	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2 (Obs4)	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
3 (Obs10)	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs4)	3 (Obs10)
1 (Obs1)	0	20,000	10,000
2 (Obs4)	20,000	0	10,000
3 (Obs10)	10,000	10,000	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.6: Healthcare service accessibility

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504	61,504
2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2
1	0	38,496
2	38,496	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs13)	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920	61,920
2 (Obs3)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs13)	2 (Obs3)
1 (Obs13)	0	38,080
2 (Obs3)	38,080	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.7: Local authorities' efficiency

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749	65,749
2	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414	97,414
3	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797	77,797
4	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548	53,548

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4
1	0	31,666	12,049	12,201
2	31,666	0	19,617	43,867
3	12,049	19,617	0	24,250
4	12,201	43,867	24,250	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs14)	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856	65,856
2 (Obs3)	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829	94,829
3 (Obs22)	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434	78,434
4 (Obs11)	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622	57,622

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs14)	2 (Obs3)	3 (Obs22)	4 (Obs11)
1 (Obs14)	0	28,973	12,578	8,234
2 (Obs3)	28,973	0	16,394	37,207
3 (Obs22)	12,578	16,394	0	20,812
4 (Obs11)	8,234	37,207	20,812	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.8: Regional public finances' soundness and public funds spending efficiency

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015	82,015
2	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125	90,125
3	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797	49,797
4	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154	75,154
5	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632	96,632

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	8,110	32,219	6,861	14,616
2	8,110	0	40,328	14,971	6,507
3	32,219	40,328	0	25,357	46,835
4	6,861	14,971	25,357	0	21,478
5	14,616	6,507	46,835	21,478	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381	83,381
2 (Obs23)	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625	89,625
3 (Obs3)	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476	52,476
4 (Obs5)	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380	76,380
5 (Obs14)	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155	97,155

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs23)	3 (Obs3)	4 (Obs5)	5 (Obs14)
1 (Obs1)	0	6,244	30,905	7,001	13,774
2 (Obs23)	6,244	0	37,149	13,245	7,530
3 (Obs3)	30,905	37,149	0	23,904	44,679
4 (Obs5)	7,001	13,245	23,904	0	20,775
5 (Obs14)	13,774	7,530	44,679	20,775	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.9: Regional public authorities' auto-financing capabilities

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924	77,924
2	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249	96,249
3	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489	85,489
4	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068	70,068
5	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208	56,208

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	18,325	7,566	7,856	21,716
2	18,325	0	10,760	26,181	40,041
3	7,566	10,760	0	15,421	29,281
4	7,856	26,181	15,421	0	13,860
5	21,716	40,041	29,281	13,860	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs25)	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832	77,832
2 (Obs3)	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498	92,498
3 (Obs14)	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017	85,017
4 (Obs20)	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942	69,942
5 (Obs13)	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566	55,566

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs25)	2 (Obs3)	3 (Obs14)	4 (Obs20)	5 (Obs13)
1 (Obs25)	0	14,667	7,186	7,889	22,266
2 (Obs3)	14,667	0	7,481	22,556	36,933
3 (Obs14)	7,186	7,481	0	15,075	29,452
4 (Obs20)	7,889	22,556	15,075	0	14,377
5 (Obs13)	22,266	36,933	29,452	14,377	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.10: Fiscal policy toward firms

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000
2	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139	77,139
3	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100	91,100
4	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100	98,100
5	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569	85,569

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	11,139	25,100	32,100	19,569
2	11,139	0	13,961	20,961	8,431
3	25,100	13,961	0	7,000	5,531
4	32,100	20,961	7,000	0	12,531
5	19,569	8,431	5,531	12,531	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs25)	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944	65,944
2 (Obs5)	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778	77,778
3 (Obs4)	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944	90,944
4 (Obs12)	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167	98,167
5 (Obs18)	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389	85,389

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs25)	2 (Obs5)	3 (Obs4)	4 (Obs12)	5 (Obs18)
1 (Obs25)	0	11,833	25,000	32,222	19,444
2 (Obs5)	11,833	0	13,167	20,389	7,611
3 (Obs4)	25,000	13,167	0	7,222	5,556
4 (Obs12)	32,222	20,389	7,222	0	12,778
5 (Obs18)	19,444	7,611	5,556	12,778	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.11: Fiscal policy toward workers

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740	72,740
2	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604	88,604
3	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191	53,191
4	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029	81,029
5	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578	96,578

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	15,864	19,549	8,289	23,838
2	15,864	0	35,413	7,575	7,974
3	19,549	35,413	0	27,838	43,387
4	8,289	7,575	27,838	0	15,549
5	23,838	7,974	43,387	15,549	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545	73,545
2 (Obs22)	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866	88,866
3 (Obs3)	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652	56,652
4 (Obs26)	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938	79,938
5 (Obs18)	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626	96,626

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs22)	3 (Obs3)	4 (Obs26)	5 (Obs18)
1 (Obs1)	0	15,321	16,893	6,393	23,082
2 (Obs22)	15,321	0	32,214	8,928	7,761
3 (Obs3)	16,893	32,214	0	23,286	39,975
4 (Obs26)	6,393	8,928	23,286	0	16,689
5 (Obs18)	23,082	7,761	39,975	16,689	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.12: Average and median earnings

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848	82,848
2	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622	69,622
3	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534	60,534
4	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4
1	0	13,227	22,314	17,152
2	13,227	0	9,087	30,378
3	22,314	9,087	0	39,466
4	17,152	30,378	39,466	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs11)	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345	82,345
2 (Obs7)	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612	69,612
3 (Obs25)	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286	61,286
4 (Obs6)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs11)	2 (Obs7)	3 (Obs25)	4 (Obs6)
1 (Obs11)	0	12,734	21,059	17,655
2 (Obs7)	12,734	0	8,325	30,388
3 (Obs25)	21,059	8,325	0	38,714
4 (Obs6)	17,655	30,388	38,714	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.13: Efficiency of judicial institutions at the regional level

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627	69,627
2	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206	88,206
3	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062	36,062
4	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996	78,996
5	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409	96,409

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	18,580	33,565	9,369	26,782
2	18,580	0	52,145	9,210	8,203
3	33,565	52,145	0	42,934	60,347
4	9,369	9,210	42,934	0	17,413
5	26,782	8,203	60,347	17,413	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266	69,266
2 (Obs9)	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263	88,263
3 (Obs3)	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745	33,745
4 (Obs5)	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301	78,301
5 (Obs17)	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680	96,680

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs9)	3 (Obs3)	4 (Obs5)	5 (Obs17)
1 (Obs1)	0	18,996	35,521	9,035	27,413
2 (Obs9)	18,996	0	54,517	9,961	8,417
3 (Obs3)	35,521	54,517	0	44,556	62,934
4 (Obs5)	9,035	9,961	44,556	0	18,378
5 (Obs17)	27,413	8,417	62,934	18,378	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.14: MNEs' competition effectiveness

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102	61,102
2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
3	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781	36,781

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3
1	0	38,898	24,322
2	38,898	0	63,219
3	24,322	63,219	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs19)	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420	60,420
2 (Obs3)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
3 (Obs20)	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286	36,286

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs19)	2 (Obs3)	3 (Obs20)
1 (Obs19)	0	39,580	24,134
2 (Obs3)	39,580	0	63,714
3 (Obs20)	24,134	63,714	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.15: Operational infrastructures

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972	93,972
2	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976	79,976
3	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119	65,119
4	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984	55,984
5	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979	42,979

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	13,996	28,853	37,988	50,992
2	13,996	0	14,857	23,992	36,996
3	28,853	14,857	0	9,135	22,139
4	37,988	23,992	9,135	0	13,004
5	50,992	36,996	22,139	13,004	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs4)	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843	91,843
2 (Obs6)	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724	80,724
3 (Obs8)	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851	64,851
4 (Obs24)	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046	56,046
5 (Obs16)	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106	45,106

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs4)	2 (Obs6)	3 (Obs8)	4 (Obs24)	5 (Obs16)
1 (Obs4)	0	11,118	26,991	35,796	46,736
2 (Obs6)	11,118	0	15,873	24,678	35,618
3 (Obs8)	26,991	15,873	0	8,805	19,745
4 (Obs24)	35,796	24,678	8,805	0	10,940
5 (Obs16)	46,736	35,618	19,745	10,940	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.16: Financial infrastructures

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670	38,670

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2
1	0	61,330
2	61,330	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2 (Obs16)	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194	39,194

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs16)
1 (Obs1)	0	60,806
2 (Obs16)	60,806	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.17: Innovation effectiveness

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147	94,147
2	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164	76,164
3	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079	52,079
4	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052	40,052
5	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	17,983	42,069	54,095	30,252
2	17,983	0	24,085	36,112	12,269
3	42,069	24,085	0	12,026	11,817
4	54,095	36,112	12,026	0	23,843
5	30,252	12,269	11,817	23,843	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002	100,002
2 (Obs3)	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106	79,106
3 (Obs5)	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444	50,444
4 (Obs7)	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430	40,430
5 (Obs19)	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895	63,895

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs3)	3 (Obs5)	4 (Obs7)	5 (Obs19)
1 (Obs1)	0	20,896	49,558	59,572	36,107
2 (Obs3)	20,896	0	28,662	38,675	15,210
3 (Obs5)	49,558	28,662	0	10,014	13,451
4 (Obs7)	59,572	38,675	10,014	0	23,465
5 (Obs19)	36,107	15,210	13,451	23,465	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.18: Education and labor-market consistency

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742	89,742
2	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354	62,354
3	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483	80,483
4	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209	72,209
5	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672	99,672

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	27,388	9,260	17,534	9,929
2	27,388	0	18,128	9,854	37,318
3	9,260	18,128	0	8,274	19,189
4	17,534	9,854	8,274	0	27,463
5	9,929	37,318	19,189	27,463	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286	90,286
2 (Obs15)	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941	61,941
3 (Obs21)	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192	80,192
4 (Obs14)	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811	71,811
5 (Obs13)	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344	99,344

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs15)	3 (Obs21)	4 (Obs14)	5 (Obs13)
1 (Obs1)	0	28,346	10,094	18,476	9,057
2 (Obs15)	28,346	0	18,251	9,870	37,403
3 (Obs21)	10,094	18,251	0	8,381	19,152
4 (Obs14)	18,476	9,870	8,381	0	27,533
5 (Obs13)	9,057	37,403	19,152	27,533	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.19: Superior schools and research institutions’ quality and dynamics

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391	59,391
2	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084	33,084
3	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3
1	0	26,307	40,609
2	26,307	0	66,916
3	40,609	66,916	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs25)	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299	56,299
2 (Obs6)	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000
3 (Obs3)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs25)	2 (Obs6)	3 (Obs3)
1 (Obs25)	0	18,299	43,701
2 (Obs6)	18,299	0	62,000
3 (Obs3)	43,701	62,000	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.20: Availability of specialized research & training

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276	98,276
2	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448
3	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667	88,667
4	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517	95,517
5	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096	85,096

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	4,828	9,609	2,759	13,180
2	4,828	0	4,782	2,069	8,352
3	9,609	4,782	0	6,851	3,571
4	2,759	2,069	6,851	0	10,421
5	13,180	8,352	3,571	10,421	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816	97,816
2 (Obs3)	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448	93,448
3 (Obs25)	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736	88,736
4 (Obs5)	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747	95,747
5 (Obs21)	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057	85,057

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs3)	3 (Obs25)	4 (Obs5)	5 (Obs21)
1 (Obs1)	0	4,368	9,080	2,069	12,759
2 (Obs3)	4,368	0	4,713	2,299	8,391
3 (Obs25)	9,080	4,713	0	7,011	3,678
4 (Obs5)	2,069	2,299	7,011	0	10,690
5 (Obs21)	12,759	8,391	3,678	10,690	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.21: Sophistication of local demand

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116	66,116
2	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464	82,464
3	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406	28,406
4	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545	89,545
5	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551	98,551

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	16,348	37,710	23,429	32,435
2	16,348	0	54,058	7,081	16,087
3	37,710	54,058	0	61,139	70,145
4	23,429	7,081	61,139	0	9,006
5	32,435	16,087	70,145	9,006	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667	66,667
2 (Obs8)	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609	82,609
3 (Obs3)	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435	30,435
4 (Obs24)	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696	88,696
5 (Obs14)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs8)	3 (Obs3)	4 (Obs24)	5 (Obs14)
1 (Obs1)	0	15,942	36,232	22,029	33,333
2 (Obs8)	15,942	0	52,174	6,087	17,391
3 (Obs3)	36,232	52,174	0	58,261	69,565
4 (Obs24)	22,029	6,087	58,261	0	11,304
5 (Obs14)	33,333	17,391	69,565	11,304	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.22: Extent of cluster development and specialization

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862	70,862
3	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032	55,032

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3
1	0	29,138	44,968
2	29,138	0	15,829
3	44,968	15,829	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs1)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2 (Obs5)	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198	71,198
3 (Obs15)	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564	54,564

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs1)	2 (Obs5)	3 (Obs15)
1 (Obs1)	0	28,802	45,436
2 (Obs5)	28,802	0	16,634
3 (Obs15)	45,436	16,634	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Appendix V.23: Rigidity of employment

Barycenters of classes

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343	91,343
2	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832	86,832
3	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890	80,890
4	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649	93,649
5	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162	97,162

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between barycenters of classes

	1	2	3	4	5
1	0	4,511	10,454	2,306	5,819
2	4,511	0	5,943	6,817	10,330
3	10,454	5,943	0	12,759	16,272
4	2,306	6,817	12,759	0	3,513
5	5,819	10,330	16,272	3,513	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Central objects

Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1 (Obs6)	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354	91,354
2 (Obs10)	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654	87,654
3 (Obs4)	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035	81,035
4 (Obs17)	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686	93,686
5 (Obs16)	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256	97,256

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).

Distance between central objects

	1 (Obs6)	2 (Obs10)	3 (Obs4)	4 (Obs17)	5 (Obs16)
1 (Obs6)	0	3,700	10,318	2,332	5,902
2 (Obs10)	3,700	0	6,618	6,033	9,603
3 (Obs4)	10,318	6,618	0	12,651	16,221
4 (Obs17)	2,332	6,033	12,651	0	3,570
5 (Obs16)	5,902	9,603	16,221	3,570	0

Source: personal computation based on FSO (2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2019, 2020a, 2020b, 2020c), Credit Suisse (2016, 2019), FCA (2019, 2020), Google Maps (2020), OECD (2019), SBB timetables (2020), SIR, (2020), and on Study.eu (2020).