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Regional divergences in Europe

Innovation, economic complexity and human capital attractiveness

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1. Introduction

The way an economic system works is influenced by the cumulative nature of productivity process in space. Locational theory, regional growth and local development theories, give us understanding to the role of "space", that is included as an economic resource of the "territory" in which firms are situated and generate advantages.

Exogenous elements of attractiveness and endogenous capacity of local economic and social actors are strengthened and enhanced by a concentrated territorial organization which due to the development process (Hartmann, Guevara, Aristarán, & Hidalgo, 2015). The territorial organization is able to generate local processes of knowledge-acquisition and learning, networks of economic and social relations, and advantages of economic and physical proximity among economic actors.

Recent works, especially the one from Hidalgo (2016), look at the industrial structure (industries location, patents data and occupations) as the expression of knowledge in the networks of people and firms that are present in a territory.

According to Hidalgo, interregional inequality is acting two main forces, which also inspired the sequel of the thesis.

The first force - chapter 2, concerns the economic structure which have highlighted the economic complexity of a country related to technological innovation and their proximity to the knowledge and knowhow available in economy, intended as educational level or the percentage of the population with tertiary education. High-technology and knowledge-intensive sectors in large metropolitan areas favoured the mobility of highly skilled towards economic cores.

The second type of force – chapter 3, is the long cycle of regional evolutionary features, which can be understood as a link between an economy's level of social capital and the health of its institutions, since the ability of people to form social and professional networks may influence the efficiency of the entire production system.

The empirical study provided in the thesis is inspired by a different in differences analysis by Giannone (2016). The analyses shown that both the relative price and supply of skill increased since 1980, suggesting an increase in relative demand for educated workers. The

literature named Skill-Biased Technical Change (SBTC) this shift in demand, and researchers explain how SBTC led to rise in earning inequalities (Giannone, 2016).

While there is increasing empirical evidence showing that new activities that emerge in a region indeed tend to be related to the region's industrial structure, still there are few evidences of when and under what condition the human capital matters. With regard to this, chapter 4 explains the features of human capital endowment, and considered the concept of leaning-by-doing (Arrow, 1962) as the relevant aspect of economic growth theory.

Chapter 5 addresses these gaps in the literature by undertaking a systematic quantitative analysis of how the relationship between human capital attractiveness and high skill workers distribution varies across different types of regions.

Moretti (2012) coins the term of 'Great Divergence' to explain how the skills were diverging over time and space in USA' MSAs (Giannone, 2016).

The thesis demonstrates that, contrary to USA, European regions have an overall convergence between regions.

The research stress three main conditions. The first suggests that performance differences between high-skill (college degree) and low-skill (non-secondary level) workers play a crucial role in the cessation of regional convergence. Due to differences in their initial skill composition and social learning (Sah & Stiglitz, 2015), some cities benefited more from SBTC and consequently are becoming more attractive in terms of human capital. These facts are also consistent with a story of demand forces becoming stronger than supply forces at local level pushing incomes of high-skill workers up more in cities where their concentration is higher (Giannone, 2016).

The second condition highlighted an economic event which has probably an impact on the regional high skills attractiveness. This event is known as the economic crisis in 2008, which affect the all European countries and its productivity. For that reason, the analysis will take to different patters: the period from 2000-2007 will be compared to the next period of time 2008-2016.

Third condition is related to differences between EU15 (old member) and EU 11 (member since 2004) analysed by the changes in college share through the years 2004 (date on EU11 entrance) and 2016. Since Albu (2016) shown the characteristics of each group of countries by the GDP growth index and their regional convergence, next in this chapter will be

graphically explain what occurs by both macro-regions in relation to their college share input though a period of time. Moreover, the investigation focused on two European western countries (EU 15), such as Italy and Germany, which are considered different for their implementation of industrial policies.

Chapter 6 explain the importance of institutions, which may work through (i) educational system which are determinants for skills creation, but also, improve (ii) industrial policies and productivity for growth in complex economies. Therefore, (iii) the 'bridging activities', such as the role of university-industry, are required to generate externalities and (iv) strengthen the linkage between territories. A comparation between Germany and Italy is performed. These features are still investigating by the literature, and also by this thesis, in order to explain in a socio-political sense, the characterisation of regional divergences.

2. Complex economy

The theory of economic complexity focuses on productive knowledge embedded within real economic goods.

> "accumulating productive knowledge is difficult. For the most part, it is not available in books or on the Internet. It is embedded in brains and human networks. It is tacit and hard to transmit and acquire. It comes from years of experience more than from years of schooling." (Hausmann, Hidalgo et al 2013)

2.1. Economic regional theories

The first part of this thesis provides a sequence of theories and models by regional economics come over the last fifty years. Locational theory, regional growth and local development theories, give us understanding to the role of "space", that is intended as an economic resource of the "territory" in which firms are situated and generate advantages.

The way an economic system works is influenced by the cumulative nature of productivity process in space. Source of advantages such as high endowments of productivity factors and geographic location advantages, generate a spatial proximity that reduce costs and transaction cost.

To better understand the geographic distribution of such recourses and potentials, is important identify between factors which deal with development economies. The exogenous factors are related to the territory offers, such as raw material or natural advantages; by contrast, the endogenous factors are human capital, social fixed capital and accessibility - intended as the distance between production and consumption (Capello, 2011).

Hidalgo (2016) considered that observation in his book "Why Information Growth". He says that making a strong distinction between the generation of value and the appropriation of monetary compensation helps us to understand the difference between wealth and economic development. The world has many countries that are rich but still have underdevelopment economies.

Economic development is based not on the ability of a pocket of the economy to consume (e.g. Oil producer countries) but on the ability of the people to make and turn into a growth economy (e.g. innovators countries).

Hidalgo (2016) called “crystals of imagination” the solid objects that humans create to accumulate information in growing economies and making it requires an enormous amount of knowledge and knowhow. The volume of knowledge and knowhow determined the complexity of a product.

Exogenous elements of attractiveness and endogenous capacity of local economic and social actors are strengthened and enhanced by a concentrated territorial organization which due to the development process. The territorial organization is able to generate local processes of knowledge-acquisition and learning, networks of economic and social relations which support more efficient and less costly transactions, and advantages of economic and physical proximity among economic actors.

Through this first section, a literature investigation focuses on whether people or even the context actually learn and generate prosperity.

Researchers identify regional economics as the branch of economics which incorporates the dimension of ‘space’ into the analysis of cross-country market evolution. This is the novel approach which differ from the previous analysis that developed most of their attention and effort to determine the quantities of resources to be used for various purposes.

By including space in models and logical schemes, regional economic theories interpret the formation of prices, demand, productive capacity, levels of output and development, growth rates, and the distribution of income in conditions of unequal regional endowments of resources.

To do so, two large groups of theories make up regional economics: locational theory and regional growth (and development) theory.

2.1.1. Locational Theory

Locational theory is the oldest branch of regional economics, developed in the early 1900s. It has typically microeconomics foundations and it involves investigation into the location choices of firms and households and over the analysis of disparities in the spatial distribution of activities.

Location theory explains mechanism of disparities in distribution activities by the concepts of transportation costs, which diffuse activities in space, and agglomeration economies, which instead cause activities to concentrate, by removing any geographical (physical) feature that might explain that phenomena.

Location theory takes into considerations factors that influence these mechanisms, such as different type of production among territories, the spatial market shared among producers and the distribution of activities in space.

To do so, location models differ according to hypotheses on the spatial structure of demand and supply which reflect the aims that the models pursue.

There are models whose aim is to interpret the location choices of firms. Researchers explained the choice as determined by minimize transportation costs between alternative locations and under the influence of agglomeration economies.

Other models undertake to identify the division of a spatial market among producers, which is the market areas of firms. According to theories of profit-maximizing location, the equilibrium is determined by a logic of profit maximization whence each producer controls its own market area.

By analysing the spatial structure of demand and supply, the more recent theories on location assume that production site has a spatial dimension and is extended across a territory, while the consumption site (the market) is localized.

2.1.2. Regional Growth Theory

Theories coming next trying to interpret the development by using a syntatic indicator: the growth of a region's output or per capita income. While location theory is typically microeconomic foundations and it adopts a traditionally static approach, the regional growth theory is instead essentially macroeconomic.

In the 1950s and 1960s, regional growth theories investigate through the economic determinants of development and the mechanisms that enable a system to grow and achieve higher rates of output, greater levels of per capita income, lower unemployment rates, and higher levels of wealth.

According with the regional studies, there are numerous factors which may trigger a growth process, among them increased demand for locally produced goods, greater local production capacity, a more abundant endowment (quantitative and qualitative) of local resources and production factors, and a larger amount of savings available for investments in infrastructures and technologies intended to increase the efficiency of production processes. The study focused on regions, which are small geographic entities where goods that are produced frequently are going over the local demand and are sold in domestic country or even at international markets.

Local Development Theories: the components of territorial competitiveness

While theories discussed above use the term 'space' to denote homogeneous and uniform territorial areas, the theories now considered 'space' as diversified.

This new concept of 'space' enables identification of polarities in a territory, treated as spatially heterogeneous within a region.

Economic activities, resources, social and economic relations structure are around these polarities to generate a cumulative process of territorial agglomeration and development.

A more complex conception of space takes over, based on the economic and social relations that arise in a territorial area.

Theories radically change in their nature when space is conceived as "diversified-relational". The notion of a region is not anymore concerning a system acting and reacting economically as a single, but it takes place as individual economic actors, acting in terms of location choices, productive and innovative capacity, competitiveness, and relations with the local system and internationally.

Exogenous elements such the installation of new infrastructure, or the local presence of multinational firm, they may catalyse new economic activities and development for the entire area, even if they have nothing to do with local features and productive capacities.
On the other hand, the endogenous elements occur when decision-making capacity of local economic and social actors are able to control the development process, support it during phases of transformation and innovation, and enhance it with external knowledge and information.
Due to all these factors, the aggregation in territorial organization generates local processes of knowledge-acquisition and learning. The economic and social relations networks support efficient, less costly transactions and proximity advantages among economic actors (Capello, 2011).

Some researchers agreed that such phenomena inevitably generated inequalities through regions. The high demand for accessibility to central areas triggers competition between core and peripheries activities for locations closer to the market, which it has generated divergence. Such differences in the levels of development in Europe, through the countries and within its, have proven considerably persistent of territorial inequalities. Many cities and regions across Europe's economic peripheries have been stuck in a low-development trap, unable to break into sustained levels of economic development over time (Rodriguez-Pose and Fratesi, 2007), fuelling social and political tensions.
The question is spontaneously, how opportunities be enhanced in less dynamic cities and regions, and the potential of these areas exploited while encouraging economic progress across Europe?
In the last section of this thesis, it will be discussed this issue, since the role of social capital and the health of institutions become relevant to determine the economic development of regions.

2.1.3. Competing theories of neoclassical approach

What we learned since now, is that agglomeration is forces as the most significant complement to the changing spatial economic activities. In fact, more recent theory of economic developments has looking at territorial disparities in a different prospective.

New Economic Geography (NEG) and Urban Economics are the theories which points to the notion of 'dispersion', since the early 1980s. Although the different fundamentals that previous theories share with NEG and urban economics, they all agree to the ideal that concentration and dispersion can occur simultaneously, giving rise to convergence and divergence patterns.

Since the 1980s, the rise of new economic industries such as IT, advanced services and other, have enhanced agglomeration economies and the advantages of city-regions. In fact, many theories emphasise the benefits of spatial agglomeration for competitive advantages such as externalities, input-output links and physical infrastructure and accessibility, and from skills and human capital to innovation incubators (Iammarino, Rodríguez-Pose, & Storper, 2017). But why economic activities continue to agglomerate despite recent advances in communication and transportation technologies? Tacit knowledge such as social links and closeness opportunities (infrastructures, services) are still in strength competition with digital communication channel. The following chapter will observe this issue in relation on the crucial ability to form networks in a complex economy.

Moreover, NEG theory makes some considerations related to migration effect connected to agglomeration forces spread over the larger city, reinforcing a talent disparity between high income places and other regions, regardless of national policies to diffuse educational opportunities.

This issue will be considered in the research part of the thesis; which are the forces that leads higher-skilled workers to move in such agglomeration areas? Hence, relevant for the study is the trade-off between efficiency of agglomeration and equity through institutions, which have been the main topic of discussion in these next generation theories.

2.2. Ability to form networks

As already announced in the previous chapter, complex economy is the collective system by which people make information growing, through the accumulation of knowledge and the ability to learn. Differences in complexity explain the variations in the degree to which economic process agglomerate and develop. The literature estimates the relationship between competitive advantages trough innovation and spatial concentration. Geographical space has the role in lowing barriers, cost of knowledge and networking across individuals and firms. All these factors are decisive in growing cities, industrial clusters and regional systems.

To better understand the growth of information in economies, it may be identified the mechanisms of people's ability to form the networks they need to accumulate volume of knowledge and knowhow, which leads information growing.

The creation of networks performed in economic system, are affected by factors such as the capability of a place to obtain knowledge and the human experiential aspects of learning. According with Hidalgo (2016), the size of productive networks is influenced by the so called personbyte and firmbyte theory. The first theory implies the distribution of knowledge and knowhow among people, and it points the need of larger networks to accumulate more knowledge and knowhow. The firmbyte theory requires knowledge to be distributed among a network of firms.

The factors that limit the size of firms or humans' networks form, have been studied from various researchers in the branch of transaction cost theory or new institutional economics. Both the theories studied the cost of economic links and the ways in which people organize to deal with commercial interactions.

Transaction cost theory dates back to 1937 by the study of Ronald Coase, at the time student at London School of Economics. The theory consists of the idea that economic transactions are costly, they require negotiations, drafting of contract, solving disputes, setting up inspections, and so on. According to Coese, the boundary of the firms is determinate by transaction cost, because when external transactions are less costly than the internal transactions, firms stop growing, since it is better for them buying things from the market than to produce these internally. That means there is a price of links and the limit for networks to accumulate knowledge and knowhow (size of networks). To better understand

whether networks of firms facilitate the accumulations of large volumes of knowledge and knowhow, is necessary learn more about the cost of firm-to-firm links. In some case, firms do not have difficulties to create large volumes of knowledge and knowhow, then the cost of links are low. On the other hand, it can occur that firms' cost of making links are high, then the volume of knowledge and knowhow are limited (Hidalgo, 2016). This assume inequalities trough areas which benefit, or not, from good externalities.

On what do theories agree about the dissemination of networks that stimulate cohesion between regions, cores and peripheries?

Since neoclassical growth theory posited that development intervention is not necessary, competing theories emerged recently contributed to promoting a certain level of cross-country convergence. New economic geography (NEG), as already mentioned, has resulted in looking at territorial disparities and the trade-off between efficiency of agglomeration and equity through institutions.

The negative externality linked to agglomeration has been largely overlooked by their risk of rising territorial inequality, which are turned into social violence and economic and political tensions and reactions (Iammarino et al., 2017).

The literature in this field has tended to approach the question of regional growth in Europe from the institutional prospective, identifying sets of local factors that contribute to promote equity trough regions.

Then, a more interesting question is suggested by thinking at the relationship between equity and development. While agglomeration forces may restrict the potential for convergence across regions, the literature do not explain fully the gap in productive output between leading and lagging regions in the EU.

It would require identifying whether active intervention could improve capacities to move up the technological frontier/product space, and which such capacities are susceptible to improvement with political intervention (Iammarino et al., 2017).

2.3. Innovation and knowledge proximity

New technologies and innovations are surely responsible of economic development which guarantee growth and prosperity to cities and regions. Researchers in urban concentration agreed that upcoming waves of new technologies are likely to develop through strong agglomeration economies, especially in Europe. What occurs is that skilled labour, strengthening networked of innovation and production are remaining concentrated in a limited group of Europe regions, which are becoming leaders in economic growth.

That question come spontaneously; why economic activities continue to agglomerate despite recent advances in communication and transportation technologies?

Complex technologies reinforce urban agglomeration by yield some (tacit) knowledge embodied in social networks (links) and that does not travel well trough digital communication channel.

Researchers working at the European Commission explain the correlation between accelerating globalisation and technological change, which is commonly considered by current economic geography theories, in particular by NEG, as the agglomeration forces driving economic growth. Globalisation is defined as the network-based of global division of labour and creation of economic value, while technological change presumes a decline in transport, communication and information costs.

According with Rodríguez-Pose (et al., 2011) the link between innovation and agglomeration tends to be self-reinforcing; in fact, innovative activities tend towards agglomeration, and the greater the economic agglomeration, the greater the potential for innovation, for knowledge spillovers and for higher levels of economic growth.

Moreover, technological advances and the flexiblisation of production systems have allowed for the development of greater economic activity in areas formally disadvantaged by higher distances, costs, and/or resource bottlenecks (Rodriguez-Pose, 2003).

The geographic distribution of developed economies covered all the regions surrounding cutting-edge metropolitan areas. Information and knowledge spillovers to other metropolitan areas arise where they are well networked as part of an integrated urban system, especially trough physical transport and communications links, as well as links within firm and industry production chains. But the scope for this is limited.

Particularly, these limitations occur in metropolitan environments where space may be limited by geographic areas (core and periphery regions), which creates diseconomies and inequalities as a counteraction (see chapter 3.1).

In a way to identify how interregional inequalities arise, is useful to find some evidences about the distribution and accumulation of knowledge, which generate prosperity or rather decreasing economies.
Recent works, especially the one from Hidalgo (2016), look at the industrial structure (industries location, patents data and occupations) as the expression of knowledge in the networks of people and firms that are present in a territory.
According to Hidalgo, interregional inequality is acting two main forces, which also inspired the sequel of the thesis.
The first force concerns the economic structure which have highlighted that the complexity and diversity of products a country exports are related to technological innovation and a good proxy of the knowledge and knowhow available in an economy, intended as years of schooling or the percentage of the population with tertiary education. High-technology and knowledge-intensive sectors in large metropolitan areas favoured the mobility of highly skilled, non-routine and creative jobs towards economic cores.
The second type of force is the long cycle of regional evolutionary features, which can be understood as a proxy of an economy's level of social capital and the health of its institutions, since the ability of a country to produce sophisticated products also critically depends on the ability of people to form social and professional networks (Hidalgo, 2016).

As the evidence of correlation between complex technology and urban agglomeration, Hidalgo (2016) investigate the industrial structure of European countries. His study tried to analyse whether the urban concentration of economic activities has increased with the complexity of the economy. The authors explore this question though a research based on historical patent data, since it provides the longest time series (back to 1850).

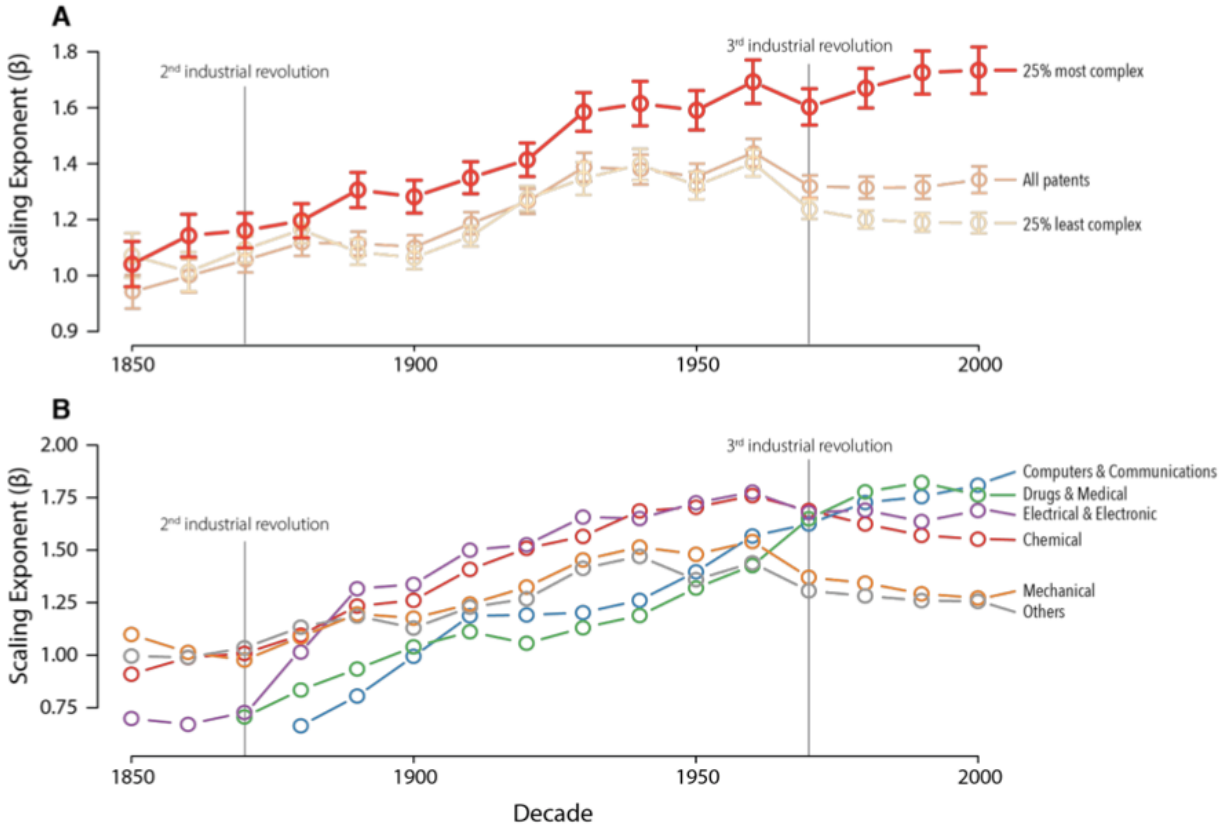

Figure 1 - Complex Economic Activities Concentrate in Large Cities[1]

The figure above observes the scaling exponent for the top 25% most complex patents granted each decade between 1850 and 2010 (red line). It reviled that the urban concentration of complex technologies (newer knowledge) has continuously increased for the past 150 years and has accelerated with each industrial revolution (Balland et al., 2018). Using historical patent data, Hidago (2018) shows that the concentration in large cities of more complex inventions has increased continuously since at least 1850, while that of the least complex technologies has decreased since the 1970s.

Therefore, the IT revolution reviled an increasing concentration of the most complex technologies in cities, and on the other hand, a decreasing urban concentration of the least complex ones.

The study shows the positive correlation between complex technology and urban agglomeration, also in supports of the main theories on the field such as NEG and urban

[1] Pierre-Alexandre Balland, Cristian Jara-Figueroa, Sergio Petrali, Mathieu Steijn, David Rigby, César A. Hidalg, 2018

economics. It is assumed that competitive advantages in terms of positive externalities generate concentration of complex technology that forces the dynamism of European large cities and regions.

Such externalities, as already mentioned, are input-output links to physical infrastructure and accessibility, and from skills and human capital pools to innovation incubators.

3. Regional evolutionary efficiency

Regional evolutionary features consist of place-specific endowments of people and skills, firms and industries, formal and informal institutions, capacities for innovation, and their reaction to change. The changing structure of the economy interacts with the characteristics of regions to generate a pattern of development (Iammarino et al., 2017). At the long-term development, it might generate divergence. This is because the attractiveness of best opportunities in specific areas leads inequalities for the others.

3.1. Divergence in core and periphery regions

As different skill groups have increasingly become concentrated in different places, recent trends have by and large favoured metropolitan regions, which benefit from agglomeration economies, positive externalities, and knowledge spill overs, often at the expense of some intermediate and peripheral regions.

The monocentric city model came over these assumptions and the location theory soon become the "new urban economics". But why would complex economic activities concentrate more in large cities?

According to R. Capello (2011), the general equilibrium location models revealed that in favoured metropolitan regions, the main interest is no longer decisions by individual firms or household, instead the definition of the size and density of cities, which guarantee a specific principle of spatial organization of activity. That is the aim of agglomeration; firms seek the accessibility to a diversified market, relatively for production factors and final goods, through information, connection to international infrastructures. For people, jobs and wages at commuting minimal costs, while recreational services (e.g. museums, theatres) and specific services (e.g. universities), at proximity distance.

New urban economic theories are unable to explain the location choices of firms and household among alternative urban centres and why exist numerous cities which depend, wholly or partly, from larger cities with higher quality services and activities.

Researchers are today trying to explain why an urban hierarchy exists.

Therefore, the current long wave of development fundamentally favours geographical concentration of the best jobs and most innovative activities. High demand for accessibility to central areas triggers competition between core and peripheries activities for locations

closer to the market. It has generated divergence, so the less- favoured regions comprising a mixture of low incomes and skills, low labour-force participation, institutions that quite development (Iammarino et al., 2017).

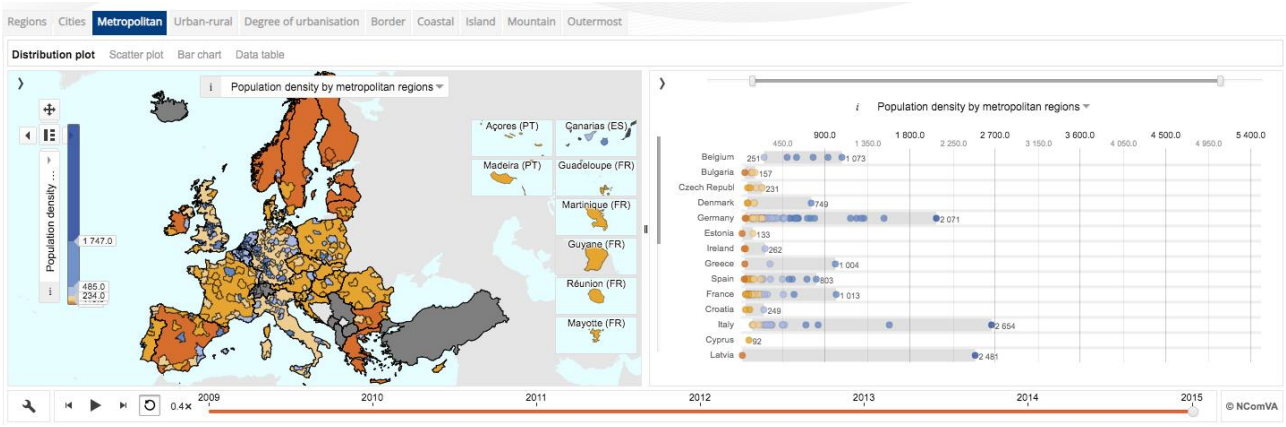

Figure 2 - Screenhot from eurostat.com, population density by metropolitan regions[2]

The process of urban structural change generates a new territorial model characterised by a dual organisational pattern (Leborgne & Lipietz 1992); core and some intermediate regions are regarded as the regions benefiting from recent changes, whereas old industrial areas and most peripheral regions as losing spaces (Farole, Rodríguez-Pose, & Storper, 2011).

By urban analysis, the spatial diversification manifests themselves in congestion in term of time, housing costs (with implications for wages and other inputs) and environmental degradation, and that cause the so called 'urban paradox' (Cities, 2016). People who enjoy a comfortable life live in close proximity to others who may face considerable challenges such as in cost housing, poverty or crime.

Cities in EU do not present the same urban agglomeration structure; contrariwise, Germany does not have very large city, while it performs very well, and it is one of the wealthy countries in EU. On the other hand, countries such as France, the national performance depends on very big cities (Iammarino et al., 2017).

[2] Eurostat's website – Applications: There are several interactive applications on the Eurostat website which provide tools for visualising and analysing territorial data. Among these, City Statistics Illustrated contains data for 26 statistical indicators across European cities, with information displayed in a map and as a bar chart.

From the theoretical review, geographical proximity does not automatically induce knowledge spillovers or innovation diffusion. Social networks and firms connection appear to be channels for knowledge diffusion and learning processes.
Differences in social, political and institutional settings determine different interaction between local economics actors, knowledge and innovation activities (Rodríguez-Pose, 1999). What occur in EU (e.g. Germany and France cities agglomerations) is that physical proximity and co-location is not a sufficient condition for knowledge spill overs to be effectively exploited. Institutional proximity helps the mechanisms of economies to be successfully innovated and performed in common with cultural norms which enriches the market. Non-geographical proximities demonstrate a number of drivers that process economies development, mostly related regionally, where economic agent interaction and institutional framework pattern the innovative capacity of specific regional contexts and allow absorbing and exogenous productive knowledge in an economically productive way (Ascani et al., 2012). This explains the different capacities to trigger economic development processes across space.

What is explain until now in the thesis, is that more complex an economic activity is, the larger is its tendency to concentrate in large cities. This is supported also by the patents research by Hidalgo shows in the previous chapter. Complex industries exhibit a much greater degree of concentration in large cities than less complex industries.
The agglomeration of economic activities is considered a key ingredient of knowledge creation and economic growth, which seek firms and people to find the location where they can share inputs with other economic actors, learn from the context and match with the right employees.

The expression of knowledge embodied in the networks of people and firms is revealed by the industrial structure. By looking at industrial structure is evident how the human capital (knowledge and knowhow) is agglomerated, and the social capital and the health of institutions which have the ability to form networks.

3.2. Human capital agglomeration

What came out from the previous analysis in the thesis, is that geographical proximity per se does not automatically induce knowledge spill overs or innovation diffusion: other forms of proximity, interacting with space, such as open business and social networks appear to be critical channels for knowledge diffusion and learning processes.
Hence, connectivity is the force which drive convergence and/or divergence of knowledge, people and skills through more integrated value chains will naturally increase the capacities of regions to be competitive.
Researchers at European Commission identified two forces of connectivity, spread (convergence) effect and hierarchy-reinforcing (backwash) effects. That conception revealed the hierarchy-reinforcing effects as the stronger than the equalising of convergence effects.

As the evidence of subnational interregional disparities, which are point in some European countries, are knowledge spill overs and labour mobility in the form of within-country migration.
Researchers investigated that the international mobility of people is growing so fast at international level, such as between EU or NAFTA countries, contrarily has been a steep decline in internal low-skilled migration in a number of countries (in EU or even in USA).
Causes of migration are investigated by recently studies: they refer to the gaps in inter-regional house prices, double income family by the higher female employment rates, new technologies communication as ICT to search job at a distance, and the wider consequence in changing nature of skills.

As regards the sources of agglomeration economies, many studies in the field revealed the role of knowledge spill overs which do exist but seems to vanish quickly with distance. The prove evidence come up for labor market pooling. Dumais, Ellison, and Glaeser (2002) studied the phenomena and they declare sources of agglomeration economies at different levels of geographical aggregation. They find knowledge spill overs to occur only at the metropolitan level, input at metropolitan level and state level, while evidence in favour of labor market pooling at all levels of aggregation. This thesis is been confirmed by Wheeler

(2006) and Yankow (2006) which explain the existence of a wage growth effect changing with jobs and matching with the explanation of agglomeration economies (Diesen, 2007).

Still related to the evidence of subnational interregional disparities, labour migration performs two effects; first is the decline in aggregation itself, the second is deeper in the phenomena which is the sharp split between the highly- and lesser-skilled workers. The more skilled workers are mainly migrating among prosperous places, and from less-prosperous to the more-prosperous regions.

Contrary, the less-skilled workers are migrating much less compared to the high-skilled, and evidences show that they migrate among the less-prosperous regions.

This phenomenon is referred to differences in works and new jobs upcoming in the new economy's skilled sectors which requires social networks. This led people to travel and be open to the more global market, while at the same time, manufacturing still exists, and it force workers to be productive in that place.

To give opportunities to improve and look at the job satisfaction of individuals, institutions have an important role; it can give their students better overall capacities via better networking and social cueing before they need to find them in other more prosperous countries.

Another role in this issue is related to the family's capabilities to have an income and connections to achieve such performances for their children (Iammarino et al., 2017). Such opportunities seem to appear in less-developed regions than those already ahead (look at familiar welfare strategy – south European countries - which in many cases are the less prosperous country now in the days).

Many studies have shown that there is a link between cities or even regions which are characterised by highly-educated workforces and rapid urban development. This may be related to highly-skilled workers which decide to stay close to where they studied, research institutes and science parks tending to cluster around academic institutions or cities characterised by high quality of life being more likely to attract entrepreneurs and highly-skilled workers.

According to Eurostat labor force survey statistic, capital cities are tending to attract a high share of graduates, in fact the overall share of people aged 25-64 in the EU-28 with a tertiary

level of educational attainment stood at just over a quarter (27.7%) in 2012. The degree of urbanisation shows a marked contrast (35.5%) of those living in cities having a tertiary level of educational attainment compared with less than one fifth (29.3%) in rural areas. This issue of higher shares being recorded among the working-age population living in cities was repeated in each of the EU Member States (Cities, 2016).

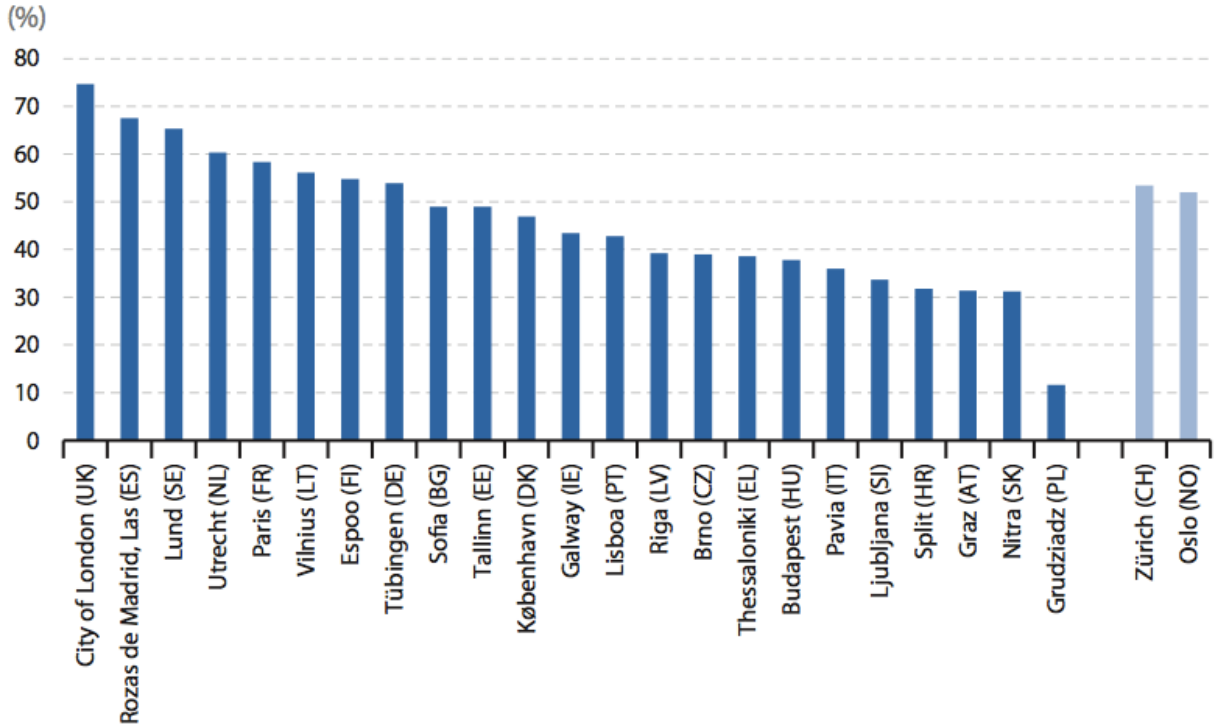

Figure 3 - Screenshot eurostat.com, proportion of people aged 25-64 possessing a tertiary level of educational attainment, 2012

It is commonplace to find capitals attracting a high share of graduates to their workforce. This is the case of many capital cities of the United Kingdom, Spain, France, Lithuania, Bulgaria, Estonia, Denmark, Portugal, Latvia, Hungary and Slovenia. The rest of EU countries shown a highest share of the working-age population with a tertiary level of educational attainment where the cities are characterised by a high quality of life or their technological/innovative nature. An example of this are Lund (Sweden) and Espoo (Finland), both home to a range of high-technology enterprises and business start-ups, while Utrecht (the Netherlands) has been named as the most competitive region in the EU. Those cities attract human capital as much they growth in the economy.

3.3. Social capital and the health of institutions

Previous models of theory (such as Schumpeterian growth models and NEG) emphasized the low capacity to innovate and assimilate innovations to the low levels of human capital, or in the case of NEG, to the insufficient scale and poor accessibility to markets.

More recent models underline the gap in technological and innovation capacities between regions, sometimes attributed to differences in human capital levels, others to the ability in structuring R&D capacity, and others to the tendency of firms and entrepreneurialism to be profitable.

Much of the recent research on economic growth identifies institutions as a fundamental determinant of a region's or a nation's economic growth tendency.

Many backwardness areas differ for the role of institutions which generate problems such as clientelism, institutional sclerosis, corruption by durable local elites who have an incentive to block innovation.

According to researchers in the field, in such an environment where institutions are 'inappropriate', a region is likely to fail in abilities of growing and it is vulnerable to the risk of low productivity traps. Weak institutions and poor government have negative influence on the development and by giving standards which aimed to improve skills or innovative capacity, or same potential sources of growth (Farole et al., 2011).

Rodríguez-Pose and Di Cataldo (2017) explained that good institutions are also essential for the promoting of low-skilled jobs and for reducing social exclusion.

Later by this thesis, it will be investigating whether institutions, in other words 'equity', come ahead on 'efficiency', which deals with economies agglomeration and competitiveness.

Until now, it is clear the role of firms, individuals, institutions and the important of special location, which bond good externalities necessaries for the well social being and the growth of regions, nations or even the entire European Union itself.

4. Human capital attractiveness

The previous part of the thesis takes its cue from the literature and evidences supporting the fact that agglomeration economies are leading city regions through an exponential growth due to positive externalities, especially by the next few decades. This is causing an opposite direction for the less favoured regions, which have been stuck in a low-development trap, differing for income inequalities, less incentives and networking.

Theories such as New Economic Geography (NEG) and Urban Economics point to the notion of 'dispersion' and they all agree to the ideal that concentration and dispersion should occur simultaneously, giving rise to convergence and divergence patterns (Iammarino et al., 2017). Some researchers agreed that such phenomena inevitably generated inequalities through regions. The high demand for accessibility to central areas triggers competition between core and peripheries activities for locations closer to the market, which it has generated divergence. Such differences in the levels of development in Europe, through the countries and within its, have proven considerably persistent of territorial inequalities (Iammarino et al., 2017).

Hidalgo (2016) assumes that interregional inequalities are acting two main forces: good proxy of the knowledge and knowhow and the level of social capital and the institutional intervention – see chapter 3.
While chapter 4 is investigating over the force related to the capability of a place to obtain knowledge and knowhow, and it will be observed though evidences the consequently attitude of regions to converge or diverge in a socio-political sense.

The attitude of a territory to create networks between people and firms is assumed to be fundamental required by many researchers.
Since the 2000s, innovations and complex technologies have an important role in urban agglomeration, but they do not take the place of some others knowledge embodied in social network. In fact, the role of human capital is relevant in building networks, and it is able to lead complex economic and consequently economics growing.

Although the theoretical difficulties in assessing human capital, it is assumed that the average of people with higher education level perform functions at a higher level in advanced economies. The high-skilled workers are considered as an index of human capital.

While many studies have been analysing the 'technological change' and economic growth related to increasing factors of production, such as labor and capital, this thesis follow the studies which rather investigated over the forces that increases in productivity, the human capital force.

In 1962 Ken Arrow, the pioneer of the concept 'human capital', published important papers attempting to explain technological process, one of these is about learning by doing. K. Arrow (1962) argues that as people in such economy process produce and invest, they become better in what they do. So, the process of leaning is performed (Arrow & Series, n.d.).

This is a briefly anticipation to the concept called endogenous growth theory, where innovation is determined within models of growth.

In the next chapters, it will be better explained the concept of learning by doing and what researchers intended with endogenous growth theory.

Regional studies make some considerations related to migration effect connected to agglomeration forces spread over the larger city, reinforcing a talent disparity between high income places and other regions, regardless of national policies to diffuse educational opportunities.

It is assumed that people endowed with human capital are more likely to relocate (migrate) from a place to another because of their adaptability to new opportunities offered by other location. As well, skilled workers are less vulnerable to job loss because they are not easily replaced (Fratesi, 2014).

This section will explain which are the specific forces that leads higher-skilled workers to migrate in agglomeration areas.

The next and last section (III part) will investigate whether the trade-off between efficiency of agglomeration and equity through institutions occurs and can overcome divergences between European regions.

4.1. Learning by doing in the complex economy

This section shows the two different perspectives providing alternative explanations of the phenomenon of divergence. One is referred on certain characteristic of innovation, the other is based on socioeconomic considerations. The two perspectives have a quite different approach at policy level and this thesis will see respectively the socio-political response of some countries in Europe.

Arrow (1962) considered the concept of leaning-by-doing as the relevant aspect of economic growth theory. He argues that learning is a by-product of production. This explain the localisation of learning, such as the spillover effect, which departs from the concept of uniformity. Accretions in knowledge could be relevant for one technology but not for another.

The experience in production and leaning become relevant for the production mechanisms and consequently for its growth. The specialization in production emphasised the important of specialisation in learning (Sah & Stiglitz, 2015).

These concepts concerning technological learning have important implications for economic theory and policy.

In somehow, Arrow (1962), with the introduction of leaning-by-doing concept, revealed a way of thinking of production mechanisms which called for the importance of socio-political implications.

The current generation of growth theories, formulate models in which per capita income growth and long-run performance reflects structural and policy parameters of local and global economy (Grossman & Helpman, 1994).

These parameters, to be back on Arrow's conception, see capital – human or physical - as the driving force behind economic growth.

However, human and physical capital are investments that in perfect competition economies must stay above the discount rate for investment to remain profitable.

Physical capital (Arrow, 1962) and human capital (Lucas,1988) produce investment which may contribute to the productivity of capital held by others.

According to Romer, capital investment not only increases the stock of physical capital but also increases the level of the technology for all firms in the economy through knowledge spillovers (Romer, 1994).

At the firm level, the decision to employ in technology and its level of production, cannot be decided only looking at the current factor prices. If a firm believes that, at some future point, it will pay to switch to a more capital-intensive technology, then may decide to pay at same date at which the more capital-intensive technology has lower costs. If the gain between learning-to-learn and learning-by-doing is high, then it pays to produce more in relation than the level at which price equals short-run marginal cost.

These results follow the localised nature of technological process, such as from the fact that there is learning-by-doing. The presence of leaning-to learn just reinforce the argument.

That condition, in fact, induces a firm to pay more in production a good for which the country does not currently (and never) have comparative advantage. But what it learns from producing that good, it may generate comparative advantage in some new product at the long-run period (Sah & Stiglitz, 2015).

Technologies accumulation employed at some point changes the shape of the production schedule. The long run economic convergences are affected by the distribution of capital intensive and model of technology. Learning-to-learn effects are strengthening some conclusion. Previous lack of experiences may limit the capacity of individuals in some economies to take full advantage of the capacities for productivity improvement associated with certain technological changes (Sah & Stiglitz, 2015).

The literature investigated whether economies are performing technological process by long-run equilibrium, while some other economies may be trapped in a low-level equilibrium, with low capital labour ratio and a low rate of technological process.

It has been assumed that capital-intensive technologies have a greater capacity for learning and have been associated with increments in greater production.

This explanation from Stiglitz (2015) is complete with another clarification. If we look at the international economy context, in which knowledge can move across borders, less capital-intensive economies may have potential access to the information available in more development countries. Why such knowledge, developed for and by developed economies, may have limited relevance for low developed countries?

Once it is clear the correlation between human capital and growth, it is also clear the implication that large economies always grow faster. Human capital is the effective measure of the size of labor force; with more labor, the economy may perform more R&D and manufacturing, employing in these sectors and generating an increased rate of product innovation (Romer, 1994).

Grossman and Helpman (1991) suggest that capital intensive of workers is decisive for the purpose of growing in productivity. Let the workers be distinguished by their use of skills, such as their potential for technological improvement, respectively high-skilled versus low-skilled. A large economy with an abundant of skilled labor, will growth faster than another with less human capital. However, a large economy fulfilled by low-skilled individuals, might growth more slowly than another with a smaller population (Grossman & Helpman, 1994).

The large labor-abundant regions attract workers specialize in labor-intensive, in order to growth the productivity of such economies.

The capital intensity may vary from large economies and less developed economies, also due to the migration of high-skilled workers to such labor-abundant regions.

However, migration and knowledge-intensive of such area does not explain sufficiently why some economies stay dropped in a low and slow development.

4.2. Interregional mobility of high skilled workers

The rise of human capital and highly skilled workers is associated with the importance to accumulate knowledge and knowhow. In line with this prospective, the mobility of high skilled individuals is rising and may generate better or worst condition for the territory. While the attraction of human capital is clearly a positive indicator, the loss of skills might undermine their possibility for knowledge-driven economic development (Dotti, Fratesi, Lenzi, & Percoco, 2014).

4.2.1. Low and high skilled migration

Since the late 1980s, labour markets have become increasingly globalized, which has created new opportunities for mobility, especially of high-skilled workers. As such, it is clarified the existence of different types of migration and by which this chapter will focus on.
According with researchers, migration can occur as voluntary action rather than forced action, even most economic contributions on mobility focus specifically on voluntary migration. This has few explanations. First, the economic considerations motivate the majority of voluntary moves, such as labour market conditions at the origin and/or destination; economists are mainly interest by this type of migration.
Second, the majority of international and internal migration remains voluntary, even the recent refugee crisis in Europe is influencing negative the human price of mass forced migration and pull this phenomenon under the spotlights of public opinion. Third, the data collection on forced migration missing on large number of illegal immigrations (Faggian, Rajbhandari, & Dotzel, 2017).
These are the reasons this thesis will focus exclusively on voluntary migration.

Always according with regional studies, another distinction has to be made by the high-skill migrants who migrate internationally, and those who migrate internally and tend to relocate multiple times during their lifetimes.
In fact, the higher migration propensity of highly educated (high-skilled) migrants are also the most internally mobile.
In the last decade, regional studies have paid more attention to the composition of migration flows, focusing especially on the migration of skilled people with tertiary education.

While in advanced economies and developing economies studies the focus on human capital data tended to be on primary and secondary education, more recently the focus of education research and policy in the industrialised economies has moved towards tertiary education (Gennaioli & Shleifer, 2011). This suggest that in the last decades the economies changed, due to technological transformation, and the new economy required tertiary education skills to compete internationally.

Due to the important role that tertiary education has in advanced economies, rather than primary or secondary education, recent regional studies focus in the interactions between higher educational institutions, such as universities, and their local regions.

Researchers agreed that higher education plays an important role in influencing who migrates. According to Faggian and McCann (2006), Universities act not only as creators of human capital by instructing local young people into the market, but also as attractors of human capital to the region. In fact, universities can attract the most talented students, and strong local economies can help universities to attract students who may decide to stay on afterwards, thereby increasing the local endowment of human capital (Fratesi, 2014).

The behaviour between local market and educational institutions is a great point which researchers are trying to analyse. At the policy side, the importance of highly educated individuals become increasingly relevant in different regions. On the data side, large database containing high educated individual's information become available in Europe.

This thesis will perform data from Eurostat, which it bunches information for each European countries (EU28) and regions, allowing for detailed analyses of the interregional migration behaviour of high-skilled populations (tertiary educational level). By referring to the high-skilled internal migration, later in this chapter it will be discuss about the regional consequences of high-skilled migration.

4.2.2. Interregional migration

The relationship between skilled migration and regional development has clearly become the main interest point for many researchers in *Regional Studies*. They investigated whether the role of skilled labour, education and training affect in somehow the prosperity in local economies. This can be observed at the international level as the overall system process, or as occur more frequently, at the regional level as interregional mobility.
This thesis will consider the interregional mobility in its research, because of few reasons. First, the literature argues that, in term of economic growth, regions differ considerably by the national average. Second, regions are the ones that have concentration of high-skill workers larger than the national average. To compare properly the many forces interacting on the market, it is required to analyse the behaviour of regions, such as core-metropolitan areas versus peripherical areas.

However, the definition of 'region' varies between studies. In regional economics, the definition of regional scale depends on the phenomena under investigation, and even if it is the same across studies, there is still not the unanimity on what regional scale should be used or what defines a 'migration movement' (Faggian et al., 2017).
According to the Eurostat researching paper (eurostat, 2011), the definition of 'region' differs in size and in 'nature'. These are normally divided into normative and analytical criteria:

- Normative regions are expression of political will and the limits are fixed according to the task allocated to the territorial communities, historical, cultural and other factors;
- Analytical (or functional) regions group together zones using geographical criteria or using socio-economic criteria such as local labour markets or travel-to-work areas.

The Eurostat Commission named the current *NUTS classification* (Nomenclature of territorial units for statistics) to define the hierarchical system structured by levels, for dividing up the economic territory of Europe. NUTS classification subdivides each Member State into a number of NUTS 1 regions, each of which is in turn subdivided into a number of

NUTS 2 regions and so on. NUTS 3 corresponds to a less important or even non-existent administrative structure, it varies for different purposes.

The collection is made by the socio-economic analyses of regions:

- NUTS 1: major socio-economic regions
- NUTS 2: basic regions for the application of regional policies
- NUTS 3: small regions for specific diagnoses

The NUTS Regulation present the following minimum and maximum thresholds for the population size of the NUTS regions.

Table 1 - Definition of NUTS according to Eurostat, 2011

Level	Minimum	Maximum
NUTS 1	3 million	7 million
NUTS 2	800 000	3 million
NUTS 3	150 000	800 000

The current NUTS nomenclature applicable from 1 January 2012 subdivides the economic territory of the European Union into 97 regions at NUTS 1 level, 270 regions at NUTS 2 level and 1294 regions at NUTS 3 level.
The aim of the NUTS classification is to ensure that comparable regions appear at the same NUTS level. As population size has been de ned in the Regulation as a key indicator for comparability, each level inevitably contains regions that differ greatly in terms of area, economic weight or administrative powers (eurostat, 2011).

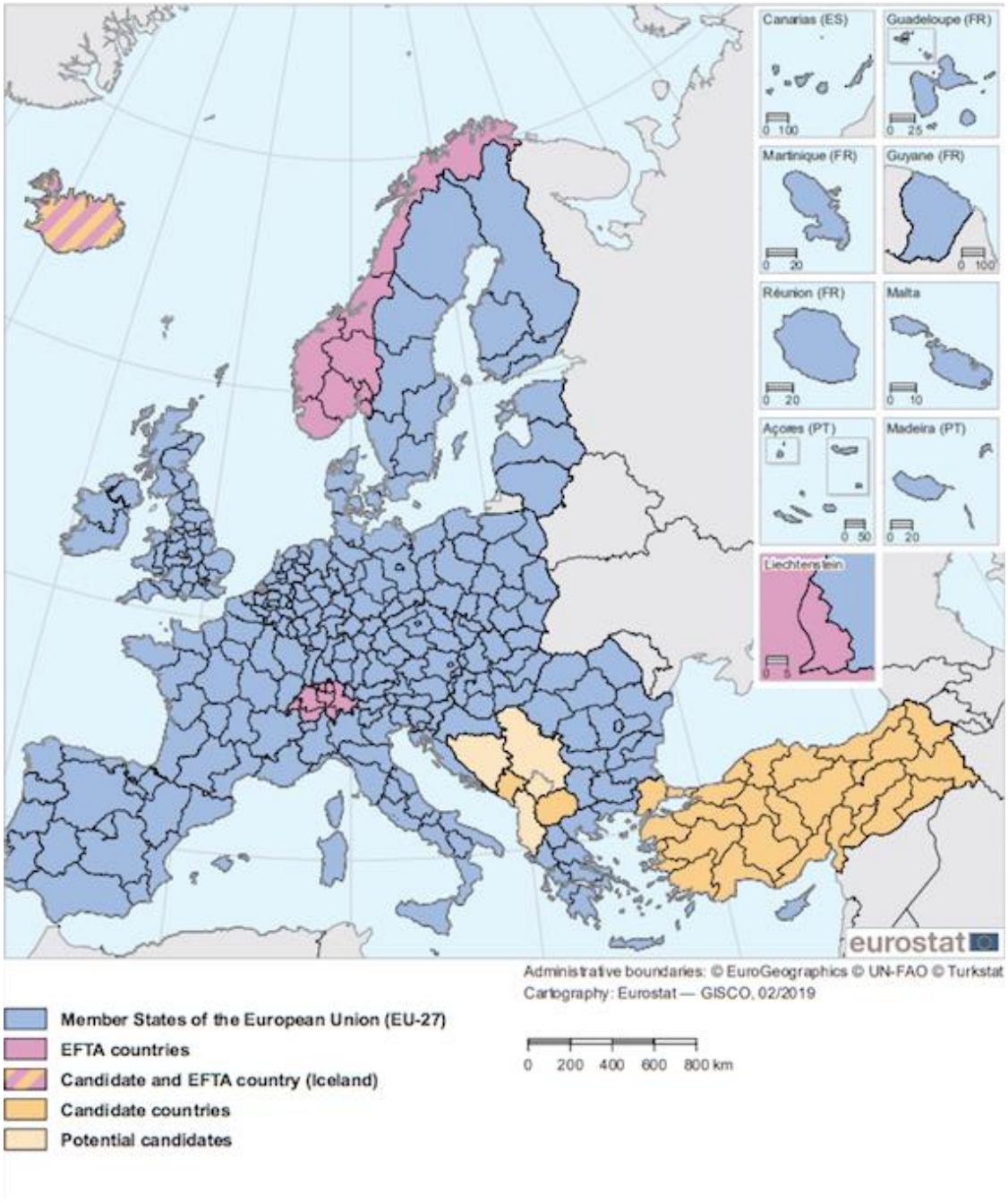

Figure 4 -screenshot eurostats.com (2010), NUTS 2 regions in the Member States of the European Union (EU-27)

4.2.3. The pooling effects

The research by this thesis will analyse the mobility of workers within regions in EU countries. In order to understand the workers mobility between firms (and even regions), it has to be clear the mechanisms, introduced at the time by Alfred Marshall, of labour-market pooling, localized spillovers and knowledge externalities.

The pooling effect tried to explain the labour-market mobility in areas where workers find it profitable. Regional researchers have found evidences about the relationship between migration, education and income within countries. The mobility rates and income increased with education, while migration tended to increase personal income. The findings reveal that educated workers (high-skill) moved towards wealthier regions, where they could find both higher incomes and faster income growth (Fratesi, 2014). This performed migrations to the richer and proposal areas, while localities with poor socio-economic conditions tended to have lower educational performance, which impacted negatively on the economy and opportunities available, stocked peripherical regions in a low-development trap.

These tendencies of development in favours geographical concentration of the best jobs and high skills, have confirmed the divergence through EU regions. On one side, metropolitans' regions are the fundamental motors of European's overall prosperity, which benefit from agglomeration efficiency. By the other side, peripherical regions are on their way of declining prosperity and lack of real opportunity, which is economically, socially and politically dangerous (Iammarino et al., 2017).

4.2.4. Regional consequences of high skilled interregional migration

In the last decade the literature investigated over the growth of high-skilled individuals' migration at the regional level. Researchers found that this attitude influence the destination region positively by promoting innovation and creating new knowledge, but also negatively by the increasing in prices of goods and decreases wages for the non-skilled workers.

About the positively aspects of in-migrants skilled workers, it is assumed that the growth of such economies results from the development of human capital base, which leads new knowledge, technologies and innovations.

The phenomenon of changes in capital-intensive is also relevant to understand some mechanisms around regional growth. In fact, industries benefit from hiring local employees that can grow their stock of knowledge, and they are also willing to pay higher wages to those workers with high skills (Faggian et al., 2017).

Faggian, McCann, and Sheppard (2007), have been studying the interregional migration behaviour of British graduates, reaching the result that graduates who excelled in college are also more likely to become repeat migrants. This has an important consequence for the regions that are hosting such new wave of migrants.

High-skilled workers may influencing outcomes in host regions as entrepreneurs and investors, and recent regional studies have investigated the impact of migration on jobs, finding two main mechanisms: production- and consumption-side channels (Faggian et al., 2017).

On the production side, industries in host regions which benefit from a large share of high-skilled works, are more likely to invest in new technologies which can consequently increase productivity of both low and high-skilled workers. In other words, migration increases the labour supply in receiving regions and grants these regions with additional production factors, so they generate more jobs.

By the way, the complementarities between native and high-skilled in-migrants is still discussed by the literature.

On the consumption side, migrants follow jobs, so migration is induced by the ability of some regions to generate jobs than others (Fratesi, 2014).

The negative consequences of high-skilled in-migration are less visible than the positive ones, however they have a strong effect by the host regions.

Constraints on urban space may amplify diseconomies of cities region. In fact, while the economic advantages of a given region lead to further in-migration, crowding and congestion will increase, as will the cost of housing (Nathan, 2014).
Same attitude is performed by the changing in wages. Any increasing in supply of high-skilled workers, it may be generate decreasing in wages for the native high-skilled workers lose from flow of high-skilled immigrants (Faggian et al., 2017).

Consequences of migration are also assumed on origin countries, even the literature present a limited number of studies. Most of these studies focused on the negative consequences for the origin country which loss high-skilled workers, for example the phenomena of brain drain.
The brain drain is the most significant consequence of out-migration and it generally assumed the transfer of human capital (such as people with tertiary education) from developing to more developed areas, with the idea that the current and future economic performances of an area are negatively influenced by the loss of its stock of human capital (Faggian et al., 2017).
Researchers studying this phenomenon, are investigating on its impact in a theoretical context. In fact, they argue that high-skilled emigration could have positive impacts on the origin.
The literature assumes that to overcome the effect of brain drain, the origin countries have to invest in education. This mechanism introduces uncertainty into the migration process, which allows the studies to assume that only a fraction of those who invest in education successfully migrate (Faggian et al., 2017).

Although positive and negative consequences of interregional migration on both destinations and origins, is migration good for the economic system overall?
This question has been investigated by many researchers in regional studies, such as Granato (at al. 2015), Kanbur and Rapoport (2005), Arntz (et al. 2014).
The main economic consequence of high-skilled migration is that it reinforces differences in regional unemployment and wages. The distinction between high or low skilled migration is the base of employment disparities and, according with Arntz (et al. 2014), 'the more

unequal employment is spread across the regional workforce, the more a region attracts an increasingly skilled inflow of migrants'.

5. Case research: skills concentration across European regions

The analysis adopts a prospective of correlation between the distribution of high-skill and their growth of intensity over time, in each EU 28 region.
As GDP is one of the indexes of complex economic of territories, this thesis explains the issue taking over another index of complexity already analysed by the literature, such as the human capital attractiveness, precisely the ability of a region to acquire and generate knowledge by the territory.

5.1. Regional divergence in Europe: a macro-analysis, EU11

Regional Studies have investigated the convergence between European countries under the GDP condition, estimating two distinct macro-regions of behaviour, namely EU15 west country and EU11 east country.
This thesis aims to investigate the interaction between convergence and divergence regions within the two macro-regions, according to the parameter of metropolitan area and industrial area.
How much is regional convergence or divergence influenced by the territorial economic characterization?

In this chapter it is analysed the regional convergence and divergence within the two macro-regions, following two main studies. The first study is by Lucian-Liviu Albu (2016), the second study from Simona Iammarino, Andrés Rodríguez-Pose, Michael Storper (2017). The interesting results have guided the objective of this thesis.
L. Albu (2016) proves evidences on the real convergence at the level of groups of countries. Since 2000, in the studies on convergence in EU was usual to consider two groups of countries: EU 11 – later entrance in EU (Bulgaria, Croatia, Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia) and EU15 – old members (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and UK).

As index of convergence, it is used GDP per capita (in euro PPS) analysed at regional levels. Albu (2016) presents some results concerning the positive convergence between EU11 and EU15.

The **Figure 5** illustrates the following dates:

EU11: GDP per capita increase from 44,4% to 65,7% for the average level for EU28;

EU15: GDP per capita decrease from 116% to 108% for the average level for EU28;

At the EU28 level: GDP per capita increase from around 19,6 to 27,3 thousand-euro PPS.

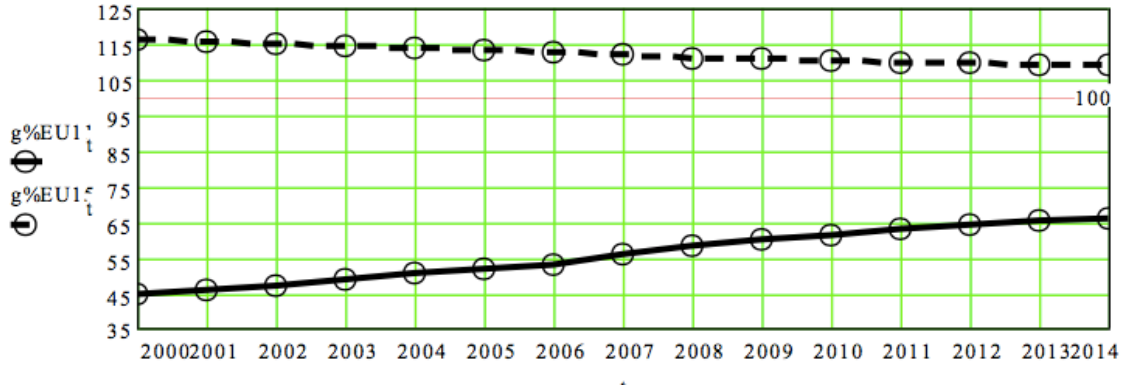

Figure 5 - Convergence in relative terms in EU28, 2000-2014 (Albu 2016)

According to the study (Albu, n.d.), the Eastern group of countries (EU11) appear to have strong regional convergence, while the GDP per capita of these countries grows slowly. Contrarily, in Western group of countries (EU15) the prosperity of economic development is followed by a moderate increasing divergence, with the exception of some countries, such as Germany, which present an overall convergence trough region.

Albu (2016) finally bunch the four behaviours of EU28 countries in relation with their divergence among regions:

- Countries that improved their position (as proportion in EU average GDP per capita level) but in the same time registered a divergence among regions (Bulgaria, Czech Rep., Baltics, Ireland, Croatia, Hungary, Poland, Romania, Slovakia, and Slovenia);

- Countries for which their position (as proportion in EU average GDP per capita level) was decreasing and in the same time they registered a divergence among regions (Denmark, Greece, France, Sweden, and UK);

- Countries for which their position (as proportion in EU average GDP per capita level) grown worse but they registered a convergence among inside regions (Belgium, Luxembourg, Italy, Cyprus, Malta, Netherlands, Austria, Portugal and Finland);

- Countries for which their position (as proportion in EU average GDP per capita level) was increasing and in the same time they registered a convergence among regions (Germany).

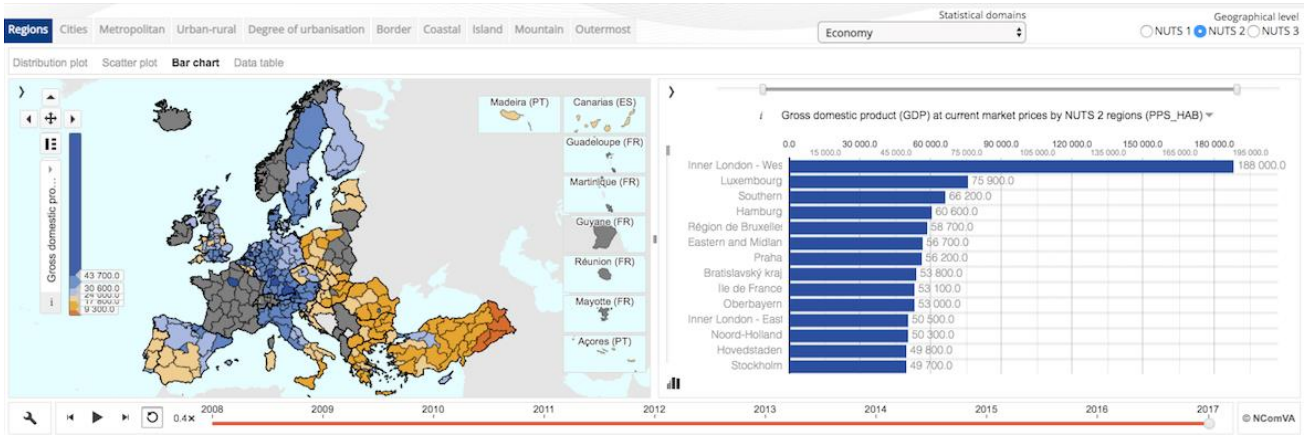

Figure 6 - Screenshot Eurostat, Gross domestic product (GDP) at current market prices by NUTS 2 regions

By the Albu analysis (2016) it can be draw conclusion that the growth of GDP factor, such as the territorial economic characterization of a country, is followed by an increasing divergence between regions. In other words, the GDP value may increase wealth in territories, but it does not raise convergences between regions. Contrarily, the wealth accumulation in core areas generate divergence with peripherical areas, also due to house costing and wages.

However, there must be same other evidences that explain the behaviour of interregional divergence.

In fact, the research made in this thesis will take another index instead of GDP and tried to explain why some geographic areas diverge from the others.

The skill ratio of workers geographically located seams to explain a diverging factor, also with respect to its mobility through similar characterization regions.

5.2. Research: skills concentration across European regions

The previous chapter replicate the research from Albu (2016), observing that the economic development factor such as the growth of GDP increases divergence between regions in EU28.

As GDP is one of the indexes of complex economic of territories, this thesis explains the issue taking over another index already analysed by the literature, such as the human capital index, precisely the high-skill workers migration.

However, the role of institutions is an important argument in Regional Studies, which is considered the key for interregional convergence.

Institutions may work through (i) educational system which are determinants for skills creation, but also, they should improve (ii) industrial policies and productivity for growth in complex economies. Therefore, (iii) 'bridging activities' are required to generate externalities and (iv) strengthen the linkage between territories. These features are investigating by the literature, and also by this thesis, in order to explain in a socio-political sense, the characterisation for the regional convergence. The last section of the thesis will take over these observations.

Moreover, it will be compared two countries In Western Europe which differ in conformity and socio-political behaviours: Italy and Germany.

Italy with focus on North/South regions behaviour, and Germany in a wide sense and with refer to later developed German Democratic Republic regions.

As already learned from Albu (2016), Germany differ from other EU Western countries (EU15) because of its attitude to register a convergence among regions and at the same time generate prosperity and wealth. Whilst, Italy is the country which perform a slow development and missing policies able to overcome the barrier which hold it from the great and unconditioned development.

The empirical analysis performed in this thesis is investigating over the changes in human capital-intensive in Europe by unit of regional statistical area, NUTS 2 classification.
The skill ration of workers between 2000 and 2016 in EU28 were slightly diverging across MSAs over time, but still having an overall convergence behaviour though regions.
However, related to the USA, Moretti (2012) coins the term of 'Great Divergence' to stress how the skills were diverging over time and space in USA' MSAs (Giannone, 2016).
The analysis made by this thesis looks at the "Great Divergence" in the USA, empirically confirmed by Giannone (2016), investigating over the European' skill ratio trend which will be demonstrate to be more oriented to the convergence of regions.
The research takes over two specific territory's characterisations: knowledge-intensive areas (skills abundant) and 'peripherical' areas (low skills predominant).
It will be demonstrated by which of both there are changes in human capital-intensive through a period of time.
The time series goes through two different patterns: 2000-2007 and 2008-2016. The gap though these two patters has been made in order to stress historical feature which characterised the evolution of the European economy, such as the 2008 economic crises.

As already announced, the empirical study performed in this section is inspired by a different in differences analysis by Giannone (2016). The analysis shows that both the relative price and supply of skill increased since 1980, suggesting an increase in relative demand for educated workers. The literature named Skill-Biased Technical Change (SBTC) this shift in demand, and researchers explain how SBTC led to rise in earning inequalities.
While there is increasing empirical evidence showing that new activities that emerge in a region indeed tend to be related to the region's industrial structure, still there are few evidences of when and under what condition the human capital matters.
This section addresses these gaps in the literature by undertaking a systematic quantitative analysis of how the relationship between human capital attractiveness and high skill workers distribution varies across different types of regions.

The research stress three main conditions. The first suggests that performance differences between high-skill (college degree) and low-skill (non-secondary level) workers play a

crucial role in the cessation of regional convergence. Due to differences in their initial skill composition and social learning (Sah & Stiglitz, 2015), some cities benefited more from SBTC. These observations are consistent with SBTC, an important productivity shift that the literature has observed since 1980s. These facts are also consistent with a story of demand forces becoming stronger than supply forces at local level pushing the wages of high-skill workers up more in cities where their concentration is higher (Giannone, 2016).

The second condition highlighted an economic event which has probably an impact on the regions' attractiveness of high skills individuals. This event is known as the economic crisis in 2008, which affect the all European countries and its productivity. For that reason, the analysis will take to different patters: the period from 2000-2007 will be compared to the next period of time 2008-2016.

Third condition is related to the macro analysis made above in this thesis. The differences between EU15 (old member) and EU 11 (member since 2004) is also analysed by the changes in college share through the years 2004 (date on EU11 entrance) and 2016. Since Albu (2016) shows the characteristics of each group of countries by the GDP growth index and their regional convergence, next in this chapter will be graphically explain what occurs by both macro-regions in relation to their college share input though a period of time.

5.2.1. Data and methodology

DATA

What it is clear by the notion of 'The Great Divergence' coined by Moretti (2012), is that in US the skill ratio of workers is along the diverging process which occurs mostly at regional level.

In order to measure the skills concentrations in different geographic areas, it has been used regional educational data from the Eurostat database[3] collected by European Commission. The Eurostat database contains unique annual personal-level statistics, such as primary, secondary and tertiary education levels covering all the European country (EU28).

The original data were aggregated into 292 European NUTS2 regions in EU28, for the period 2000, 2007, 2008, 2016.

[3] ec.europa.eu

The data are setting in two different plots, the EU15 west country and EU11 east country. In regional studies is usual to consider these two groups of countries, especially for studies relating to regional convergence.

In my analysis, are observed 245 NUTS regions for EU15 and 47 NUTS regions for EU11.

It has been dropped some countries that are most affected by the problem of missing values in employment or some small countries with only one NUTS2 (2010 classification) level region.

According to the geographic grouping by the UN Statistics Division, we formally distinguish these countries among western European countries (Belgium, Germany, France, Ireland, UK, Scotland, Switzerland, Austria, Poland, and the Netherlands), eastern European countries (Bulgaria, Poland, Czechia, Slovenia, Croatia, Hungary, Turkey, and Romania), northern European country (Finland, Norway, Sweden, Estonia, and Denmark), and southern European countries (Spain, Greece, Italy, Malta, and Portugal).

The distribution of these countries into two plots is as follow: EU 11 – later entrance in EU (Bulgaria, Croatia, Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia) and EU15 – old members (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and UK).

The aim is to explore whether the attractiveness of human skills has generated regional diversification and divergence.

Definitions:

MSA

Geographic units named by Giannone (2016) Metropolitan Statistical Area (MSA). This is representing regions under the NUTS nomenclature (Nomenclature of Territorial Units for Statistics). The research takes observation about NUTS 2 regions which identify basic regions for the application of regional policies.

MSA are ranked by the share of high-skill workers over low-skill workers. The “high-skill” MSAs are the ones that have concentration of high-skill workers larger than the national average (skill abundant), the remainder are defined as “low-skill” MSAs.

High and Low-skill Workers

Two group of workers: "high skill" workers are intended to have at least first tertiary education (college degree) while "low-skill" workers are those who have less than secondary educational level (non-secondary level).

Variables

The research looks at the convergence rates of the skill ratio over the 16 years period, between 2000 and 2016.

Two models have been differentiated: the first graph Figure 7 shows the period 2000-2007, the second graph Figure 8 shows 2008-2016.

In 2008 the European economic crisis occurs. For that reason, the research differentiates these two patterns, in order to define the changes in data before and after that year. Some observations will be made later in this chapter.

The dependent variable is the average annual growth of the skill ratio between time *t* and the initial period *Tau*. The independent variable is the logarithms of the high-skills over low-skills at the initial time *t*. The regression assesses extents to which growth in the skill ratio is related to the initial skill ratio at time *Tau*.

H and L are, respectively, the number of high-skill and low-skill living in MSA (NUTS 2 regions) at time *t* and the initial period *Tau*.

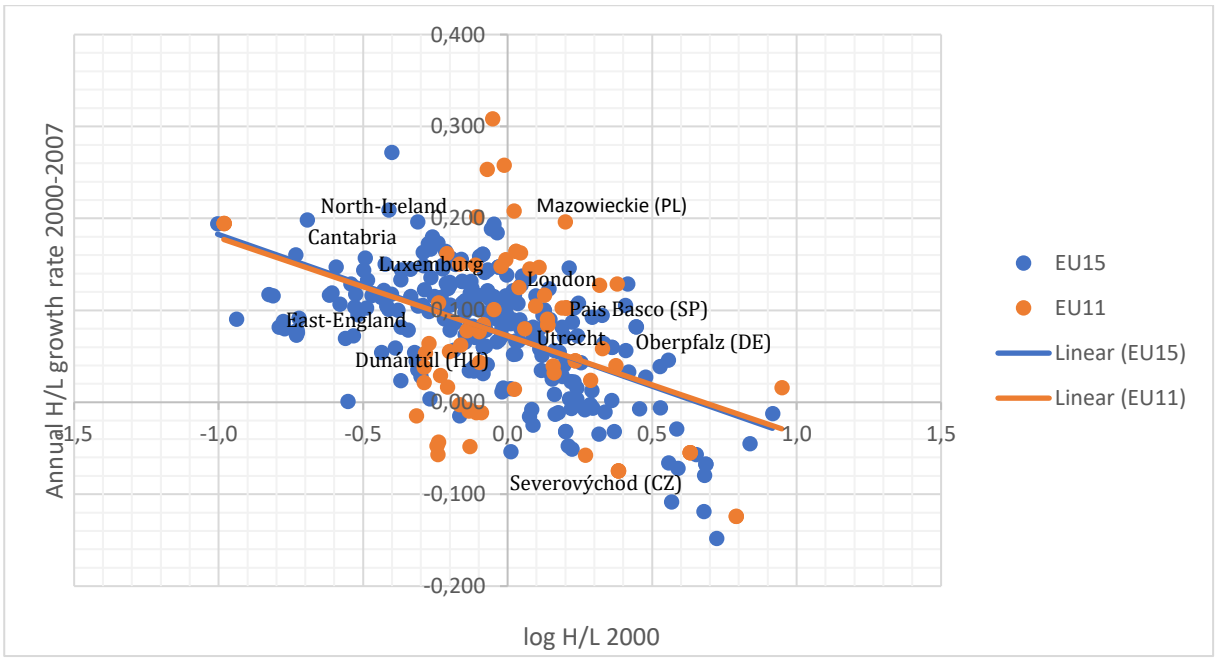

Figure 7 - Skill concentration across MSAs in EU15 and EU11, period: 2000 - 2007

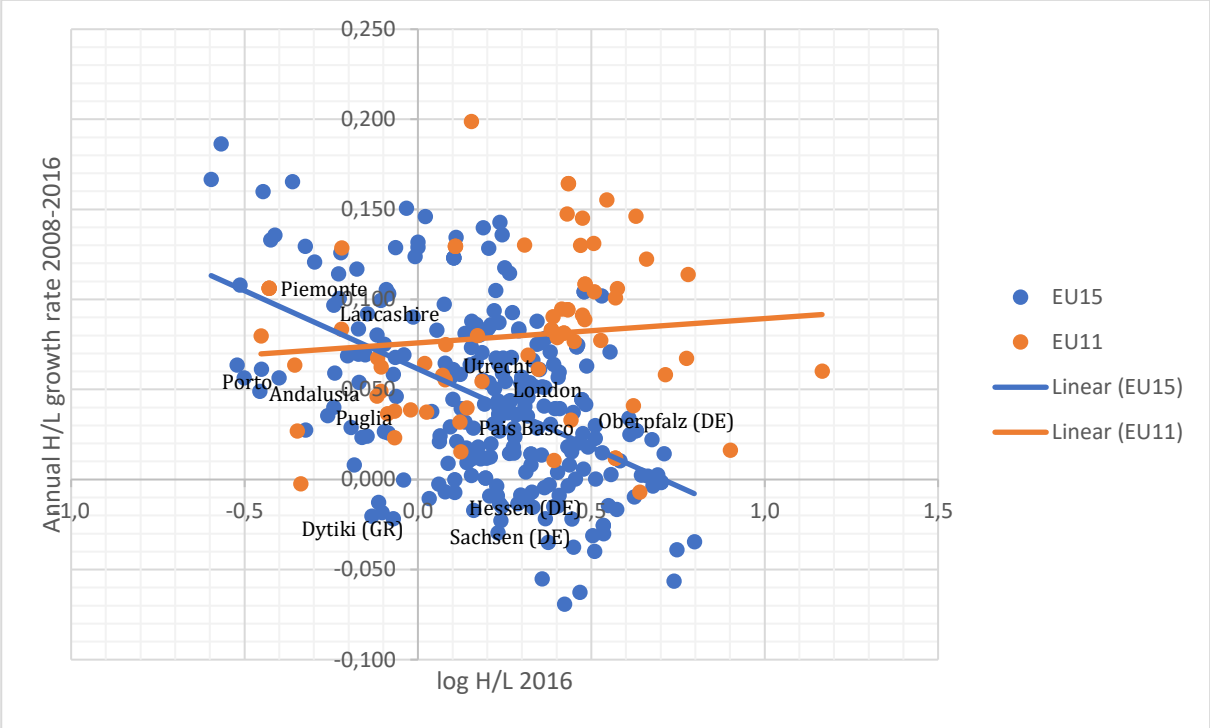

Figure 8 - Skill concentration across MSAs in EU15 and EU11, period: 2008 - 2016

5.2.2. The convergence and divergence of skill ratio over time

What happened to the distribution of high and low-skill workers over time and across space? Moreover, was it diverging or converging after 2008, when Europe experienced the economic crisis?

To answer this question, I perform an analysis covering skill ratio in period before 2008 and comparing these results with the period just after that year. Respectively, the two period take into analysis are 2000-2007, 2008-2016.

Figure 7 period of time 2000-2007, shows as the distribution of high-skill is mostly converging, that means high-skill were growing (Y>0) in regions where low skills where predominant (log(x)<0). This suggests a convergence of high skills as the trend, while just few regions where performing the opposite, such as growing high skills in already capital-abundant regions ((Y.); log(x)>0).

In the bottom-right box are situated the regions which perform a high level of high skill (H>L), while the growth of skills where mostly low, so that they were attracting low skills. This is as well a convergence behaviour.
The polling effect, such as the attractiveness of high skill in already skills-abundant city-regions was not the common trend. The human capital endowment, at the period 2000-2007, were spread homogenously trough regions. Such as, high-skills were growing where there where less, and low-skills were growing in regions where high-skills were more.

Figure 8 say something different. The period is now running from 2008 to 2016. The regression line suggests a slight change towards divergence for regions in EU 15, while the EU 11 regions drastically changes in the regression line towards divergence.
In regions where, at the initial period 2008, the high skills were higher in percentage (H>L), the graph denotes a positive change of high skills oriented to the already capital-intensive regions (Y>0). That means, in most of regions high skills are continuously growing in quantity, while the level of low skills in these areas is decreasing. This suggest there is pooling effect for such regions, which are continuously asking for high-skills.

Table 2 in Appendix shows the results of my specification. In both Panels, I report the results with a difference between the period of 16 yeas. Panel A shows the EU 15 regions, instead Panel B shows EU 11 regions, both over the years 2000-2016, separating the entire range into small section of 2 years each.
In Panel A, the annual growth rate is negative for the all period (2000-2016), even if between the years 2008-2010 the coefficient is close to 0 (-0,055). However, after 2010 the coefficients remain negative.
Panel B shows the results for EU 11. As we can see, the coefficients are negative until the year 2007, than, the coefficients are in between positive and negative values, which suggests a slightly change of trend.
The table confirms what we see from the graphs, such as, high skill in EU 15 are convergence over time, while regions in EU 11 diverged from the year 2008.

It is now clear that there is a difference between convergence processes in the period 2000-2008, and the trend of divergence from 2009 onwards. This is supporting the thesis that

after the economic crisis in 2008, the development process becomes more selective for those regions with higher capital endowment.

According to (Buccellato, n.d.), the territories with comparable production structures display similar degrees of production knowledge and, hence, degree of economic complexity. As well, my analysis depicts that human capital endowment is diverging over the regions commonly associated with highest level of complexity (Germany, Belgium, Ireland, and others).

According to the graph, the pooling effect leads regions to diverge in skills endowment; this is the case of regions where at the country level are performing convergences through the regions (Germany, Belgium, Ireland, France, Netherlands, UK). At opposite, the regions performing convergence in human capital, are situated in countries that are facing divergence between regions (Italy, Spain, Portugal, Greece).

This analysis confirms the migration effect, especially after the economic crisis in 2008. The high skilled individuals are more facilitated to move in regions where the human capital intensive is accumulated, and it is attractive for them.

5.2.3. Comparison: Italy and Germany

To better understand this behaviour, it is taken into two separately observations the cases of Italy and Germany, with the same methodology and data acquisition as the main research shows above.

The two graphs below shown Italian regions before the 2008 crisis having a very high growth of skills and regions oriented to attract high skills. The next period (after 2008) reveal loss in attractiveness, whilst the growth of high skills is particularly high, especially compared to Germans regions.

By the other side, Germans regions were overall more high-educated in both periods, however, after the crisis they shown a higher attractiveness even if the growth skills rate do not have high results as Italy performed.

As well, the high skilled individuals are more attracted by regions in which human capital intensive is accumulated.

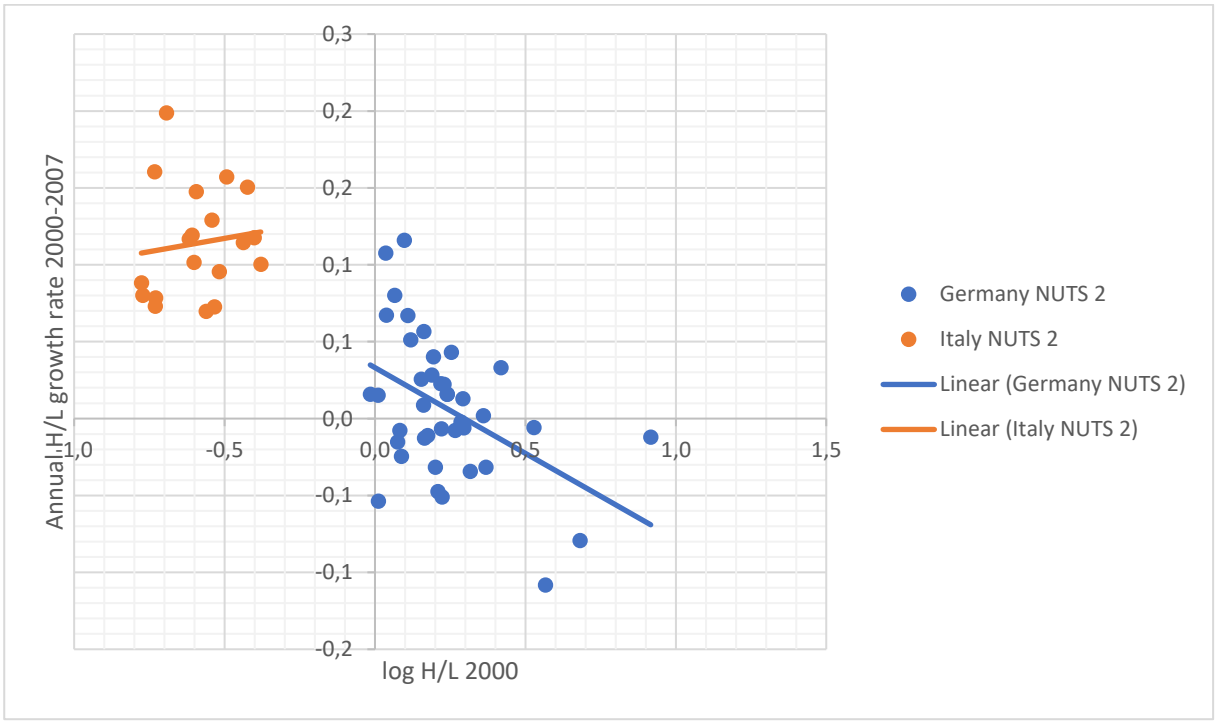

Figure 9 - Skill concentration across MSAs in Germany and Italy, period: 2000 - 2007

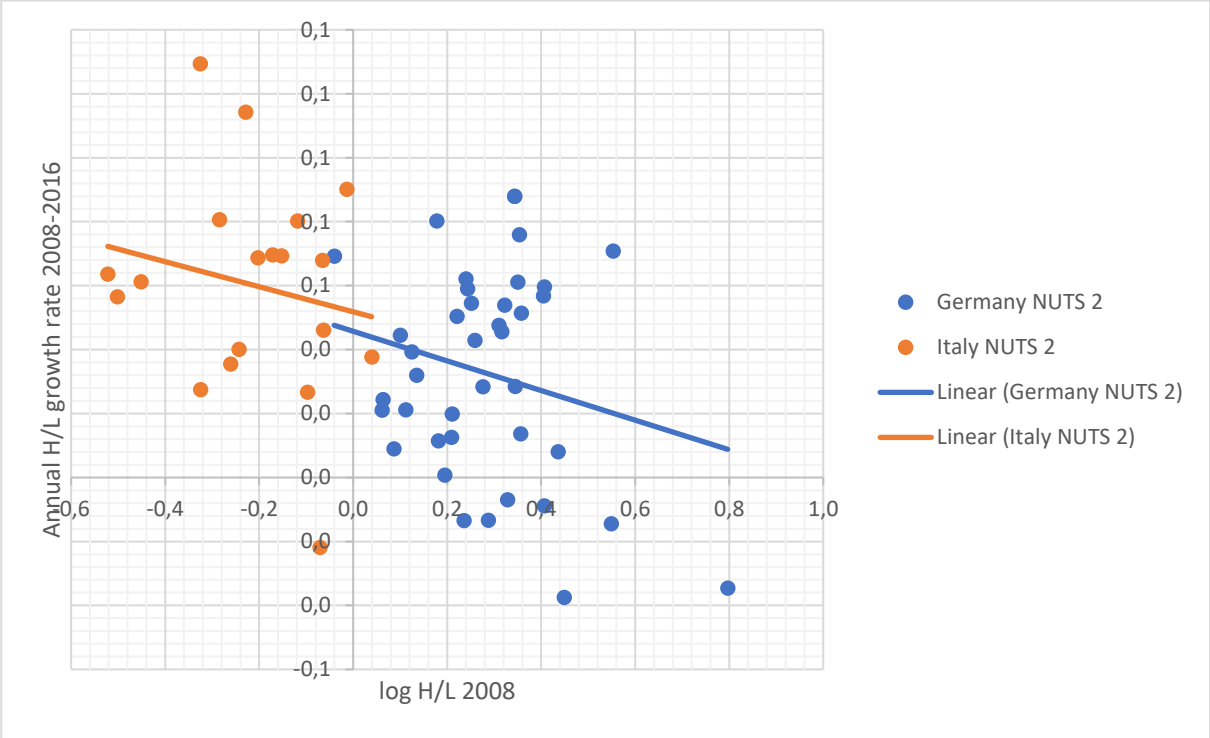

Figure 10- Skill concentration across MSAs in Germany and Italy, period: 2008 - 2016

5.2.4. Comparison: EU15 and EU11

As the overall result, European regions are processing convergence in the composition of human capital.

However, an important result is related to the differences between EU15 (old member) and EU 11 (member since 2004) which has been also analysed by the changes in college share through the years 2004 (date on EU11 entrance) and 2016.

Since Albu (2016) shows the characteristics of each group of countries by the GDP growth index and their regional convergence, here is explained what occurs by both macro-regions in relation to their college share input though a period of time.

While Albu (2016) revealed convergence between regions in EU 11, and divergence in EU 15 regions, my study finds an opposite trend which may confirm the issue.

It is assumed by the literature that a more dynamic country (in-county regional convergence) is likely to diverge and being profitable.

As it is shows by the Figure 7 (00-07) and Figure 8 (08-16), the EU 15 are processing convergence in the composition of human capital, while EU 11 are diverging through time.

At human capital level, the EU 11 are growing faster than regions EU 15, even if they still have a lower overall endowment of capital (Figures 11, 12).

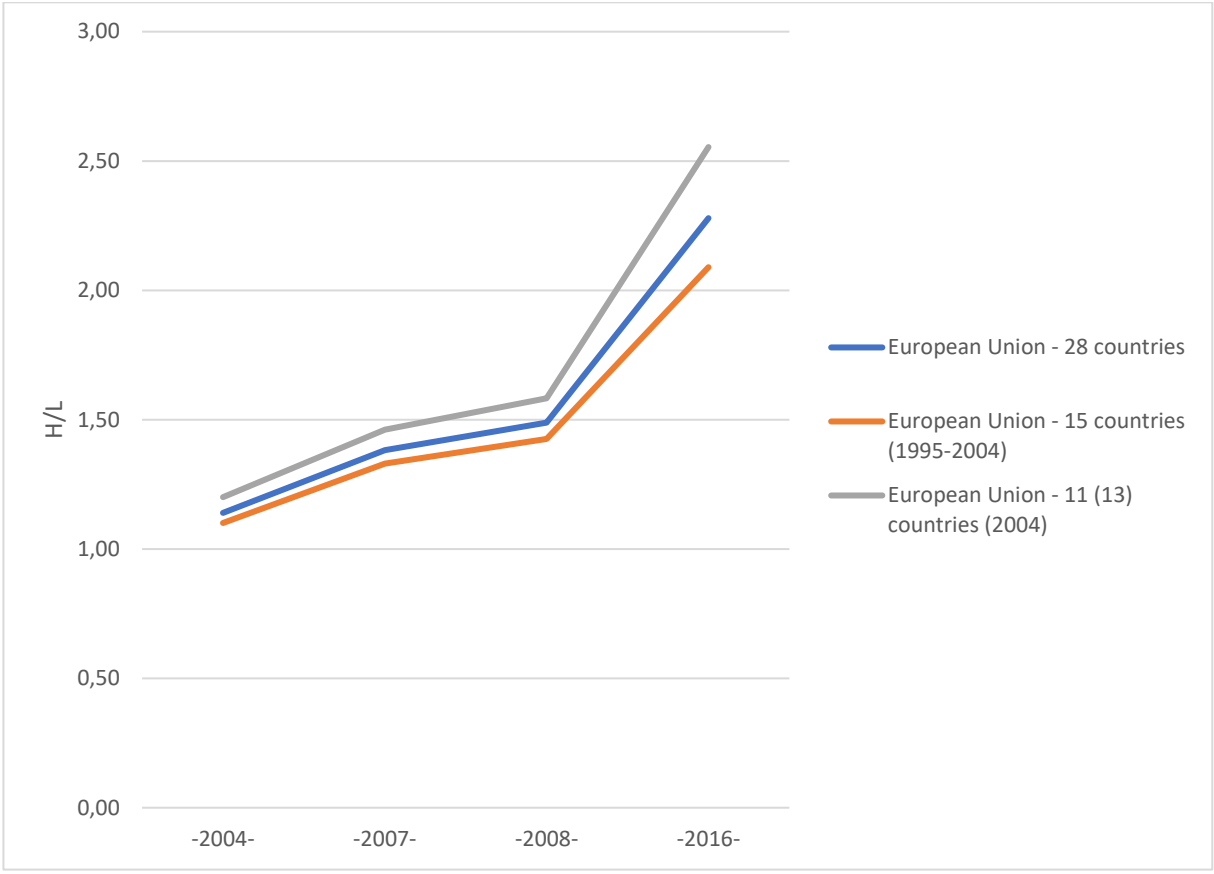

Figure 11 - Comparison of H/L in the years 2004, 2007, 2008 and 2016 between EU28, EU15 and EU11

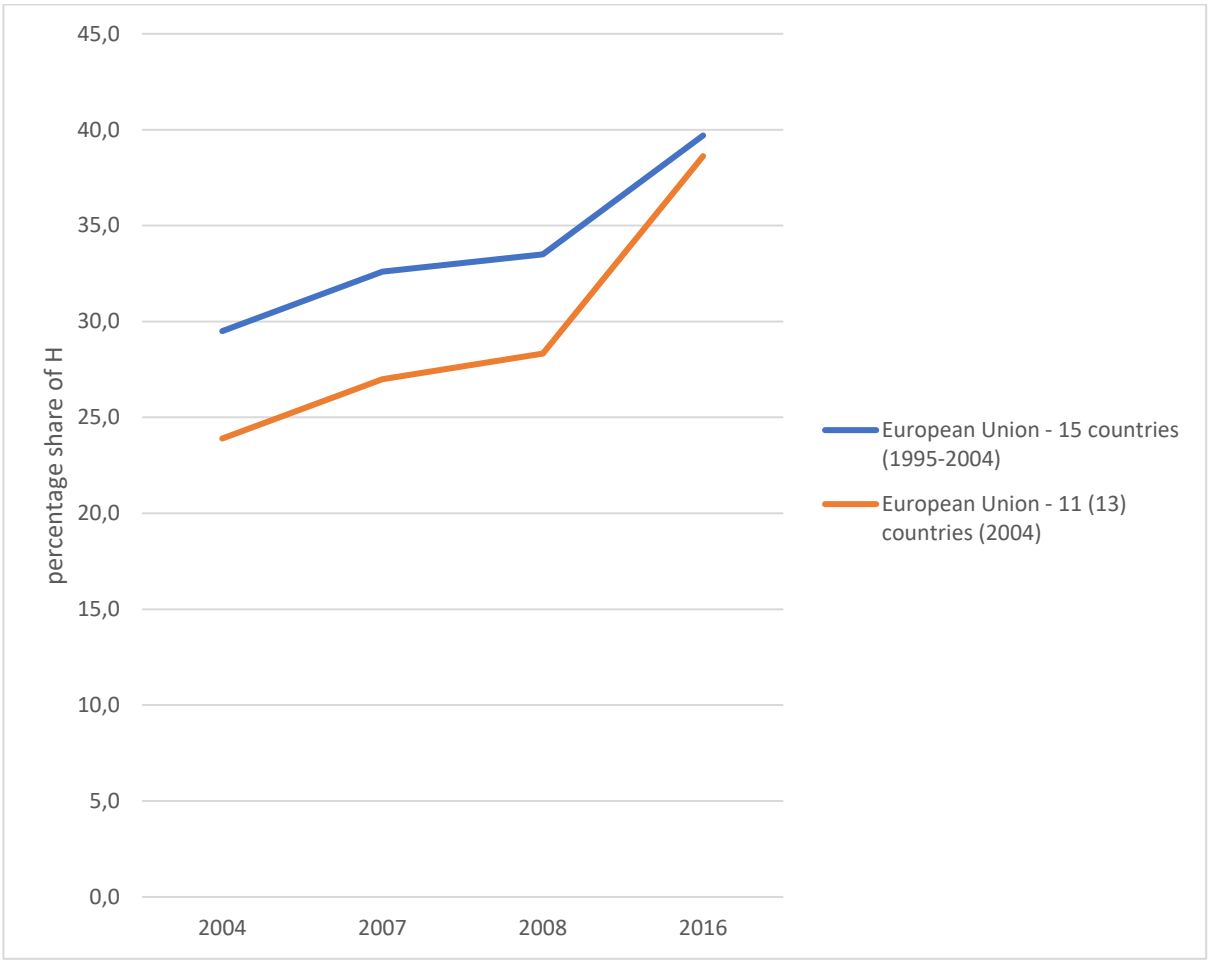

Figure 12 - Comparison of percentage share of high skilled individuals in EU 15 and EU 11, years: 2004, 2007, 2008 and 2016

This result confirms that convergence inside the regions may leads in growing development. However, Albu (2016) does not reveal growth in GDP for regions in EU 11 (in-country convergence), while there is growth in EU 15 (in-country divergence). In fact, the GDP index reveal a significant growing at the short-term.

Contrarily, the index of human capital looks at the growth rate at the long-term.

My research revealed a changing in attitude for these regions which performs convergence inside the country (EU 11). Regional dynamism makes long-term efficiency growing.

Looking at the result of my empirical research, it can be seen that there is a net difference compare to the study from Giannone (2016) which refers to MSAs in USA. Giannone (2016) suggests that the distribution of high-skill and low-skill workers across USA MSAs was converging between 1940 and 1980 and then, it started to diverge between 1980 and 2010.

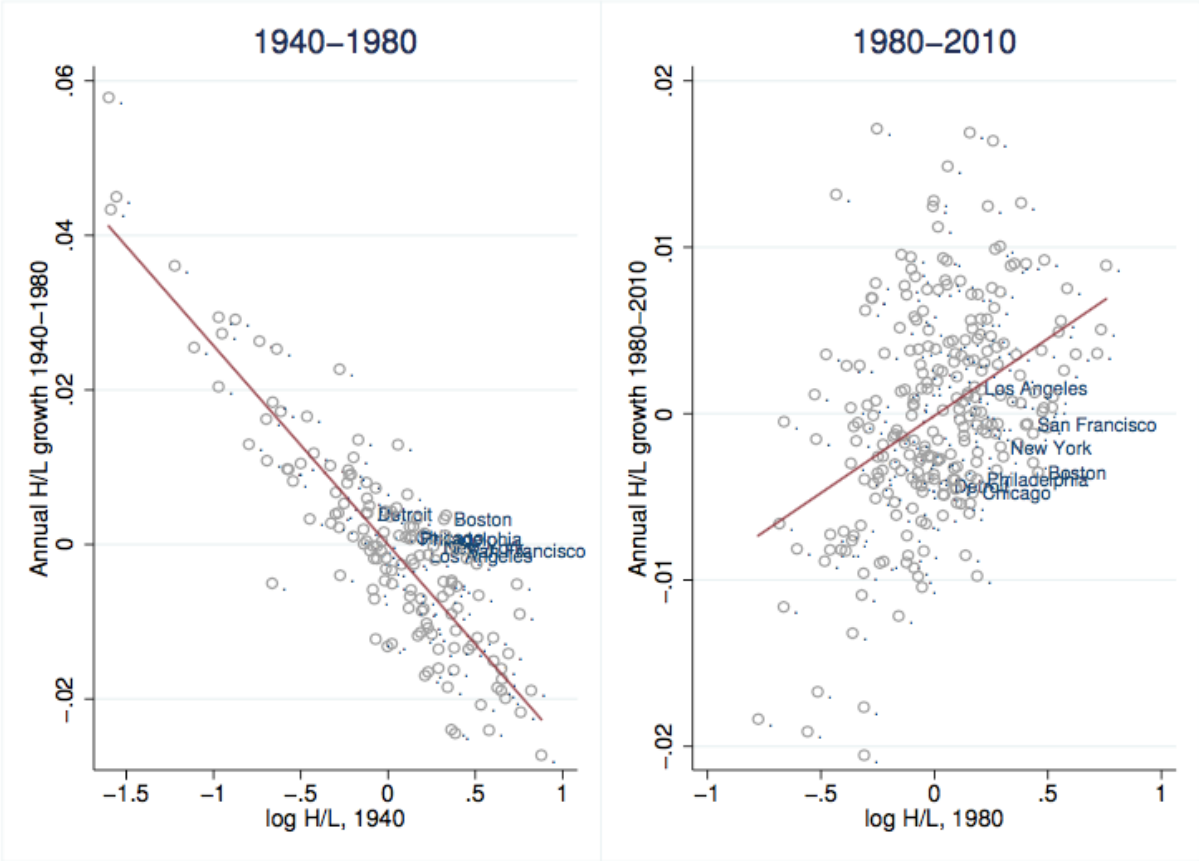

Figure 13 - Giannone (2016), Skill Convergence in the USA across MSAs before anfter 1980[4]

In Europe something similar happens, but with a divergence though regions not so significant as for the USA regions.

This chapter want to explain the features of the slightly divergence in European's regions since 2008, which probably differ in patters compared to USA.

[4] Note: This figure plots each MSA's annual average skill growth (demeaned) against its (demeaned) initial skill level. The left depicts 1940-1980; the right depicts 1980-2008. Each MSA's circle size is proportionate to its initial population size. The red line depicts a weighted least square bi-variate regression. The size of the underlying MSA is represented by the size of the circle in the figure. The line in each graph represents a weighted regression line from the bi-variate regression (Giannone, 2016).

5.2.5. Place sensitive distributed development policies (PSDDP)

According with regional studies, the European regions are subdivided into four categories, in relation to their income level: very high (VH), high (H), low (L) and medium (M) income regions.

It has been proven by the literature that the level of income is proportionate to the concentration of human capital of each region. Such as, the regions which have a higher attractiveness of human capital are consequently the regions which offer higher wages for employees.

The European Commission (Iammarino et al., 2017) elaborated the so called 'place sensitive distributed development policies' (PSDDP), which combine guidelines from development theories, while observe the specific characteristic of each regions to be adaptable in growing opportunities for their inhabitants. Place-sensitive policies goes into the potential of each territory in terms of skills attractiveness, investment, educational system, level of productivity, in order to generate development throughout.

It will combine what we learned form PSDDP for each group of regions, with what I found about the skill growth composition in EU28.

By looking at Figure 8 – period after 2008, the regions which have a high quantity of High skills, although are performing high level of growth through time (Y>0), are countries such as Germany, Belgium, Ireland, Holland, Netherlands, Sweden, UK, Switzerland. These regions play a constant growth, so that they remain stable in the position for the entire period of time (2000-20016).

According to (Iammarino et al., 2017) the regions in the very-high-income group (VH) maintain high-wage activities while are changing in landscape for growth in comparative advantages. Their position is similar to my results, such as, they have to be statics to keep their prosperity, or by pushing the edge of innovation upon their technological barriers. Only investing and developing new technologies these groups of regions could maintain their prosperity.

However, the high-income regions do not differ a lot from VH, but they must compete with medium-income regions which are slowly reaching higher levels of productivity and developing their skills. The territories for VH and H income-regions are mostly metropolitan centres and industrial city-regions.

The low-income regions (L) are characterised by a limited skills composition, especially in the areas of technology and organizations, on the other hand they have advantages of having low-cost land and labour.
The economic activity is becoming more routinised, so that low cost of localisation and labour are intensifying the productivity in such low-income areas where are offer this.
This advantage is understood as 'advantage of backwardness' and in Europe is heterogeneous distributed between EU southern and eastern peripheries.
In other words, these countries might be efficiency by making their labour and land available at low cost, although having connectivity and institutions which support this process. Weak institutions, as well factors mobilise, and infrastructural investment might be intended as challenges that L-income regions may deal with to reach attractiveness and be more efficiency. The effort to improve in PSDDP is relevant to exploit their initial advantages and move into the middle-income group.

In regional development economics has been identified the so called 'middle income trap'. This is referring to the categories of countries which perform low-income, but still can reach very high growth rates.
For medium-income regions (M) are intended these territories which do not attract low skills workers because of the labour costs are rising since it is not convenient for them.
However, M regions do not perform advantages of richer countries in terms of productivity, infrastructure and quality of organizations.
For these two reasons the medium-income regions are 'trapped': they do not evolve in innovation and production, as the VH and H regions, as well their labour and land cost are not low enough to compete with the low-income regions.
Europe has an important number of such regions, especially in southern countries (Italy, Spain, Portugal, Greece) which are affected by poor government and corruption. However, regions in medium-income trap can be differentiated between patterns: the 'slow-growing' and 'declining' in industrial areas.
The regions such as Italian Mezzogiorno, Greece, Spain, Portugal, are performing a slightly growth and their prosperity will depend mostly by the improvements of governance.

According to my empirical analysis, the quantity of high-skills in the southern regions is lower compared to the majority of low-skills. However, the growth of high-skills through the years is confirmed (Y>0), even if is less intense than in regions such as northern Italy, northern Spain, and so on.
The declining in industrial productivity is referred to the incapacity of a region to obtain high skills, adapting living costs and safeguard social problem. Areas in Northern Italy, northern Spain and France are the mostly affected.
In referring to my analysis, such regions result to have a quantity of low-skills higher than high-skills, with a positive index of high-skills growth through years (Y>0).

However, this analysis does not take into consideration the high-skills migration which affect many countries, especially these in low- and medium-income regions.
In medium-income regions is still more evident how students, just after studying at the origin countries, move to the H- and VH- income regions, such as the regions which attract high-skills because of high wages and work satisfaction.
For that reason, my research does not explicitly show divergence, but considering that H- and VH- income countries are moving through the years toward divergence (H>L; Y>0). It may be suggested that middle-income regions, even if they have a high capital-intensive growth compared to other regions, are not able to sustain themselves and, below them, attract highly skilled resources.
That result may be confirming what Iammarino (et. Al. 2017) explained in their research: low and medium-income regions should increase attractiveness of capital flows, building new knowledge links, restructure industries and economic eco-system through internalisation and university-business collaboration.
Following the example of industrial reconversion in the ex-German Democratic Republic and in Scandinavia, regions are inspired to be more proactive especially by generate investments in re-skilling.

The last section (Chapter 6) of the thesis will consider the remedies and solutions for European regions to be more high-skills attractive and to lead in prosperity for their inhabitant.

5.2.6. Models of economic complexity

As we learned from Hidalgo (2016), there is positive correlation between complex technology and urban agglomeration. That means, urban concentration of economic activities has increased with the complexity of the economy. In fact, agglomeration leads information growing, which is required to generate complex economy.

To better understand the growth of information in the economy we need to understand people's ability to generate networks they need to accumulate volume of knowledge (Hartmann et al., 2015). This ability is explained by the role of human capital, which due to complex economic and consequently growth economic.

Human capital is the effective measure of the size of labor force; with more labor, the economy may perform more R&D and manufacturing, employing in these sectors and generating an increased rate of product innovation (Romer, 1994).

Exogenous elements such the investment in new infrastructure, or the local presence of multinational firm, they may catalyse new economic activities and development for the entire area, even if they have nothing to do with local features and productive capacities.

On the other hand, the endogenous elements occur when decision-making capacity of local economic and social actors are able to control the development process, support it during phases of transformation and innovation, and enhance it with external knowledge and information (Hartmann et al., 2015).

The role of long-term knowledge accumulation is extremely important for regional growth. It has been assumed that capital-intensive technologies have a greater capacity for learning and have been associated with increments in greater production.

Human capital accumulation is needed for the creation of particular goods and is acquired on-the-job or through learning-by-doing.

Lucas (1988) argued that if different goods are taken to have different potentials for human capital growth, then the same considerations of comparative advantage that determine which goods get produced where will also dictate each country's rate of human capital growth (Lucas Jr., 1988).

The comparative advantages that produce a country's initial production mix will simply be intensified over time by human capital accumulation.

Lucas (Lucas Jr., 1988) argues that a more satisfactory treatment of product-specific learning would involve modeling the continuous introduction of new goods, with learning potentials on any particular good declining with the amount produced.
It might be occurred that comparative advantages are not efficient enough, because it can be most convenient for a country to buy from other economies. Complex knowledges are important but very often also comparatively inefficient.
For instance, in USA the mobility of factors is limited, especially compared to Europe. This can be a reason why USA has a regional divergence more intense (Giannone, 2016) respect to Europe.

In the previous chapter it has been proposed a dilemma: why such knowledge, developed for and by developed economies, may have limited relevance for low developed countries?
According to (Romer, 1994), productive knowledge should not only be educational, but there should be a combination of industrial productive experiences.
High- and very-high-income regions are performing a combination of exogeneous forces, such as great investment in productivity and infrastructures, while at the same time the endogenous forces of human capital characterisation are achieving great performance, being the most high-skills attractive regions in Europe.
This is a growth model that differentiate from the ones proposed by medium- and low-income regions.
According to Stiglitz (2015), there exist some important implications for the appropriate technology policy and for industrial policy characterisation. An economic model that encompasses appropriate technological and industrial policies, should help low developed countries to the appropriate use of knowledge and to be more attractive on the market.

6. Regional divergences in Europe: the role of institutions

This thesis focused mostly by EU Western countries (EU15), investigating over the increasing in regional divergences.
In order to understand why many cities and regions across Europe's economic peripheries have been stuck in a low- development trap, and why some leading regions are performing better than their national average, researchers investigated toward the importance of political institutions.

This section takes over the role of institutions with the aim to compare two different realities (in political terms), such as Italy and Germany.
Since the key goal for convergence and development of regions has to be increasing the productivity of individuals and systems by enhancing education and labour-force participation (Iammarino et al., 2017), the role of the educational systems becomes extremely relevant.
According to Rodríguez-Pose (2017), weak institutions and poor-quality government are crucial obstacle to development.
As few researchers questioned, which is the role of institutions in leading growth efficiency?
Place-sensitive distributed development policies (PSDDP) refer to an innovative development policy approach which remain sensitive to the characteristics, features and conditions of every territory. Different development regions require different policy approaches.
The next chapter will take into observation Italy, with focus on North/South regions behaviour, and Germany in a wide sense and with refer to later developed German Democratic Republic regions.
To better understand the migration of high skill since their initial skill ratio, it is investigated which role institutions have in the process, especially in education system.

6.1. Policy response in complex economy

Many researchers in regional studies are questioning about the trade-off between efficiency of agglomeration and equity through institutions, which have been the main topic of discussion in the last decades.

The agglomeration of economic activities is considered a key ingredient of knowledge creation and economic growth.

The differences in the urban concentration of economic activities are explained by differences in their level of complexity (Balland et al., 2018). Large cities provide externalities that are required by an economy to growth in complexity. New technologies, the diffusion of knowledge and knowhow, industries that hire educated workers, all these characteristics are necessary for a region to growth in prosperity.

However, agglomeration present a list of negative consequences of externalities. Researchers in NEG and urban economic agreed that pollution, congestion, housing costs and some others environmental consequences have been predominated over the well-being of cities and inhabitants. What becomes the main prominent negative externality linked to agglomeration is the rising of territorial inequalities.

Territorial inequalities in Europe led favoured metropolitan regions (core) benefiting in terms of wages, work satisfaction and other input, whereas less favoured regions (peripheral) face considerable challenges such as in cost housing, poverty or crime.

The following map shows the differences in wealth (GDP per capita) of European countries. Many countries, such as Italy, France, Spain, perform a high GDP value in metropolitan areas, contrarily to the rest of the country.

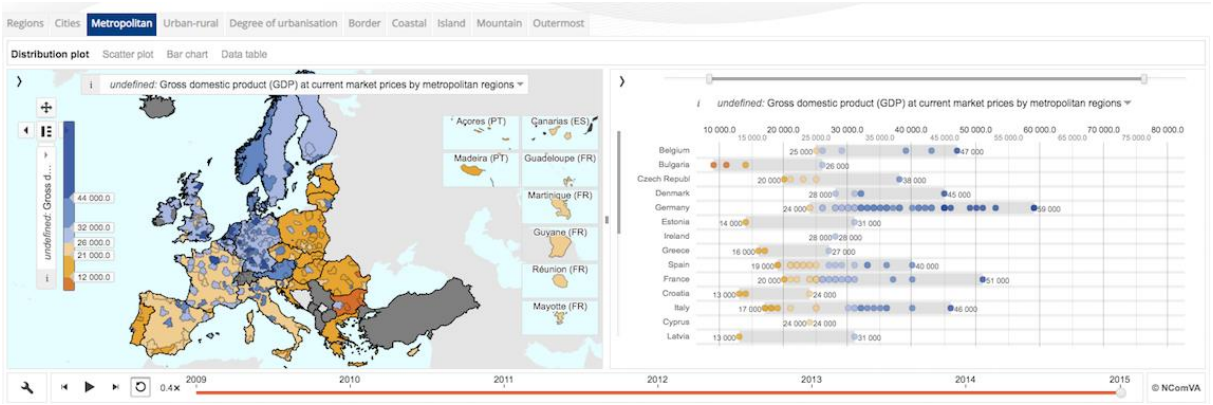

Figure 14 – Screenshot eurostat.com, Gross domestic product (GDP) at current market prices by metropolitan regions

In sum, agglomeration creates divergence by definition, which means that the most competitive city regions are these who diverge in development patterns with the neighbouring territories, letting them in a poorest an underdevelopment condition.

While agglomeration forces may restrict the potential for convergence across regions, the literature do not explain fully the gap in productive output between leading and lagging regions in Europe.
It has been investigated by researchers in regional studies if governance and institutions may achieve income convergence among regions through the redistribution of economic activity.

In the previous chapters have been performed an empirical study which considerate the attractiveness of high-skilled workers connected to agglomeration forces spread over the larger city, reinforcing a talent disparity between high income places and other regions.
As mentioned, the concentration of high-skilled workers in core areas is related to the highest wages and opportunities that such locations offer to them.
The high demand for educated works, explained by the concept of Skill-Based Technical Change (SBTC), increase since 1980 and has grown in conjunction with earning inequalities. The interaction of SBTC and agglomeration economies imply that more educated areas have skill premium[5]. High-skill workers migrate to educated cities more than do low-skill workers.

[5] Skill premium is defined by Giannone (2017) as the difference between the wages of the high-skill workers compared to the wages of the low-skill workers.

According to Iammarino (et al., 2017), this process has generated divergence. The current long wave of development fundamentally favours geographical concentration of the best jobs and most innovative activities. This is the phenomenon so called the "Great Divergence" (Moretti, 2012), which has been observed for USA regions since 1980.

The less-favoured regions pays the consequences of regional divergence, comprising a mixture of low incomes and skills, low labour-force participation, institutions that restrain development and social disequilibrium (Iammarino et al., 2017).

The role of technology has become even more significant since 1980, when technological innovation interacted with agglomeration forces and counterbalances convergence forces. Since technology is skill-biased, convergence forces are favouring the larger cities, pushing them towards the productivity frontier (Giannone, 2016).

The Figure 15 represent the GDP per head (2013) versus the distribution of patent applications (2010, 2011) as index of economic development, by European NUTS 2 regions. This map reveals the distribution of wealth between regions in relation of their innovation factor (patents). This explain the divergence between city regions and periphery regions. City regions are the fundamental motors of European's overall prosperity, while periphery regions are declining in prosperity and reveal inadequacy of opportunity.

This regions attitude is not only economically inefficient, but also socially and politically dangerous. That is the reason why many researchers in the field of urban and regional studies are trying to dissimulate the phenomenon of divergence that is spreading globally.

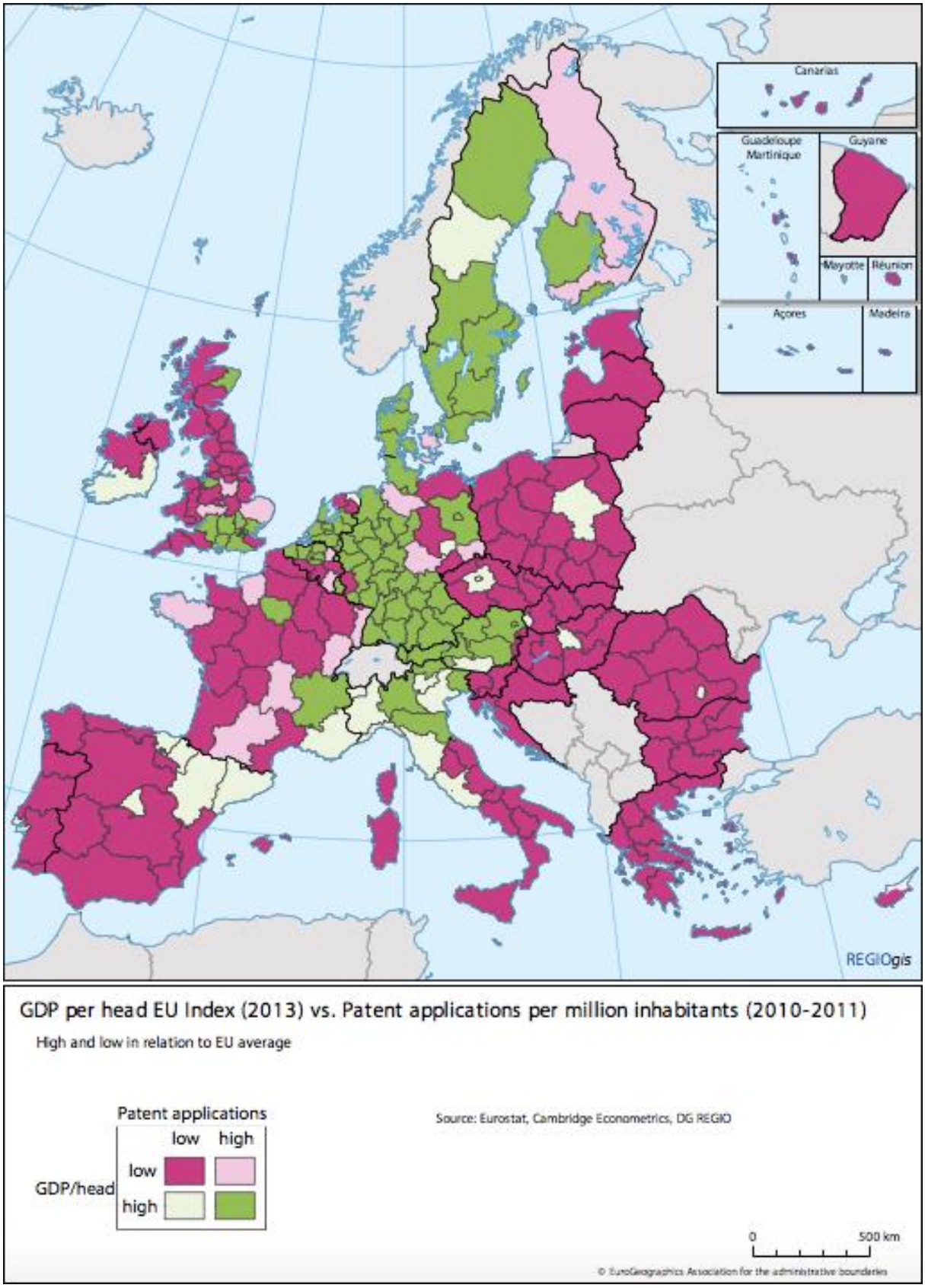

Figure 15 - Iammarino (et al., 2017), GDP per head EU Index (2013) vs Patent aplications per million inhabitants (2010-2011)

Three main considerations have been made in relation to the map below. The first is about the very strong regional effects throughout the data, with many EU regions performing better or worse than their national averages. At the regional level, each economic development is distinct and variegated with a strong attitude to diverge through work processes.

The second consideration reveals leading regions in Europe, comprising metropolitan regions and regional core areas (Germany, Austria, norther Italy). Some countries differing by the concept of core regions. For instance, Germany performs wealth along many regions, so the regional core areas are quite diffuse along the territory, while UK's regional development is more related to their proximity to core metropolitan areas (London). The third consideration refers precisely to these countries in the EU that are generally more evenly developed than others.

6.2. Educational system

Theories such as endogenous growth, new economy geography (NEG) and evolutionary economic geography theories all considerate the positive effects of agglomerations, behind the dynamism of large cities and regions.
However, many cities and regions across Europe's economic peripheries have been trapped in a low- development. As few researchers questioned, which are the role of institutions in the agglomeration era?
According to Rodríguez-Pose, breaks in governance and weak institutions are crucial obstacle to development. Instead, the capability to generate prosperity and maximizing the territorial potential to generate and share positive externalities, is an attitude which differs trough regions and, even more, countries (Iammarino et al., 2017).

This chapter will focus on regional divergence, especially in western countries, taking into analysis two countries which differ substantially in economic development: Italy and Germany.
Germany has a high-income but evenly-developed country, which means relatively low interregional GDP variance.
Germany displays the ongoing effects of the lagging former German Democratic Republic regions, but, according to the EU commission report (Iammarino et al., 2017), the overall growth rate of GDP per head is on average the highest of EU.
Instead, Northern Italy performs a high- or very-high-income regions, but the overall rate of GDP per head of Italy is affected by the divergence between Northern regions and the less developed South regions.
How did Germany overcome the regional divergence, even in less developed regions such as German Democratic Republic, instead Italy doesn't yet?

As already anticipated in the previous section, different development regions require different policy approaches.
In fact, some regions require i) to be pushed towards more innovative functions in their economic mix; ii) expanding the sources of creativity and satisfaction of human grounds; and iii) stimulating greater investment in basic capabilities that are essential to a dignified and creative life (Simona Iammarino, Andrés Rodríguez-Pose, Michael Storper, 2017).

According to neoclassical growth theories and others recent theories in regional economic studies, regions economic growth is determinates by few factors which are respectively physical capital, human capital and innovation. These drivers are the responsible of informing development policies across countries.

The Cohesion Policy of European Union's regional development have been invested in improving the infrastructure which deal with enlarge physical capital, as well as increasing the quality and accessibility of human resources, and expanding technologies and innovative capacity of individuals and firms in Europe.

While European's policies success in delivering greater economic input to the regional growth convergence, still there is a loss in the returns of investment in the three main growth characteristics.

This explain variation in regional economic growth and researchers tend to know less about what determines regional growth in Europe.

Researchers in regional studies, especially (Rodríguez-Pose & Ketterer, 2016), are focusing to the role of institutions and the quality of each government,.

Many studies explained the changes in government quality between regions that contribute to the economic dynamism of European regions. In fact, each region performs better or worst economic performance due to the government quality, which represents a significant barrier to development in terms of economics and policies cohesion.

From this perspective, institutions contribute to determining why certain development strategies reach their goal, while some others not. The government quality, which reflects institutional conditions, affect the three axes of growth announced before. The technical progress, the efficiency of investment in output such as physical and human capital (i.e., infrastructures, education, property rights).

Institutional parameters, which led government to perform ad hoc policies, may be subdivided into segments concerning human-capital related components (i.e., education), local region- and interregional-specific aspects (Rodríguez-Pose & Ketterer, 2016).

The one specific aspect which concern the human-capital evolution and leads better performance for the entire economic process (from individual's side and firm's side) is the educational system. A high level of education leads people to achieve knowledge and

knowhow to spend in growing wages and job satisfaction. Education can occur by acquiring knowledge from the educational system, offered by each government, or by household education. The intra-household externalities refer to the indirect assimilation of educational information from other members of the household, as well acquiring higher level jobs though recommendations.

The highly educated members of the household may help drive up aspirations and provide better occupational opportunities for the less-educated members, leading their earnings raise (Rodríguez-Pose & Tselios, 2012).

However, some other studies look at educational externalities generated by schooling as an indicator of geographic concentration of human capital across regions.

Regional education spillovers are crucial factors analysed by theories of regional economic growth.

Researchers highlight that educational endowment in a region has consequences both individual and social level. At individuals' level, a higher endowment of education explains the higher probability for individuals to be productive by interacting and sharing knowledge within others in the regions.

At the social level, this attitude leads regions involving in pecuniary externalities, such as encouraging investment by firms and raising wages for the entire community.

Moreover, researchers agreed that agglomeration economies with higher educated workers benefit from high skill premium, so that agglomeration effects raise the wages of all the workers (Giannone, 2016).

As a response, people living in such context are better favoured in accumulating knowledge. In fact, the coexistence of high and complementary educated workers generates higher wages and opportunities, while the region obtains incentive for further qualifications.

According to Stiglitz (2015), the technology prospective may be based on three aspect.

The first is related to learning as by-product of production, which referred to the phenomenon of 'learning-by-doing' coined by Arrow (1962).

The second aspect highlight the spillover effect, which look at the location as the learning determinant. In fact, one technology may need some knowledge which are not so relevant on other technologies. In that way knowledge are clustered and more efficient for the

productivity. The third aspect reveal the process of learning which is itself, learned (Sah & Stiglitz, 2015).

These aspects have important implications on policy, in a way that learning and the capital-intensive have to be straighten related to the productivity process.

Human capital, without productivity complex, is not efficient and may decide to migrate to more attractive regions.

Industrial policy may consider the importance on building activities which help the connection between productivity and labor market, the so called "bridging activities".

6.3. Bridging activities

The ability to accumulate knowledge and knowhow by the networks of firms and people has increased overtime, mainly due to the phenomenon of globalisation.

This is evidenced by the expansion of the production process and the relative dissipation of production that takes place thanks to the capacity of networks to accumulate large volumes of know-how.

Modern manufacturing is the result of large international networks which involve links for the exchange of intermediate products. However, not only links from the market are needed (management and administrative), but also their complementary to the society dimension.

Hidalgo (2016) in his book 'Why information grows' discussed these issues and explained few basic notions related to the ability of economies to generate structures that can hold knowledge required to reach complexity. First, he argues that there is a proportion between networks and the volume of knowledge embodied. Second, any links hold costs that determine the volume of networks acquired. Third, there are transaction points or breaks in the structures of accumulation of networks which will define the consistence of links.

According to Hidalgo (2016), the accumulation of knowledge is difficult because creating the networks required to embody knowledge is difficult.

Humans' capacity has to cooperate with firms' capacity, in a way to build 'nodes' useful to create matching activities.

Universities have been studied by many researchers as the greater channel which may influence production innovations, sometimes in collaboration with local firms.

Anna Valero (2019), Tommaso Agasisti and Carsten Pohl (2012) have been studying the economic impact of universities by the territory.

This chapter will differentiate two evolutionary patterns of Italy and Germany, looking at the consequences of social networks with economic outcome.

6.4. Comparative efficiency of universities: Italy and Germany

A. Valero (2019) investigated over the increases in university presence associated with economic growth at cross-countries level. She demonstrated as a 10% increase in the number of universities is associated with a 0.4% higher GDP per capita in a region. Regional fixed effects and other confounding influences that the benefit of universities is apparently not confined to the region where they are built but the geographical distance influence positively the spillover to neighbouring regions (Valero & Van Reenen, 2019).

Agasisti (2012) agreed that universities operating in regions where the level of unemployment is high are less efficient than the ones operating in favoured-labour market regions. There is a positive correlation between educational systems and employment. This confirmed the thesis of Valero (2019), suggesting a positive spillover between universities and private company (Agasisti & Pohl, 2012).

Regional externalities, such as educational system, are likely to generate interregional externalities, and vice versa.

The literature agreed that externalities cannot be constrained by regional boundaries because of their intrinsic meaning. Interregional spillovers benefit from agglomeration economies, such as individual's mobility, aggregate regional wage and economic development.

One region can be affected by externalities of educational effect from the neighbouring regions. This may happen because a number of reasons; the most significant reason is the proximity distance between regions, which generate interaction among agents and leads economic growing. The closer is the proximity, the higher the probability of interregional education spillovers (Rodríguez-Pose & Tselios, 2012).

As many researchers agreed, the country-fixed effect may vary with changes in institutions or government.

Vanolo (2019) estimated that there is positive and significant correlation between country level democratic institutions and universities. The investigation takes as perception of

democracy the ones obtained from the "World Values Survey". The result is that countries with e.g. corruption, or other failure in democracy, may be affected by a slowly economic growth due a highly significant association between university presence in a region and approval of a democratic system (Valero & Van Reenen, 2019).

Agasisti and Pohl (2012) have investigated over two base countries in EU 15, already taken into observations by this thesis, which differ mainly by their institutional and governance characterisation: Germany and Italy.

The contrasting experiences of East Germany and Southern Italy suggest that a somewhat different approach may help to uncover the mechanisms at work that explain why a poor region remains poor despite low barriers to factor mobility and trade (Boltho, Carlin, & Scaramozzino, 2018).

Researchers have been looking at the comparative efficiency of university in both countries has developed over time.

Both countries manifest a relatively large differences referring to Northern and Southern Italy, as well Eastern and Western Germany, respectively. It has been investigating the economic circumstance of both countries in relation to their higher educational institutions. The influence of governance regulations, constraints on finance, and imperfect competition may affect negatively the university landscape. To this point, previous research from (Agasisti and Dal Bianco, 2006; Kempkes and Pohl, 2008) explained that university located in economically disadvantaged regions (Eastern Germany, Southern Italy) were less efficient than higher education institutions in more prosperous regions (Western Germany, Northern Italy).

However, the results of the research made by Agasisti and Pohl (2012) reveal that in the period 2001-2007 the universities in economically disadvantaged regions have performed efficiency and growth over time, in both countries.

According to the researchers, Germany is assumed to be more efficient in educational institutions compared to Italy, whereas Italian universities are improving their efficiency more rapidly than German's universities.

This result from Agasisti and Pohl (2012), is also confirmed by the research made in this thesis, such as, Italian regions are better exposed over time to the growth of skills, while Germans regions are better educated in term of quantity of educated individuals, but their growth over time increase slowly respect to Italy.

However, there exist a positive relation between educational institutions and employment level, which is associated to the efficiency of universities.

External factors are positively associated with regions that perform employment in science and technology, which may reveal the grade of economic complexity that each region produce.

Human resources in science and technology indicate spillover effect due the great connection between universities and e.g. private companies.

For that reason, Italian higher education institutions are not operating at the optimal scale, while German is performing high results.

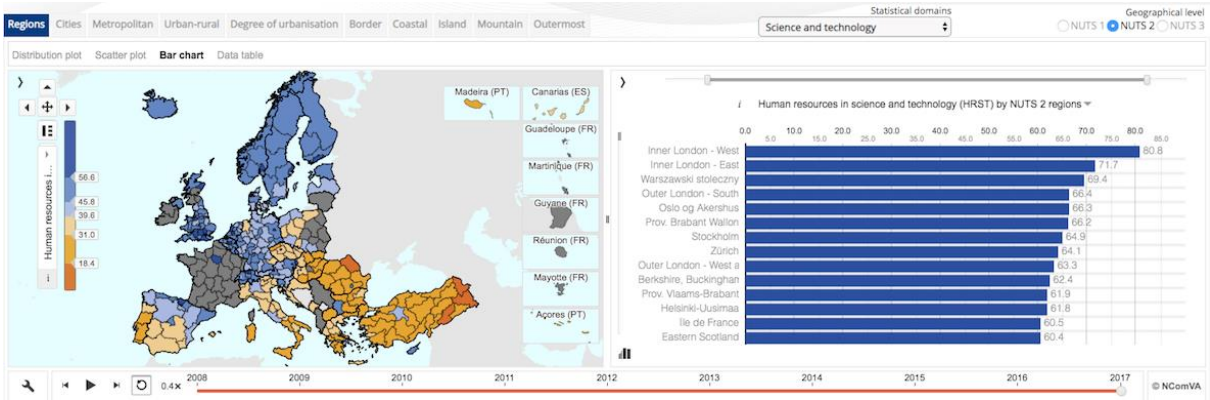

Figure 16 – Screenshot eurostat.com, Human resources in science and technology (HRST) by NUTS 2 regions

In sum, institutions promoting high education are not enough efficiency if they are not integrated with complex productivity. Industrial policies can enhance the variety of production and complex technologies in order to be constantly on the innovation frontier.

The 'Bridging activities', such as universities, technological infrastructures, training activities on the territory, are intended as logics of production systems that economies can establish in order to achieve a higher development performance.

These activities are based on learning system, able to guarantee basic skills and provide competences in learning as by-product of production, which has been demonstrated being

the main force of technological development. Many studies agreed that the best regions are these who produce and learn accordingly.

6.5. Spatial connection

After a straight analysis on regional economic development in European countries, it is now clear that agglomeration is the process who creates divergence. The most competitive city regions are these who diverge in development patterns with the neighbouring territories, letting them in a poorest and underdevelopment condition.
The rising of inequalities becomes dangerous at the social level, leading poverty and inefficient economies in many surrounding areas.
Agglomeration attract high skills because of high wages, best jobs and most innovative activities, while in less-favoured cities, less opportunities, congestion, housing costs are affecting the well-being of their inhabitant.
Many theories (NEG, evolutionary economic geography) agreed that agglomeration has positive effects by the dynamism of large city and regions. However, the capability to generate prosperity and maximizing the territorial potential to share positive externalities, is an attitude which differs through regions and, ever more, countries.

Balland, Hidalgo (et al. 2018) validate the idea that differences in the urban concentration of economic activities are largely explained by differences in their level of complexity. This level is determinate by the use of new technologies and innovation, the presence on the territory of scientific research centres, industries that hire more educated workers, and occupations that require more years of education.
All these characteristics are well concentrated in large cities, where the required externalities reside and the networks well established (Balland et al., 2018).

The definition of the size and density of cities is no longer a decision of individual companies or household, but it is guaranteed by the specific principle of spatial organization of the activity.
The metropolitan space promotes the transmission of information, which is the aim of agglomeration; firms seek the accessibility to a diversified market, for the production of

factors and final goods, share information, connection to international infrastructures, matching with over firms. For people, cities offer recreational services (e.g. museums, theatres) and specific services (e.g. universities), at proximity distance.

According to (Iammarino et al., 2017), an important issue for overcome regional inequalities and generate a more homogeneous growth process, especially within each country, is determinate by the intra-periphery connection.

To do so, city-regions are required to create a broad range of activities, such as, investment in infrastructure, active labor market policies and labor-force participation, creating new businesses and improve the return of educated human capital, innovation and production. Training workers, re-skills planification and university-business identity which occurs as linkages skills requirement by the local productive structure and for technological progress.

7. Conclusion

The thesis has analysed the patterns of convergence, in terms of structural change and human capital attractiveness across 292 regions part of EU28. The analysis has been conducted adopting a prospective of correlation between the distribution of high-skill and their growth of intensity over time, in each region.

As GDP is one of the indexes of complex economic of territories, this thesis explains the issue taking over another index of complexity already analysed by the literature, such as the human capital attractiveness, precisely the ability of a region to acquire and generate knowledge by the territory.

The study goes through two different time series: 2000-2007 and 2008-2016. The gap between these two patters has been made in order to stress historical feature which characterised the evolution of the European economy, such as the 2008 economic crises.

The study stress three main conditions. The first looked at the distribution of high and low-skill workers over time and across space. The data suggest an overall convergence for regions in EU 28, contrary to USA MSAs divergence shown by Giannone (2016) with a difference in differences analysis.

The second condition observed the phenomenon by separating two main sets of data: EU 15 and EU 11. The data reveal that EU 15 are processing convergence in the composition of human capital, while EU 11 are diverging through time.

At the human capital level, regions in EU 11 are growing faster than the those in EU 15, even if they still have a lower overall endowment of capital (see Figures 11, 12).

The third condition takes over the economic crisis in 2008 as the determinant factor of changes towards regional divergence.

The analysis suggests differences between convergence processes in the period 2000-2008, and the trend of divergence from 2009 onwards. This support the fact that after the economic crisis in 2008, the development process becomes more selective for those regions with higher capital endowment.

This process is also explained by looking at the specific cases of Italy and Germany. The two-graph (see Figures 9, 10) shown Italian regions before the 2008 crisis having a very high growth of skills and regions oriented to attract high skills. The next period (after 2008)

reveal loss in attractiveness, whilst the growth of high skills is particularly high, especially compared to Germany.

By the other side, Germans regions were overall more high-educated in both periods, than, after the crisis they shown a higher attractiveness even if the growth skills rate do not have high results as Italy performed.

Iammarino (et al., 2017) elaborated the so called 'place sensitive distributed development policies' (PSDDP), which combine guidelines from development theories, while observe the specific characteristic of each regions to be adaptable in growing opportunities for their inhabitants. Place-sensitive policies goes into the potential of each territory in terms of skills attractiveness, investment, educational system, level of productivity, in order to generate development throughout.

By comparing my results with what we learned from PSDDP, is interesting to look at the so called 'middle income trap' (Iammarino et al., 2017).

For medium-income regions (M) are intended these territories which do not attract low skills workers - since it is not convenient for them, and they do not evolve in innovation, production and infrastructures, as the high- (H) and very-high- (VH) income regions. For these two reasons the medium-income regions are 'trapped'.

Regions in medium-income trap can be differentiated between patterns: the 'slow-growing', such as regions performing a slightly growth in prosperity mostly depends by the improvements of governance (Italian Mezzogiorno, Greece, Spain, Portugal), and 'declining' in industrial areas, referred to the incapacity of a region to obtain high skills (Northern Italy, northern Spain and France).

However, my analysis does not take into consideration the high-skills migration which affect many countries, especially these in low- and medium-income regions.

It might be suggested that middle-income regions, even if they have a higher capital-intensive growth compared to other regions, are not able to sustain themselves and, below them, attract highly skilled resources.

That result might confirm what Iammarino (et. Al. 2017), Hartmann (et al.,2015) and others argued in their researches: low and medium-income regions should increase attractiveness of capital flows, building new knowledge links, restructure industries and economic eco-system through internalisation and university-business collaboration.

Following the example of industrial reconversion in east Germany, regions are inspired to be more proactive especially by generate investments in re-skilling and by generating links between production and labor market.

As well, at the territorial level, many researchers agreed that an important issue for overcome regional inequalities and generate a more homogeneous growth process, especially within each country, is determinate by the intra-periphery connection.

8. Appendix

Appendix 1 - DATASET (Eurostat.com, 2019)

GEO/TIME	Europa	2000 H	2007 H	2008 H	2016 H	2000 L	2007 L	2008 L	2016 L
Belgium	EU15	35,2	41,5	42,9	45,6	27,4	18,9	17,0	17,5
Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest	EU15	43,9	47,6	48,4	51,9	30,3	25,8	26,7	21,4
Vlaams Gewest	EU15	36,4	42,0	43,6	47,3	23,6	15,7	13,4	14,5
Prov. Antwerpen	EU15	36,0	40,2	42,3	40,8	23,9	18,4	13,1	17,5
Prov. Limburg (BE)	EU15	29,7	34,7	37,5	46,4	23,0	18,1	13,2	16,3
Prov. Oost-Vlaanderen	EU15	38,0	41,9	43,8	50,6	28,4	16,0	14,4	12,0
Prov. Vlaams-Brabant	EU15	46,3	54,0	53,7	56,1	17,8	8,9	12,2	12,5
Prov. West-Vlaanderen	EU15	31,0	39,0	40,5	45,9	22,9	15,5	13,9	13,4
Région wallonne	EU15	29,9	38,0	39,3	39,6	33,3	21,8	19,1	21,0
Prov. Brabant Wallon	EU15	43,4	53,1	57,0	59,2	20,2	16,0	11,6	11,8
Prov. Hainaut	EU15	26,2	31,2	34,2	36,1	34,0	25,1	20,2	22,9
Prov. Liège	EU15	28,3	37,8	38,2	37,9	37,7	24,2	21,9	24,5
Prov. Luxembourg (BE)	EU15	35,5	38,7	45,3	41,0	26,8	15,5	16,3	17,6
Prov. Namur	EU15	30,7	45,9	39,8	37,3	35,0	15,6	17,2	16,7
Danmark	EU15	32,1	38,1	39,2	47,7	14,8	18,9	19,7	15,4
Germany (until 1990 former territory of the FRG)	EU15	25,7	26,5	27,7	33,2	14,8	14,9	14,4	13,0
Baden-Württemberg	EU15	28,3	30,0	29,8	38,0	17,1	15,5	14,2	11,9
Stuttgart	EU15	29,2	29,9	31,8	39,6	15,8	17,1	14,2	11,0
Karlsruhe	EU15	31,3	32,3	29,6	39,1	16,0	15,1	14,5	13,2
Freiburg	EU15	23,6	27,9	27,3	34,6	20,3	14,0	15,6	12,5
Tübingen	EU15	27,8	29,2	27,8	37,1	17,8	14,2	12,2	10,9
Bayern	EU15	26,9	28,9	30,7	38,3	15,0	12,0	12,1	9,7
Oberbayern	EU15	34,6	36,2	38,6	48,2	13,2	11,0	10,8	7,8
Niederbayern	EU15	21,4	21,6	22,1	27,4	16,3	11,6	10,0	9,9
Oberpfalz	EU15	19,5	26,1	27,3	30,9	15,6	9,7	10,7	13,0
Oberfranken	EU15	20,7	23,7	25,6	28,2	19,0	13,8	14,1	11,1
Mittelfranken	EU15	29,0	27,3	29,0	36,1	17,1	13,8	14,0	12,2
Unterfranken	EU15	19,4	27,9	29,6	36,1	17,9	12,6	11,6	8,9
Schwaben	EU15	23,8	21,2	22,3	29,9	11,5	13,1	14,8	10,7
Berlin	EU15	33,7	37,4	37,0	46,2	14,7	16,1	16,4	11,4
Brandenburg	EU15	26,4	23,4	25,1	22,4	5,5	8,7	9,2	7,7
Bremen	EU15	21,8	24,0	31,1	30,7	22,6	22,3	26,9	21,9
Hamburg	EU15	30,2	30,0	30,4	44,1	17,4	15,5	13,8	10,2
Hessen	EU15	28,6	28,9	28,9	37,1	14,5	15,3	16,2	13,6
Darmstadt	EU15	31,8	30,8	30,2	40,2	13,6	16,5	17,4	14,3
Gießen	EU15	23,4	27,5	27,6	31,8	18,2	13,6	16,6	12,9
Kassel	EU15	22,4	22,9	25,2	29,1	14,5	12,2	11,1	11,5
Mecklenburg-Vorpommern	EU15	22,0	22,4	23,6	20,7	11,4	11,8	8,4	10,0

Niedersachsen	EU15	21,6	21,4	22,3	26,6	14,9	13,9	14,7	16,0
Braunschweig	EU15	21,6	24,4	26,6	30,0	13,0	15,4	12,5	14,9
Hannover	EU15	26,4	26,2	26,2	30,2	18,2	12,3	16,2	16,9
Lüneburg	EU15	18,1	15,0	18,2	22,6	14,8	14,6	15,8	16,6
Weser-Ems	EU15	19,4	18,8	18,1	23,7	13,3	14,1	14,0	15,5
Nordrhein-Westfalen	EU15	22,5	22,9	25,3	31,0	18,6	20,0	19,0	17,1
Düsseldorf	EU15	22,1	23,4	25,2	31,6	21,6	20,6	20,0	17,7
Köln	EU15	25,8	28,9	32,1	37,1	18,1	17,0	17,0	15,7
Münster	EU15	22,8	21,5	23,2	28,8	14,1	18,7	17,0	16,4
Detmold	EU15	20,8	20,6	21,1	24,1	17,5	19,3	17,3	18,4
Arnsberg	EU15	19,8	16,8	20,5	27,7	19,3	24,1	22,5	17,8
Rheinland-Pfalz	EU15	22,9	23,1	25,0	30,6	15,3	16,7	15,4	16,1
Saarland	EU15	22,7	18,4	20,8	29,0	13,6	15,9	12,1	18,8
Sachsen	EU15	33,0	35,6	35,7	29,3	4,0	4,7	5,7	6,2
Sachsen-Anhalt	EU15	23,6	17,7	18,8	19,5	6,4	10,7	9,7	11,2
Schleswig-Holstein	EU15	23,0	20,0	21,6	25,2	14,5	15,8	13,8	16,0
Schleswig-Holstein	EU15	23,0	20,0	21,6	25,2	14,5	15,8	13,8	16,0
Thüringen	EU15	26,0	28,2	26,2	24,9	7,7	8,7	7,4	7,9
Ireland	EU15	27,5	45,2	47,9	54,6	29,6	18,6	15,9	8,2
Éire/Ireland	EU15	27,5	45,2	47,9	54,6	29,6	18,6	15,9	8,2
Greece	EU15	25,4	26,3	25,7	42,7	30,9	25,8	26,2	17,1
Voreia Ellada	EU15	25,2	26,4	26,1	41,8	34,2	28,3	30,3	18,4
Anatoliki Makedonia, Thraki	EU15	20,6	22,8	22,3	32,7	42,2	36,6	39,0	27,3
Kentriki Makedonia	EU15	26,3	27,9	27,9	46,2	31,0	24,8	26,6	14,8
Dytiki Makedonia	EU15	25,8	21,5	19,3	30,3	37,8	34,9	38,4	24,2
Ipeiros	EU15	26,7	28,3	27,2	44,9	35,1	28,7	29,4	15,8
Kentriki Ellada	EU15	19,2	20,9	20,9	34,5	40,3	30,3	31,4	21,4
Thessalia	EU15	24,6	24,8	25,9	40,4	37,8	25,9	25,9	15,0
Dytiki Ellada	EU15	16,7	23,5	24,6	35,2	44,8	28,2	30,8	24,7
Sterea Ellada	EU15	15,8	17,7	15,5	31,6	43,2	33,4	35,7	21,4
Peloponnisos	EU15	17,9	19,3	17,6	32,4	35,7	31,7	29,7	25,4
Attiki	EU15	31,4	31,6	30,2	50,4	19,2	18,8	18,9	12,0
Nisia Aigaiou, Kriti	EU15	18,3	17,9	19,0	35,0	42,9	35,6	31,7	22,6
Voreio Aigaio	EU15	17,8	16,0	22,5	38,1	33,1	29,0	27,8	21,1
Notio Aigaio	EU15	13,5	12,4	11,0	24,7	48,2	44,0	40,7	23,3
Kriti	EU15	20,9	21,5	22,6	40,7	43,4	32,8	27,5	22,6
Spain	EU15	29,2	40,9	41,3	40,1	49,2	35,0	34,5	35,4
Noroeste (ES)	EU15	27,9	43,7	44,8	46,1	51,5	33,1	32,5	29,1
Galicia	EU15	27,5	44,5	45,8	44,3	53,8	33,0	33,1	29,7
Principado de Asturias	EU15	29,3	39,1	40,8	52,4	48,5	34,8	32,9	27,2
Cantabria	EU15	27,4	48,0	47,1	43,5	46,0	30,5	29,3	29,1
Noreste (ES)	EU15	40,8	52,6	50,1	51,6	37,0	26,1	24,5	24,4
País Vasco	EU15	44,6	59,3	57,9	56,9	31,9	23,2	21,4	21,6
Comunidad Foral de Navarra	EU15	40,8	53,2	46,7	54,3	40,0	25,3	24,8	25,0
La Rioja	EU15	32,2	42,3	38,7	42,7	46,1	29,5	30,3	35,4
Aragón	EU15	35,9	43,7	41,9	44,2	42,7	30,6	28,1	25,7
Comunidad de Madrid	EU15	37,8	50,1	52,2	47,9	36,9	23,7	22,0	26,8

Centro (ES)	EU15	26,6	38,1	37,0	36,3	54,4	38,8	40,7	40,0
Castilla y León	EU15	34,1	43,6	44,8	41,4	44,9	32,9	31,0	32,9
Castilla-la Mancha	EU15	19,8	34,2	30,6	32,0	62,4	42,1	46,7	45,8
Extremadura	EU15	21,2	33,5	32,4	34,5	62,5	45,7	50,6	42,9
Este (ES)	EU15	28,2	38,5	39,8	39,9	46,7	34,7	34,7	35,5
Cataluña	EU15	29,8	39,7	42,6	43,1	41,8	33,8	33,4	33,8
Comunidad Valenciana	EU15	27,0	39,1	38,0	37,1	52,4	33,8	35,3	37,5
Illes Balears	EU15	22,8	27,5	28,9	32,8	55,8	45,0	40,5	38,0
Sur (ES)	EU15	23,2	34,3	34,1	31,5	59,9	45,1	44,3	45,3
Andalucía	EU15	23,1	34,4	34,5	31,1	60,6	44,9	43,8	45,8
Región de Murcia	EU15	23,9	34,2	32,3	34,5	55,9	46,1	46,9	41,6
Ciudad Autónoma de Melilla (ES)	EU15	23,3	37,8	31,0	27,3	54,4	34,4	42,1	43,7
Canarias (ES)	EU15	21,4	33,0	33,3	34,9	57,5	41,1	40,6	34,7
France	EU15	27,4	41,4	41,0	43,6	26,0	18,1	17,0	14,2
Île de France	EU15	39,9	53,3	49,9	57,2	23,5	15,8	16,8	13,6
Île de France	EU15	39,9	53,3	49,9	57,2	23,5	15,8	16,8	13,6
Centre - Val de Loire	EU15	23,5	37,8	37,7	31,8	26,2	12,2	16,2	16,3
Bourgogne	EU15	16,0	27,2	31,2	26,2	27,2	21,7	13,7	18,1
Franche-Comté	EU15	22,1	32,4	37,2	43,1	29,2	25,8	21,3	8,9
Normandie	EU15	23,5	30,7	35,4	31,9	27,2	18,4	20,7	14,2
Basse-Normandie	EU15	26,5	32,9	39,4	30,3	21,7	16,9	18,4	16,0
Haute-Normandie	EU15	21,7	29,1	32,2	32,9	30,5	19,6	22,6	13,1
Nord-Pas de Calais	EU15	20,9	36,2	34,5	36,2	34,3	20,5	20,9	17,2
Picardie	EU15	24,6	30,3	32,8	29,4	30,3	22,3	19,3	22,0
Alsace - Champagne-Ardenne - Lorraine	EU15	24,0	36,4	36,3	39,6	26,4	20,6	19,0	15,6
Alsace	EU15	24,4	35,2	42,2	44,0	22,9	23,1	19,7	12,3
Champagne-Ardenne	EU15	24,2	34,4	28,3	35,0	30,6	22,2	21,4	16,8
Lorraine	EU15	23,4	38,6	36,0	39,1	27,4	17,6	17,0	17,3
Pays de la Loire	EU15	21,8	38,7	39,6	45,6	26,6	16,6	13,8	9,0
Pays de la Loire	EU15	21,8	38,7	39,6	45,6	26,6	16,6	13,8	9,0
Bretagne	EU15	27,1	45,4	45,2	39,4	16,6	10,7	8,1	9,7
Aquitaine - Limousin - Poitou-Charentes	EU15	23,8	33,6	36,7	39,2	24,9	20,3	14,8	11,6
Aquitaine	EU15	24,1	34,1	38,6	35,9	24,8	16,7	12,1	14,5
Poitou-Charentes	EU15	24,8	36,2	32,9	41,6	26,6	24,5	19,1	8,3
Languedoc-Roussillon - Midi-Pyrénées	EU15	24,2	44,0	43,3	46,4	24,4	17,9	16,9	13,3
Languedoc-Roussillon	EU15	20,7	42,0	40,6	40,2	30,0	22,1	23,9	16,8
Midi-Pyrénées	EU15	27,2	45,5	45,4	52,5	19,6	14,5	11,2	9,9
Auvergne - Rhône-Alpes	EU15	27,5	44,2	42,3	48,2	24,7	17,1	17,6	11,6
Auvergne	EU15	25,5	37,4	44,0	45,8	24,4	19,6	15,7	12,2
Rhône-Alpes	EU15	27,9	45,7	41,9	48,6	24,8	16,5	18,0	11,4
Provence-Alpes-Côte d'Azur	EU15	24,2	38,0	38,5	41,2	30,7	22,3	18,2	17,4
Provence-Alpes-Côte d'Azur	EU15	24,2	38,0	38,5	41,2	30,7	22,3	18,2	17,4
Italy	EU15	11,6	18,6	19,2	26,2	44,2	34,8	33,4	28,8
Nord-Ovest	EU15	12,0	20,0	20,2	28,5	40,3	30,8	29,9	27,7

Piemonte	EU15	12,4	19,8	18,0	24,5	40,9	34,5	31,5	31,3
Liguria	EU15	14,6	21,1	22,0	23,0	40,0	27,1	25,9	32,3
Lombardia	EU15	11,5	19,9	20,9	30,8	40,1	29,7	29,7	25,6
Nord-Est	EU15	12,7	19,2	19,3	28,9	39,1	29,8	28,7	22,6
Provincia Autonoma di Bolzano/Bozen	EU15	9,8	13,8	13,8	23,9	33,5	28,9	29,2	19,1
Provincia Autonoma di Trento	EU15	10,6	20,6	21,9	35,0	33,0	23,1	22,6	18,1
Veneto	EU15	10,5	16,8	17,0	29,6	42,6	31,0	28,8	21,1
Friuli-Venezia Giulia	EU15	13,5	21,2	19,9	22,2	34,1	24,6	24,9	22,5
Centro (IT)	EU15	13,3	22,7	23,6	31,0	40,7	29,0	27,8	23,2
Toscana	EU15	11,0	18,6	23,1	29,2	45,6	35,6	34,3	25,3
Umbria	EU15	14,1	20,2	19,6	31,7	33,8	24,8	22,8	21,8
Lazio	EU15	14,5	25,8	25,5	31,5	38,5	25,7	23,3	21,4
Sud	EU15	9,9	15,4	16,4	21,7	52,2	44,0	41,3	35,2
Abruzzo	EU15	11,0	21,0	22,3	26,9	43,2	31,5	25,8	21,7
Molise	EU15	9,4	22,1	23,9	32,6	46,4	30,7	31,4	23,1
Campania	EU15	9,2	14,0	14,1	19,7	54,5	48,4	46,9	40,0
Puglia	EU15	9,4	13,9	15,3	20,3	56,2	46,0	43,3	35,7
Basilicata	EU15	8,6	18,7	20,3	27,4	46,5	35,7	32,4	25,7
Calabria	EU15	12,6	17,1	19,1	23,8	45,9	38,9	34,8	32,8
Isole	EU15	9,7	13,7	15,0	18,6	51,8	43,8	42,9	36,3
Sicilia	EU15	9,7	14,1	14,3	18,0	52,0	44,6	45,4	36,8
Sardegna	EU15	9,5	12,6	17,0	20,3	51,1	41,4	35,9	34,5
Luxembourg	EU15	21,2	35,3	39,8	54,6	33,5	27,6	21,7	12,5
Netherlands	EU15	26,5	34,9	38,0	45,7	25,9	19,2	19,2	15,2
Noord-Nederland	EU15	23,2	32,9	31,5	42,4	25,6	19,7	19,4	13,5
Groningen	EU15	30,8	39,2	37,3	52,3	25,3	19,1	21,0	12,1
Friesland (NL)	EU15	21,4	32,1	29,9	35,5	21,6	17,0	17,4	16,7
Drenthe	EU15	15,9	24,9	26,1	38,1	31,3	24,3	20,3	10,8
Oost-Nederland	EU15	24,1	29,8	32,7	40,1	26,3	20,8	21,3	17,0
Overijssel	EU15	21,0	28,6	32,9	41,5	25,2	19,4	17,9	16,1
Gelderland	EU15	26,7	31,7	34,9	40,4	25,5	21,2	21,8	16,6
Flevoland	EU15	20,8	24,9	22,1	35,2	32,9	23,2	28,3	21,1
West-Nederland	EU15	30,7	38,2	42,2	49,4	25,1	18,0	18,2	14,3
Utrecht	EU15	38,7	44,6	52,6	58,6	22,2	15,7	12,9	11,8
Noord-Holland	EU15	34,2	41,8	43,6	53,0	21,8	16,4	17,7	13,1
Zuid-Holland	EU15	26,7	34,8	39,2	45,4	27,7	20,0	19,4	15,9
Zeeland	EU15	16,0	18,6	23,1	29,6	34,7	18,8	28,1	16,4
Zuid-Nederland	EU15	20,4	33,1	36,1	43,1	27,5	20,3	19,6	16,6
Noord-Brabant	EU15	20,2	33,4	36,8	44,5	26,9	19,6	17,8	16,3
Limburg (NL)	EU15	21,1	32,2	34,2	40,1	28,8	21,7	24,2	17,3
Austria	EU15	15,9	20,9	21,9	40,1	16,7	13,5	12,8	12,0
Ostösterreich	EU15	19,2	23,3	22,2	44,1	18,0	13,9	13,4	13,0
Niederösterreich	EU15	15,3	18,2	16,5	40,0	17,8	10,0	10,7	9,1
Wien	EU15	23,4	28,4	27,6	47,4	17,9	17,1	15,7	16,0
Südösterreich	EU15	12,7	18,4	20,5	37,8	14,2	9,6	9,3	9,6
Steiermark	EU15	12,8	19,5	20,3	38,6	15,4	9,3	10,4	10,4
Westösterreich	EU15	13,9	19,3	22,3	36,4	16,6	15,2	14,0	12,0

Oberösterreich	EU15	12,8	19,2	23,8	37,6	16,9	15,1	14,2	10,1
Salzburg	EU15	18,8	20,4	20,9	37,6	17,0	10,7	10,7	10,2
Tirol	EU15	10,5	19,7	21,5	35,1	14,8	17,8	14,6	14,4
Vorarlberg	EU15	17,3	17,5	20,1	33,0	18,1	16,9	16,8	16,7
Portugal	EU15	11,1	19,5	21,6	34,6	74,5	60,2	57,5	33,9
Continente	EU15	11,4	19,8	22,0	35,2	74,0	59,6	56,9	32,9
Norte	EU15	9,2	14,6	16,6	31,5	79,8	69,0	65,5	36,2
Centro (PT)	EU15	8,0	21,6	22,0	36,6	80,7	62,9	61,6	31,3
Área Metropolitana de Lisboa	EU15	17,5	26,6	30,7	42,3	59,3	45,2	43,0	29,3
Alentejo	EU15	12,2	17,1	17,8	24,2	75,3	60,9	58,0	34,7
Finland	EU15	40,3	47,3	45,7	46,1	14,5	9,8	9,1	9,3
Manner-Suomi	EU15	40,4	47,4	45,7	46,2	14,5	9,8	9,1	9,3
Länsi-Suomi	EU15	37,8	44,8	41,6	43,4	14,8	8,7	8,8	7,7
Sweden	EU15	31,8	41,0	42,0	51,0	12,4	10,9	11,0	12,3
Östra Sverige	EU15	35,7	44,9	46,9	56,5	10,6	10,2	10,2	12,1
Stockholm	EU15	40,6	48,7	51,8	62,1	11,3	9,9	10,1	10,8
Östra Mellansverige	EU15	29,1	38,8	38,9	46,8	9,7	10,7	10,4	14,3
Södra Sverige	EU15	29,4	40,4	40,1	48,6	15,0	11,1	11,8	12,7
Sydsverige	EU15	32,3	43,5	44,6	51,4	18,4	12,1	10,6	13,2
Västsverige	EU15	27,8	40,4	39,9	48,6	13,1	10,1	12,3	12,5
Norra Sverige	EU15	28,6	32,7	34,6	42,8	10,0	12,0	11,2	12,0
United Kingdom	EU15	29,0	38,3	39,5	48,2	34,1	20,2	18,3	14,9
North East (UK)	EU15	22,3	33,0	35,8	40,0	42,0	20,4	17,6	14,3
Tees Valley and Durham	EU15	22,0	32,4	31,8	31,3	43,1	22,0	13,3	13,4
Northumberland and Tyne and Wear	EU15	22,5	33,4	39,0	47,1	41,0	19,1	21,0	15,0
North West (UK)	EU15	26,3	33,2	33,4	43,6	34,7	22,1	22,7	15,3
Cumbria	EU15	16,4	35,3	33,5	38,9	41,3	16,5	17,7	18,3
Greater Manchester	EU15	27,7	34,6	33,7	45,4	36,3	21,1	23,6	16,2
Lancashire	EU15	26,1	27,1	26,7	38,8	34,1	28,0	26,7	14,7
Yorkshire and The Humber	EU15	24,7	30,3	33,2	37,0	37,7	25,9	21,1	21,4
East Yorkshire and Northern Lincolnshire	EU15	18,8	24,9	33,1	35,8	41,6	32,4	21,3	16,6
North Yorkshire	EU15	33,2	37,5	48,3	38,9	23,7	21,4	14,1	14,5
South Yorkshire	EU15	17,7	26,4	28,0	34,5	41,5	25,8	22,6	22,1
West Yorkshire	EU15	28,4	32,2	31,6	38,5	38,5	25,0	22,2	24,7
East Midlands (UK)	EU15	23,9	32,9	33,5	39,9	37,9	22,1	19,6	14,2
Derbyshire and Nottinghamshire	EU15	22,4	33,9	35,0	44,5	41,4	21,3	18,7	11,7
Leicestershire, Rutland and Northamptonshire	EU15	24,7	32,7	31,3	38,8	34,8	24,0	22,9	15,2
Lincolnshire	EU15	27,8	30,2	34,4	28,8	32,7	18,6	13,0	19,3
West Midlands (UK)	EU15	24,4	34,7	32,5	39,8	39,2	24,6	22,5	22,0
Herefordshire, Worcestershire and Warwickshire	EU15	31,0	46,6	35,7	47,2	33,7	15,5	17,7	16,1
Shropshire and Staffordshire	EU15	20,4	28,2	28,8	35,2	38,2	27,3	25,4	16,4
West Midlands	EU15	23,6	32,7	32,9	39,0	42,3	27,3	23,1	26,9

East of England	EU15	23,9	36,0	34,8	40,4	36,2	20,5	20,4	17,8
East Anglia	EU15	22,1	35,4	35,6	38,7	37,1	23,0	19,4	18,8
Bedfordshire and Hertfordshire	EU15	30,0	39,6	38,3	44,8	30,5	18,7	18,5	15,1
Essex	EU15	20,0	33,0	30,2	38,6	41,0	19,3	23,9	19,0
London	EU15	43,7	48,7	49,8	67,8	26,1	16,2	14,7	9,2
South East (UK)	EU15	30,8	38,5	41,6	46,1	30,2	17,9	15,0	14,7
Berkshire, Buckinghamshire and Oxfordshire	EU15	35,2	42,1	46,1	53,4	26,3	16,1	12,8	14,5
Surrey, East and West Sussex	EU15	34,6	44,3	46,0	47,9	26,0	17,1	15,4	13,1
Hampshire and Isle of Wight	EU15	26,0	34,7	39,7	40,0	34,9	19,6	15,7	17,8
Kent	EU15	23,5	29,0	29,2	39,6	37,2	19,8	17,4	14,0
South West (UK)	EU15	27,3	38,5	40,4	43,9	34,2	17,2	17,5	13,8
Gloucestershire, Wiltshire and Bristol/Bath area	EU15	35,1	44,2	42,7	51,4	29,5	15,1	14,8	10,0
Dorset and Somerset	EU15	22,3	31,1	33,9	36,2	38,9	17,7	20,1	22,1
Cornwall and Isles of Scilly	EU15	17,5	31,4	33,7	32,8	45,1	21,4	28,3	13,1
Devon	EU15	21,2	35,1	45,6	41,5	33,3	19,9	15,2	13,2
Wales	EU15	24,4	32,9	35,2	39,5	39,8	22,9	20,6	16,9
West Wales and The Valleys	EU15	20,0	29,9	33,8	41,7	43,4	25,2	22,1	15,8
East Wales	EU15	31,9	37,1	37,0	35,3	33,6	19,8	18,7	19,1
Scotland	EU15	32,6	45,2	46,6	60,0	31,2	19,4	15,2	12,0
Northern Ireland (UK)	EU15	25,4	36,4	38,7	35,5	36,5	22,0	20,4	15,5
Northern Ireland (UK)	EU15	25,4	36,4	38,7	35,5	36,5	22,0	20,4	15,5
Iceland	EU15	32,6	36,3	38,3	48,8	39,6	29,3	30,2	15,2
Ísland	EU15	32,6	36,3	38,3	48,8	39,6	29,3	30,2	15,2
Ísland	EU15	32,6	36,3	38,3	48,8	39,6	29,3	30,2	15,2
Norway	EU15	37,3	43,7	46,2	50,1	7,7	14,7	13,5	18,0
Norge	EU15	37,3	43,7	46,2	50,1	7,7	14,7	13,5	18,0
Oslo og Akershus	EU15	51,0	56,4	60,2	59,9	7,4	11,3	11,0	17,4
Hedmark og Oppland	EU15	32,9	35,0	31,6	46,8	6,9	17,8	11,7	15,0
Sør-Østlandet	EU15	31,4	40,1	39,4	42,1	8,7	17,9	16,0	19,3
Agder og Rogaland	EU15	30,0	38,8	39,0	38,3	7,8	12,4	13,3	21,9
Vestlandet	EU15	36,4	40,0	42,2	53,9	8,1	13,4	13,0	13,1
Trøndelag	EU15	31,8	36,4	51,8	54,0	8,2	15,8	10,9	11,7
Nord-Norge	EU15	32,8	37,6	37,8	42,4	6,2	21,8	21,8	29,4
Switzerland	EU15	27,3	36,5	41,3	51,2	11,9	10,6	9,7	9,7
Schweiz/Suisse/Svizzera	EU15	27,3	36,5	41,3	51,2	11,9	10,6	9,7	9,7
Bulgaria	EU11	19,5	26,0	27,1	33,8	23,7	17,9	19,6	17,9
Yugozapaden	EU11	25,8	37,6	38,0	47,2	12,4	7,8	9,1	8,2
Czechia	EU11	13,7	13,3	15,4	32,8	8	5,7	5,7	5,9
Ceská republika	EU11	13,7	13,3	15,4	32,8	8	5,7	5,7	5,9
Praha	EU11	31,1	25,8	32,2	56,1	3,5	2,6	2,2	2,4
Strední Cechy	EU11	8,8	10,2	13,1	26,8	14,3	5,8	5,2	5,8
Jihozápad	EU11	10,9	12,8	13,1	24,3	4,6	4,1	5,9	6,8

Severozápad	EU11	10,5	6,7	7,6	20,8	14,2	12,8	12,6	13,1
Severovýchod	EU11	11,7	9,7	11,2	26,2	6,3	7,9	5,4	7,4
Jihovýchod	EU11	14,6	15,1	17,0	40,5	6,1	2,7	4,0	3,2
Střední Morava	EU11	11,3	12,4	12,0	28,4	8,8	3,7	4,9	5,8
Moravskoslezsko	EU11	11	12,8	14,4	29,7	7,6	7,1	7,1	5,5
Estonia	EU11	30,4	33,5	34,4	45,4	7,1	11,6	14,2	9,9
Eesti	EU11	30,4	33,5	34,4	45,4	7,1	11,6	14,2	9,9
Eesti	EU11	30,4	33,5	34,4	45,4	7,1	11,6	14,2	9,9
Cyprus	EU11	31,1	46,2	47,1	53,4	19,5	14,6	12,7	13,1
Kypros	EU11	31,1	46,2	47,1	53,4	19,5	14,6	12,7	13,1
Kypros	EU11	31,1	46,2	47,1	53,4	19,5	14,6	12,7	13,1
Latvia	EU11	18,6	25,7	26,3	42,8	7,7	18,3	20,5	12,6
Latvija	EU11	18,6	25,7	26,3	42,8	7,7	18,3	20,5	12,6
Latvija	EU11	18,6	25,7	26,3	42,8	7,7	18,3	20,5	12,6
Lithuania	EU11	42,6	36,4	39,9	58,7	6,9	14,9	14,7	6,4
Lietuva	EU11	42,6	36,4	39,9	58,7	6,9	14,9	14,7	6,4
Hungary	EU11	14,8	20,6	22,8	33,0	18,6	15,4	14,9	14,1
Közép-Magyarország	EU11	22,2	31,2	32,6	45,7	14,4	10,2	9,7	7,5
Dunántúl	EU11	11,5	15,2	18,5	26,6	18,3	16,6	15,7	14,4
Közép-Dunántúl	EU11	11,9	16,5	18,3	25,0	17,3	15,7	17,5	14,5
Nyugat-Dunántúl	EU11	11	15,3	16,0	26,6	15,2	12,5	13,3	12,4
Dél-Dunántúl	EU11	11,6	13,4	21,4	28,7	22,6	22,5	16,2	16,9
Alföld és Észak	EU11	11,7	15,6	17,8	25,8	21,9	18,9	18,7	20,0
Észak-Magyarország	EU11	11	14,8	16,2	26,3	21,2	19,8	21,2	20,4
Észak-Alföld	EU11	12,8	14,7	17,3	24,8	24,9	22,0	20,2	21,5
Dél-Alföld	EU11	10,9	17,3	19,8	26,6	18,9	14,6	14,9	17,7
Malta	EU11	7,4	20,8	21,0	32,0	71	57,5	56,4	38,3
Malta	EU11	7,4	20,8	21,0	32,0	71	57,5	56,4	38,3
Malta	EU11	7,4	20,8	21,0	32,0	71	57,5	56,4	38,3
Poland	EU11	12,5	27,0	29,7	44,6	11,3	8,5	7,9	5,3
Makroregion Poludniowy	EU11	10	27,1	30,9	44,0	10,3	5,6	5,2	4,4
Malopolskie	EU11	11,9	28,5	31,9	45,9	11,3	7,2	7,0	4,0
Slaskie	EU11	8,6	26,2	30,2	42,5	9,7	4,5	3,8	4,7
Makroregion Pólnocno-Zachodni	EU11	10,7	23,4	25,9	40,7	9,8	9,4	8,8	5,2
Wielkopolskie	EU11	9,9	23,4	24,5	41,1	8,3	7,6	7,0	3,7
Zachodniopomorskie	EU11	13,5	26,3	31,3	43,3	11,8	13,4	11,1	8,5
Makroregion Poludniowo-Zachodni	EU11	12,4	22,7	25,1	40,6	12,6	8,4	8,3	6,8
Dolnoslaskie	EU11	11	24,3	25,9	41,9	14,1	8,6	8,7	7,0
Makroregion Pólnocny	EU11	12,3	20,7	24,4	40,7	15,9	10,1	9,4	7,6
Kujawsko-Pomorskie	EU11	11,1	14,0	18,4	36,5	13,9	13,0	12,9	6,0
Warminsko-Mazurskie	EU11	13,6	21,4	23,7	34,4	20	11,8	9,6	12,8
Pomorskie	EU11	12,4	26,4	30,5	48,0	14,6	6,4	5,9	5,9
Makroregion Centralny	EU11	12,1	25,8	29,2	46,4	9,7	10,3	9,1	5,4
Lódzkie	EU11	12,6	25,8	30,4	46,4	9,4	8,9	8,2	5,8
Makroregion Wschodni	EU11	13,7	24,9	28,0	42,3	10	9,9	9,4	4,8
Lubelskie	EU11	18,4	24,9	27,7	41,3	9,5	10,9	8,6	5,8

Makroregion Województwo Mazowieckie	EU11	17,7	42,1	40,9	57,0	11,2	7,6	6,8	4,0
Romania	EU11	8,9	13,9	16,0	25,6	12,1	20,0	21,0	23,4
Macroregiunea unu	EU11	7,3	13,0	14,3	25,6	11,8	18,7	17,5	23,5
Nord-Vest	EU11	8,6	13,1	14,3	26,6	14,7	18,3	18,3	23,2
Centru	EU11	6	12,8	14,3	24,5	8,8	19,1	16,7	23,8
Macroregiunea doi	EU11	7,9	10,0	12,1	18,3	13,9	24,7	27,0	33,0
Nord-Est	EU11	7,5	10,2	12,3	16,3	13	24,1	26,8	36,2
Sud-Est	EU11	8,6	9,7	12,0	20,8	15	25,5	27,2	28,8
Macroregiunea trei	EU11	11,4	19,7	21,9	33,9	10,8	16,9	18,3	18,4
Sud - Muntenia	EU11	5,7	9,5	9,1	17,2	11,8	21,8	25,8	26,4
Bucuresti - Ilfov	EU11	19,8	33,3	37,9	47,8	9,3	10,5	8,7	11,6
Macroregiunea patru	EU11	9,1	13,5	15,8	22,6	11,7	18,8	20,2	17,8
Sud-Vest Oltenia	EU11	6,6	12,7	13,6	22,5	9	18,5	22,6	19,7
Vest	EU11	12	14,4	18,3	22,7	14,8	19,2	17,3	16,0
Slovenia	EU11	18,5	31,0	30,9	44,2	17,3	10,0	10,2	6,4
Slovenija	EU11	18,5	31,0	30,9	44,2	17,3	10,0	10,2	6,4
Slovakia	EU11	10,6	14,8	15,8	31,5	7,7	6,1	6,0	6,4
Slovensko	EU11	10,6	14,8	15,8	31,5	7,7	6,1	6,0	6,4
Západné Slovensko	EU11	7,4	12,7	12,1	29,1	7,8	5,1	4,5	3,6
Stredné Slovensko	EU11	10,2	13,0	16,3	26,5	7,1	6,9	5,9	7,4
Východné Slovensko	EU11	7,8	13,0	13,8	29,1	8,7	7,4	9,3	10,6

Appendix 2 – Quality statistic index

Panel A: EU15	**00-03**	**03-05**	**05-07**	**08-10**	**10-12**	**12-14**	**14-16**
covarianza (x;y)	-0,008	-0,017	-0,016	-0,004	-0,012	-0,011	-0,011
varianza (x)	0,111	0,104	0,090	0,076	0,077	0,068	0,062
annual growth	-0,071	-0,165	-0,182	-0,055	-0,155	-0,156	-0,170
standard error	0,089	0,134	0,129	0,110	0,119	0,130	0,135
N	245	245	245	245	245	245	245

Panel B: EU11	**00-03**	**03-05**	**05-07**	**08-10**	**10-12**	**12-14**	**14-16**
covarianza (x;y)	-0,009	-0,014	-0,001	0,021	-0,024	0,001	-0,002
varianza (x)	0,115	0,160	0,128	0,115	0,160	0,128	0,136
annual growth	-0,075	-0,087	-0,010	0,183	-0,151	0,007	-0,018
standard error	0,1269	0,1350	0,1280	0,1371	0,1298	0,1283	0,1266
N	47	47	47	47	47	47	47

9. Index of Abbreviations

NEG	New Economic Geography
H	Tertiary education attainment
L	Non-secondary attainment
MSA	Metropolitan Statistical Area
NUTS	Nomenclature of territorial units for statistics
PSDDP	Place Sensitive Distributed Development Policies

10. Index of figures

11. Index of tables

12. Biliography

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