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Accessibility and Peripheries: An Empirical Investigation in the Lombardy Region

Accessibilità e periferie: una verifica empirica in Lombardia

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Abstract. This paper is related to a national research project covering every Italian region and province with respect to their performances in the attainment of the priorities of the 2014-2020 EU Cohesion Policy. The first part of the paper presents a survey of the literature available on Inner Peripheries, with specific regard to the methodologies useful for their identification. The second part will present an analysis at the national level, with a focus on the case of Lombardy, and an index of multimodal accessibility selected for a preliminary evaluation of the concept of Inner Periphery. The third part of the paper will discuss an empirical assessment of the Inner Periphery individuated in the Lombardy region, using a set of indicators provided by the STeMA model. The discussion developed in the three sections is intended to test the territories defined as Inner Periphery in Lombardy according to the set of indicators made available by the national project.

Keywords: accessibility, inner peripheries, Lombardy, territorial cohesion.

Riassunto. L'articolo si inserisce in un progetto di ricerca nazionale che esamina, per tutte le regioni e province italiane, la capacità di raggiungere le priorità della Politica di Coesione europea per il periodo 2014-2020. La prima parte del contributo presenta una rassegna della letteratura disponibile sul tema delle *inner peripheries*, con particolare attenzione alle metodologie utili per la loro identificazione. La seconda parte presenta un'analisi al livello nazionale, con un approfondimento per la Lombardia, e un indice di accessibilità multimodale selezionato per una valutazione preliminare del concetto di *inner periphery*. La terza parte dell'articolo discuterà una valutazione empirica di quelle individuate nella regione Lombardia, utilizzando un insieme di indicatori forniti dal modello STeMA. La discussione sviluppata nelle tre sezioni ha lo scopo di esaminare i territori definiti come *inner periphery* in Lombardia sulla base degli indicatori resi disponibili dal progetto nazionale.

Parole chiave: accessibilità, *inner peripheries*, Lombardia, coesione territoriale.

1. Introduction

This paper originates from the ongoing project of the Italian National Research Council “Territorial Impact Assessment of the Territorial Cohesion in the Italian regions. Place Evidence Model for Assessing Policies Devoted to Green Economy in Internal Area and Metropolitan Inner Peripheries”. The first part of this paper presents a survey of the literature available on inner peripheries, territories in an intermediate situation between the urban and the rural, featuring limited accessibility and potential socio-economic decline, with specific regard to the methodologies useful for their identification. A critical aspect is identified by the literature in the endowment of infrastructures: we thus discuss, in the second part of the paper, at the national level and with a focus on the case of Lombardy, an index of multi-modal accessibility. The third part of the paper is related to the performance of Lombardy and its provinces in the attainment of the priorities of the 2014-2020 EU Cohesion Policy. The implementation of the STeMA model of Territorial Impact Assessment will allow an illustration of the context of Lombardy with respect to the heterogeneous performances of its provinces for each of the policy priority and for the efficiency in the use of resources and funds. A specific analysis will be addressed to the provinces classified as inner peripheries.

2. Inner peripheries and accessibility¹

2.1 The concept of inner peripheries

In our research the issue of inner peripheries was approached starting from the contributions by the ESPON projects addressing the territorial typologies.

In ESPON GEOSPECS Geographic Specificities and Development Potentials in Europe (ESPON, University of Geneva 2012):

- “an inner periphery could be understood as an area where the rural economy (agriculture and animal breeding) is not important enough for the area to be defined as rural, but where the population is not dense enough for it to be called urban” (p. 6);
- “Inner peripheries may appear more frequently in rural areas that are “in the shadow” of larger metropolitan areas or separated from nearby rural centers by national borders” (p. I).

ESPON PROFECY project, standing on the results

of the GEOSPECS team, proposes to survey the territories by using at least three typologies of areas (ESPON, University of Valencia 2016):

1. areas with scarce economic potential which are “interstitial” to areas with high economic potential: these are regions that, being surrounded by “central” areas and not being in a geographic periphery of the European Union, still present characters of peripherality;
2. areas with poor access to services of general interest: this could be the consequence of a geographical marginality (but in this case PROFECY would contradict several of the previous statements) or (more appropriately, in our opinion) the effect of changes in the way the services are provided (e.g. privatization, reconfiguration of administrative powers, etc.). The deterioration of services could also be the negative consequence of the reduction in public spending;
3. areas with poor economic performance, excluded from the most relevant economic networks and that were not able to organize a functional proximity, taking advantage for example of the processes of *borrowing size*. Frequently, according to the discussion developed by the PROFECY group, this is a consequence of weaknesses in the system of local governance, in particular of the poor capacity of being influential in the centers of political decision.

The emerging concept of inner periphery refers to areas which combine both urban and rural features: an intermediate typology in which none of the two specificities emerge in a definite way. We thus consider as inner peripheries territories that, albeit not peripheral from a geographical point of view (“inner”), are marginal (“peripheral”) compared to the average economic performances of the regions or macro-regions they belong to. They are areas presenting a set of features that makes them “disconnected from networks and centers of power”. Their low economic performance does not appear as a structural condition, but rather a conjunctural one. Moreover, the issues of accessibility they are facing seem to be not related to the availability of infrastructures, but also to the accessibility to services of general interest.

2.2 Inner peripheries vs. internal areas

As to the Italian context the definition of “internal areas” was proposed for the territories relatively far from the centers of provision of services (education, health, transportation), but still rich in environmental and cul-

¹ The discussion of the concept presented here is a summary of Pagetti, Ietri 2018, and Ietri, Pagetti 2019.

tural assets, while very heterogeneous and diversified after centuries-long processes of anthropization.

The concept of “internal areas” could be compared with “inner peripheries” according to four parameters: the definition principle, the specificities, the data used for their delineation and the territorial context.

The definition principle and the data used for the delineation are referred to the operational individuation of the areas. As to the “internal areas”, the pivotal element is the geographical localization, the distance from the main urban areas (centers) in particular; then the demographic aspects concur in defining areas with a scarce density. As to the inner peripheries instead the crucial element is to be found in trends, pointing out territories marginal to the main economic processes or that lost relevant features of the local economy. Thus, as to the population and the labor market, the time series are the main sources for the definition of inner peripheries.

As to the territorial specificities, the internal areas are characterized by a marginal localization, a scarce population and by environmental features that impact on the marginality. As to the inner peripheries the territorial specificities are rather related to socio-economic determinants.

Finally, the territorial context of areas, or rather the territorial contexts where the likeliness to found both kind of areas is higher. As to the “internal areas”, many are localized in border areas between countries or regions, as an example in many mountain areas. As to the inner peripheries, they are more likely to be localized in territories strongly related with a metropolitan area, with which they might depend for the provision of services of general interest or for other economic determinants.

2.3 The identification of inner peripheries

Inner peripheries are studied and “scouted” by the team of the ESPON PROFECY (ESPON 2017) project according to four criteria.

1. “Economic potential”. This is *de facto* a measurement of accessibility, comparing each NUTS 3 region with its neighboring units according to the potential accessibility by car and rail. If the selected NUTS 3 province has an accessibility level below the average of the neighboring regions and a negative trend, it is thus classified as inner periphery.
2. “Depleting areas”. This criterium refers to demographic and economic indicators: population density, population change, GDP per capita (stock and trend), unemployment (stock and trend). For each

NUTS 3 province, when the demographic or GDP or unemployment stock is below the average of the neighboring provinces and the related trend is negative, the province could be considered as an inner periphery.

3. “Access to regional centers”. The main indicator for this criterion is the travel time from each cell of a 2,5x2,5 km raster grid to the closest urban area². Each 2,5km x 2,5km cell is defined as an inner periphery if the travel time is 150 per cent above the provincial average at NUTS 3.
4. “Travel time to services of general interest”. The same methodology developed for the previous criterium 3 is implemented in this last method, considering instead the travel time to centers where services of general interest are provided.

It must be noted that criteria 3 and 4 use a raster grid instead of a NUTS 3 unit. The main problems related with this choice are the lack of time series and a relatively low comparability with other sources or studies. As a matter of fact, the researchers of the team PROFECY related the raster grid delineations of criteria 3 and 4 to the larger NUTS 3 provinces: the individuation of inner peripheries for the ESPON space is in fact presented with a list of NUTS 3 units. Also in consideration of these aspects, in our focus and in the following section, we decided to elaborate on a NUTS 3 level accessibility index, in order to be able to work on data comparable in time series and among territorial units³.

3. An indicator of multimodal accessibility

3.1 The available data for Italian potential multimodal accessibility

Infrastructural assets are an important factor for the growth and competitiveness of territories because of their decisive contribution in attracting human and material resources. Today, the technological evolution of transport networks (high-speed rail, multimodality) and digital networks has a profound impact on the infrastructural capital of the territory, influencing its development prospects and attractiveness (Crescenzi et al. 2016; Prezioso 2016). From this point of view, Italy now

² Defined according to regional centroids for NUTS 3 areas and cities participating to the Urban Audit program (https://ec.europa.eu/regional_policy/en/policy/themes/urban-development/audit/)

³ According to these criteria, as to the case of the Lombardy region, the provinces classified as inner peripheries are: Brescia, Lodi, Pavia and Sondrio (ESPON 2017). This aspect will be developed further in sections 3 and 4 of the paper.

has two infrastructure gaps: one with respect to Europe, the other between the central-northern part of the country and the south including Sardinia and Sicily (Muscarà 2015).

As regards the first aspect, the gap with Europe in the field of transport infrastructure, Italy ranks below the EU average in all indicators of infrastructure quality, with negative effects on Italy's economic activities and a low level of satisfaction among economic operators and the general public (EC 2018). In particular, the quantity of goods transported by road is higher than the European average, to the detriment of rail transport. Italy is also still some way from reaching the 2020 renewable energy targets in transport (10%), also due to uncertainty in the allocation of incentives and the regulatory framework.

The ESPON MATRICES project provides indicators for potential accessibility of NUTS 3 regions, considering road, rail, air and multimodal⁴. In MATRICES, the potential accessibility index is calculated considering every NUTS 3 region as both an origin and a destination. For each NUTS 3 unit, the population in all destination regions is weighted by the travel time needed in order to reach them. This is added to the indicator value for the accessibility potential of the origin region. The values are expressed as an index, related to the ESPON average. The specific indicator we chose is the relative change of the accessibility potential between 2001 and 2014.

As the accessibility data used refer to the period 2001-2014, it should be noted that domestic traffic of goods and passengers has experienced a sharp contraction in these years of economic recession. Only in recent years has passenger traffic recovered (MIT 2018, pp. 47-50).

The trend of potential multimodal accessibility in the 2001-2014 period shows, at the regional level, a two-fold image of Italy (fig. 1). On one hand the accessibility grew steadily in the northern regions, including Emilia-Romagna and Tuscany, and towards southern Lazio and Campania; on the other, in the southern regions the accessibility had minor improvements.

As to the provincial (NUTS 3) level, the potential multimodal accessibility grew in both the north-east and north-west of the country, thanks to road infrastructures (e.g. the Pedemontana highway) and rail (with a crucial role of the introduction of high speed rail lines). The growth in accessibility is less relevant in the mountainous or partially mountainous provinces of the Alpine

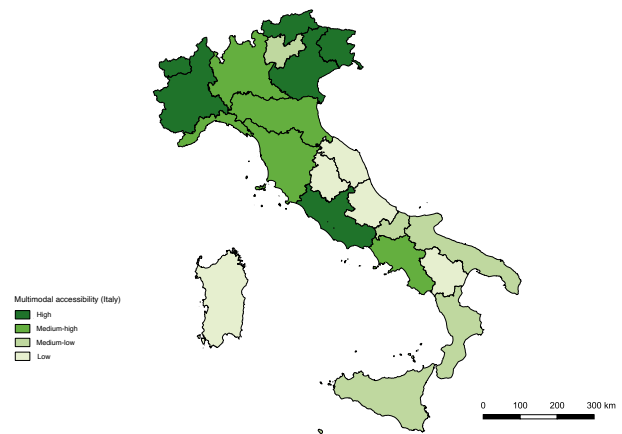


Figure 1. Regional map of the multimodal accessibility in Italy. Source: authors' elaboration.

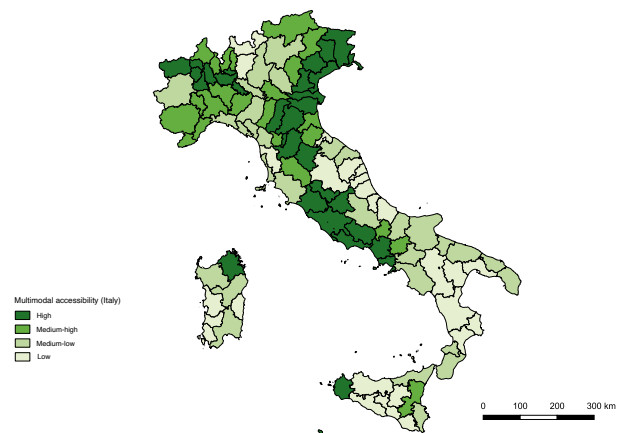


Figure 2. Provincial map of the multimodal accessibility in Italy. Source: authors' elaboration.

area. It is instead stronger in the plains and in the eastern provinces, that have been progressively connected with the main railway axe from northern to central Italy along the *Bologna-Rome-Naples-Salerno* line (fig. 2).

In the central part of the country⁵, the improvement of railway facilities has had an effect of diversification between the provinces facing the Tyrrhenian Sea and those facing the Adriatic Sea, the latter group showing an improvement in accessibility far lower than the former.

In the south of continental Italy there is a clear difference between the provinces interested by main railway and road infrastructures and the other, where the accessibility did not change. In the main islands there

⁴ https://bsr.espon.eu/opencms/opencms/Headline_indicators/Multi-modal_accessibility_potential/tables.html

⁵ As statistical subdivision, Central Italy encompasses Tuscany, Marche, Lazio and Umbria.

were no relevant changes, except for the provinces of Olbia-Tempio in Sardinia, and Trapani and Catania in Sicily. In addition, it should be noted that, in the south of Italy, high-speed rail is to be found only marginally (13,3% of the national network) and the interconnection between port infrastructure and the rail network is particularly critical.

In national and European reports (Bergantino et al. 2018; EC 2018; Giorgiantonio et al. 2018), even in very detailed studies (Svimez 2017), the north-south divide is highlighted not only in terms of infrastructure resources, but also in terms of traffic management technology which create inequalities, particularly with regard to safety on regional railways.

As to the specific case of Lombardy it is possible to point out that in most provinces, mainly in the north-western part of the region (provinces of Milan and Varese), the improvements in multimodal potential accessibility were relevant. The infrastructural works related to Expo 2015 have certainly had a great impact on the improvements in accessibility. The growth is weaker instead in the provinces of Sondrio, Bergamo and Brescia, featuring large mountain areas. Also the province of Cremona, mainly flat, has a less relevant improvement in accessibility. However, we should bear in mind four new road projects completed in Lombardy: Pedemontana, *BreBeMi* (Brescia-Bergamo-Milan), Tem (Milan's eastern ring road) and the fourth lane of the A4 motorway, whose benefits are in any case to the advantage of the entire economic system of the Po Valley. To this we must add the completion of the road network that improves accessibility to the Valtellina. The construction of the Cremona-Mantua motorway, which has been in the pipeline for several years, should finally begin and will contribute to filling an accessibility gap that remains very substantial in the Lower Lombardy Plain. The Lombardy airport system, with its main airports of Malpensa, Linate and Orio al Serio, has in turn benefitted from important improvements. The regional railway network, although undersized compared to other more developed regions of Europe (IReR 2009), has also benefitted from significant infrastructural improvements both at regional and national level. In the latter case, we cannot fail to mention the commissioning of the high-speed/high-capacity rail network in 2009.

3.2 Expected changes in the near future

The changes in potential multimodal accessibility are referred to the 2001-2014 period. We could consider some expected changes for the 2015-2030 period,

“to combine increased connectivity, public safety and territorial development” (Bergantino et al. 2018, 11), as a few infrastructures are still in the process of being constructed. Some of them will have an impact on the accessibility in northern Italy:

- Alptransit in Lombardy on the railway Gotthard axe;
- the Brennero base railway tunnel on the Verona-Trento-Bolzano-Innsbruck line;
- the expected (or not?) completion of the Turin-Lyon;
- the completion of the high-speed Milan-Venice railway line;
- the multimodal hub of Trieste airport (already operative), as an improvement for the provinces of Udine, Trieste, Gorizia;
- the completion of the third highway tracks on the Venice-Trieste line;
- the construction of the Pedemontana highway in the Veneto region.

4. The regional context and the inner peripheries

The third part of this paper approaches the analysis of the Lombardy region according to the SteMA model's methodology. The model involves the collection of data, followed by the construction and subsequent examination of a series of indicators that allow the analysis of the regional context at levels NUTS 3 (regional level) and NUTS 3 (provinces). These indicators are then grouped into four determinants, corresponding to the priorities of the EU 2014-2020 strategy: *Smart Growth, Inclusive Growth, Sustainable Growth, Resources and Funds* (fig. 3)⁶. The indicators and determining factors developed in the framework of the national research project (see section 1) allow us to perform a test on the features of inner peripheries in the provinces of Lombardy.

4.1 Smart Growth

The examination of the determining factor *Smart Growth* shows that Lombardy as an overall is classified at the medium-high level. At the same level of the regional average are the provinces of Milan, Varese, Como, Monza-Brianza, Bergamo and Brescia, while the provinces of Lecco, Pavia, Lodi, Cremona and Mantua are at the medium-low level and Sondrio at the lower level (fig. 3a).

⁶ We refer to Prezioso 2018 for a detailed presentation of the methodology of the research project.

The provinces are ranked, heterogeneously, in three levels also according to the components of the determining factor: *Digital Society, Education and Innovation Status Quo*.

As to *Digital Society* the provinces of Bergamo, Brescia and Pavia (medium-high level) are differentiated from the other provinces: Milan, Varese, Como, Monza-Brianza and Cremona (medium-low level) and Sondrio, Lecco, Lodi and Mantua (low level).

In the case of *Education* the provinces of Milan, Varese, Como, Monza-Brianza, Bergamo and Brescia (medium-high level) are followed by Lecco, Pavia, Lodi, Cremona and Mantua (medium-low level) and Sondrio (low level). This ranking of the provinces is reproduced in the case of *Innovation Vulnerability*, the combination of *Digital Society* and *Education*.

As to the *Innovation Status Quo*, along the three levels are ranked the provinces of Milan, Como, Lecco, Bergamo, Brescia and Pavia (medium-high level), Varese, Monza-Brianza and Lodi (medium-low level) and Sondrio, Cremona and Mantua (low level).

A more detailed examination of each single group of variables shows that some provinces perform at a high level according to specific indicators. As to *Digital Society* the provinces of Milan, Varese, Como, Monza-Brianza, Bergamo and Brescia emerge for the indicator *Internet User*; again Milan and Varese are best performers for *Penetration of ultra wide band*; the province of Bergamo is instead very well ranked for *Internet in the Public body*. The abovementioned six provinces are noteworthy in the group of variables *Education* for the indicator *Population with three years degree* and, with the province of Pavia, for *Structures education in the creation of knowledge*. Moreover the province of Milan is best performer for the indicator *Population in the long learning*. As to the group of indicators *Innovation Status Quo*, the provinces of Milan and Lecco emerge for *R&D Infrastructures*.

It is possible to underline two aspects: the limited number of provinces in the higher position for some indicators (*Penetration of ultra wide band, Internet in the Public body, Population in the long learning* and *R&D Infrastructures*) and the absence of provinces at the higher position for two indicators (*Index of innovative dependency*, part of the component *Education*, and *Telecommunication Development Level* in *Innovation Status Quo*). Together with what emerged from the analysis of the position of the provinces as to the determinant factors and its components, this shows the existence of relevant areas of improvement in the region for what concerns the *Smart Growth*.

Specific attention should be paid to the province of Sondrio, one of the four provinces that the ESPON

PROFECY research (ESPON 2017) delineates as inner periphery. This province, being defined inner periphery according to the criteria of “access to regional centers” and “travel time to services of general interest” (see section 2 for details), is ranked lowly by the data available as to the determining factor, the typologies and the individual indicators. There are three other provinces outlined by PROFECY as inner peripheries: Brescia, Lodi and Pavia. Brescia, defined according to the criterium “access to regional centers”, as anticipated is ranked medium-high as to the determining factor and its components and ranked high as to the indicators *Internet user, Structures education to the creation of knowledge* and *Population with three years degree*. The province is at a medium-low level only for *Penetration of ultra wide band, Index of innovative dependency* and *Telecommunication Development level*.

In comparison with the provinces of Brescia and Sondrio the territories of Lodi and Pavia have an intermediate position in the ranking. The province of Pavia, defined inner periphery as to the criteria “economic potential” and “depleting areas”, shows some analogies with the province of Brescia. It is in fact ranked medium-low as to the determinant factor *Smart Growth* and the component *Education* (within this group of variables Pavia shows an high level of *Structures education to the creation of knowledge*); it shows instead a position medium-high for *Digital Society* and *Innovation Status Quo* and the indicators part of the group (with the exception of *Telecommunication Development level*). The province of Lodi differently, defined “inner periphery” according to the criterium “depleting area”, is never ranked above the medium-low level. At this level and at the low level the province of Lodi is ranked for the indicators part of the group of variables *Digital Society, Education* and *Innovation Status Quo*.

4.2 Inclusive Growth

Within the framework of the determining factor of *Inclusive Growth*, all provinces are positioned at a medium-high level, with the exception of Sondrio, Pavia and Lodi, that are located at a medium-low level (fig. 3b). The provinces of Lombardy have varying values in the different typologies that make up the determining factor, i.e. the *Structural Inclusion Variables*, the *Education Inclusion*, the *Social Inclusion* and, finally, the *Institutional Capability*. Within the *Structural Inclusion Variables*, we can see that Milan, Brescia and Mantua report high values, while all the other provinces are showing medium-high values (Varese, Como, Lecco, Monza-Brianza, Bergamo and Cre-

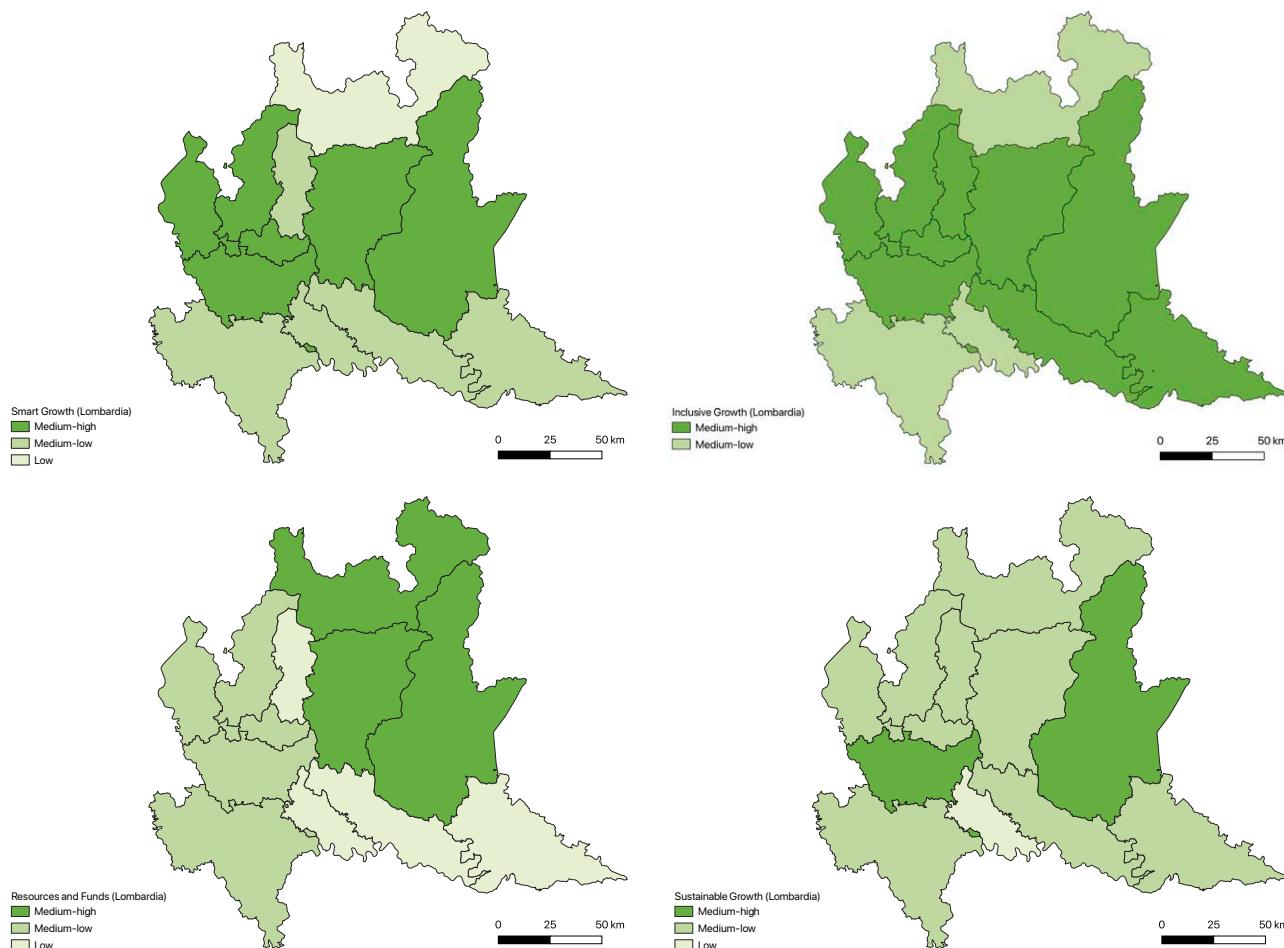


Figure 3 (a, b, c, d – clockwise order). The determinant factors in the provinces of Lombardy, 3a. *Smart Growth*, 3b. *Inclusive Growth*, 3c. *Sustainable Growth*, 3d. *Resources and Funds*. Source: authors' elaboration.

mona), with the exception of Sondrio and Pavia. In particular, the medium-low values of Pavia were impacted both by the reduced performance of both the *economic variables* (as shown by the Espon analysis, which identifies it as a “depleting area”) and by those relating to the *quality of life*. In the case of Sondrio, the overall medium-low value was mainly determined by the *economic variables*. If we look carefully at the elements related to accessibility within the *Structural Inclusion Variables*, i.e. those related to *leisure* (cultural opportunities and touristic rate), Lodi emerges as the only province that is deficient in both values; Milan, Como and Brescia are instead the provinces that have positive levels in both values; Sondrio shows medium-low *cultural opportunities*; the *touristic rate* is medium-low in Varese, low in Lecco, Monza-Brianza, Bergamo, Pavia, Cremona and Mantua.

If, on the other hand, we take into account the *Education Inclusion*, which, at a regional level shows values

that are not particularly brilliant (medium-low), Lecco is the only exception with overall medium-high values. The provinces of Milan, Varese, Como, Monza-Brianza, Bergamo and Cremona rank among the regional average (medium-low), whilst Sondrio, Brescia, Pavia, Lodi and Mantua have low values. In the case of these last five provinces, the negative impact is above all due to the low percentage of the *population without a first level degree*; Lodi is also distinguished by its high rate of “NEETs”⁷. Again, if we look closely at the accessibility elements of the *Education Inclusion* that are present in the framework of the *Inclusion in education system* (especially *incoming and outgoing students*), we see that Milan, Como and Monza-Brianza are within the regional average (high), Varese, Bergamo, Brescia and Pavia have medium-high values, Lecco, Cremona and Mantua

⁷ Acronym that stands for “Not in Education, Employment, or Training”.

medium-low values, whilst Sondrio and Lodi report low values.

The third component of the *Inclusive Growth* determining factor is the *Social Inclusion*, from which homogeneous medium-high level regional data emerge without revealing differences between the various provinces. There are, however, some noteworthy elements. First and foremost, the data within the *Social Inclusion* on *foresight inclusion* show differentiated values on the regional territory: high in Milan, Bergamo, Brescia, Pavia, Cremona and Mantua; medium-high in Varese, Como, Monza-Brianza and Lodi; medium-low in Sondrio and Lecco. Secondly, the *attitude to social welfare* (which considers *female employment* and the presence of *pre-school child care facilities*) shows high values in Milan and Monza-Brianza, medium-high values at a regional level and in various provinces (Sondrio, Varese, Como, Lecco and Pavia) and medium-low values in Bergamo, Brescia, Lodi, Cremona and Mantua. Taking into account the indicators most related to accessibility that are contained in this area of *Social Inclusion* (*employment*, *youth employment*, *foreigners employed*, *female employment* and *child care*) we find medium-low values in Sondrio (*child care*), Varese (*youth employment*), Lecco (*foreigners employed* and *child care*), Bergamo (*female employment* and *child care*), Brescia (*female employment* and *child care*), Pavia (*child care*), Lodi (*foreigners employed* and *female employment*), Cremona (*female employment*) and Mantua (*female employment*). Sondrio is the only province to register even a low value, in terms of *foreigners employed*.

The fourth and final component assessed is the *Institutional Capability*, also defined as confidence in governance, which is high on a regional level. If we drill down to the provincial level we find high values in Milan, Varese, Como, Monza-Brianza and Brescia, medium-high values in Sondrio, Lecco, Bergamo, Lodi, Cremona and Mantua and medium-low values only in the province of Pavia. The shortcomings in the area around Pavia are mainly attributable to the low election turnout. Accessibility has no effect on data we use to estimate the *Capacity of Institutions*. From the analysis of the data deriving from the four components of *Inclusive Growth*, it emerges, as said, that the regional value is medium-high, with the exception of the provinces of Sondrio, Pavia and Lodi.

Taking into consideration the four provinces identified as inner peripheries, it is possible to make some specific assessments. Sondrio records medium-high values for *Social Inclusion* and *Institutional Capability*, medium-low values for *Structural Inclusion Variables* and low values for *Education Inclusion*. Brescia

shows high values for *Structural Inclusion Variables* and *Institutional Capability*, medium-high values for *Social Inclusion* and low values for *Education Inclusion*. Pavia achieves medium-high values for *Social Inclusion*, medium-low values for *Structural Inclusion Variables* and *Institutional Capability*, low values for *Education Inclusion*. Finally, Lodi, for its part, indicates medium-high values for *Structural Inclusion Variables*, *Social Inclusion* and *Institutional Capability*, medium-low values for *Education Inclusion*. The four provinces identified as inner peripheries have in common the medium-low or low result of *Education Inclusion*; the only other Lombard province which has the same significant shortcoming is Mantua.

4.3 Sustainable Growth

The *Sustainable Growth* determining factor is related to two topics: economic growth, as to the business activities and the financial markets, and sustainability, as to *Infrastructures sustainable* and *Climate Change Adaptation*. As to the aspects of economic growth, Lombardy demonstrates good performances according to every aspect, except for internationalization (*Commercial integration*) and for data related to *Local Units* of enterprises. As to the aspects of sustainability, as it will be discussed further below, the region and its provinces show instead weaknesses in several indicators (fig. 3c).

Among the *Economic Structural variables*, the *GDP per capita* is always at medium-high or high levels, with the exception of Pavia; the green added value is also high or medium-high in the region except for Sondrio and Lodi. As to the *Internationalization*, the context is quite heterogeneous among the provinces in particular for the *Commercial integrations of goods*: Milan, Pavia and Lodi are very low in this respect, while other provinces are medium high, except Como (high). The *Commercial integration* reveals good performances only for Brescia. *Foreign direct investments* are instead high in every province of the region.

It is well known that Lombardy is home to many *Manufactural companies*: this is especially the case for Milan, Monza-Brianza, Bergamo and Sondrio, while other provinces are classified medium-low or low in this respect. Medium-low or low are also the data for *Local Units* in the region, except Sondrio and Mantua. The performance of the *Local Productive system* is medium-high for Milan, Sondrio and Brescia, lower for other territories.

As to the sustainability of the *Local Productive system*, the best performances are shown by Varese,

Monza-Brianza and Brescia, while Como and Pavia are medium-high. Many provinces have lower performances because of low incidence of *green labels*, while others (such as Milan) because of a low share of *workers in green industry*.

As to the overall structural performance of the *productive system*, the best performers are – as one could expect – Milan and Brescia. But also Sondrio is classified as the two mostly urban areas of the region, despite being instead a mountainous internal area. The territory of Sondrio has a good performance in most indicators, except *Local Units* and *green workers*.

Bank and Insurance and financial institutions are active in the Lombardy region and performance in this respect is very positive in every province except for Monza-Brianza and Varese (medium-low). In both cases it must be noted that the provinces are functionally and geographically very close to the metropolitan pole of Milan, where most financial services are localized. Other provinces, more peripheral, might instead have developed *local credit institutions* and *financial systems* on their own.

As anticipated, Lombardy has a very heterogeneous situation as to the environmental indicators. In *Climate Change Adaptation* the worst performer is Sondrio, where several indicators are very low, especially those related to *air quality*, *risk* and *waste*. The provinces of Milan, Como, Lecco, Monza-Brianza, Lodi perform medium-low in particular because of poor *air quality*: this is likely to be an effect of the Milan urban agglomeration. In general, the worst performances are related to the *waste cycle*: every provincial territory, except Sondrio, perform badly in this area.

The last relevant aspect of *Sustainable Growth* is accessibility, an indicator relevant also in order to assess the degree of geographical peripherality of territories. As one could expect, *Multimodal accessibility* in Lombardy is somehow related to the infrastructural proximity to Milan or to the main infrastructures. Thus, the provinces of Milan, Monza-Brianza, and Lodi have the highest levels of *Multimodal accessibility*; then Varese, Como, Lecco, Pavia and Mantua. The province of Mantua, quite far from Milan, benefits probably from being on the Brennero highway axis. Medium-low levels of *Multimodal accessibility* are shown by Brescia and Cremona. As to Brescia, recently connected in the Italian high-speed railway network, the actual performance might be underestimated by the indicators. It must be noted anyway that the provincial territory includes a large part of Alpine and pre-Alpine mountain areas. This is also the case for Bergamo and Sondrio, territories that are ranked low as well in the indicators of accessibility.

4.4 Resources and Funds

As to the determining factor *Resources and Funds*, Lombardy as a whole is ranked at the low level. As to the provincial level, at the same low level are ranked the provinces of Lecco, Lodi, Cremona and Mantua. The other provinces are ranked at intermediate levels: at the medium-high level the provinces of Sondrio, Bergamo and Brescia; at the medium-low level the provinces of Milan, Varese, Como, Monza-Brianza and Pavia (fig. 3d). This determining factor is articulated in three components: *Level of intervention in innovation and knowledge*, *Level of intervention in sustainability* and *Funds used*.

As to the first component the provinces are concentrated in the lower rankings, with the exception of Sondrio that is ranked at medium-high level: in a medium-low level are ranked the provinces of Varese, Como, Monza-Brianza, Bergamo, Brescia, Pavia and Cremona; in the lowest position the provinces of Milan, Lecco, Lodi and Mantua. This distribution of provinces in the ranking is similar to the component *Level of intervention in sustainability* and its intersection with the component *Level of intervention in innovation and knowledge* considered above.

A few differences are shown by some provinces: Sondrio, Bergamo and Brescia improve their position in the ranking (Sondrio shows a high level while Bergamo and Brescia are ranked medium-high); the province of Cremona has instead a worse ranking (low level).

The ranking for the component *Funds used* is quite different from the previous groups examined. The provinces of Milan and Brescia are ranked at a high level, followed by Bergamo, in the medium-high level. Varese, Monza-Brianza and Mantua are ranked in the medium-low level and the other provinces at the low level. As we saw for the components, only a few provinces have high rankings: Sondrio for *Level of intervention in sustainability*, Milan and Brescia for *Funds used*. The ranking of this group of provinces is instead more heterogeneous in consideration of each indicator: for some indicators other provinces are ranked at the high level,

For what concerns the *Level of intervention in innovation and knowledge*, the province of Sondrio is ranked at a high level for *Spending on economic development and competitiveness* and *Spending on professional training*. Besides the province of Sondrio, Bergamo and Brescia are ranked high as to *Spending on research and development*. For what concerns the *Level of sustainability* the province of Sondrio has a high ranking for *Spending on sustainable development* and, similarly to Bergamo and Brescia, for *Spending on transport and the right to mobil-*

ity and *Spending on social rights, social politics and the family*. Sondrio, Bergamo and Brescia with Varese and Monza-Brianza perform well for *Spending on youth policies, sport and leisure*.

For what concerns *Funds used*, the province of Milan emerges for *Rate of cross border and transnational cooperation* and *Cohesion funds used in project*. Similarly the province of Brescia emerges for the use of cohesion funds.

In this context, for what concerns the provinces as inner peripheries, the province of Sondrio has a peculiar position. In the analysis developed so far it emerges for a high level as to the indicators of *Level of intervention in innovation and knowledge*, for the component *Level of sustainability* and for the indicators that it includes. At the same time Sondrio is ranked low for *Funds used*.

The province of Brescia is ranked high for *Funds used*, namely for *Cohesion funds used in projects*. Moreover, it is ranked high and medium-high for the indicators related to the *Level of intervention in innovation and knowledge* (except for *Spending on employment*) and the *Level of sustainability*.

Pavia ranks in intermediate levels – medium-high and medium-low – for the indicators included in the *Level of intervention in innovation and knowledge* and the *Level of sustainability*; it is instead ranked low as for *Funds used*.

The positioning of the province of Lodi is instead more homogeneous: it is ranked low and medium low for the indicators included in the three components (with the exception of *Spending on research and development* in which the province is ranked medium-high).

5. Discussion

The analysis of the determining factors has shown the complex articulation of Lombardy; it could be discussed further considering a few aspects. A first aspect, related with the data presented above, is the territorial distribution of the rankings of the four determining factors compared (fig. 3). As to the *Smart Growth*, the region is articulated in three parallel areas, from north to south (fig. 3a). The central area is the best performing one, and includes the province of Milan, Varese, Como, Monza-Brianza, Bergamo and Brescia, with medium-high performances (except Lecco, medium-low); the southern part of the region, including Pavia, Lodi, Cremona and Mantua is at the medium-low level, while the northern province of Sondrio is performing low.

As to the determining factor *Inclusive Growth* (fig. 3b), the central best performing area is larger and

includes also Lecco, Cremona and Mantua. This area of medium-high performance has its counterparts in the northern province of Sondrio and in the southern provinces of Pavia and Lodi with a low performance.

The territorial distribution for *Sustainable Growth* (fig. 3c) is dissimilar: the medium-high performance is displayed only by Milan and Brescia, while the rest of the region performs medium-low (or low in the case of Lodi).

Finally, the data for *Resources and Funds* show a division of the region in three areas (fig. 3d). Two longitudinal areas emerge: towards the west with medium-low performances (Milan, Varese, Como, Monza-Brianza and Pavia); towards the east with medium-high performances (Sondrio, Bergamo and Brescia). Another area with a low level is distinguishable in the southern part of the region (Lodi, Cremona and Mantua): also the province of Lecco performs low.

Despite this heterogeneity in the territorial distribution, Lombardy as a region is ranked medium-high for *Smart Growth*, *Inclusive Growth* and *Sustainable Growth*. The position of the region is instead weak for what concerns *Resources and Funds* (low level).

Another aspect underlying the complexity in the territorial articulation of Lombardy is the position of provinces with regard to the determining factors considered jointly. Territorial units at the provincial level could be divided in three groups. The first group encompasses the provinces with medium-high performances in at least three determining factors, while the fourth could still be medium-high or medium low. In this group are the provinces of Milan, Bergamo and Brescia. The second group includes the provinces with medium-high performances in two determining factors and medium-low performances in two determining factors. In this group are Varese, Como and Monza-Brianza. Finally, a third group includes a heterogeneous set of cases. They have medium-low performances in at least two determining factors and have different combinations for the other two determining factors: medium-high and low Sondrio, Lecco, Cremona and Mantua; medium-low for both determining factors for the province of Pavia; low for the provinces of for both determining factors for the province of Lodi.

If we consider the provinces identified as inner peripheries, they are part of the first and third group listed above. The province of Brescia performs medium-high for the determining factors *Smart Growth*, *Inclusive Growth*, *Sustainable Growth* and *Resources and Funds*, while Pavia is at the medium-low level. The province of Lodi has a medium-low level for *Smart Growth* and *Inclusive Growth* and low for *Sustainable Growth* and

Resources and Funds. Sondrio shows a medium-low level for *Inclusive Growth* and *Sustainable Growth*, a low level for *Smart Growth*, but a medium-high level for *Resources and Funds*.

When compared to the regional average, the four inner periphery provinces have heterogeneous positions for the determining factors. The province of Brescia ranks at the regional average for *Smart Growth*, *Inclusive Growth* and *Sustainable Growth* and exceeds the average for *Resources and Funds*. The other provinces are in general below the regional level. Sondrio and Pavia rank at higher levels only for the case of *Resources and Funds* (they perform medium-high and medium-low respectively). As to this determining factor the province of Lodi is instead comparable to the regional average (low).

The differentiation among the four provinces revealed by the analysis is related to their geographical and socio-economic context and allows to discuss the criteria according to which the inner peripheries were individuated (ESPON 2017). The criterium of “access to regional centers” is relevant for Brescia, largely mountainous (Alpine or pre-Alpine), and for Sondrio, entirely mountainous and considered an inner periphery also according to the criterium “travel time to services of general interest”. As to the identification of internal areas (see section 2 above), in the province of Sondrio are localized two of the internal areas recognized for the implementation of the *Strategia Nazionale per le Aree Interne* (National Strategy for Internal Areas): the Valchiavenna and the Alta Valtellina⁸.

It is instead related to an economic and demographic decline (criterium “depleting areas”) the identification of inner periphery for the province of Lodi: a largely rural flatland province.

The criteria “depleting areas” and “economic potential” concern the province of Pavia, partially including some areas of the Appennines.

In consideration of the discussion presented above and of the rankings of the indicators, the province of Brescia largely has better performances than the other provinces identified as inner peripheries and is usually ranked similarly to the regional average.

Being classified as inner periphery according to the criterium “travel time to services of general interest”, the socio-economic system of the province appears to be not affected negatively by a low accessibility. It should be considered whether the features of the territory of the prov-

ince of Brescia are comparable with the territories clearly emerging for their being peripheric. This specifically with regard to the policy options will be considered and studied in the following stages of the research project.

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⁸ The other internal areas in Lombardy are the Alto Oltrepò (province of Pavia) and the Alto Lago of Como (provinces of Como and Lecco), <https://www.regione.lombardia.it/wps/portal/istituzionale/HP/Dettaglio-Redazionale/istituzione/direzioni-general/direzione-generale-enti-locali-montagna-e-piccoli-comuni/strategia-nazionale-aree-interne>

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