

Economic development of EU metro regions: which factors better explain differences in economic performance at different levels of income?^{1,2}

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Abstract

The EU has 271 metro regions which in 2013 held 59% of the population, 62% of employment and 68% of GDP (PPS). This highlights their role as centres of employment, their higher productivity and higher wages. This paper describes the economic performance of European cities since 2000 and the underlying key factors, ranging from education, innovation and employment to market access, agglomeration economies and specialisation. The paper takes also a closer look at income differences across cities, showing that some European cities may face the risk of a so-called 'middle-income trap', i.e. a situation where a middle-income city's economy does not grow fast enough to catch up with the group of high-income cities. It also shows that the key sources of urban economic development are likely to be different in each income group as they face different challenges.

1. Introduction

The EU has 271 metro regions which in 2013 held 59% of the population, 62% of employment and 68% of GDP (PPS). This highlights their role as centres of employment, their higher productivity and higher wages (European Union and UN-HABITAT, 2016)

This paper describes the economic performance of European cities since 2000 and the underlying key factors, ranging from education, innovation and employment to market access, agglomeration economies and specialisation. In the remaining of the paper, the term 'city' is used interchangeably with metro region, which is defined by a functional urban area (city plus

¹ This paper presents the main findings of Chapter 3 on Urban Economic Development in EU cities of the report: The State of European Cities 2016. Cities leading the way to a better future, European Union and UN-Habitat (2016), available at: http://ec.europa.eu/regional_policy/en/policy/themes/urban-development/cities-report.

² We gratefully acknowledge Prof. Michael Storper, Professor of Economic Geography at the London School of Economics and Political Science, who contributed to the substantive content of the chapter.

commuting zone) of at least 250,000 inhabitants. This is the scale at which critical interactions in land and labour markets occur and reflect effective economic borders.

The second part of the paper takes a closer look at income levels, showing that some European cities may face the risk of a so-called 'middle-income trap', i.e. a situation where a middle-income city's economy does not grow fast enough to catch up with the group of high-income cities. This lack of convergence may be preceded by a period of high growth (catching up), but it can also be part of a longer period of low growth. Joining the high-income cities requires many changes in the economy and its labour force, higher investments, a shift to higher value added activities, more innovation, a better educated labour force and a better business environment. If a city does not succeed in addressing these challenges its income growth risks being too low to catch up with the group of high-income cities.

2. Cities have more university graduates and higher employment rates

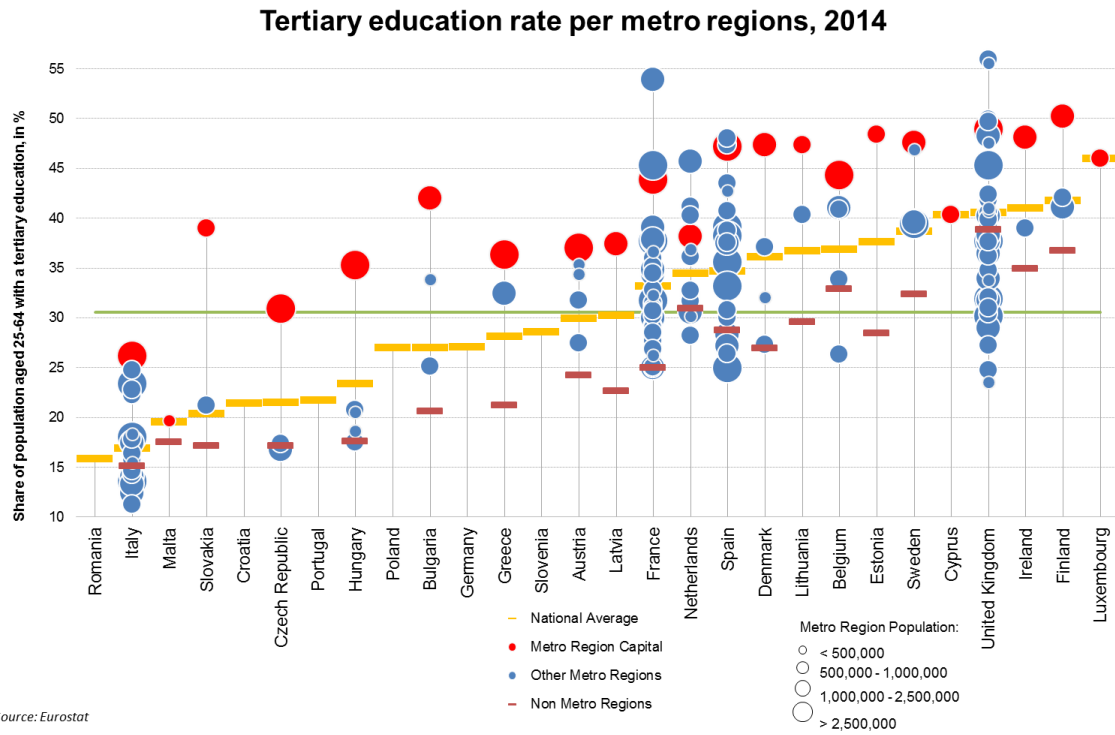
Cities and especially larger cities tend to have a more highly educated population than other territories (Figure 1). Demand for highly skilled labour attracts educated people from different parts of a country. The presence of higher education institutions makes it easier for residents to obtain a tertiary degree and find a job matching those skills. In the EU, in 2014, around 30% of its population aged 25-64 has a completed tertiary education. In metro regions, this is slightly higher at 32% and it is 41% in capital metro regions.

Although many cities benefit from high employment rates (Figure 2), a number of cities in Greece, Italy, Romania and Spain had employment rates of less than 50% in 2014. Increasing these rates to the EU average of 70% would have a significant impact on economic growth and household incomes.

In all EU countries,³ the productivity of metro regions is on average higher than that of non-metro regions. Furthermore, large cities tend to be more productive than smaller cities. In all countries, except Germany, the capital has a higher productivity than the country as a whole (Figure 3).

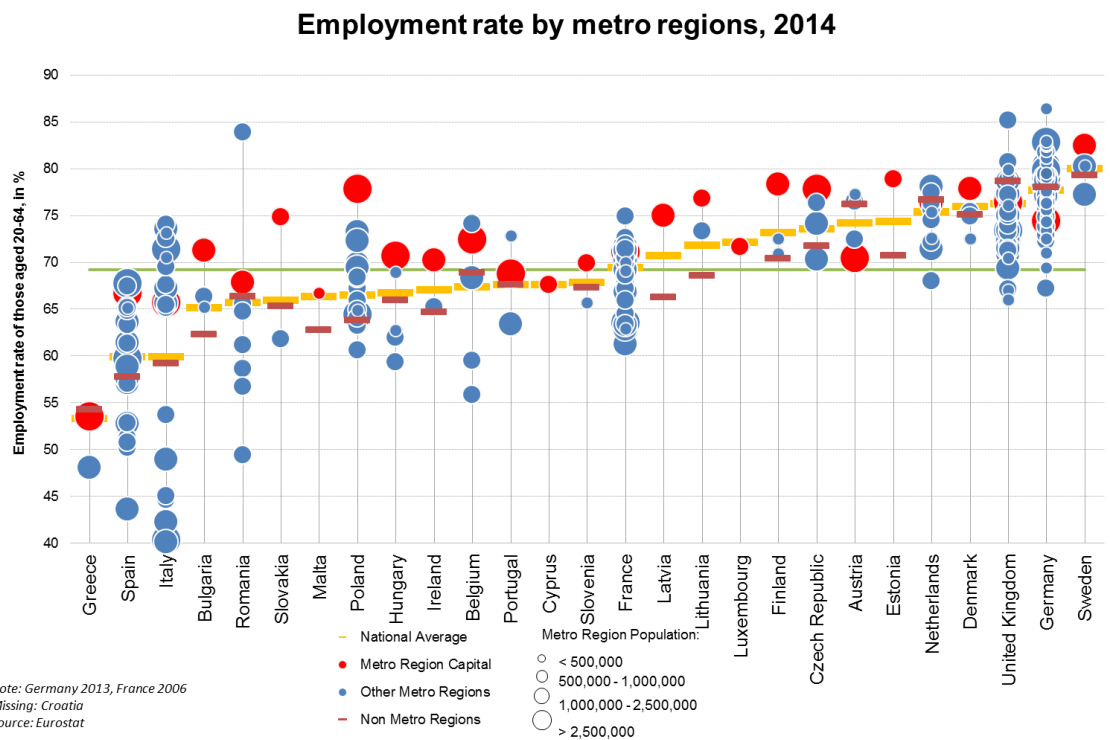
³ In Luxembourg and Cyprus the metro region covers the entire country as these countries consist of a single NUTS-3 region. As a result, their national and metro region values are identical.

Figure 1: Tertiary education per metro region, 2014



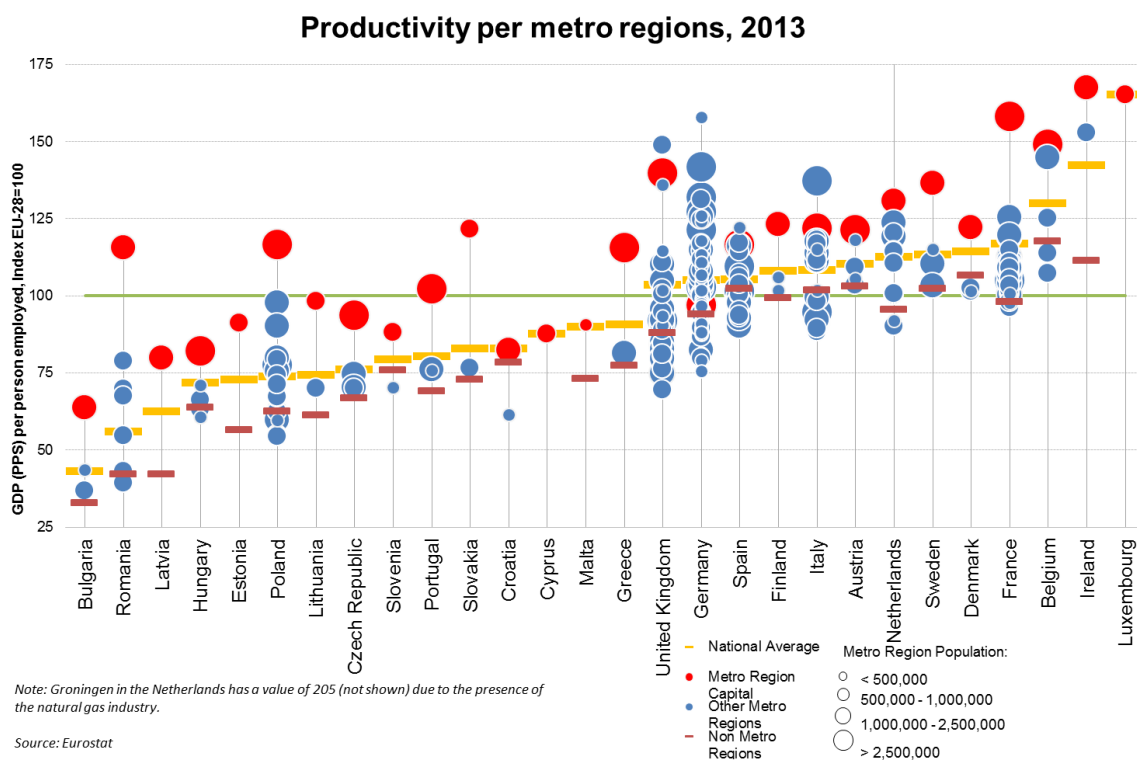
Source: Eurostat, DG REGIO calculations

Figure 2: Employment rate per metro region, 2014



Source: Eurostat, DG REGIO calculations

Figure 3: Productivity per metro region, 2013



Source: Eurostat, DG REGIO calculations

3. Productivity in EU cities

Several factors can boost urban productivity: human capital, the quality of the business environment, entrepreneurship, quality of institutions, market access, access to capital, costs of land and labour, as well as research and innovation. Some of them are reinforced by agglomeration economies.

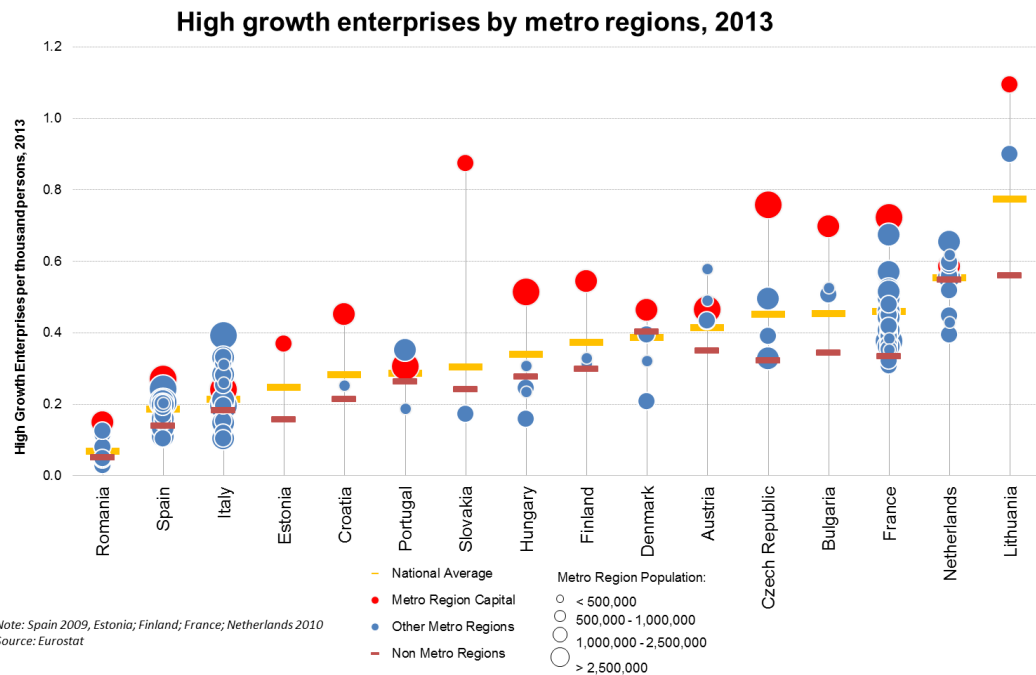
This paper cannot cover all the above factors; it touches on innovation, high-growth firms, agglomeration economies and borrowed size. A subsequent section addresses market access.

High growth firms and innovation are concentrated in cities

High-growth firms can provide important contributions to job creation and economic growth. The number of high-growth firms per capita is typically higher in metro regions than in non-metro regions, and in most cases it is highest in the capital metro region (Figure 4).

Cities are not the only places where innovation occurs, but they offer an environment, which is particularly conducive to the introduction of new ideas, products and processes. A vast body of literature enumerates factors explaining why cities are often more innovative than other regions, such as the presence of a creative and skilled workforce, a wide diversity of stakeholders, the fact that specialised clusters are more frequently located in cities, the presence of universities and research institutions or a mindset open to change.

Figure 4: High-growth enterprises by metro region, 2013

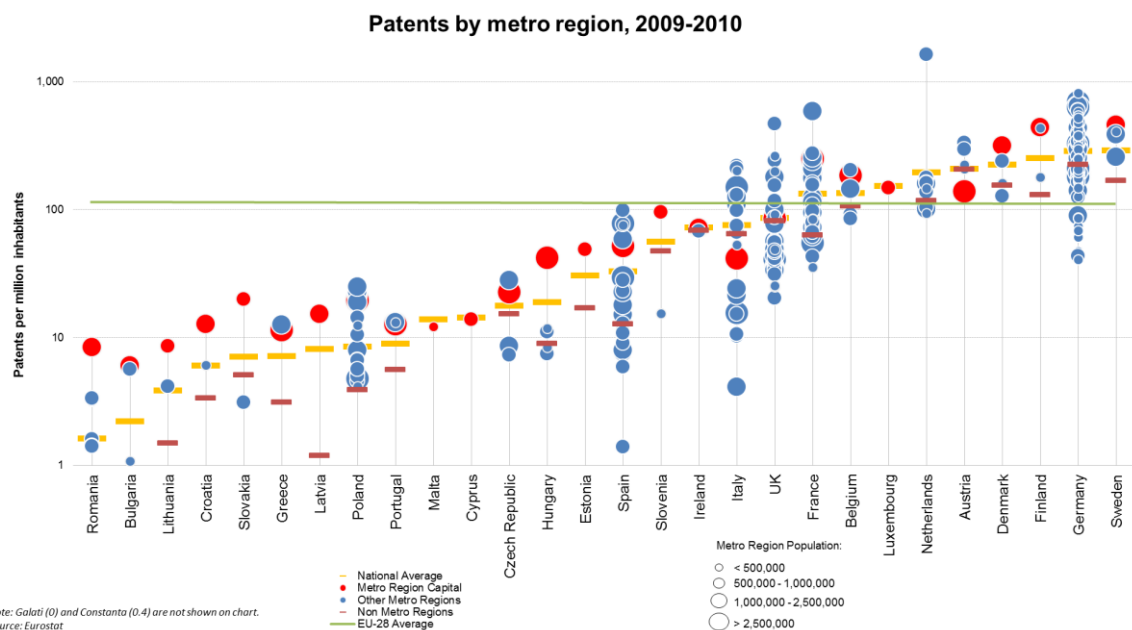


Source: Eurostat, DG REGIO calculations

The innovative capacity of cities is underlined by the number of patents per inhabitant. This is in general higher in capitals and large cities than in non-metro regions (

Figure 5). Some metro regions, however, score well below the national average. This, for example, is the case in France, Germany, Italy, Spain and the United Kingdom, suggesting that the spatial structure of innovation is more complex in advanced economies.

Figure 5: Patents by metro region, 2009-2010



Source: Eurostat, DG REGIO calculations

Matching, sharing and learning increase productivity

Cities benefit from agglomeration economies through two related but distinct channels. The first is related to the size of the city, also known as 'urbanisation economies'. Urbanisation economies arise when the size of the city leads to higher productivity. It is estimated that a doubling in city size increases productivity by 2 to 5% (OECD, 2015). The second channel is related to the size of an economic sector or cluster, also known as 'localisation economies' or specialisation. This allows smaller cities to reach high productivity levels by hosting small but globally competitive clusters.

The three main sources of agglomeration economies are often described as matching, sharing and learning (Puga, 2010). Firstly, larger local labour markets lead to better matches between labour demand and supply. The larger a city, the more potential jobs across a range of skill levels are available to a worker without the need to move. Similarly, larger cities offer a larger pool of potential job candidates across a range of skill levels. Therefore, in larger cities workers usually find a job that is a better match to their particular skills and qualifications. Furthermore, larger cities allow for greater specialisation and a greater division of labour which raises productivity. Smaller cities with a highly specialised economy also benefit from better matching because their demand attracts the specific labour skills required.

Secondly, larger cities allow for better sharing of inputs in the production process such as infrastructure. Airports or railways require a fixed minimum up-front investment independent of the actual number of users. Thus, the costs per user will be lower if more users share that infrastructure. Similarly, firms in the same sector, both in large cities (and smaller but specialised cities) benefit from sharing common suppliers. Since larger suppliers can operate more efficiently, this lowers input costs and increases the availability of specialised inputs.

Thirdly, people that live and work in close proximity can learn more easily from each other than people at greater distances. Larger cities therefore usually produce more ideas and innovations than smaller ones due to the larger number of people who work there. These ideas tend to increase productivity and spread first within the city before they reach other parts of the country. Furthermore, when more people with different ideas work close to one another, it becomes more likely that they combine these ideas to create innovations that can also increase productivity.

Depending on the type of economic activity, different forms of agglomeration economies exist. Some forms are very local and appear to have effects only within a few hundred metres of a cluster of firms or people. Others have a wider geographic reach and can increase productivity at significantly greater distances. For many types of agglomeration economies, the total number of firms or people in the economic cluster matters as does their proximity or density.

Agglomeration effects have a strong impact on wages, both directly through the salaries paid to the workers in these sectors and indirectly through the quantity and quality of the additional employment they induce, for supplier chains and for the home-serving market. The indirect impacts or multiplier effects are extremely varied and depend on the economic sector. Current estimates are that old manufacturing industries generate about two indirect jobs for every additional core job, while new economy sectors can generate up to five such jobs (Moretti,

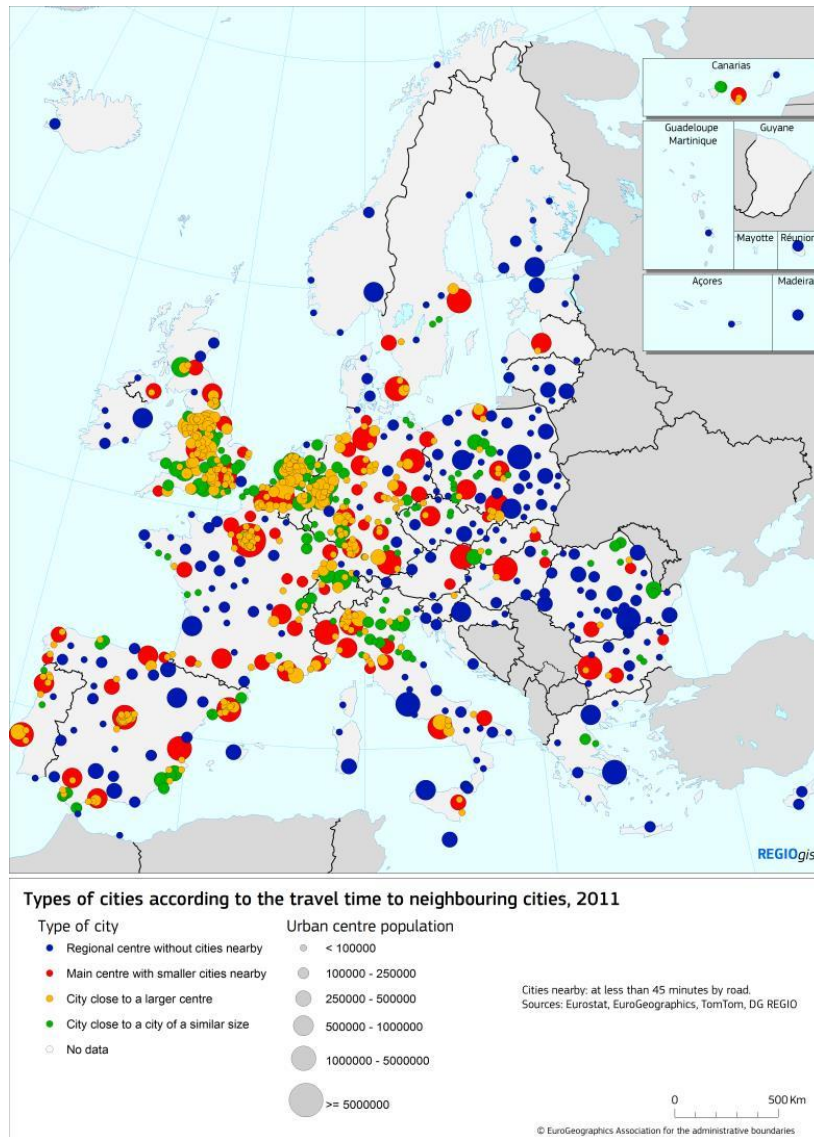
2012). These differences open up major (and often cumulative) wedges in income, as well as in population and migration dynamics.

Cities close to other cities may benefit from 'borrowed size'

Compared to other parts of the world, Europe has a smaller share of its population in very large cities. Given that urbanisation economies increase with city size, this could imply lower productivity in Europe. European cities, however, tend to be close to each other and well-connected. Most studies agree that the productivity of a city is higher if it is close to another city - a phenomenon known as 'borrowed size'. A recent OECD study demonstrated productivity enhancing effects of greater population numbers for distances of up to 300 kilometres (OECD, 2015). However, the magnitude of these effects is generally smaller than the magnitude of urbanisation economies.

Many cities in Europe are located close to one another, defined as 'at a travel time of less than 45 minutes by road' (Map 1). This feature applies in particular to cities located in the core of Europe. The situation is different for cities located in the periphery. In some cases, for example in Nordic countries, cities may be located far apart. In other cases, deficiencies in the road network may increase driving time between nearby cities, for example in Poland and Romania. Against this background, it can be assumed that the 'borrowed size' effect works for many European cities, but not for all of them.

Map 1: Types of cities according to travel time to neighbouring city



Source: Eurostat, TomTom, EuroGeographics, DG-JRC, and DG REGIO

4. Accessibility to EU cities

Transport infrastructure investments are widely used to promote economic development, but their real impact on the economy is more complex and hard to predict. In some cases, the projections of transport demand have proved to be too optimistic. In Europe, several heavily underutilised highways, airports and high-speed rail lines demonstrate this optimism bias (Flyvbjerg *et al.*, 2003). In certain cases, actual use turned out to be so low that the airport or high-speed rail line had to be closed down.

Even for projects where demand projections are more accurate, the impact can be difficult to predict. In principle, lowering of transport costs should boost trade and economic growth. New economic geography, however, warns that improving the transport connections between two cities may not necessarily help both cities, even if improving overall productivity levels. For

example, if a city with less productive firms is connected to a city with more productive firms, the more productive firms can capture the market of the other city, leading to a reduction of economic activity in one city in favour of the other. This underlines the importance of promoting productivity growth by improving human capital, innovation and the business environment.

Reducing transport costs increases the market a firm can serve. The need for a larger market, however, depends on the type of firm. The non-tradable sector primarily serves the local market. Within the tradable sector, products or services can be targeting a regional, national or even global market. This means that some firms will require better global connections, while others will only benefit from national or regional improvements. Depending on the product or service, market access may require the movement of goods, people or merely of data online. As a result, firms look for locations with for them favourable connections; whether freight or passenger transport or high-speed broadband connections.

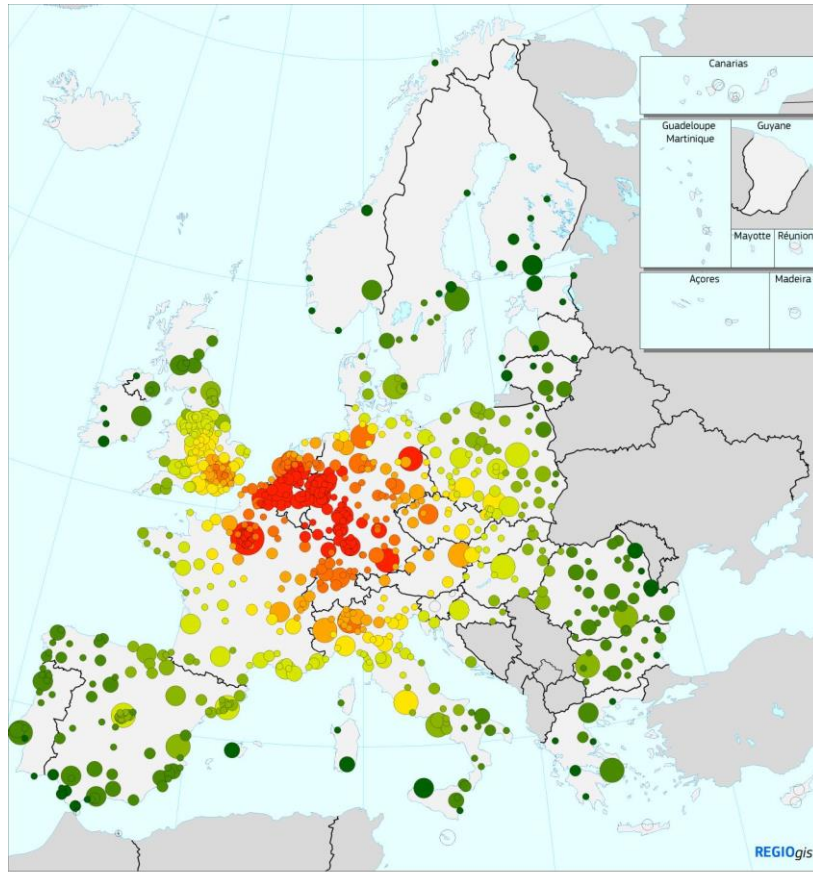
Regional market access by road is mainly determined by population distribution. A remote city will always have a small market, even with large road investments. As a result, transport investments, especially in areas with a mature network, cannot radically alter market access. Potential road accessibility⁴ is highest in the cities in the centre of Europe (Map 2). Some of the larger cities in less centrally located countries still have high accessibility, including Barcelona, Budapest, Madrid, Rome and Warsaw. Cities at the edges of Europe have lower potential road accessibility, but this has not stopped cities like Dublin, Edinburgh, Helsinki, Oslo or Stockholm from reaching very high levels of GDP per head.

Cities in central and eastern EU countries, however, are not yet connected by a mature road network and will only have a better market access after the completion of the Trans-European Transport Network (Map 3).

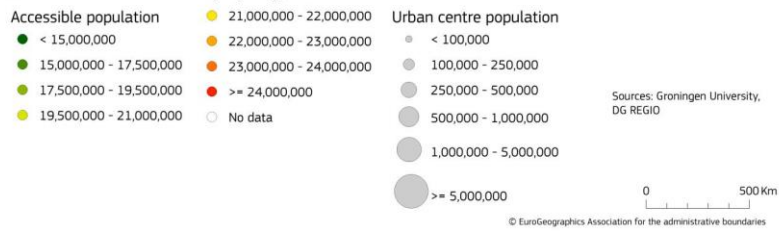
The speed and frequency of trains is also much lower in central and eastern EU countries (Poelman and Ackermans, 2016). Although some countries, such as the Czech Republic and Hungary, may have a dense rail network (Map 4) the frequency and speed of the service on many of these lines makes it difficult to offer an attractive alternative to travel by car.

⁴ Potential road accessibility is an inverse-travel time weighted population figure, using an exponential function. It means that population that can be reached quickly counts for more than people far away.

Map 2: Potential road accessibility per city, 2012

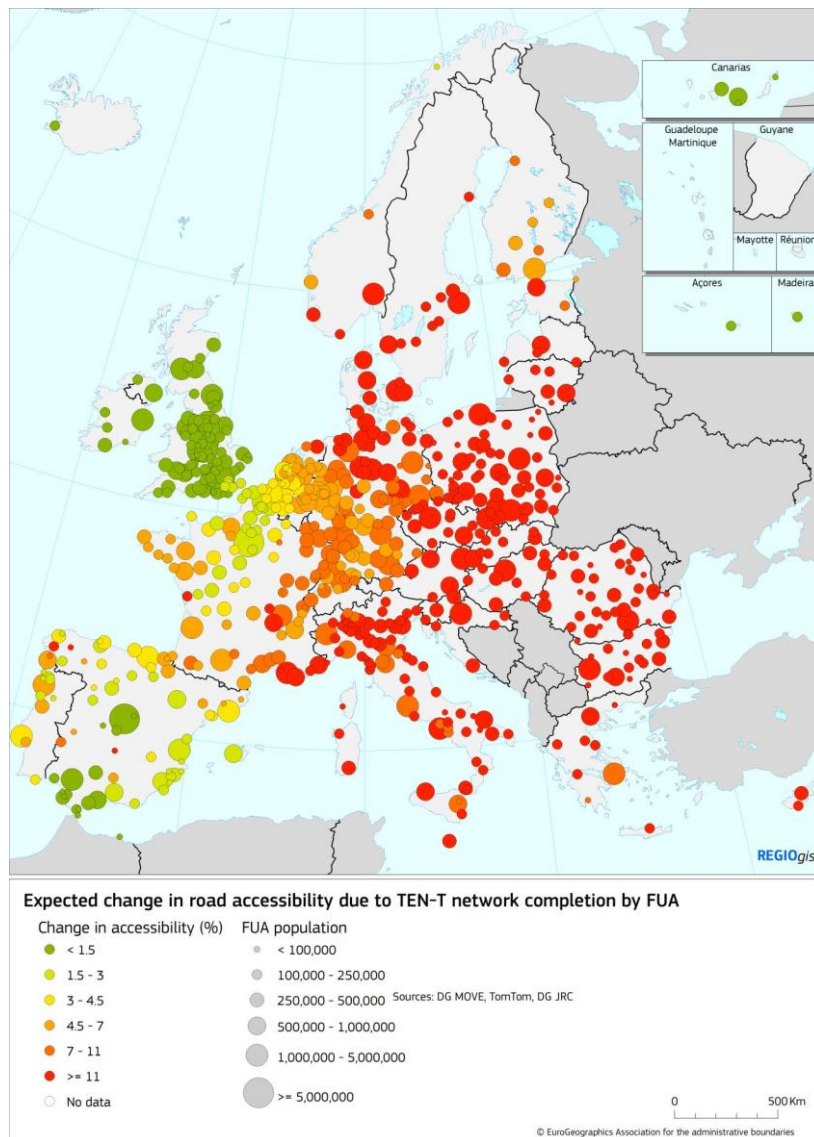


Potential road accessibility by city, 2012



Source: Groningen University, DG REGIO

Map 3: Expected change in road accessibility due to the TEN-T network completion, by FUA



Source: DG MOVE, TomTom, DG JRC

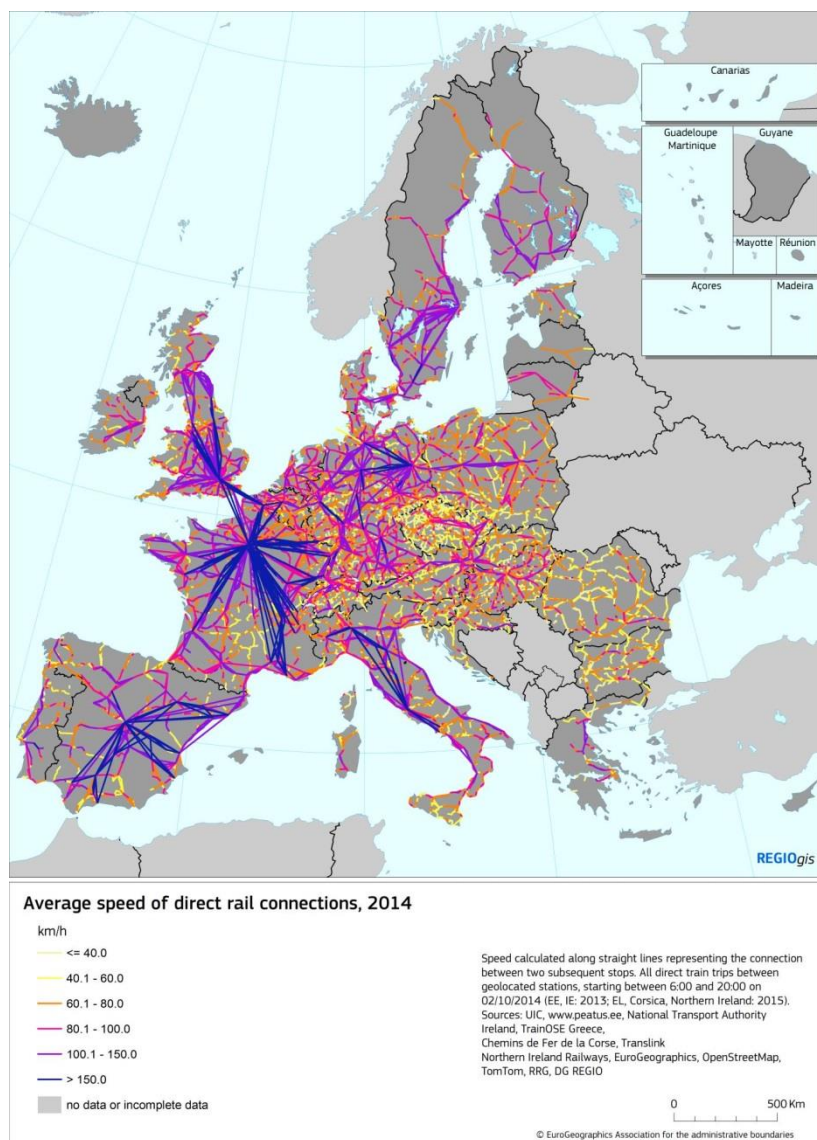
Potential rail accessibility is very high in the cities in and around the highly urbanised areas of the UK, the Netherlands, Belgium, northern France and the Rhine-Ruhr area in Germany. This is due to the combination of high population concentrations, a dense rail network, high-speed rail connections and relatively high frequencies. Relatively high accessibility ranges further to the cities in the west and east of France, substantial parts of Germany, the north of Italy and some of the larger centres in Spain. Somewhat lower values are found in Austria and Switzerland, reflecting the limitations due to the mountainous environment. Still lower values are observed in more peripheral western parts of the EU (Ireland, Portugal and Spain) and in northern Europe, where there are longer distances between cities and relatively low population densities. In most of the eastern part of the EU, city accessibility is much weaker, mainly due to low frequencies and slow speeds.

By 2050, the EU intends to complete a European high-speed rail network. By that time, rail, both high and normal speed, should capture at least 50% of all medium-distance passenger transport

(COM(2011)144).⁵ This will require substantial investments, especially in countries where the network is not very dense and the service tends to be slow and infrequent (Map 4)

Access to passenger flights is highly skewed ranging from more than 3000 flights a day in London and its surrounding cities, to cities without any flights within 90 minutes driving time in eastern Poland and Romania (Map 5). Improvements in the road network in Poland and Romania may allow several of these cities to access existing airports within 90 minutes driving time. The many business parks close to airports also indicate that such kind of access is also highly valued by firms.

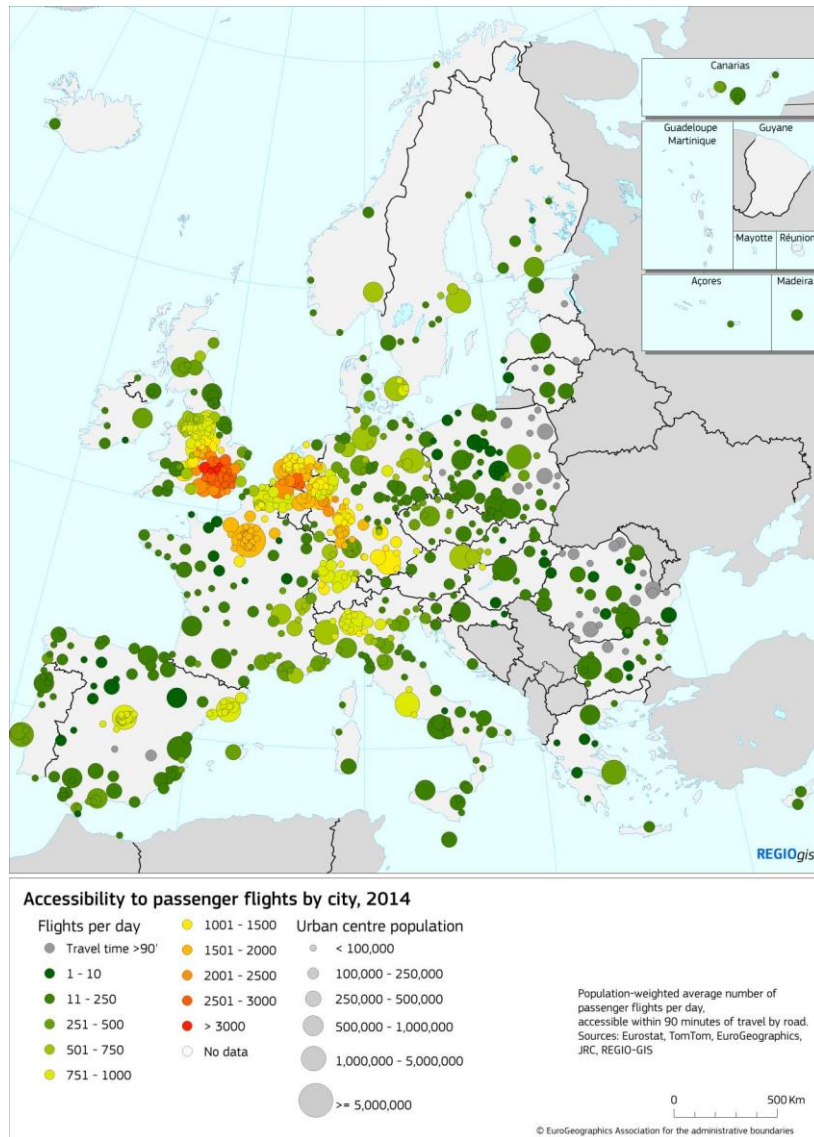
Map 4: Average speed of direct rail connections, 2014



Source: see Map 4

⁵ COM (2011) 144 final. WHITE PAPER, Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system

Map 5: Accessibility to passenger flights by city, 2013



Source: Eurostat, TomTom, EuroGeographics, DG-JRC, and REGIO-GIS

5. Urban economic growth by city income levels

Although city size has an impact on productivity levels, there remains an unexplained variation among cities. This variation and how a city can transition between different levels of development are the focus of the following sections. There are two key questions to be answered: (1) How can high-income cities maintain their advantage? (2) How can lower-income cities transition to a higher-income level?

Urban economies at similar per capita income levels share many key attributes, including their levels of education, science and technology endowments, infrastructure quality and institutional quality. Conversely, between economies with different income levels these attributes tend to differ significantly. Cities can therefore be grouped into 'development clubs'.

The concept of development clubs can be used to describe and analyse changes because the motors of change differ from one club to another. A very-high-income economy, for example, has high wages and high employment rates, whereas a low-income economy will have low wages and/or low employment rates. The high-income economy must resist cost competition from below by continuing to innovate or capture innovative, high-wage sectors. The low-income economy can offer low-cost land and labour to capture activities susceptible to re-location in search of cost reductions. Each club, therefore, has specific needs and challenges related to its starting point and its medium-term prospects.

Grouping urban economies into clubs or income groups can generate insights into their development and prospects. It avoids treating all cities in the same way or focussing only on a few case studies. It thus sheds light on the dynamics of a large, differentiated economy-wide division of labour with each club influencing the other through competition for specialisations and the sorting of factors (capital, labour, firms, technology) among them.

For the purpose of this analysis, cities have been classified into four income groups according to their level of GDP per head (in PPS) in 2013 (Table 1 and Map 6)

Table 1: GDP per head thresholds per development club or income group

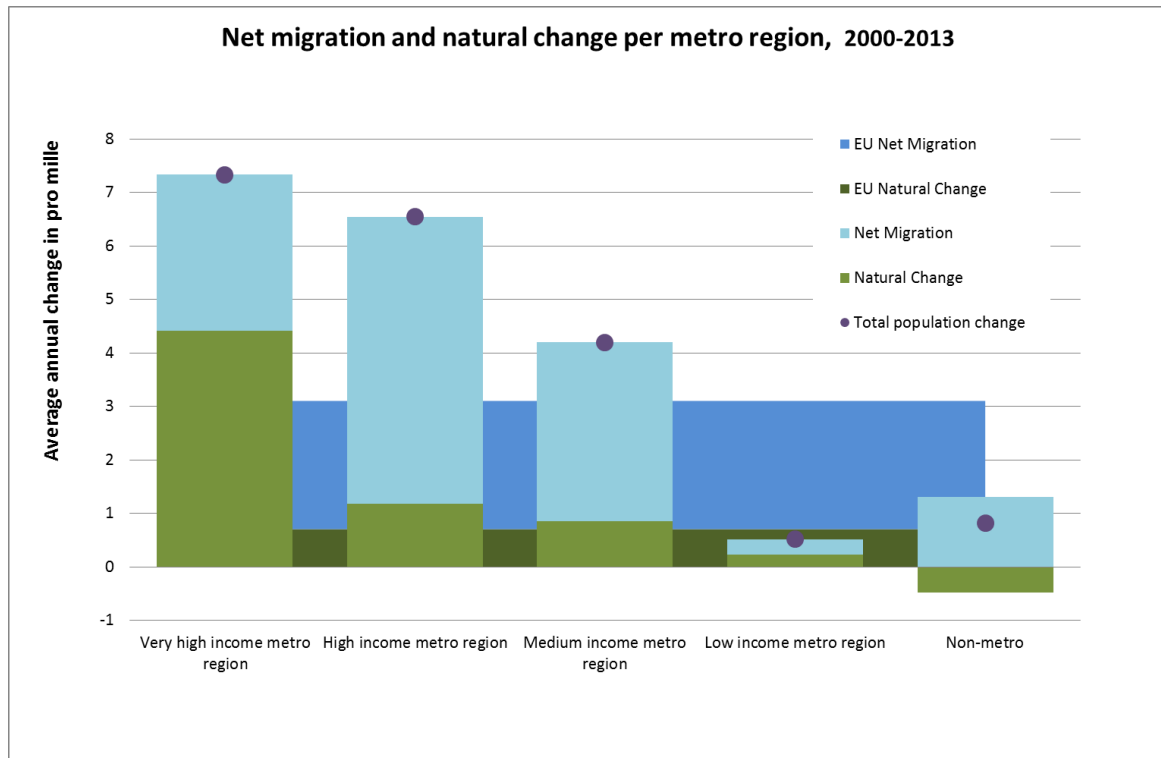
Development club or income group	GDP per head (PPS) relative to the EU average	Number of cities	Average population size
Very-high-income (VH)	>150% of the EU average;	25	2,400,000
High-income (H)	between 150% and 120%	50	1,134,000
Medium-income (M)	between 120% and 75%	148	933,000
Low-income (L)	less than 75%	48	901,000

Europe is not a fully integrated market yet. Labour mobility between countries is lower than in a more integrated economy like that of the USA. Language barriers are high. Institutions and business environments are also different. All these factors continue to generate strong differences in average skill levels, technological and scientific capacities, and employment rates between countries. Thus, the economy of each city is shaped in part by being in the EU, but also strongly by its national economy. Therefore, European cities are first analysed relative to EU benchmarks and next within their national context.

Higher-income cities attract more people

Although economic growth and population change are entwined, the average population size in the four income groups is not all that different (Table 1). Although population size plays an important role in the success of the two largest European cities, Paris and London, other factors contribute to successful economic development as well. If we exclude London and Paris from the analysis, the average size in each of the four income groups defined above varies between 1.4 million (in the very high income group) and 0.9 million (in the low income group) with some variation within each group.

Figure 6: Population change per city income group, 2000-2013

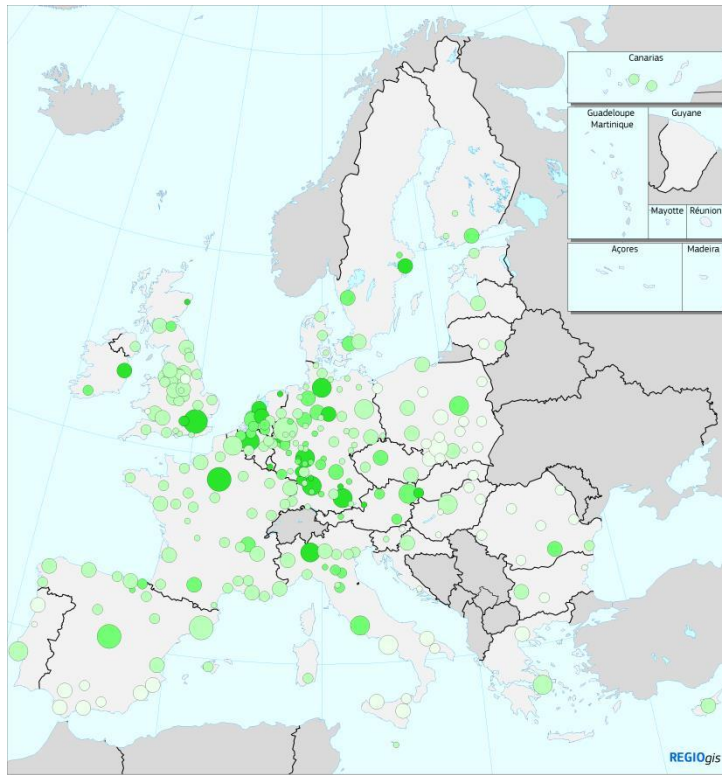


Source: Eurostat and DG REGIO calculations

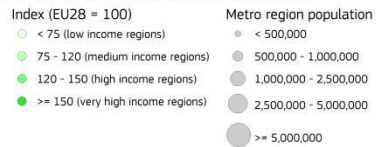
Figure 6 shows that population growth differs more by income group than population size does. Population growth is above the EU average in all but the low-income cities. The higher the income, the higher is the population growth. In other words, people are attracted to wealthy cities in Europe.

Although the average population change in low-income cities is low, it does vary with outliers that range from high growth to rapid population reductions (Map 7). For example, six Spanish cities (Alicante, Cádiz, Granada, Málaga, Murcia and Sevilla) experienced growth over 10%, while four cities declined by more than 10% (Galati and Craiova in Romania, Kaunas in Lithuania and Opole in Poland).

Map 6: GDP per head (PPS) by metro region, 2013



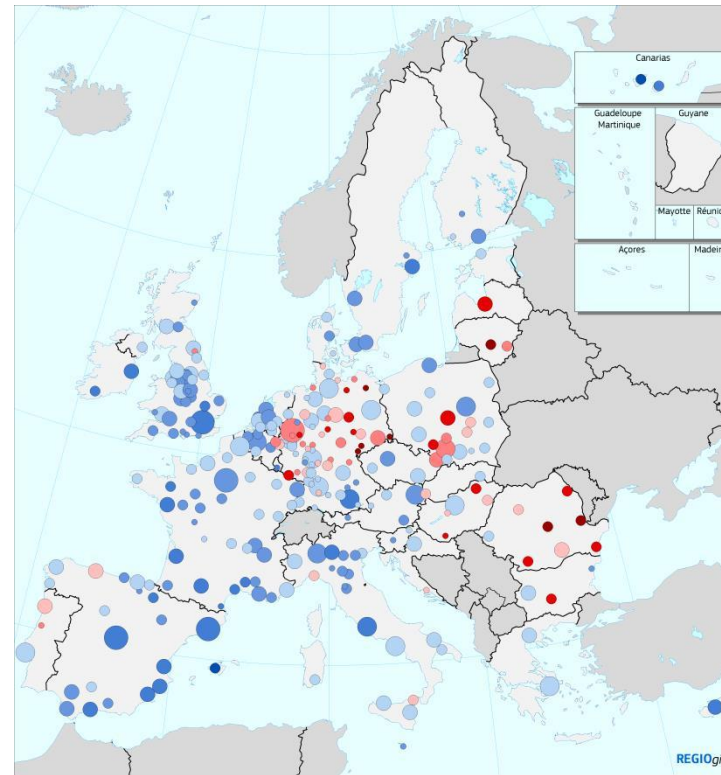
GDP per head (PPS) by metro region, 2013



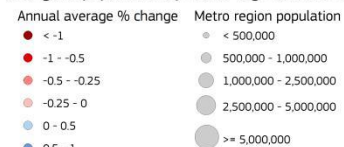
Sources: Eurostat, DG REGIO



Map 7: Population change by metro region, 2000-2013



Change in population by metro region, 2000-2013



Sources: Eurostat, DG REGIO



Source: Eurostat and DG REGIO calculations

The net migration rate is higher in high- and medium-income cities than in very-high-income cities. This may in part be due to the higher housing costs in very-high-income cities. Natural population change is much higher in very-high-income cities, almost six times the EU average. On the other hand, it is only slightly higher than the EU average in high- and medium-income cities, and close to zero in low-income cities.

In low-income cities, population growth is close to zero. As a result their GDP per head growth is higher than that in other income groups. Low-income cities as a group, however, did not create any additional jobs over this period, although the jobs are likely to have become better paid. This, in combination with their low-income level, may explain the low net migration rate for these cities.

The latest population projections suggest that in the next decade natural population change will be negative in low- and medium-income cities, while very-high-income cities will retain strong natural population growth. Net migration is also expected to become negative in the low-income cities, whereas the net migration rate of the high- and very-high-income cities is estimated to be double the EU average.

Overall, GDP growth between 2000 and 2013 was strongest in the very-high- and high-income cities (Table 2), but offset by substantial population growth. As a result, GDP per head growth was highest in the low-income cities, which experienced, on average, almost no population change. Within each group, however, there is substantial variation with some high-income cities with low population growth as, for example, in some German cities and several low-income cities with high population growth, i.e. some Spanish cities.

Table 2: Population, GDP and employment change per city income level

Metro region by income level	Average annual change 2000-2013, in %			
	Population	GDP	GDP per head	Employment
Very high	0.7	1.6	0.9	0.8
High	0.6	1.3	0.7	0.9
Medium	0.4	1.1	0.7	0.4
Low	0.2	1.3	1.1	0.0
All Metro	0.5	1.3	0.9	0.6
Non-metro	0.1	0.9	0.8	0.0
EU	0.3	1.2	0.9	0.3

Source: Eurostat and DG REGIO calculations

A closer look at the low-income cities reveals three distinct sub-groups. The largest group has high GDP growth and low or negative population change. These cities are almost exclusively located in central and eastern EU countries, reflecting the ongoing catching-up process. The second sub-group recorded slightly higher population growth, but low GDP growth. These are located in Spain. And, finally, there is a small group of low-income cities with both low GDP and low or negative population growth. These cities are found in Greece, Hungary, Italy, Portugal and Spain.

To summarise, high- and very-high-income cities attract people, whereas low-income cities tend to see their population decline to negative net migration.

High-income cities have higher employment rates and employment growth

Employment growth was higher in the (very) high-income cities than in the medium- and low-income cities in 2000-2013 (Table 3). In fact, employment in low-income cities (-0.01%) and outside cities (-0.04%) even declined during this period. Accordingly, (very) high-income cities have high employment rates and low unemployment rates (Table 3). Low-income cities, on the other hand, have low employment rates and an unemployment rate 50% above the EU average. Nevertheless, total employment in EU cities increased by 8% over this period, compared to a decline of 0.4% in non-metro regions.

Table 3: Employment and unemployment rates, patents and industrial employment per city income group

Metro region by income level	Employment rate (20-64) 2014, in %	Unemployment rate 2014, in %	Patents per million inhabitants (Avg. 2009-10)	Employment in industry 2013, as share of total in %	Change in industrial employment share 2000-2013, in percentage points
Very high	76	7	241	11.2	-3.4
High	73	8	202	13.7	-3.6
Medium	69	11	104	14.6	-4.8
Low	58	18	11	18.7	-3.8
All Metro	70	10	137	14.1	-4.2
Non-metro	68	10	72	19.3	-2.8
EU	69	10	112	16.1	-3.6

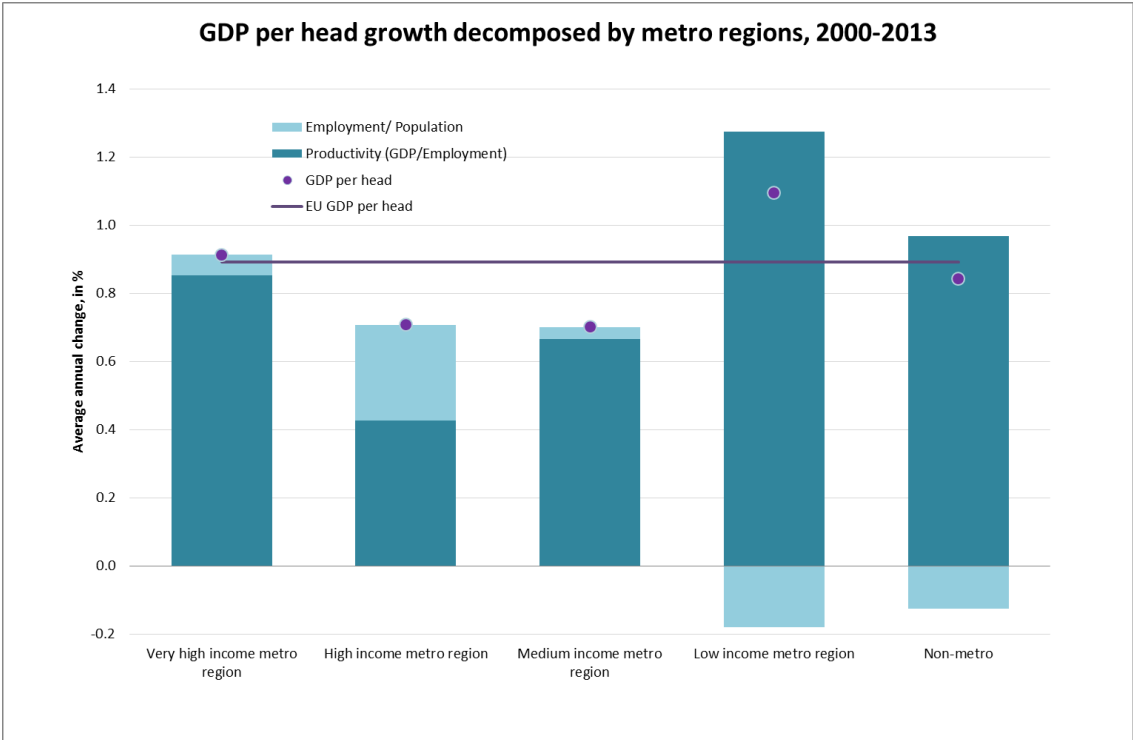
Source: Eurostat and DG REGIO calculations

The picture that emerges is that cities with high incomes and employment growth tend to attract working age people. This would support the hypothesis that people follow jobs and not *vice versa*; although the analysis is far from conclusive.

Economic growth per head favours both low and very-high-income cities

As we have seen above, GDP growth per head is highest in low-income cities, indicating a classic catching up process as predicted by classical economic theory. Most of the low-income cities are located in the EU-13. The few low-income cities located in the EU-15 saw their economies shrink relative to their population. Productivity growth is typically the main source of catching up and this is confirmed for the low-income cities. Their growth is driven purely by productivity growth (defined as GDP per person employed), while employment declined relative to population (Figure 7). The next highest group in terms of economic growth is the very high-income cities, suggesting an opposite dynamic of reinforcing their structural strengths by continuously attracting high-income-generating activities. In other words, whereas the low-income cities are moving closer to the economic 'frontier', very-high-income cities are moving this frontier as demonstrated by their high productivity growth (Figure 7) and their high number of patents manifesting their innovativeness (Figure 5).

Figure 7 GDP per head growth decomposed by group, 2000-2013



Source: Eurostat and DG REGIO calculations

Manufacturing provides employment in high and low-income cities

Economic specialisation differs across income levels because cities have different comparative advantages that lead to a geographical division of labour between different kinds of economies according to their endowments of labour, capital and other factors. This pattern of comparative advantages leads to inter-industry trade between economies at different levels of development and specialisation. Moreover, as transport and communication costs have declined, it has become feasible to divide industries into different phases and locate the different phases in different places. This leads to intra-industry trade between economies at different levels of development. Finally, industries can be divided into the part that is clustered or agglomerated, and the phases or parts that can be geographically dispersed. As a result, in the 21st century we no longer see simple or clear distinctions between economies by the industries they contain, but more subtle and hard-to-measure patterns of economic difference.

To get a good picture of these differences, a fine decomposition of industries is needed to show the types of jobs or tasks they perform, and to distinguish clusters from more dispersed activities. However, the only data which are available are employment shares in manufacturing (Table 3). They show that very-high-income cities have the lowest share of employment in manufacturing (11%), while the low-income cities have the highest share (18.7%), a share similar to that of the non-metro regions (19.3%). All four groups have witnessed a reduction of more than 3 percentage points between 2000 and 2013. This reflects competition from emerging economies and non-metro regions for the less skilled and less innovative (more cost-sensitive) manufacturing.

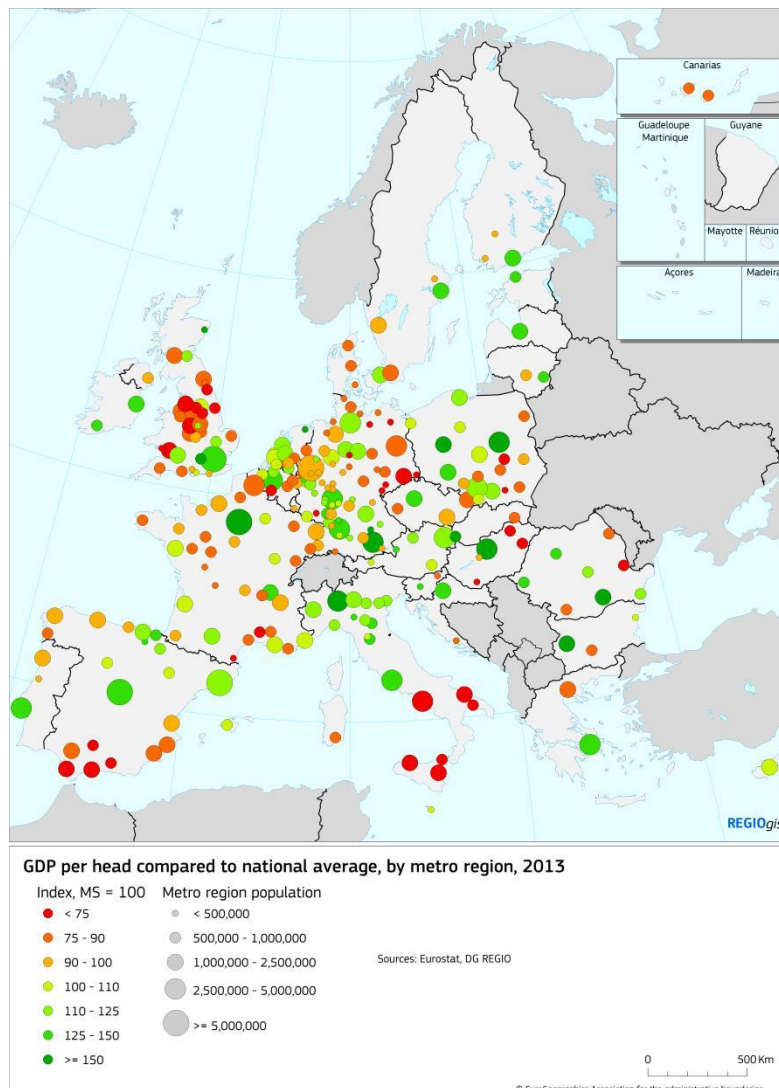
Very-high income cities are less tied to their country's economy

Benchmarking the city's GDP per head to the country's GDP per head shows that all very-high-income cities also have a (very) high income relative to their country (Map 8). The GDP of the very-high-income cities also tends to grow faster than national GDP, implying that they may be more connected to the global economy and less tied to the country's economy.

In contrast, the high-income cities, on the other hand, do not perform as well. Only one in three has an income that is also high relative to national income. Warsaw and Bucharest are the two outliers with an income of more than double the national income.

Four out of five medium-income cities also have a medium income relative to national income. Positive exceptions are for example Budapest, Poznań and Sofia with an income at least 50% higher than national income. Only two out of five low-income cities had an income 25% below the national average.

Map 8: GDP per head compared to national average, 2013



Source: Eurostat and DG REGIO calculations

A closer look at city performance shows that in several countries, especially in central and eastern EU countries, the capital city has a far higher income and productivity than the second-tier cities. For example, GDP per head in Bratislava, Bucharest, Budapest, Paris and Sofia is more than 50% higher than that of the country. Improving the performance of second tier cities would have a big impact on the national economies.

7. Conclusion

Many European cities outperform their country in terms of productivity, employment, education and innovation. Since 2000, employment in cities grew by 7%, while it declined in the rest of the EU. GDP generated in cities grew almost 50% faster than elsewhere.

As a result, cities help their national economy become more knowledge-based and competitive. However, there are also cities that do less well, especially those that struggle simultaneously with a legacy of de-industrialisation, lack of innovation capacity and population decline.

Low-income cities need to better mobilise their natural advantages, making their labour and land available at low cost and high efficiency. Success depends on their market access, the quality of their infrastructure, their administrations and business environment, and the skill set of their labour force.

Low-income cities tend to lose talent and youth to higher income cities, generating a negative demographic dynamic. If their populations age due to out-migration of the young, they will face a long-term decline in their working-age population. To avoid that this trend turns into a vicious cycle, low-income cities need to transition quickly to the middle-income group.

Medium-income cities risk falling into a 'middle-income trap.' As productivity and wages grow, they become less attractive for labour-intensive or low-skill activities. To become attractive for higher value-added activities, these cities have to improve the quality of their institutions and business ecosystems, upgrade the network infrastructures, and critically, become more innovative and improve the skills set of the labour force through better education. Moving up the value chain requires much higher investment per worker than in the early stages of development, because it requires a more skilled labour force and the introduction of new business models at the company level.

High-income cities tend to be more vulnerable than very-high-income cities because their comparative advantages often overlap with the medium-income cities. They are also vulnerable to standardisation of the products they produce (product cycles, maturity), which often allows industries to move to locations with lower costs and less-skilled labour. The impact of this trend depends on the capacity of the high-income city's firms to generate innovations within their areas of economic specialisation and to expand into high value added economic activities related to their specialisation.

Very-high-income cities must maintain their specialisation in high-wage activities in the face of a changing global landscape of comparative advantages. Specifically, they must cope with two challenges. One is that the activities that are high-wage at one moment in time tend progressively to

become more widespread and more routine. This allows the entry of imitators with lower wages. A second is that, when innovative sectors mature, they tend to spread geographically so that the initially leading region no longer has a lock on them. The richest cities can therefore only maintain their comparative advantages by continuing to push the boundaries of innovation and technology in their areas of activity.

This work showed that the key sources of urban economic development are likely to be different in each income group as they face different challenges. Although there are a few common drivers of economic development (good institutions, infrastructure and education), transitioning between income groups cannot be achieved with a 'one-size-fits-all' strategy. As a result, policies promoting urban economic development should be differentiated. All cities are in a dynamic process of dealing with the challenges that result from their position in the constantly changing, economy-wide division of tasks and specialisations.

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