3 Economic development and the metropolitan system

This chapter presents evidence on the relationship between economic development and the growth of metropolitan areas. It examines how the share of people living in metropolitan areas differs by countries' economic development, with a focus on the role of structural transformation for explaining such differences. It analyses how the proportion of people living in metropolitan areas is associated with both economic development and regional income disparities. Finally, it examines the relevance of human capital and migration in metropolitan areas as drivers of regional disparities.

Key messages

- Urbanisation and economic development go hand in hand. Overall, countries with higher per capita gross domestic product (GDP) tend to be more urbanised, especially in terms of the metropolitan population. The population share living in metropolitan areas above 1 million is roughly 4 times higher in high-income (47%) than in low-income countries (12%). This confirms the notion that while urbanisation does not necessarily lead to economic development, economic development does not happen without urbanisation.

- In advanced economies, urbanisation historically occurred at the same time as a structural shift from agriculture to manufacturing and, more recently, as a transition to the service sector. Thus, the distribution of population across space is linked to countries' economic structure. For example, a large service sector and a high proportion of people living in metropolitan areas go together in European and OECD countries.

- However, the link between urbanisation and structural transformation is less clear in less advanced economies. While Asia mainly urbanised through a process of industrialisation, many countries in Africa, Latin America and the Middle East have taken a different path to urbanisation, backed by large natural resource rents.

- Within countries, the distribution of the metropolitan population across metropolitan areas differs by countries' economic development. In middle-income countries, the dominance of a few large metropolitan areas creates a higher concentration of metropolitan population. In high-income countries, the metropolitan system is spatially more balanced as a larger number of large metropolitan areas are more spread out across the territory. Therefore, regional economic disparities differ by level of economic development. They are largest in middle-income countries, where the GDP per capita in the most metropolitan regions is twice as large as the per capita income in the least metropolitan regions.

- Different patterns of migration and human capital accumulation within countries appear to drive spatial disparities. Regions with larger shares of metropolitan population record higher net migration than regions with a lower metropolitan population. Human capital accumulation, as measured by the year of schooling of the population, is also higher in metropolitan regions, although to a much larger extent outside European and OECD countries. There, people living in the most metropolitan regions are on average almost 2.6 years more educated than inhabitants of the least metropolitan regions.

Economic development and the distribution of people over space

Urbanisation and economic development go hand in hand

Many countries have experienced sizeable shifts in the geographic distribution of their population over the past decades, in particular developing countries. Population growth paired with gradually increasing urbanisation rates have resulted in an expansion in the size of some cities, a shrinking population in others, and the emergence of entirely new cities. Population growth in Africa and Asia has been especially rapid in the previous two decades. Between 1990 and 2015, the population living in cities with more than 10 million people more than doubled, and 10 of these cities emerged, including 7 in Asia, as well as Istanbul, Lagos and Teheran (see Chapter 4 for more details).

Despite the sharp increase in urbanisation in developing countries, countries with higher per capita GDP (purchasing power parity [PPP], 2011 USD) still tend to be more urbanised. This finding is visible at different points in time between 1975 and 2015. More specifically, building on data covering 168 countries in 2015, a positive and statistically significant correlation is consistently observed between national GDP per capita and measures of urbanisation. The latter include the share of people living in metropolitan areas, in cities only or cities, towns and semi-dense areas. The term "metropolitan areas" in this publication is used as a shorthand for functional urban areas (FUAs), i.e. cities plus their commuting zones.[1] While national GDP per capita is positively correlated with all three measures of urbanisation, the correlation is strongest when the share of the population in metropolitan areas is considered (see Annex 3.A for a detailed description). Also, from a theoretical point of view, it would seem most appropriate to look at the connection of urban development with the share of people that are part of cities' labour markets, i.e. live in metropolitan areas.

Consequently, this chapter aims to describe the relationship between economic development and the spatial distribution of the population across metropolitan areas (with more than 50 000 inhabitants).[2] This relationship is examined at different spatial scales and through different lenses, depending on the question of interest. The fact that urbanisation and economic development often tend to go hand in hand raises the question of which one drives which. There are good reasons to believe that causality runs both ways. It is generally argued that while the fact that countries urbanise does not necessarily imply that they will develop (Henderson, 2010[1]), sustainable economic growth does not occur without urbanisation.

### *Higher levels of development correspond to larger metropolitan areas*

As countries develop, the share of people living in metropolitan areas increases and does so relatively more in the largest ones. The average share of a country's total population living in metropolitan areas is only 34% in low-income countries, but 71% in high-income countries (Figure 3.1). Between low- and high-income countries, the relative difference in the population share in metropolitan areas increases with the size of the metropolitan area. While the share of the population living in metropolitan areas with up to 1 million inhabitants is roughly the same across the different income classes, the population share living in metropolitan areas with more than 1 million is roughly 4 times higher in high-income countries than in low-income countries. Even more striking, the share of inhabitants of metropolitan areas with more than 5 million inhabitants is roughly 13 times as high in high-income than in low-income countries. More precisely, when moving from low- to high-income countries (i.e. from the left to the right of Figure 3.1), the average share of people living in metropolitan areas with more than 5 million people increases from 2% to 22%. By contrast, the average share of population living in metropolitan areas with less than 250 000 people shrinks with economic development: it halves from 14% in low-income countries to 7% in high-income economies. This pattern is robust to controlling for potentially different average country sizes in the four income groups (see Annex 3.B).

Overall, larger metropolitan areas tend to be relatively more related to national economic development. To some extent, this might be the result of a structural transformation process happening at a higher pace in these areas.

The positive relationship between economic development and the share of the metropolitan population holds also over time. A panel analysis based on GDP and population data in 1990, 2000 and 2015 confirms that, over time, higher economic growth and a larger share of the metropolitan population are correlated (see below). This correlation between economic development and share of the metropolitan population is particularly strong in countries at low and middle stages of development relation.

Figure 3.1. Economic development and population in metropolitan areas, 2015

Share of population in metropolitan areas of different sizes by income group
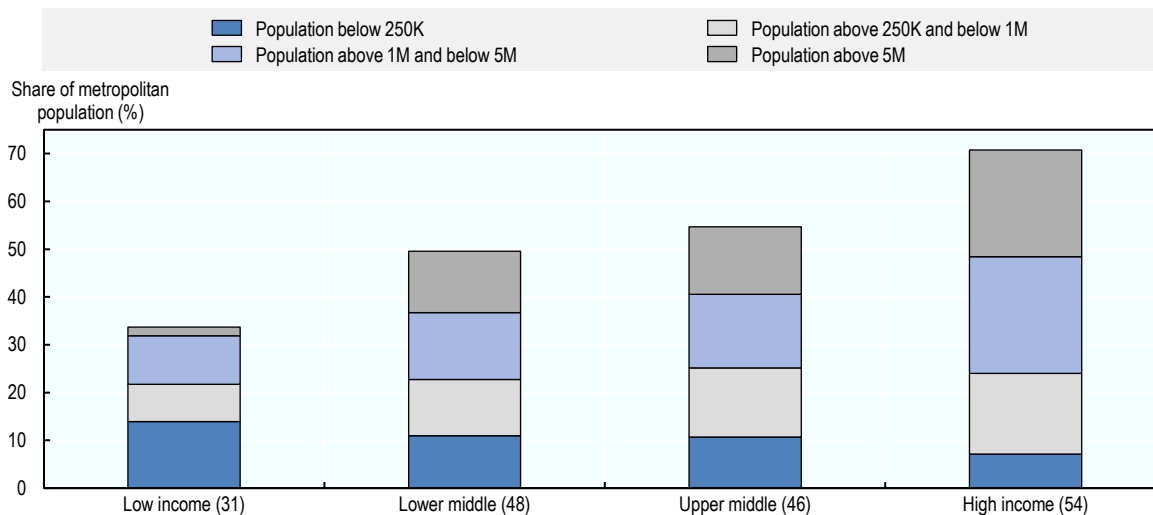
Note: Metropolitan areas refer to functional urban areas (FUAs), which are composed of cities of at least 50 000 inhabitants plus their respective commuting zones. The number of countries in each income group is reported in parentheses. This figure shows the total population in each metropolitan area size class divided by the total population in each income group (as defined by the World Bank income categories in 2015). Similar patterns hold when restricting the attention to the share of population living in cities, as well as when looking at the share of the metropolitan population in 1990 and 2000.

Source: OECD calculations based on GDP data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

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Economic theories on why urbanisation is connected to economic development

Traditional economics has long viewed the process of urbanisation through the lens of structural transformation. When countries develop, they experience structural changes in their economic sectors and therefore urbanise. In particular, the spatial distribution of the population, employment, and production changes with economic development (Desmet and Henderson, 2015[3]). Theories on structural transformation state that the transition to modern economic growth is intrinsically linked to rural-urban migration through a declining share of employment in rural agriculture and a shift toward manufacturing and service industries in cities (Rostow, 1960[4]). Thus, urbanisation occurs for two concurrent reasons when economies develop. First, productivity gains in agriculture release rural labour and push employment toward cities. Second, the rise of industrial sectors (for example those driven by enhanced international trade), pull resources towards cities (Gollin, Parente and Rogerson, 2002[5]; Michaels, Rauch and Redding, 2012[6]; Jedwab, Christiaensen and Gindelsky, 2017[7]).

Other views stress the importance of technological progress in allowing for urbanisation, citing, for example, the role of sewage, surges in agricultural productivity, high-rise buildings or urban transport as factors allowing for increasing levels of urbanisation. Agglomeration benefits (see Box 3.1) and increased innovation arising in decently-functioning cities would then drive economic development. This would be accompanied by a sectoral transformation as when people move out of rural areas into urban centres, they typically shift from agricultural to manufacturing and service activities (Henderson, 2010[1]; Duranton, 2015[8]; Glaeser, 2014[9]; Jedwab and Vollrath, 2015[10]). These non-agricultural sectors have high rates of productivity growth and agglomeration effects in urban areas also promote further economic growth.

Causality likely runs both from economic development to urbanisation, and from urbanisation to economic development. That is, as countries develop, they become more urbanised, which in turn drives economic development. Examples of such a virtuous circle encompass countries in Europe and the United States since the 18th-19th centuries, Japan and South Korea since the mid-20th century, as well as China and India more recently (Glaeser et al., 1992[11]; Duranton, 2008[12]; Glaeser and Gottlieb, 2009[13]).

Box 3.1. Agglomeration economies

In cities, agglomeration economies arise because some economic factors make it beneficial for firms and households to be located close to each other (OECD, 2015[14]; Collier, Jones and Spijkerman, 2018[15]). The mechanisms that create agglomeration benefits can be broadly split into three groups: sharing, matching and learning (Duranton and Puga, 2004[16]; de la Roca and Puga, 2017[17]).

Sharing of facilities or inputs by a large number of firms generates the critical mass that is needed for the provision of certain goods and services that involve high fixed costs (e.g. large infrastructure). Larger labour markets result in better matches between employers and employees, which raises productivity. Finally, technology spillovers allow businesses to learn from other nearby located businesses about the latest production methods. In larger cities, more businesses in similar sectors exist, yielding more opportunities to learn and adopt the most efficient production methods. Furthermore, access to finance and venture capital might be larger in locations with existing agglomerations of successful firms.

Overall, agglomeration economies can have large effects. OECD estimates suggest that productivity increases by 2%-5% for a doubling population size, which is in line with comparable studies for individual countries (Ahrend et al., 2014[18]; Combes, Duranton and Gobillon, 2011[19]). Other recent studies find even larger estimates in African and other developing economies (Henderson, Nigmatulina and Kriticos, 2018[20]), which might be particularly relevant for today's rapidly urbanising countries. However, agglomerations also give rise to disadvantages and specific costs, which can discourage migration to cities. Higher prices of land, housing and cost of living can offset the benefits of being located in a city. Moreover, factors like air pollution or congestion increase when cities become larger, further reducing the benefits of agglomeration.

Source: OECD (2015[14]), *The Metropolitan Century: Understanding Urbanisation and its Consequences*, https://dx.doi.org/10.1787/9789264228733-en; Collier, P., P. Jones and D. Spijkerman (2018[15]), *Cities as Engines of Growth: Evidence from a New Global Sample of Cities*; Duranton, G. and D. Puga (2004[16]), "Micro-foundations of urban agglomeration economies", http://dx.doi.org/10.1016/S0169-7218(04)07048-0; Ahrend, R. et al. (2014[18]), "What Makes Cities More Productive? Evidence on the Role of Urban Governance from Five OECD Countries", https://dx.doi.org/10.1787/5jz432cf2d8p-en; Combes, P., G. Duranton and L. Gobillon (2011[19]), "The identification of agglomeration economies", http://dx.doi.org/10.1093/jeg/lbq038; Henderson, J., D. Nigmatulina and S. Kriticos (2018[20]), *Measuring Urban Economic Density*, http://dx.doi.org/10.1596/1813-9450-8678.

Despite supporting evidence from developed countries, structural transformation is no longer the main explanation for urbanisation in many developing countries. Particularly in Sub-Saharan Africa, high levels of urbanisation are not accompanied by industrialisation. Here, urbanisation has proceeded without the development of significant and competitive manufacturing sectors (Henderson and Kriticos, 2018[21]).[3] A stream of recent studies argues that the income effects of natural resource exploitation have driven urbanisation without industrialisation across many countries of the continent (Gollin, Jedwab and Vollrath, 2016[22]). Other studies suggest that rural deprivation has induced significant migration to African cities for reasons such as civil wars, deficient rural infrastructure and services, and climatic variability (Fay and Opal, 1999[23]; Collier et al., 2010[24]; Henderson, Storeygard and Deichmann, 2016[25]). Furthermore, a combination of high fertility rates in cities and declining urban mortality played a leading role in driving

urbanisation (Jedwab and Vollrath, 2019[26]). Finally, structural change seems to have played out differently in many resource-rich countries in Africa and Latin America, where labour has moved into low-productivity sectors or informality rather than high productivity (Mcmillan, Rodrik and Verduzco-Gallo, 2014[27]). The following three sections provide evidence on the relevance of structural transformation for urbanisation and examine developing and developed countries separately, while further distinguishing between resource-exporting and non-resource-exporting developing countries.

Evidence on structural transformation at play

The structure of countries' economies differs with their economic development, as previously mentioned. Across the world, higher GDP per capita is associated with a lower share of agriculture, and higher shares in manufacturing and services in the economy (Figure 3.2). In fact, the macroeconomic literature documents that modern economic growth is intrinsically linked to the transition of the economy from agriculture to manufacturing and services (see Herrendorf, Rogerson and Valentinyi (2014[28]) for a review). While the decrease of agriculture and the increase in the service sector is steady with economic development, manufacturing behaves differently. Its share in the economy follows a hump shape. It increases for lower levels of development, peaks at some moment in time, and then starts to decrease for higher levels of development. This transition of the economy between different sectors implies that the spatial distribution of the population, employment and production processes change, and some of these shifts will favour urbanisation. Most of today's developed economies have undergone this path during the first wave of urbanisation that accompanied the Industrial Revolution. Improvements in agricultural productivity driven by innovation occurred in Great Britain before the 18th century and spread to other parts of Europe, which coincided with a move of workers out of agriculture and into manufacturing. As a larger population could be sustained from farming the same amount of land, the number of people that could live in cities increased leading to fast urbanisation (Allen, 2012[29]). In this context, however, it is also important to note that urbanisation itself typically leads to shifts in sectoral activity, for example by resulting in an increasing weight of the service sector in the economy.

Figure 3.2. As countries grow, the sectoral composition of the economy changes

Average value-added per economic sector (as a share of total value-added in the three sectors) by income group
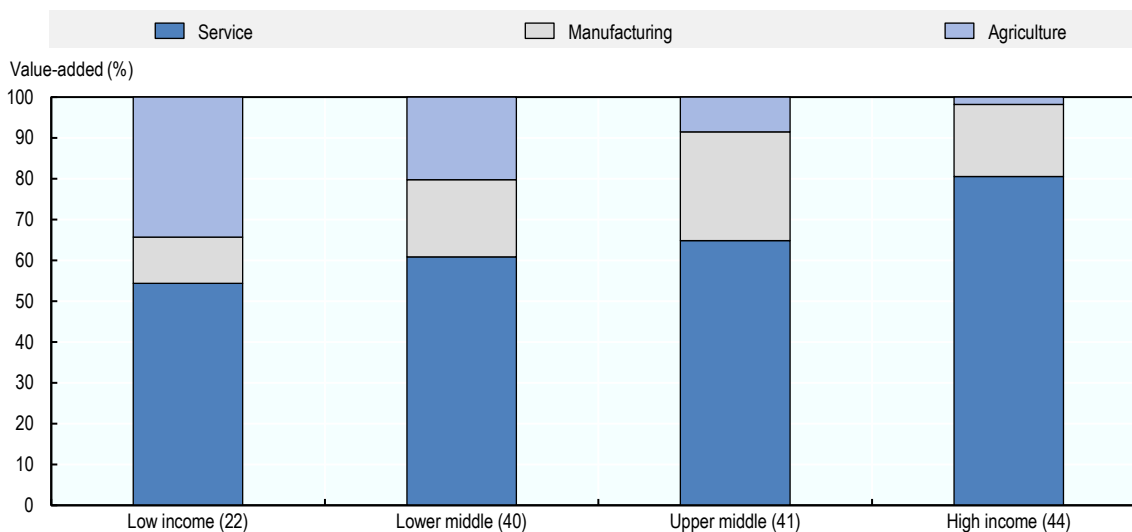
Note: Data refer to the year 2015. Only countries with available sectoral information are included. The number of countries in each category is reported in parentheses. First, for every country, the value-added shares in each sector are computed. Then, these values are considered when taking population-weighted averages by income group the country belongs to in 2015.
Source: OECD calculations based on sectoral composition data from the World Bank.

Manufacturing vs. services in the context of urbanisation

The relative importance of the manufacturing and service sectors in the context of urbanisation depends on countries' economic development and the respective start of urbanisation. In countries that were at the forefront of industrialisation, the share of employment in manufacturing peaked as early as the first half of the 20th century (OECD, 2015[14]). Among advanced economies today, the share of the metropolitan population is positively correlated with the importance of the service sector and negatively correlated with the importance of manufacturing in the economy (Figure 3.3).[4]

Today's developed economies, which mostly experienced industrialisation in the past, now heavily rely on metropolitan areas as important locations for tertiary activities. This results from two factors. Urban dwellers typically consume more services than those in rural areas, implying a shift towards services with urbanisation. At the same time, as the service sector benefits from agglomeration economies, the availability of information technology (IT) and the large variety of amenities that cities and their commuting zones offer, a larger service sector may lead to an increase in population in metropolitan areas.[5] This is consistent with the observation that developed countries that remain more manufacturing-intensive tend to have smaller metropolitan areas in relative terms, partly driven by the fact that manufacturing has become spatially more dispersed and services spatially more concentrated (Desmet and Henderson, 2015[3]).

Figure 3.3. Structural transformation and the metropolitan system in European Union and OECD countries, 2015

Rich countries with larger metropolitan areas have more service-based economies
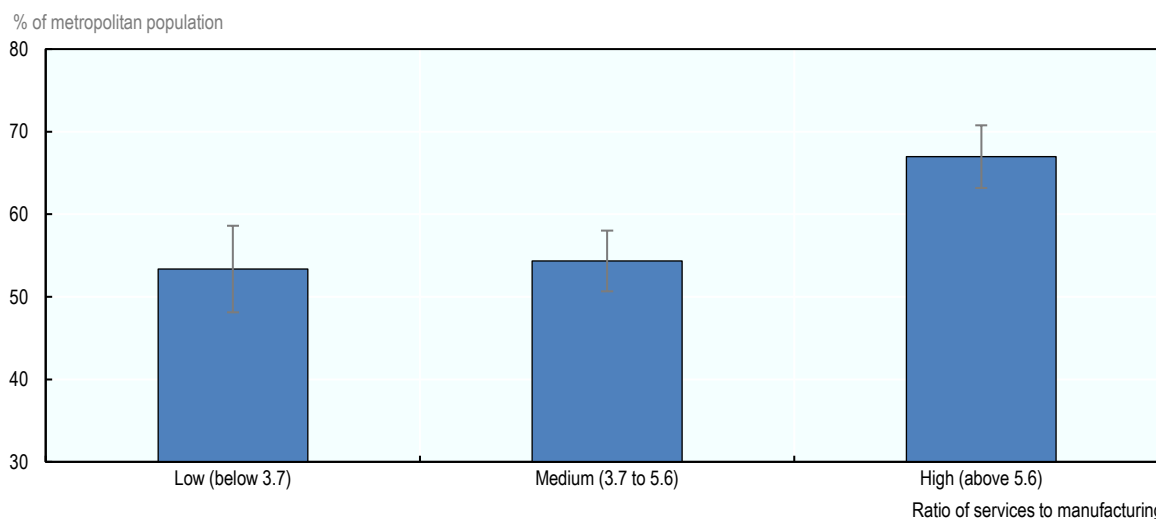
Note: Unweighted average of country values. Horizontal categories are defined using terciles of the ratio of value-added share in the service and the manufacturing sector. Only countries with available sectoral information are included. 90% confidence intervals are reported. Similar results are obtained with high-income countries as defined by the World Bank.
Source: OECD calculations based on sectoral composition data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

The empirical pattern in developing countries contrasts with the experience of developed economies. For developing countries, there is no clear link between a more metropolitan population and a more service-based economy (relative to manufacturing, see Annex 3.C). Two factors could explain the different experience compared to developed countries. First, for most of those developing countries that have been industrialising, industrialisation occurred later than in developed economies and thus manufacturing could

still play an important role in driving urbanisation in those places. Second, the presence of natural resources in many developing countries, especially in Africa but also in Latin America, has attenuated the link between structural transformation and the shape of the metropolitan system. Among those resource-rich countries, many never fully experience industrialisation but transitioned directly from agriculture to services, mostly consisting of non-tradable, low-value-added services often in the informal economy (Mcmillan, Rodrik and Verduzco-Gallo, 2014[27]). The next section takes a closer look at those resource-rich developing countries that seem to have followed a different path to urbanisation with a markedly different structural change than both high-income countries that urbanised early and countries in Asia such as China.

An alternative path: Urbanisation without industrialisation

Industrialisation and urbanisation do not necessarily need to go hand in hand. A number of recent studies show that different urbanisation paths can occur, as in the case of many African and Middle Eastern countries with large natural resource endowments (Gollin, Jedwab and Vollrath, 2016[22]; Collier et al., 2010[24]). Positive productivity shocks to the resource sector draw workers into the sector and out of agriculture and other tradable sectors. Surplus income generated from natural resource extraction can, in turn, generate a strong rise in the demand for urban goods and services (relative to food), in particular, if the government transfers a larger than proportional share of the tax intake from natural resource extraction to the urban population, which frequently appears to be the case. This added demand is met largely through imports (except for urban services, which are produced locally). As a result, urbanisation is driven by consumption, not production, creating "consumption cities" (Lall, Henderson and Venables, 2017[30]). In fact, evidence from the harmonised global definition of metropolitan areas confirms that among less advanced economies, countries with a higher share of natural resource exports have a larger proportion of people living in metropolitan areas (column 3 of Annex Table 3.C.1). In a sample of 82 countries, there is a positive and statistically significant association between the metropolitan population and resource exports (as a share of total merchandising exports).[6]

Although there is a positive association between economic development and the size of metropolitan areas across both resource exporting and non-resource exporting developing countries, the process that shaped the urban system differs substantially across these economies (column 4 of Annex Table 3.C.1). For those countries that rely relatively little on natural resource exports, industrialisation (measured by the share of manufacturing in the economy) and the size of the metropolitan system are strongly correlated. In contrast, for resource exporters, the share of the population living in metropolitan areas is relatively high, and this share is unrelated to the size of the manufacturing sector (see Annex Figure 3.C.2). Recent work supports this finding. In Africa and Latin America, where for many countries natural resources account for a large share of exports, the relatively productive sectors such as natural resource extraction or certain parts of manufacturing have not been able to absorb the surplus labour from agriculture (Mcmillan, Rodrik and Verduzco-Gallo, 2014[27]). Instead, workers have mostly moved into low-productivity services and informality.

Overall, these findings correspond to two widely discussed but distinct paths to urbanisation, namely the different experiences in Africa and Asia as well as parts of Latin America. In East Asia and South Asia, countries mainly urbanised via a process of industrialisation. More recently, those countries have increasingly transitioned to service-based economies. In contrast, many countries in Sub-Saharan Africa and Latin America did not experience a notable structural transformation. Resource-rich countries in Africa and Latin America often urbanised without developing a strong manufacturing sector, with increases in urbanisation instead of being driven by resource rents. In those countries, structural change may not have been growth-increasing as in Asia because labour did not move to high-productivity activities, but often ended up in low-productivity activities, in particular in the informal sector (Mcmillan, Rodrik and Verduzco-Gallo, 2014[27]; OECD, 2016[31]). Encouragingly, evidence suggests that, at least in Africa, the effect of

structural change on productivity has passed a turning point, positively contributing to overall productivity growth in recent years (Mcmillan, Rodrik and Verduzco-Gallo, 2014[27]).

Regional economic development and the metropolitan system

The distribution of population across metropolitan areas differs with economic development

A positive association between economic development and the share of metropolitan population leaves open the question of the spatial distribution of the metropolitan population at different stages of development. A growing metropolitan population might result in a homogenously-distributed and low-concentrated metropolitan system, characterised by similarly medium-sized metropolitan areas. At the same time, it may also lead to an unbalanced and highly concentrated metropolitan system, with one or a few highly populated metropolitan areas and many smaller ones may arise.

Across the world, there is a non-linear relationship between the stage of development of a country and the concentration of the metropolitan population across different metropolitan areas. The dominance of a few large metropolitan areas over the remaining ones tends to increase from low to intermediate stages of development. For richer countries, the metropolitan system is more balanced, with a lower concentration of the metropolitan population in a few metropolitan areas. This non-linear pattern is shown in Figure 3.4, in which the Gini index is used to measure the spatial concentration of the metropolitan population.[7] These results hold when using different measures of concentration, such as the coefficient of variation of the metropolitan population, the Herfindahl-Hirschman Index (HHI), and the coefficients from Zipf's law between rank and population for the largest 10 metropolitan areas in the country.[8]

The presence of a few large metropolitan areas rather than the predominance of a single one best explains the higher concentration of metropolitan population in countries at intermediate stages of development. Regression analysis confirms that primacy, i.e. the share of the largest metropolitan area in the national metropolitan population, first increases and then decreases as income grows. However, the ratio between the largest and second-largest metropolitan areas does not. This suggests that it is not the difference between the largest metropolitan areas and the subsequent ones that drives the inverted U-shaped correlation between metropolitan concentration and development. Rather, it is more likely to be the existence of a few large metropolitan areas dominating over the remaining smaller ones.[9]

The non-linear relationship between economic development and the concentration of the metropolitan system, depicted in Figure 3.4, is often characterised as a regional development issue. As countries urbanise, the process of urbanisation proceeds at first in a small number of regions where a large share of the metropolitan population concentrates (more discussion in the next section). With further economic development, there might be greater regional convergence. According to Barro and Sala-i-Martin (1991[32]), such regional convergence would be driven by a catching-up of backward regions.

To some extent, the relationship between growth and the concentration of metropolitan population might also reflect the transition from agriculture to manufacturing and, subsequently or directly without far-reaching industrialisation, to the service economy that countries may experience as they develop. If the geographical use of space differs across sectors, then a country's overall spatial organisation will change as the relative importance of different sectors evolves. In particular, the shift from agriculture to manufacturing could create imbalances in the distribution of the metropolitan population. Locational advantages, together with agglomeration economies, could explain the formation and sustained growth of only a few large metropolitan areas experiencing fast industrialisation compared to others remaining behind. For instance, historical proximity to agricultural land, natural resources or navigable waterways have been important factors for the emergence of metropolitan areas in the first place. Later on, agglomeration economies make it convenient for businesses and workers to move to the existing high-

density areas, thus creating a virtuous circle. This transition that accompanies countries from low- to middle-income levels helps to describe the initial positive relationship between the Gini index for the metropolitan population and GDP per capita (Figure 3.4, lighter part of the line).

Figure 3.4. Economic development and the concentration of the metropolitan population

Higher values of the Gini coefficient indicate a higher concentration of a country's total metropolitan population
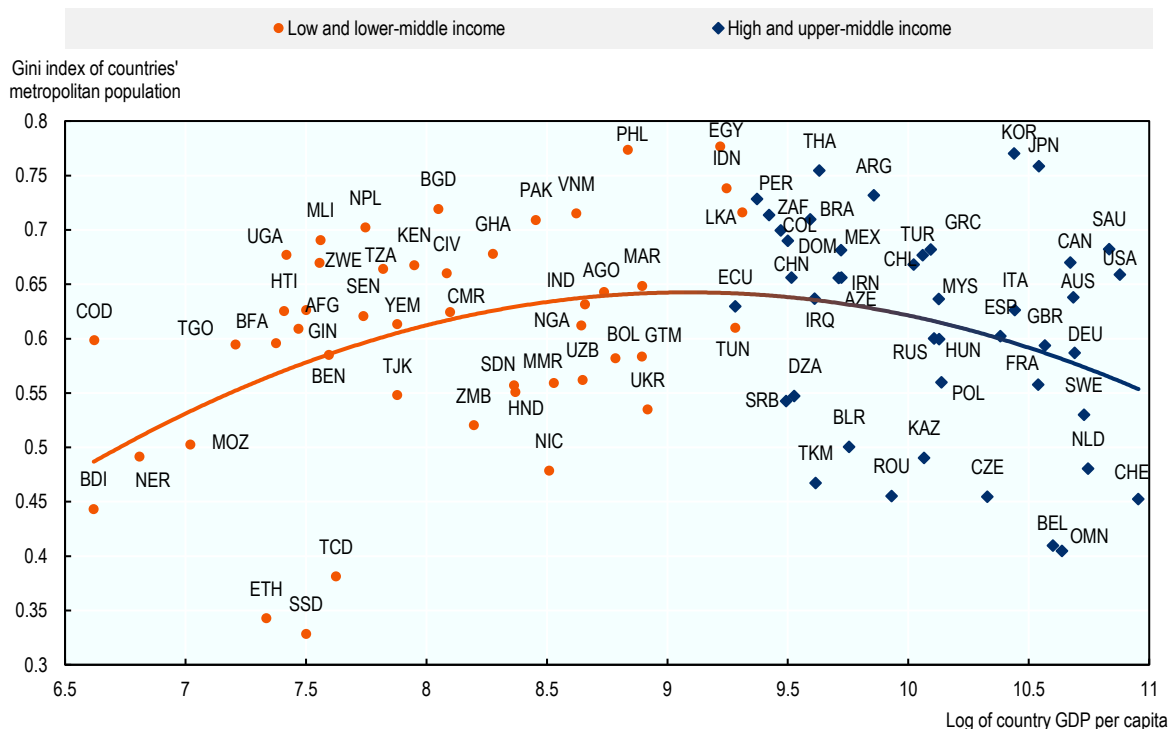
Note: Eighty-nine countries are included. For a meaningful interpretation of the Gini coefficient, countries with less than ten metropolitan areas are excluded from the computation. The R-squared of the regression that includes the log (country GDP per capita) and its quadratic value is 0.12. The estimated value of GDP per capita at which Gini reaches its maximum is almost USD 10 000. A similar pattern is obtained when using the coefficient of variation in the metropolitan population rather than the Gini index.

Source: OECD calculations based on data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

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However, even within a given sector, the geographical use of the space may change over time, as sectors transition from being young to being mature. For instance, as mentioned above, European countries and the United States have experienced deconcentration in manufacturing and greater concentration in services in past decades. In part, this is explained by the fact that younger industries stand more to gain from knowledge spillovers, which are enhanced by the geographic concentration of economic activity (Desmet and Henderson, 2015[3]). As a result, with manufacturing becoming spatially more dispersed, the population in small- or medium-sized metropolitan areas could increase, compensating existing imbalances. This transition, which is more likely to occur at more advanced stages of development, is a possible explanation underlying the negative relationship between the Gini index and GDP per capita (Figure 3.4, darker part of the line). As pointed out in the previous section, many developing countries in Africa and certain countries in Latin America followed a different path to urbanisation than most of

North America, Asia and Europe did beforehand. They urbanised without far-reaching industrialisation and without significant gains in productivity. This markedly different experience, especially in Africa, raises the question of whether today's low-income countries will follow the same trajectory of moving to a more balanced metropolitan system as they develop.

Box 3.2. Income inequality and the concentration of the metropolitan population

A large literature dating back to Williamson (1965[33]) has examined the link between regional development and spatial as well as overall interpersonal income inequality. In most OECD countries, income inequalities have been rising over the last three decades and the global financial crisis has further increased inequality and poverty rates (OECD, 2015[34]). Rising inequality has not only been connected with other macro-level trends such as globalisation or skill-biased technical progress but also with the evolution of metropolitan areas (Hamnett, 1994[35]).

In developed economies, there is a positive and significant relationship between the spatial concentration of the metropolitan population within the country and the level of interpersonal income inequality among its citizens (Figure 3.5). Countries with a more unbalanced metropolitan system, as measured by the Gini coefficient of the metropolitan population, tend to have a higher Gini inequality index of personal income. The result is robust to the inclusion of controls such as the country per capita GDP and total population. Importantly, this positive association does not imply a causal relationship due to many omitted factors that could simultaneously influence both variables. Nevertheless, some hypotheses to explain this finding can be outlined.

In OECD countries, larger metropolitan areas display higher levels of income inequality (Boulant, Brezzi and Veneri, 2016[36]). As a result, countries characterised by the dominance of a few big metropolitan areas over the remaining smaller ones could exhibit higher interpersonal income inequality overall. In fact, the gap between high- and low-skilled jobs tends to widen in metropolitan areas, where the effect of globalisation on workforce polarisation are stark (OECD, 2016[37]). Moreover, the high socio-economic residential segregation of the rich and the poor that metropolitan areas exhibit is also closely connected to higher income inequality (OECD, 2018[38]).

High-productivity gains due to agglomeration economies in larger metropolitan areas could also imply that an unequal distribution of the metropolitan population might translate into economic disparities across subnational regions, which are a crucial component of the overall interpersonal income inequality (Milanović, 2005[39]). In this respect, recent studies have shown that variation in individuals' earnings in the United States (US) has an important spatial dimension. Much of the 1970s-2010s increase in earnings inequality resulted from increased dispersion of the earnings among the establishments where individuals work, rather than within-establishment differences (Barth et al., 2016[40]).

Imbalances in the distribution of the metropolitan population might also be correlated with other socio-economic factors, which can, in turn, explain interpersonal income inequality. Examples include the level of economic development or the degree of trade openness of a country, its fiscal and political decentralisation as well as the level of linguistic and ethnic segregation (Ezcurra and Rodríguez-Pose, 2017[41]). Moreover, internal conflicts, which undermine trust, social and political stability, might be correlated with the distribution of both income and people over space (Kanbur and Venables, 2005[42]).

Figure 3.5. Income inequality and spatial concentration in developed countries

Higher values of the Gini coefficients indicate higher interpersonal income inequality (vertical axis) or higher concentration of the country's total metropolitan population (horizontal axis)

Note: Only high and upper-middle-income (42) countries are included. Moreover, countries with less than ten metropolitan areas are excluded from the computation of the Gini index of the metropolitan population. The coefficient of the underlying regression is 0.44 and the associated R-squared is 0.26. Results are robust to the inclusion of (the log of) country GDP per capita and total population.
Source: OECD calculations based on disposable household income inequality data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Finally, another plausible explanation for the observed relationship is that the expected returns from moving to a metropolitan area are higher if there is greater interpersonal income inequality. A job at the upper end of the distribution is worth more if inequality is high and these jobs are predominantly found in metropolitan areas, especially in the largest ones. Therefore, in this view, the higher level of income inequality in a country might influence the distribution of people over space.

Source: Williamson, J. (1965[33]), "Regional inequality and the process of national development: A description of the patterns", *Economic Development and Cultural Change*, Vol. 13/4, pp. 1-84; OECD (2015[34]), *In It Together: Why Less Inequality Benefits All*, https://dx.doi.org/10.1787/9789264235120-en; Hamnett, C. (1994[35]), "Social polarisation in global cities: Theory and evidence", http://dx.doi.org/10.1080/00420989420080401; Boulant, J., M. Brezzi and P. Veneri (2016[36]), "Income Levels And Inequality in Metropolitan Areas: A Comparative Approach in OECD Countries", https://dx.doi.org/10.1787/5jlwj02zz4mr-en; OECD (2016[37]), *Making Cities Work for All: Data and Actions for Inclusive Growth*, https://dx.doi.org/10.1787/9789264263260-en; OECD (OECD, 2018[38]), OECD (2018), *Divided Cities: Understanding Intra-urban Inequalities*, https://dx.doi.org/10.1787/9789264300385-en; Milanovicᶦ, B. (2005[39]), *Worlds Apart: Measuring International and Global Inequality*, Princeton University Press; Barth, E. et al. (2016[40]), "It's where you work: Increases in the dispersion of earnings across establishments and individuals in the United States", http://dx.doi.org/10.1086/684045; Ezcurra, R. and A. Rodríguez-Pose (2017[41]), "Does ethnic segregation matter for spatial inequality?", http://dx.doi.org/10.1093/jeg/lbx007; Kanbur, R. and A. Venables (2005[42]), *Spatial Inequality and Development*, http://dx.doi.org/10.1093/0199278636.001.0001.

The income gap between regions with the highest and lowest metropolitan population shares decreases with economic development

Economic disparities across regions within a country are often relatively high. They typically go beyond simple income inequality and can be found in numerous dimensions such as productivity, housing prices, job opportunities and access to services (OECD, 2018[43]). Whether lagging regions are converging to economically more advanced ones is therefore of crucial importance when considering the persistence of regional inequality (see Box 3.3). Socio-economic disparities often emerge when comparing regions with a different share of the metropolitan population. A newly assembled dataset consisting of a sample of about 1 500 subnational regions from 82 countries (described in Annex 3.D) allows examining to what extent regional disparities in various socio-economic dimensions change with the share of the regional population in metropolitan areas. Similarly, it allows to assess how such disparities are associated with country-wide economic development.

At higher stages of economic development, countries tend to have a more equal distribution of resources across the most and the least metropolitan regions. Thus, economic development has largely reduced regional disparities in terms of GDP per capita in today's industrial countries. Similar patterns hold for a range of well-being indicators other than GDP per capita, such as unemployment, consumption and human capital (World Bank, 2009[44]).

Structural transformation helps to explain the link between spatial inequality and regional development. In agrarian economies, regional differences are limited. Early industrialisation leads to clusters of manufacturing activity emerging in particular locations, leading to an increase in regional income disparities. As industrialisation spreads and agriculture loses importance across the economy, those income differences decline (Desmet and Henderson, 2015[3]).

The US economy provides an example for the rise of regional differences at earlier stages of development, and their subsequent decline later on. In fact, US income per capita across regions diverged during the 19th century and early 20th century and converged afterwards (yet at a much slower pace over the last 30 years (Ganong and Shoag, 2017[45])). Changes in the industrial structure across regions help to explain these patterns. During the industrialisation of the northeast and the formation of the manufacturing belt, regional differences in the share of manufacturing increased and with it, regional differences in income per capita. At the beginning of the 20th century, this trend reversed. The states which had most agriculture initially were also the ones where agriculture declined the most and where income per capita growth was strongest. This led to a more equal redistribution of income gains across regions (Kim and Margo, 2004[46]).

Box 3.3. Economic growth and income convergence across regions

There is substantial inequality among regions of the same country that needs to be understood. For example, according to a data set based on the OECD regional database and Gennaioli et al. (2014[47]) (see Annex 3.D), the richest region in the average country is 4.7 times richer than the poorest one, a difference roughly similar to that between South Africa and the United States in 2010. Sometimes, these differences can be more extreme. Moreover, poor countries display a greater dispersion of regional GDP levels than rich countries. Because these income differences summarise past growth trajectories, understanding the speed of regional convergence can shed light on the persistence of regional inequality.

The work by Gennaioli et al. (2014[47]) systematically studies regional convergence by using a large sample of subnational regions. To compute GDP growth rates, the authors expand the dataset from Gennaioli et al. (2013[48]) by collecting time-series data on regional GDP as well as human capital. Using

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data on 1 528 regions in 83 countries, they analyse the patterns of convergence among regions and compare them to convergence across countries.

According to their estimates, regions converge by around 2% per year within a country. The national convergence rate is around 1%, not much slower than the regional rate. This result is puzzling. Barriers to the mobility of human and physical capital are arguably much less important within than between countries, implying that the difference between regional and national convergence should be higher than what is observed in reality.

The authors explore whether slow regional convergence is the product of institutional barriers to regional mobility of resources. They find that regional convergence is indeed faster in richer countries, consistent with the latter having lower regional inequality, and in countries with better-regulated capital markets and fewer trade barriers.

The research raises the puzzle of slow convergence between subnational regions but does not provide a resolution of this puzzle. Potentially critical factors accounting for regional growth such as structural transformation, technology diffusion and urbanisation should be taken into account. One potential explanation might be that regional convergence is mostly driven by technological catch-up rather than migration (Barro and Sala-I-Martin, 1992[49]).

Source: Gennaioli, N. et al. (2014[47]), "Growth in regions", http://dx.doi.org/10.1007/s10887-014-9105-9; Gennaioli, N. et al. (2013[48]), "Human capital and regional development", http://dx.doi.org/10.1093/qje/qjs050; Barro, R. and X. Sala-I-Martin (1992[49]), "Regional growth and migration: A Japan-United States comparison", *Journal of the Japanese and International Economies*, Vol. 6/4, pp. 312-346.

Income disparities between more and less metropolitan regions are larger in countries at intermediate stages of development

Over time, there is a common pattern of rising differences in income between more and less metropolitan regions, followed by a process of regional convergence. Consequently, the relation between national income per capita and regional dispersion in income per capita often exhibits an inverted-U-shaped pattern, a phenomenon called "spatial Kuznets curve" (Kim, 2008[50]; Combes et al., 2011[51]). Consistent with the evidence on the spatial Kuznets curve, findings based on the globally consistent definition of metropolitan areas show that economies at intermediate stages of development tend to have larger regional income disparities between more and less metropolitan regions than the poorest and the richest countries (Box 3.4).10 In particular, in lower- and upper-middle-income countries, the GDP per capita in the most metropolitan regions is twice as large as in the least metropolitan regions. By contrast, in low and high-income economies, this gap more than halves, with income per capita around 40% higher in the most metropolitan region compared to the least metropolitan region (Figure 3.6).

Box 3.4. Regional income according to share of the population in metropolitan areas

The figure below reports the percentage difference in GDP per capita of regions compared to the least metropolitan region in their respective country. This difference in GDP per capita varies with the share of the metropolitan population in a region. Average differences are presented separately for two groups of countries. The lighter, dashed line presents the regional income disparities based on metropolitan population for middle-income countries. The darker, solid line shows those disparities for high- and low-income countries.

The higher the metropolitan population share of regions in middle-income countries is, the richer they tend to be (dashed line, Figure 3.6). The y-axis shows the relative income difference to the least metropolitan region in the country. Regions in middle-income countries with 90%-100% of the

population in metropolitan areas have twice the GDP per capita level of the least metropolitan region in the same country.

Figure 3.6. Income disparities between less and more metropolitan regions by stage of development

Countries at intermediate stages of development have larger regional income disparities
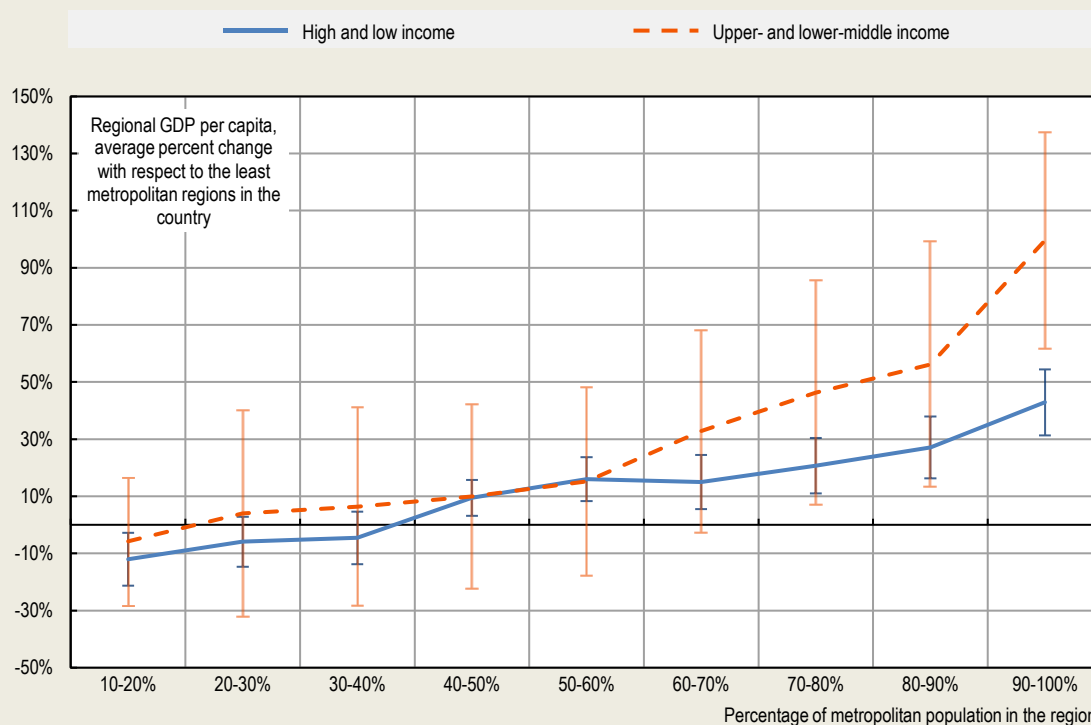
Note: Data refer to the year 2000. The solid line uses data on 567 regions in 36 countries. The dashed line uses data on 932 regions in 45 countries. The chart reports coefficients on a set of dummies, one for each category of metropolitan population share, and the respective 95% confidence intervals. The omitted dummy is the one referring to 0%-10% of the metropolitan population. Hence, each number needs to be interpreted with respect to the average regional GDP per capita in regions with less than 10% of their population living in metropolitan areas. Each number is statistically significant when the associated confidence interval does not overlap with the horizontal (0%) line.
Source: OECD calculations based on GDP data described in Annex 3.D, population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297, and country's income group data from the World Bank.

The findings suggest that a part of the spatial Kuznets curve may be explained by the higher advantages of urbanisation in middle-income countries. With economic development, countries tend to follow a process of urbanisation, which is concentrated in a few regions. This increases spatial inequality. In countries at higher stages of development, urbanisation spreads more evenly across regions, potentially mitigating spatial income disparities. In countries with lower development, a rapidly increasing concentration of population and economic activity in a country's metropolitan areas takes place. As a result, significant disparities in productivity, wages and basic welfare may occur between regions with higher and lower shares of the metropolitan population. The concentration of capital, consumers and workers brings production advantages to metropolitan regions, which benefit from agglomeration economies. Larger local markets enable firms to spread the fixed costs of production across a wider number of consumers and lead to productivity advantages. This, in turn, is reflected in higher wages in metropolitan areas and greater availability of a more diversified range of goods and services (World Bank, 2009[44]).

The metropolitan population is larger in regions with higher GDP growth rates

Within countries, a larger share of the metropolitan population in 1990 is associated with faster regional economic growth over the last 25 years (Figure 3.7). This finding holds in both EU, OECD and other countries, yet the pattern seems to be clearer in the former. Figure 3.7 shows the average share of metropolitan population for different categories of regional GDP growth, in deviations from the country averages. Regions with very low relative GDP growth rates had 5 percentage point lower metropolitan population shares compared to the national average. In contrast, regions with very high GDP per capita growth had metropolitan population shares that were almost 8 percentage points higher than the country average.

Figure 3.7. The share of metropolitan population and regional GDP per capita growth

Within countries, regions with a relatively larger share of the metropolitan population grew faster

All 53 countries
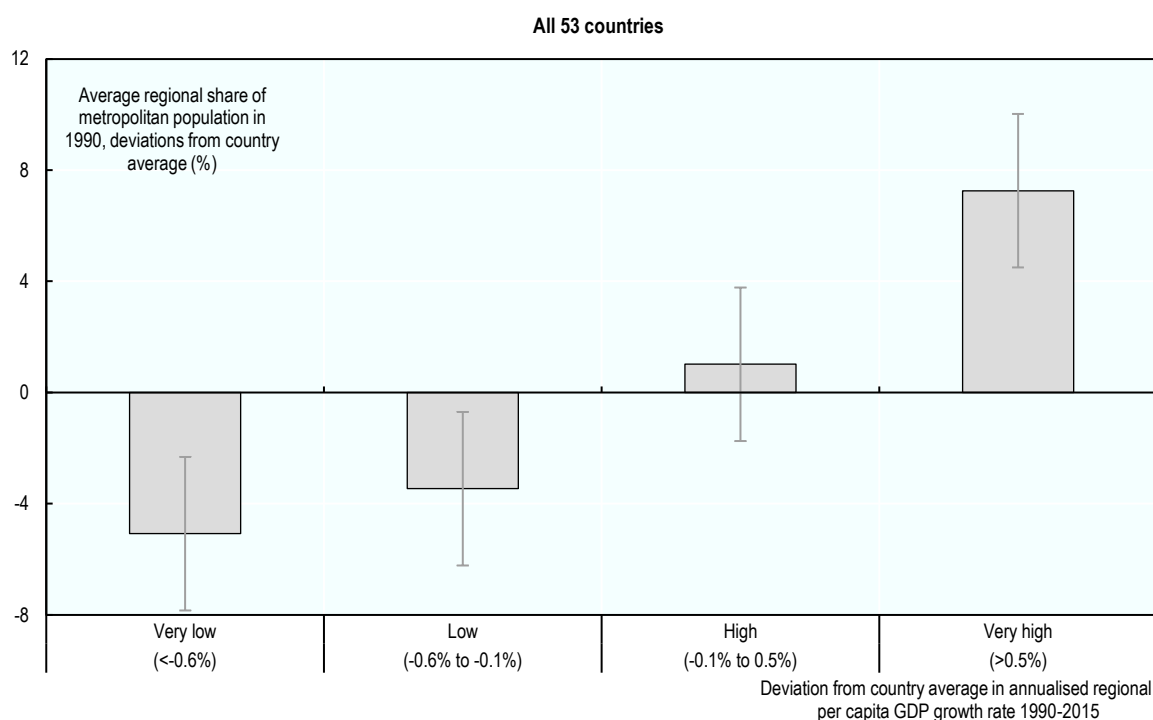
Note: Data on 641 regions in EU+OECD and 444 regions in other countries. 95% confidence intervals are reported. Annualised GDP growth rates (1990-2015) controlling for country dummies and 1990 GDP levels are used to build categories on the horizontal axis. Each category contains the same number of regions (quartiles of GDP growth), ordered from the smallest to the highest value of growth rate. Growth is based on constant price GDP.

Source OECD calculations based on GDP data described in Annex 3.D and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Within the EU and the OECD, this pattern is even more striking. Regions, where per capita GDP grew much faster than their countries' average, have a share of the metropolitan population that is 10 percentage points larger than the respective country average in1990. The corresponding number for countries outside of the EU and OECD is slightly above 6 percentage points. Regression analysis confirms these findings.

The positive association between regional economic development and the share of the metropolitan population holds also when GDP levels are considered. In fact, regions with a larger share of the metropolitan population have higher GDP per capita levels in 2015. Regression analysis on 1 153 regions

in 57 countries with available data for 2015 shows that, on average, a 1% rise in GDP per capita relative to the country GDP per capita is associated with a 0.25 percentage point increase in the share of metropolitan population.[11] The relationship is larger in EU and OECD countries, where the estimate is 0.43, more than twice as large as the corresponding number for other economies.

Theories on structural transformation and agglomeration economies help explain the positive association between economic growth and the share of the metropolitan population across subnational regions. Similar to countries, regions' economic sectors transition from agriculture to manufacturing or from manufacturing to services when they develop.

In developing countries, agricultural productivity differentials across regions can be large, implying that industrialisation is unevenly spread over the territory. Adoption of new technologies yields productivity gains in agriculture in regions with high growth potential, releasing rural labour and promoting the development of the industrial sector, thus pushing workers towards metropolitan areas where industries tend to be located. As a consequence, the level of migration towards metropolitan areas may differ substantially across space.

In regions in developed countries, economic development goes hand in hand with technological progress and labour-saving innovations, which reduce employment in manufacturing and boost the transition to services and knowledge-intensive professions. While manufacturing becomes spatially more dispersed, services concentrate in high-density areas, where they benefit from knowledge spillovers and information technology (IT) infrastructure. As a result, metropolitan areas become the centres of innovation and creativity, home to IT-intensive industries with high growth potentials. While further growth of the service economy might benefit metropolitan areas and induce economic growth, the documented pattern does not offer any information on whether faster GDP per capita growth in more metropolitan regions will continue.

Regions with a high share of metropolitan population today were also denser in the past. They experienced productivity growth over time due to economic factors that, in the long run, make it beneficial for firms and households to be located close to each other such as lower transport costs, better employer-employee matches and knowledge spillovers. These factors create productivity advantages and higher wages, which in turn attract more workers and firms. As a result, metropolitan areas that already have many businesses and people attract even more and grow in this process.

Box 3.5. The economic performance of OECD metropolitan areas

Is per capita income higher in metropolitan areas? In the following, this box examines whether GDP per capita is higher in OECD metropolitan areas than the respective national average. Using data from the OECD Metropolitan Database on the 630 metropolitan areas in OECD countries allows for a comparison of GDP levels, both in absolute and per capita terms.

Cities and their commuting areas are key contributors to the national socio-economic performance. In 2015, the 563 metropolitan areas with available data accounted for almost 55% of the total population and more than 60% of the total GDP of the entire OECD area. The economic importance of metropolitan areas reflects their large potential for job creation, innovation and green growth, as well as the fact that these places are hubs and gateways in global trade and transport networks (OECD, 2015[14]).

Within OECD countries, metropolitan areas have around 10% higher GDP per capita levels than their respective country (Figure 3.8). In contrast, areas outside metropolitan areas have an average GDP per capita equivalent to 92% of the country average. Moreover, the larger the metropolitan area is, the higher is its GDP per capita. To show this, the figure below reports the average ratio of GDP per capita in metropolitan areas (and non-metropolitan areas) with respect to that in their countries. While the largest metropolitan areas with more than 5 million people have more than 25% higher per capita income levels than their respective country, this is not true for smaller metropolitan areas. In fact, metropolitan areas

below a population of 1 million inhabitants actually record lower GDP per capita than the national average. More specifically, regression analysis indicates that the population threshold at which the average GDP per capita in the metropolitan areas exceeds that of their countries is, on average, 700 000 inhabitants.

Figure 3.8. Per capita income in metropolitan areas and their countries, 2015

Larger metropolitan areas have higher per capita income relative to their countries
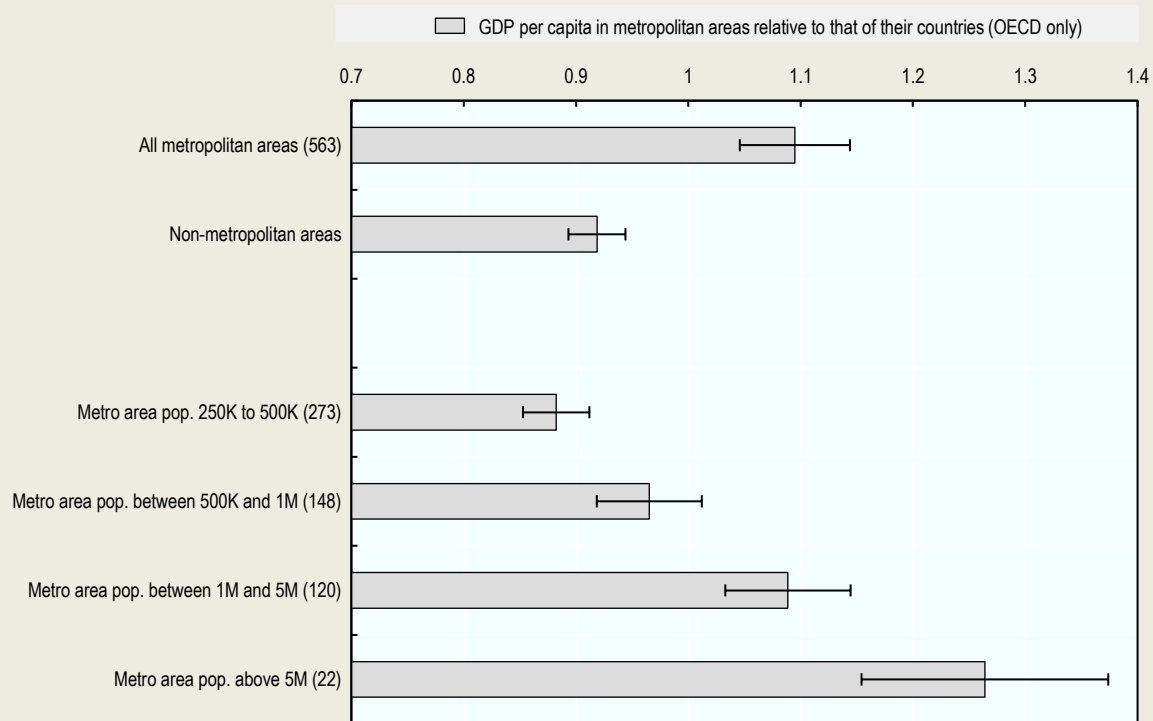
Note: Population-weighted averages of the ratio of GDP per capita in metropolitan areas relative to that of their countries are reported.
Source: OECD (n.d.[52]), *OECD Metropolitan Database*, https://stats.oecd.org/Index.aspx?Datasetcode=CITIES.

StatLink https://doi.org/10.1787/888934130341

Larger metropolitan areas are generally more productive, and hence have higher per capita GDP. However, although this is true on average, there are many differences across countries (see Annex Figure 3.D.1). Recent OECD studies suggest that for each doubling population size, the productivity level of a city increases by 2%-5% (Ahrend et al., 2014[18]). This is due to several factors, such as greater competition or deeper labour markets (and thus a better matching between workers and jobs) in larger cities, but also due to a faster spread of ideas, higher levels of human capital and a more diverse intellectual and entrepreneurial environment. Finally, it is important to mention that higher nominal GDP per capita levels do not necessarily imply that people are richer in real terms. In fact, prices of goods and services tend to be higher in larger metropolitan areas and this could offset the larger per capita income of their population (Ahrend and Lembcke, 2017[53]).

Source: OECD (n.d.[52]), *OECD Metropolitan Database*, https://stats.oecd.org/Index.aspx?Datasetcode=CITIES; OECD (2015[14]), *The Metropolitan Century: Understanding Urbanisation and its Consequences*, https://dx.doi.org/10.1787/9789264228733-en; Ahrend, R. et al. (2014[18]), "What Makes Cities More Productive? Evidence on the Role of Urban Governance from Five OECD Countries", https://dx.doi.org/10.1787/5jz432cf2d8p-en; Ahrend, R. and A. Lembcke (2017[53]), "Does it pay to live in big(ger) cities? The role of agglomeration benefits, local amenities, and costs of living", http://dx.doi.org/10.2139/ssrn.2925676.

Migration as a mechanism of regional disparities

Net migration towards metropolitan regions might partly explain regional income gaps within countries

Higher availability of job opportunities makes metropolitan areas attractive for migrants. As a result, immigration and emigration flows differ across regions within a country. These flows have been rising over the past few decades, due to large demographic and economic imbalances, ongoing conflicts and consequences of climate change such as droughts and floods. Since migration has important economic implications, understanding regional differences in migration patterns is essential. Migration typically boosts the working-age population and migrants can contribute to long-term economic growth and technological progress provided their skills are well used (OECD, 2019[54]).

The share of the immigrant population (defined as the proportion of international and domestic population aged 15 years or older moving into a given region within 5 years of a given census) tends to be larger in metropolitan regions.[12] Estimates indicate that a 10 percentage point higher share of metropolitan population is associated with an almost 2 percentage points higher share of immigrants.[13] In other words, with respect to their resident population, regions with a larger proportion of their population living in metropolitan areas tend to host more immigrants than other regions. This is depicted by the grey dashed line in Figure 3.9, which shows the additional share of the immigrant population that metropolitan regions experience compared to the least metropolitan ones.

More metropolitan regions not only have a higher share of immigrants but also a lower share of emigrants, resulting in higher net migration than in less metropolitan regions. A 10 percentage point increase in the share of the metropolitan population is associated with a drop in the share of emigrants by almost 3.8 percentage points (solid line in Figure 3.9).[14] Overall, more metropolitan regions record higher net migration gains (dash-dotted line in Figure 3.9). Although this analysis gives only a static picture, it may reconcile with the overwhelming evidence on the unprecedented growth of cities and their areas of influence in the 20th century, and especially over the last 40 years.

Both economic and non-economic factors can entice migration to metropolitan regions. Non-economic considerations often include amenities, such as access to better healthcare, education facilities and specialised shopping opportunities, which make metropolitan areas attractive (see Chapter 2 for detailed evidence). Moreover, cities and their areas of influence offer larger networks that make it more likely for newcomers to find people who share similar cultural and ethnic backgrounds. Economic considerations relate to push and pull factors that determine people's movements from the least to the most metropolitan regions. Structural transformation or lower income in rural areas pushes migrants from agriculture-intensive places towards metropolitan areas. At the same time, higher wages in metropolitan areas have a pull effect on workers. Similarly, thick labour markets in metropolitan regions result in more job opportunities and better matches between employers and employees. Finally, metropolitan areas offer migrants learning possibilities that accrue over time and bring them lasting benefits.[15]

Figure 3.9. Migration and the share of people in metropolitan areas

Net migration is larger in metropolitan regions due to higher immigration and lower emigration
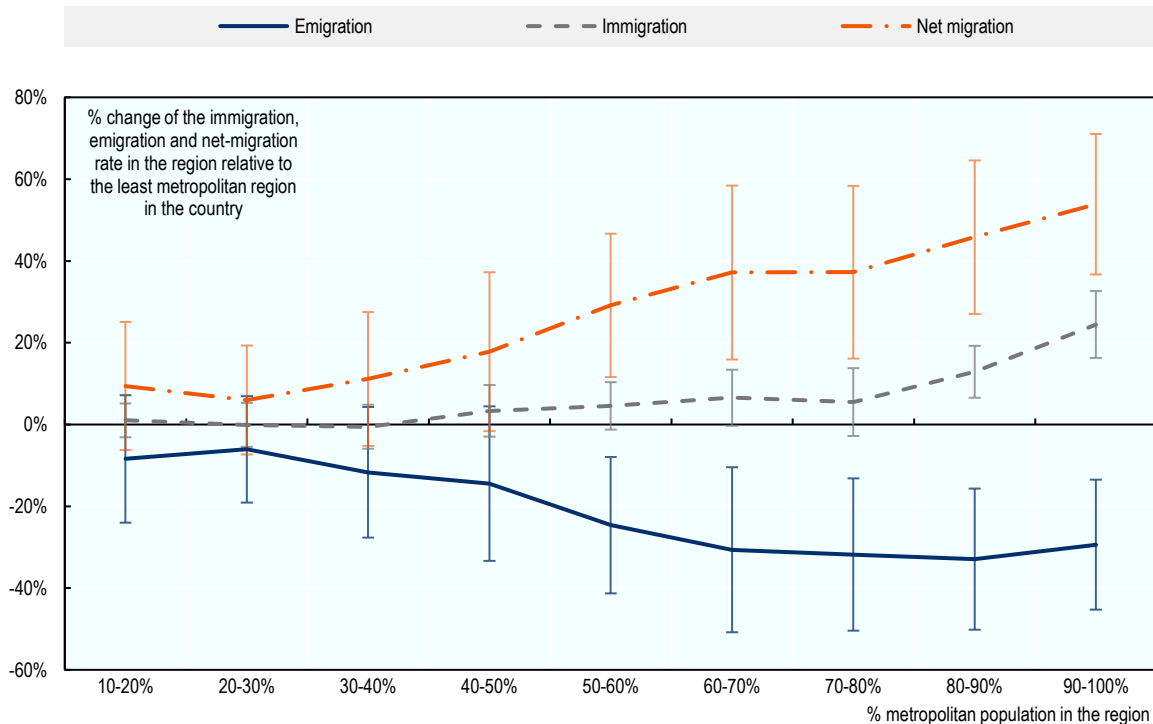
Note: Data on 683 regions in 32 countries, of which 2 are low-income, 9 are lower-middle, 13 are upper-middle and 8 are high-income, as defined by the World Bank. The share of migrants (emigrants) is defined as the proportion of international and domestic population aged 15 years or older moving into (from) a given region within 5 years of a given census. Data refer to the years between 1990 and 2010. For each region, the most recent available year is considered. The chart reports coefficients on a set of dummies, one for each category of metropolitan population share, and the respective 95% confidence intervals. The omitted dummy is the one referring to 0%-10% metropolitan population. Each line corresponds to a separate regression, where the dependent variable is, alternatively, the share of emigrant and immigrant population, and their sum. Hence, each number needs to be interpreted with respect to the average shares in regions with less than 10% of their population living in metropolitan areas. Each number is statistically significant when the associated confidence interval does not overlap with the horizontal (0%) line.

Source: OECD calculations based on migration data described in Annex 3.D and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Metropolitan regions attract more skilled workers

Metropolitan regions attract and generate more educated residents. These regions are hubs for higher education institutions and manage to maintain high human capital levels as graduates often stay on after their studies to take advantage of better job opportunities. The complementarities between universities and thick labour markets create a virtuous circle: the higher the human capital of a region, the bigger the incentive for skill-intensive firms to locate in the region and, as a result, the larger the number of highly skilled individuals that will move there.

Overall, regions with a larger share of metropolitan population have higher human capital levels, as measured by the average years of schooling. Based on a dataset of human capital in more than 1 500 regions in 110 countries (described in Box 3.6), regions with more than half of their population living in metropolitan areas have a population with 0.5 to 1 more year of schooling than regions where the share of metropolitan population is below 10%.[16] In EU+OECD countries, people living in the most metropolitan regions (above 90% of metropolitan population share) are on average almost 1 year more educated than

inhabitants of the least metropolitan regions (below 10% of metropolitan population share). Overall, estimates indicate that a 10 percentage point higher share of metropolitan population is associated with average education levels being more than 1 month higher.[17] In a typical OECD country like France, the least metropolitan region (Bourgogne) has about 20% of its population living in metropolitan areas and a corresponding average education of roughly 7.9 years. By contrast, the most metropolitan region in the country (Île-de-France) has an average education of 9.6 years, approximately 20% higher.

Regional disparities in human capital are much larger outside the EU and OECD. Here, the most metropolitan regions display a level of human capital that is, on average, more than 2.6 years higher than that in the least metropolitan regions. In this case, overall, a 10-percentage-point higher share of metropolitan population correlates with education levels being more than 2.5 months higher.[18] Considering China as an example, the Guizhou province has about 27% of its inhabitants living in metropolitan areas and a corresponding average education level of approximately 5.8 years. By contrast, with more than 98% of the metropolitan population share, the most metropolitan region in China (Shanghai) exhibits an average education level of 8.9 years, more than 50% larger.

Box 3.6. Human capital and regional development

Many are the determinants of regional development. A non-exhaustive list includes geography, natural resource endowments, institutions, culture and human capital. The work by Gennaioli et al. (2013[48]) focuses on the latter. The authors build a newly constructed database of 1 569 subnational regions from 110 countries to study the relationship between human capital and income.

Regional human capital, as measured by education, is a critical determinant of regional development, and it explains a substantial share of regional variation. Using data on several thousand firms located in these regions, authors find that regional education influences regional development through education of workers, education of entrepreneurs and regional externalities.

Data from the World Bank Enterprise Survey point directly to the role of the supply of educated entrepreneurs for the creation and productivity of firms. In fact, economic development occurs in regions that concentrate entrepreneurs who run productive firms. These entrepreneurs may also contribute to the exchange of ideas, leading to significant regional externalities. The observed large benefits of education through the creation of a supply of entrepreneurs and through externalities offer an optimistic assessment of the possibilities of economic development through raising educational attainment.

Source: Gennaioli, N. et al. (2013), "Human capital and regional development", http://dx.doi.org/10.1093/qje/qjs050; OECD (2018[55]), *Productivity and Jobs in a Globalised World: (How) Can All Regions Benefit?*, https://dx.doi.org/10.1787/9789264293137-en.

The income gaps between regions with small and large metropolitan population, documented in the section on regional economic development and the metropolitan system, partially reflects higher human capital in metropolitan regions. Human capital is a crucial determinant of economic development. More educated people tend to be more productive and this is reflected in higher wages as well as in larger per capita GDP (Ahrend and Lembcke, 2017[53]). An empirical analysis of more than 1 500 regions in 110 countries shows that, on average, 1 extra year of education among a region's population is associated with almost 26% higher regional GDP levels in 2000 and with a 1.1 percentage points higher annual GDP growth rate between 1990 and 2000 (Box 3.6).[19]

The fact that more metropolitan regions attract more skilled and qualified individuals partly explains their high level of human capital. Amenities such as parks, theatres, museums, restaurants and universities make metropolitan regions attractive for skilled workers and they do so disproportionately more for highly educated individuals. Consequently, people with higher education levels tend to live in more urbanised

regions, thus making those regions more productive. Regression analysis indicates that more than half of the difference in GDP levels and about half of the gap in GDP growth rates between more and less metropolitan regions are explained by the fact that residents in metropolitan regions are on average more educated.[20] In other words, agglomeration economies and the attraction, accumulation and generation of human capital are both roughly equally important factors to explain why metropolitan areas tend to be richer. Migration is only one of the reasons for higher human capital in metropolitan regions

Higher human capital levels in metropolitan regions are typically not only driven by migration but also reflect that locals tend to be more educated in these places. Both in countries within the EU and OECD, as well as elsewhere, the native population in regions with higher proportions of metropolitan population is more educated than in less metropolitan regions. In particular, Figure 3.10 shows that locals in regions with more than 80% of their population living in metropolitan areas are more educated than those in the average region in the country, in the order of almost 1 year (EU+OECD) to 2 years (others).

While immigrants complement locals in terms of education in EU and OECD countries, their skills can be seen as a substitute for those of locals in other countries (Figure 3.10). In EU and OECD countries, the skills of migrants do not appear to differ significantly between regions with low or high population shares in metropolitan areas. Also, migrants do not appear to be systematically more educated than other local residents in metropolitan regions. However, relative to the local native population, migrants appear to be more skilled in regions with small metropolitan populations but less skilled in regions with large metropolitan populations. Thus, migrants appear to offer some skills complementarity with locals.

Figure 3.10. Human capital and migration by metropolitan population in regions
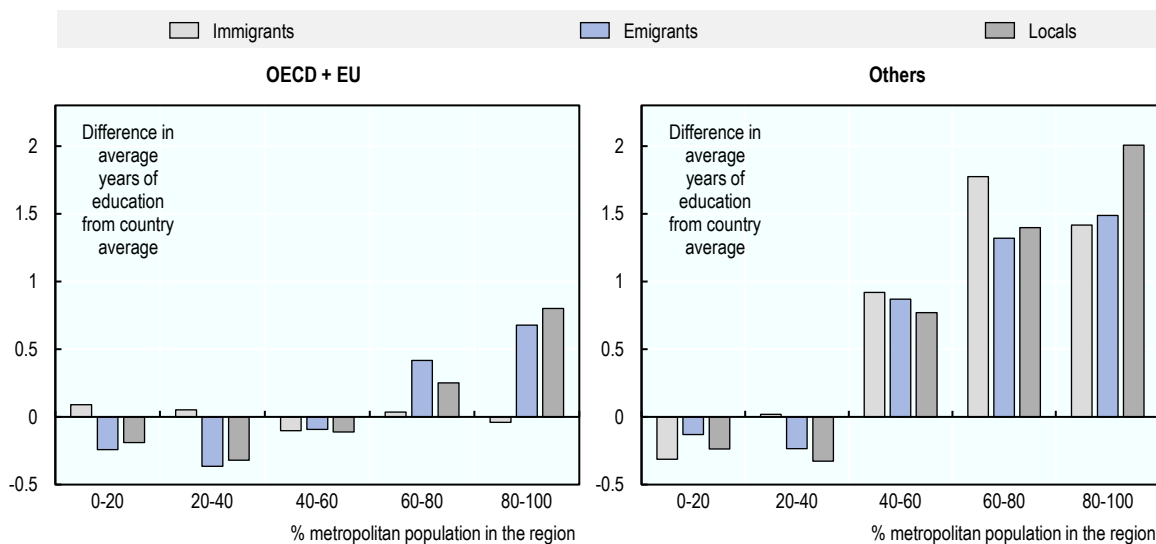
Note: Data on 291 regions in 10 EU+OECD countries and 392 regions in 22 other countries. Data refer to the years between 1990 and 2010. For each region, the most recent available year is considered. The bar charts show the average deviation from the country mean in the number of years of education for immigrants, emigrants and locals, separately, for each bin of metropolitan population share.
Source: OECD calculations based on education and migration data described in Annex 3.D and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

In non-EU and non-OECD countries, migrants appear to be more comparable to natives across regions. Here, immigrants in the most metropolitan regions are, on average, 1.5 years more educated than those who move to the average region in the country, which mimics the pattern observed for natives (Figure 3.10). Broadly speaking, both more skilled migrants and natives concentrate in regions with a larger metropolitan population. Metropolitan areas in countries outside of the EU and OECD are not only important hubs for the creation of human capital but also for attracting highly educated people from other

places. This generates a substitution effect between their respective skill sets. Consistent with this observation, recent studies document that larger cities are skill-abundant and specialise in skill-intensive activities in developing countries (Dingel, Miscio and Davis, 2019[56]).

Two facts may explain the peculiarity of EU+OECD countries in this respect. First, the substantial migration flows from underdeveloped and developing economies that richer countries have been experiencing over the last decades could explain lower education levels of migrants in metropolitan regions (OECD, 2019[57]). In this case, the overall lower levels of human capital of those migrants could offset the inflows of high-skilled domestic workers that metropolitan areas might experience.

Second, incentives for high-skilled individuals to move to metropolitan regions could be lower in the most developed countries. This may occur because skill-intensive job opportunities, amenities and higher education facilities are more evenly distributed across regions in the EU and OECD than in other countries. In other words, the least metropolitan regions in EU and OECD countries offer a wider set of opportunities than similar regions in other economies. As a result, highly educated individuals do not necessarily have to move to the most metropolitan regions to benefit from higher returns to education.

Finally, emigrants with higher human capital levels tend to come from metropolitan regions. In particular, in areas where more than 80% of the population lives in metropolitan areas, emigrants are from 0.7 (EU+OECD) to 1.5 (non-EU+OECD) years more educated than in the average region. To some degree, this is a direct consequence of metropolitan regions having better-educated locals. However, while in countries outside of the EU and OECD, a larger share of educated emigrants in metropolitan regions seems to be compensated by a considerable in-flow of high skill immigrants, this is less true in EU+OECD countries.

To some extent, this might indicate that within EU and OECD countries, human capital tends to be more evenly redistributed from the most to the least metropolitan regions than in other countries, where most of the human capital flows happen to occur across larger and smaller metropolitan areas. Alternatively, the phenomenon could reflect the fact that in the EU and OECD, people move to metropolitan areas to study and some of them leave afterwards. In both cases, evidence from Figure 3.10 points out a crucial, yet somewhat different, role of metropolitan areas between EU and OECD countries and other countries.

References

Ahrend, R. et al. (2014), "What Makes Cities More Productive? Evidence on the Role of Urban Governance from Five OECD Countries"*, OECD Regional Development Working Papers*, No. 2014/5, OECD Publishing, Paris, https://dx.doi.org/10.1787/5jz432cf2d8p-en. [18]

Ahrend, R. and A. Lembcke (2017), "Does it pay to live in big(ger) cities? The role of agglomeration benefits, local amenities, and costs of living", *SSRN Electronic Journal*, http://dx.doi.org/10.2139/ssrn.2925676. [53]

Allen, R. (2012), *The British industrial revolution in global perspective*, Cambridge University Press, http://dx.doi.org/10.1017/CBO9780511816680. [29]

Barro, R. and X. Sala-I-Martin (1992), "Regional growth and migration: A Japan-United States comparison", *Journal of the Japanese and International Economies*, Vol. 6/4, pp. 312-346, https://doi.org/10.1016/0889-1583(92)90002-L. [49]

Barro, R. and X. Sala-i-Martin (1991), "Convergence across states and regions", *Brookings Papers on Economic Activity*, https://www.brookings.edu/wp-content/uploads/1991/01/1991a_bpea_barro_salaimartin_blanchard_hall.pdf. [32]

Barth, E. et al. (2016), "It's where you work: Increases in the dispersion of earnings across establishments and individuals in the United States", *Journal of Labor Economics*, Vol. 34/S2, pp. S67-S97, http://dx.doi.org/10.1086/684045. [40]

Boulant, J., M. Brezzi and P. Veneri (2016), "Income Levels And Inequality in Metropolitan Areas: A Comparative Approach in OECD Countries", *OECD Regional Development Working Papers*, No. 2016/6, OECD Publishing, Paris, https://dx.doi.org/10.1787/5jlwj02zz4mr-en. [36]

Collier, P., P. Jones and D. Spijkerman (2018), *Cities as Engines of Growth: Evidence from a New Global Sample of Cities*, http://pubdocs.worldbank.org/en/356001527999188468/117-Cities-as-Engines-of-Growth-Collier-et-al-28March2018.pdf (accessed on 7 November 2019). [15]

Collier, P. et al. (2010), "Managing resource revenues in developing economies", *IMF Staff Papers*, Vol. 57/1, pp. 84-118, http://dx.doi.org/10.1057/imfsp.2009.16. [24]

Combes, P., G. Duranton and L. Gobillon (2011), "The identification of agglomeration economies", *Journal of Economic Geography*, http://dx.doi.org/10.1093/jeg/lbq038. [19]

Combes, P. et al. (2011), "The rise and fall of spatial inequalities in France: A long-run perspective", *Explorations in Economic History*, Vol. 48/2, pp. 243-271, http://dx.doi.org/10.1016/j.eeh.2010.12.004. [51]

Davis, D. and J. Dingel (2015), "The comparative advantage of cities", *Mimeo*, pp. 1-46, http://dx.doi.org/10.3386/w20602. [60]

de la Roca, J. and D. Puga (2017), "Learning by working in big cities", *Review of Economic Studies*, http://dx.doi.org/10.1093/restud/rdw031. [17]

Desmet, K. and J. Henderson (2015), "The geography of development within countries", in *Handbook of Regional and Urban Economics*, Elsevier B.V., http://dx.doi.org/10.1016/B978-0-444-59531-7.00022-3. [3]

Dijkstra, L., H. Poelman and P. Veneri (2019), "The EU-OECD definition of a functional urban area", *OECD Regional Development Working Papers*, No. 2019/11, OECD Publishing, Paris, https://doi.org/10.1787/d58cb34d-en (accessed on 21 October 2019). [58]

Dingel, J., A. Miscio and D. Davis (2019), "Cities, lights, and skills in developing economies", *Journal of Urban Economics*, http://dx.doi.org/10.1016/j.jue.2019.05.005. [56]

Duranton, G. (2015), "Growing through cities in developing countries", *World Bank Research Observer*, Vol. 30/1, pp. 39-73, http://dx.doi.org/10.1093/wbro/lku006. [8]

Duranton, G. (2008), *Viewpoint: From Cities to Productivity and Growth in Developing Countries*, http://dx.doi.org/10.1111/j.1540-5982.2008.00482.x. [12]

Duranton, G. and D. Puga (2004), "Micro-foundations of urban agglomeration economies", *Handbook of Regional and Urban Economics*, http://dx.doi.org/10.1016/S0169-7218(04)07048-0. [16]

Ezcurra, R. and A. Rodriǵuez-Pose (2017), "Does ethnic segregation matter for spatial inequality?", *Journal of Economic Geography*, Vol. 17/6, pp. 1149-1178, http://dx.doi.org/10.1093/jeg/lbx007. [41]

Fay, M. and C. Opal (1999), *Urbanization Without Growth: A Not So Uncommon Phenomenon*, http://dx.doi.org/10.1596/1813-9450-2412. [23]

Florczyk, A. et al. (2019), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/062975. [2]

Ganong, P. and D. Shoag (2017), "Why has regional income convergence in the U.S. declined?", *Journal of Urban Economics*, Vol. 102, pp. 76-90, http://dx.doi.org/10.1016/j.jue.2017.07.002. [45]

Gennaioli, N. et al. (2014), "Growth in regions", *Journal of Economic Growth*, http://dx.doi.org/10.1007/s10887-014-9105-9. [47]

Gennaioli, N. et al. (2013), "Human capital and regional development", *Quarterly Journal of Economics*, http://dx.doi.org/10.1093/qje/qjs050. [48]

Glaeser, E. (2014), "A world of cities: The causes and consequences of urbanization in poorer countries", *Journal of the European Economic Association*, Vol. 12/5, pp. 1154-1199, https://doi.org/10.1111/jeea.12100 (accessed on 7 November 2019). [9]

Glaeser, E. and J. Gottlieb (2009), "The wealth of cities: Agglomeration economies and spatial equilibrium in the United States", *Journal of Economic Literature*, Vol. 47/4, pp. 983-1028, http://dx.doi.org/10.1257/jel.47.4.983. [13]

Glaeser, E. et al. (1992), "Growth in cities", *Journal of Political Economy*, Vol. 100/6, pp. 1126-1152, http://dx.doi.org/10.1086/261856. [11]

Gollin, D., R. Jedwab and D. Vollrath (2016), "Urbanization with and without industrialization", *Journal of Economic Growth*, Vol. 21/1, pp. 35-70, http://dx.doi.org/10.1007/s10887-015-9121-4. [22]

Gollin, D., S. Parente and R. Rogerson (2002), "The role of agriculture in development", *American Economic Review*, Vol. 92/2, pp. 160-164, http://dx.doi.org/10.1257/000282802320189177. [5]

Hamnett, C. (1994), "Social polarisation in global cities: Theory and evidence", *Urban Studies*, Vol. 31/3, pp. 401-424, http://dx.doi.org/10.1080/00420989420080401. [35]

Henderson, J. (2010), "Cities and development", *Journal of Regional Science*, Vol. 50/1, pp. 515-540, http://dx.doi.org/10.1111/j.1467-9787.2009.00636.x. [1]

Henderson, J. and S. Kriticos (2018), "The development of the African system of cities", *Annual Review of Economics*, Vol. 10/1, pp. 287-314, http://dx.doi.org/10.1146/annurev-economics-080217-053207. [21]

Henderson, J., D. Nigmatulina and S. Kriticos (2018), *Measuring Urban Economic Density*, The World Bank, http://dx.doi.org/10.1596/1813-9450-8678. [20]

Henderson, J., A. Storeygard and U. Deichmann (2016), "Has climate change driven urbanization in Africa?", http://dx.doi.org/10.1016/j.jdeveco.2016.09.001. [25]

Herrendorf, B., R. Rogerson and Á. Valentinyi (2014), "Growth and structural transformation", in *Handbook of Economic Growth*, Elsevier B.V., http://dx.doi.org/10.1016/B978-0-444-53540-5.00006-9. [28]

Hobijn, B. and B. Jovanovic (2001), "The information-technology revolution and the stock market: Evidence", *American Economic Review*, Vol. 91/5, pp. 1203-1220, http://dx.doi.org/10.1257/aer.91.5.1203. [59]

Jedwab, R., L. Christiaensen and M. Gindelsky (2017), "Demography, urbanization and development: Rural push, urban pull and … urban push?", *Journal of Urban Economics*, http://dx.doi.org/10.1016/j.jue.2015.09.002. [7]

Jedwab, R. and D. Vollrath (2019), "The Urban Mortality Transition and Poor Country Urbanization", *American Economic Journal: Macroeconomics*, Vol. 11/1, pp. 223-75. [26]

Jedwab, R. and D. Vollrath (2015), *Urbanization Without Growth in Historical Perspective*, Academic Press Inc., http://dx.doi.org/10.1016/j.eeh.2015.09.002. [10]

Kanbur, R. and A. Venables (2005), *Spatial Inequality and Development*, Oxford University Press, http://dx.doi.org/10.1093/0199278636.001.0001. [42]

Kim, S. (2008), *Spatial Inequality and Economic Development: Theories, Facts, and Policies*. [50]

Kim, S. and R. Margo (2004), "Chapter 66 Historical perspectives on U.S. economic geography", in *Handbook of Regional and Urban Economics*, Elsevier, http://dx.doi.org/10.1016/S1574-0080(04)80023-3. [46]

Lall, S., J. Henderson and A. Venables (2017), *Africa's Cities: Opening Doors to the World*, The World Bank, http://dx.doi.org/10.1596/978-1-4648-1044-2. [30]

Mcmillan, M., D. Rodrik and I. Verduzco-Gallo (2014), "Globalization, structural change, and productivity growth, with an update on Africa", *World Development*, Vol. 63, pp. 11-32, https://doi.org/10.1016/j.worlddev.2013.10.012. [27]

Michaels, G., F. Rauch and S. Redding (2012), "Urbanization and structural transformation", *Quarterly Journal of Economics*, Vol. 127/2, pp. 535-586, http://dx.doi.org/10.1093/qje/qjs003. [6]

Milanović, B. (2005), *Worlds Apart: Measuring International and Global Inequality*, Princeton University Press. [39]

Moreno-Monroy, A., M. Schiavina and P. Veneri (2020), "Metropolitan areas in the world: Delineation and population trends", *Journal of Urban Economics*, https://doi.org/10.1016/j.jue.2020.103242. [61]

OECD (2019), *International Migration Outlook 2019*, OECD Publishing, Paris, https://dx.doi.org/10.1787/c3e35eec-en. [57]

OECD (2019), *OECD Skills Strategy 2019: Skills to Shape a Better Future*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264313835-en. [54]

OECD (2018), *Divided Cities: Understanding Intra-urban Inequalities*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264300385-en. [38]

OECD (2018), *OECD Regions and Cities at a Glance 2018*, OECD Publishing, Paris, https://dx.doi.org/10.1787/reg_cit_glance-2018-en. [43]

OECD (2018), *Productivity and Jobs in a Globalised World: (How) Can All Regions Benefit?*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264293137-en. [55]

OECD (2016), *Making Cities Work for All: Data and Actions for Inclusive Growth*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264263260-en. [37]

OECD (2016), "The implications of Africa's urbanisation for structural transformation", in *African Economic Outlook 2016: Sustainable Cities and Structural Transformation*, OECD Publishing, Paris, https://dx.doi.org/10.1787/aeo-2016-10-en. [31]

OECD (2015), *In It Together: Why Less Inequality Benefits All*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264235120-en. [34]

OECD (2015), *The Metropolitan Century: Understanding Urbanisation and its Consequences*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264228733-en. [14]

OECD (n.d.), *OECD Metropolitan Database*, OECD, Paris, https://stats.oecd.org/Index.aspx?Datasetcode=CITIES. [52]

Rostow, W. (1960), *The Process of Economic Growth*, http://www.sidalc.net/cgi-bin/wxis.exe/?IsisScript=bac.xis&method=post&formato=2&cantidad=1&expresion=mfn=033549 (accessed on 7 November 2019). [4]

Williamson, J. (1965), "Regional inequality and the process of national development: A description of the patterns", *Economic Development and Cultural Change*, Vol. 13/4, pp. 1-84, https://www.jstor.org/stable/1152097. [33]

World Bank (2009), *Reshaping Economic Geography*, The International Bank for Reconstruction and Development. Washington, DC, http://dx.doi.org/10.1596/978-0-8213-7607-2. [44]

Notes

[1] Boundaries of the latter have been estimated for the entire world (Moreno-Monroy, Schiavina and Veneri, 2020[61]).

[2] "Metropolitan areas" is a term that is often used to identify cities plus their connected surroundings for large cities only. In this work, the concept of metropolitan areas is used to define cities and their surroundings, including cities of all sizes, with the minimum threshold of 50 000 inhabitants.

[3] In Africa, farmers also disproportionately live in cities. Furthermore, rural areas have unusually low non-farm activities, which tend to progressively move to cities (Henderson and Kriticos, 2018[21]).

[4] In EU and OECD countries, a larger ratio of gross value-added (GVA) in services to GVA in manufacturing is associated with a more metropolitan population. The results are also confirmed by a regression analysis.

[5] For instance, studies have shown that the impact of IT, which are initially available in denser areas, is greater in services than in manufacturing (Hobijn and Jovanovic, 2001[59]). Even if the use of IT diffuses rapidly within countries, their more complex applications, such as e-commerce, predominantly locate and develop in metropolitan areas, which offer easier access to complementary inventions and activities.

[6] The regression controls for the share of value-added in manufacturing and services.

[7] The Gini index is a measure of inequality that ranges between 0 and 1. In this case, it is used to measure inequality in the distribution of the metropolitan population within a country. Higher values of the Gini coefficient indicate higher concentration of the country total metropolitan population in fewer (larger) metropolitan areas.

[8] The results are confirmed using a regression analysis to test for the non-linear relationship between concentration and development. In particular, on the right-hand side, the regression includes log(GDP per capita), log(GDP per capita) squared and log(total population). The estimated coefficients on squared GDP suggest that results similar to those of Figure 3.4 hold when using different measures of concentration such as the coefficient of variation of the metropolitan population, the Herfindahl-Hirschman Index (HHI), and the coefficients from Zipf's law between rank and population for the largest ten metropolitan areas in the country.

[9] A similar regression analysis as the one described in the note above is used here, where the left-hand side is either primacy (the share of the largest metropolitan area in national metropolitan population) or the ratio between the largest and second-largest metropolitan areas.

[10] The spatial Kuznets curve is about regional disparities in general. The presented analysis focuses on the role of metropolitan areas for regional disparities.

[11] This is the estimated OLS coefficient on (the log of) GDP per capita in 2015 from a regression where the left-hand side variable is the share of metropolitan population. The regression includes country dummies. Standard errors are clustered at the country level (57 countries). The coefficient of interest is statistically significant at the 99% confidence level.

[12] Due to data availability, the dataset used here is a subset of the one used in the analysis of GDP levels.

[13] This is the estimated OLS coefficient on the share of metropolitan population from a regression where the left-hand side variable is the share of immigrant population. The regression includes country dummies. Standard errors are clustered at the country level. The coefficient of interest is statistically significant at the 99% confidence level.

[14] This is the estimated OLS coefficient on the share of metropolitan population from a regression where the left-hand side variable is the share of emigrant population. The regression includes country dummies. Standard errors are clustered at the country level. The coefficient of interest is statistically significant at the 99% confidence level.

[15] Some agglomeration benefits only develop over time. Training, networks and knowledge gained while living and working in a large city are a valuable experience that contributes to the wage premium in metropolitan areas. This is supported by evidence from Spain that even when workers move away from a bigger city, their experience is still reflected in their earnings (de la Roca and Puga, 2017[17]).

[16] These estimates are in line with findings from recent studies on the spatial distribution of skills (Davis and Dingel, 2015[60]).

[17] This is the estimated OLS coefficient on the share of metropolitan population from a regression where the left-hand side variable is the years of schooling in 2000. The regression includes country dummies. Standard errors are clustered at the country level. The coefficient of interest is statistically significant at the 99% confidence level.

[18] See endnote 10.

[19] These are the estimated OLS coefficients on the average years of education from a multivariate regression where the left-hand side variable is either Ln(regional GDP per capita) or the annual GDP per capita growth rate between 1990 and 2000. Country dummies and the share of metropolitan population are included, and additional controls are Ln(population), latitude, distance to coast, malaria indicator, Ln(oil and gas production), capital dummies. Standard errors are clustered at the country level. The coefficients of interest are statistically significant at the 99% confidence levels.

[20] These are the OLS coefficients on the share of metropolitan population from a multivariate regression where the left-hand side variable is Ln(regional GDP per capita) or its growth rate, and Years of Education is added on the right-hand side. Country dummies are included and additional controls are Ln(population), latitude, distance to coast, malaria indicator, Ln(oil and gas production), capital dummies. Standard errors are clustered at the country level. The coefficient of interest is statistically significant at the 99% confidence level.

Annex 3.A. Economic development and different measures of urbanisation

National economic development is more strongly associated with the share of people living in metropolitan areas (functional urban areas, FUAs) than with the proportion of population living cities, towns and semi-dense areas. To some extent, this result could be driven by the algorithm through which metropolitan areas are estimated. However, in OECD countries for which official data are available, this result is consistent and robust to the use of non-estimated population data. While metropolitan areas have a minimum population size of 50 000 inhabitants, cities, towns and semi-dense areas include settlements from 5 000 inhabitants. The right panel of Annex Figure 3.A.1 shows the steeper relationship between the metropolitan population share and GDP per capita for the same sample of 168 countries. For any given level of GDP per capita, the black line provides the expected share of the metropolitan population of a country based on the estimated relationship between the metropolitan population share and GDP. The line points out that, on average, a 1% rise in per capita GDP is associated with a 0.1 percentage point increase in the metropolitan population share. This is almost three times as large as the correlation with the share of people living in cities, towns and semi-dense areas.

Annex Figure 3.A.1. Economic development and types of settlements, 2015

Urbanisation and economic development go hand in hand
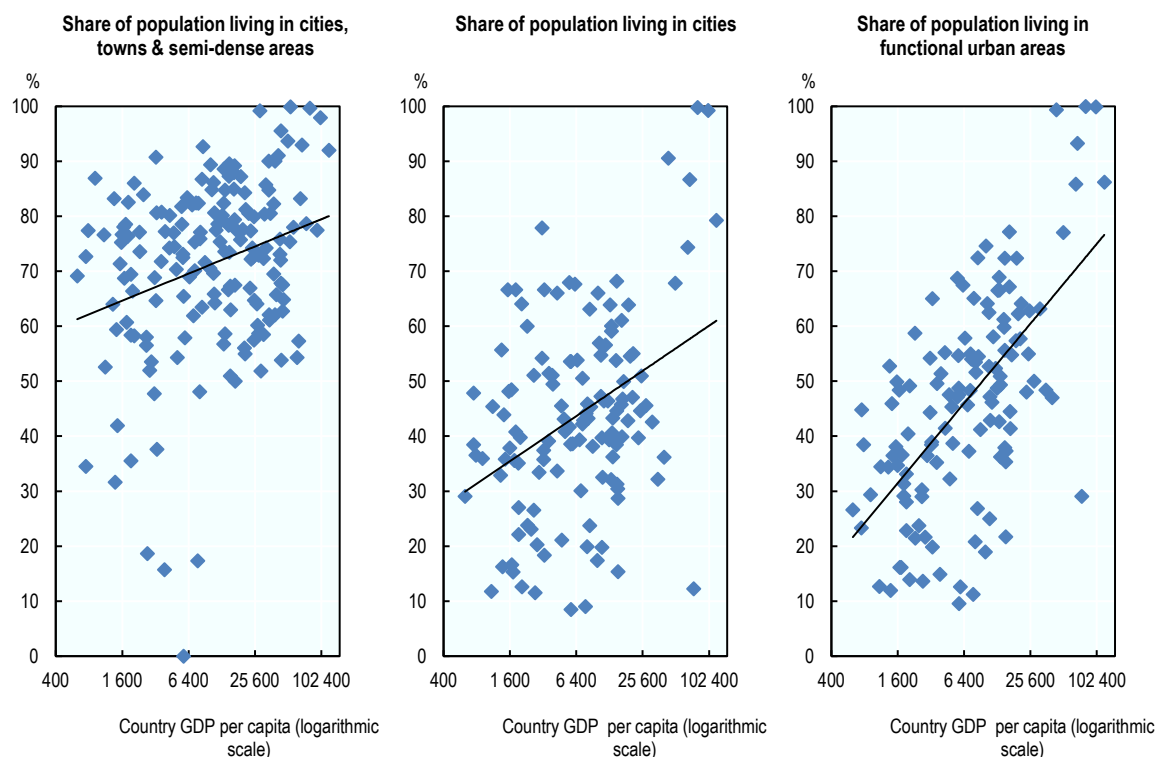
Note: 168 countries are included in each panel. The R-squared coefficients of the underlying regressions are 0.07 (left panel), 0.05 (central panel) and 0.38 (right panel). Similar patterns are obtained for years 1975, 1990 and 2000.
Source: OECD calculations based on GDP data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

The fact that economic development is more strongly associated with the share of population living in metropolitan areas reflects that the concept of FUAs is much broader and goes beyond the consideration of density and population size only. Being composed of a city and its commuting zone, metropolitan areas encompass the economic and functional extent of cities based on daily people's movements (Dijkstra, Poelman and Veneri, 2019[58]). Therefore, considering the share of a country's total population living in metropolitan areas allows measuring the extent to which national development is correlated with the fraction of people that are part of the cities' labour market in the country. For this reason, this chapter focuses on metropolitan areas and their population share.

Annex 3.B. Economic development and metropolitan population by country size

As documented in Figure 3.1, more developed countries have more metropolitan populations. In particular, the more developed a country, the more people live in metropolitan areas of 1 million or more inhabitants. These patterns still seem to hold when restricting the sample to countries of more comparable sizes. The results of Figure 3.1 could be driven by the fact that many low-income countries are small and, in turn, cannot have very large metropolitan areas. However, robustness checks mitigate this concern. By splitting the sample of 168 countries according to their size into 4 quartiles (i.e. groups with about the same number of countries), it is possible to observe that the major increase in the share of people living in greater metropolitan areas occurs in larger countries (Annex Figure 3.B.1). The 4 panels show the correlation between the share of people living in metropolitan areas of different sizes and national GDP for countries with a total population below 3.5, between 3.5 and 10, between 10 and 31, and above 31 million inhabitants. If only countries with a total population above 31 million people are considered (i.e. the largest quartile of country size), these results continue to hold, albeit with smaller sample sizes and are in fact magnified. This sample includes 5 low-, 14 lower-middle, 14 upper-middle and 11 high-income countries.

Annex Figure 3.B.1. Economic development and the geography of metropolitan areas by country size, 2015

Countries across the four graphs are split based on quartiles of their total population in 2015
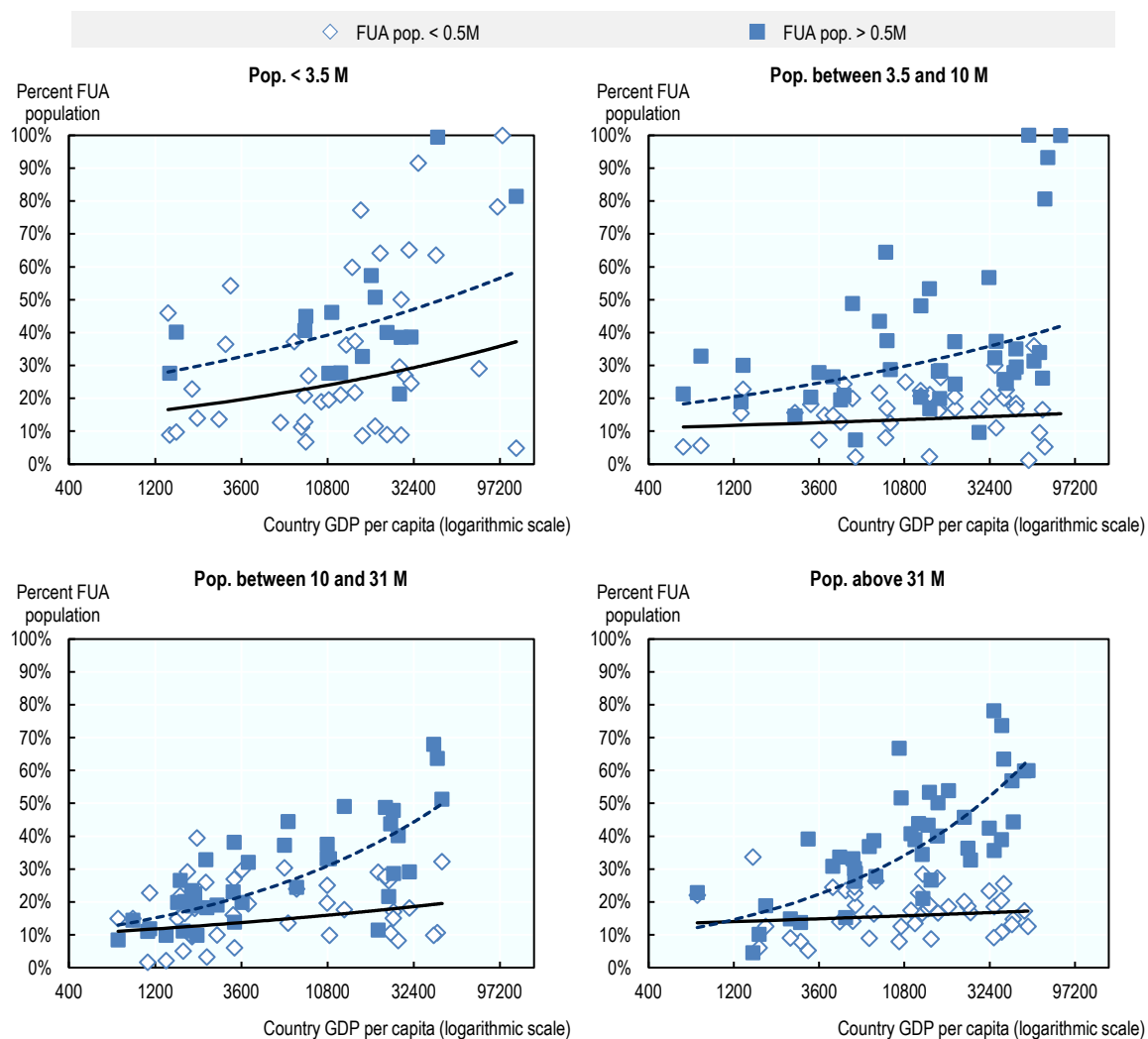
Note: 44 countries are reported in each panel. Similar patterns hold when looking at the share of the metropolitan population in 1990 and 2000.
Source: OECD calculations based on GDP data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Annex 3.C. Resource vs. non-resource exporters

Annex Table 3.C.1. Natural resources and the urban system, 2015

Coloured cells report regression coefficients that are statistically different from zero

	Dependent variable is the share of the metropolitan population (0 to 1)			
	(1)	(2)	(3)	(4)
	EU+OECD		**Others**	
Manufacturing (% of GDP)	0.40	0.40	-0.07	**0.93****
	(0.53)	(0.58)	(0.34)	(0.45)
Services (% of GDP)	**1.62*****	**2.02*****	**0.60*****	**0.48***
	(0.51)	(0.66)	(0.20)	(0.26)
Natural resource exports (% of total merchandise exports)	0.13	0.84	**0.17*****	0.44
	(0.19)	(1.17)	(0.05)	(0.36)
Manufacturing x Natural resource exports		3.50		**-2.00*****
		(3.24)		(0.65)
Services x Resource exports		-1.53		-0.05
		(1.86)		(0.67)
No. of countries	36	36	82	82
R-squared	0.63	0.65	0.50	0.54

Note: Total country population and dummies for regions of the world are included. Only countries with available information on the sectoral composition are included. Heteroskedasticity-consistent standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Sectoral composition data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Annex Figure 3.C.1. Structural transformation and metropolitan population in developing countries

There is no clear link between a move from services to manufacturing in more metropolitan regions
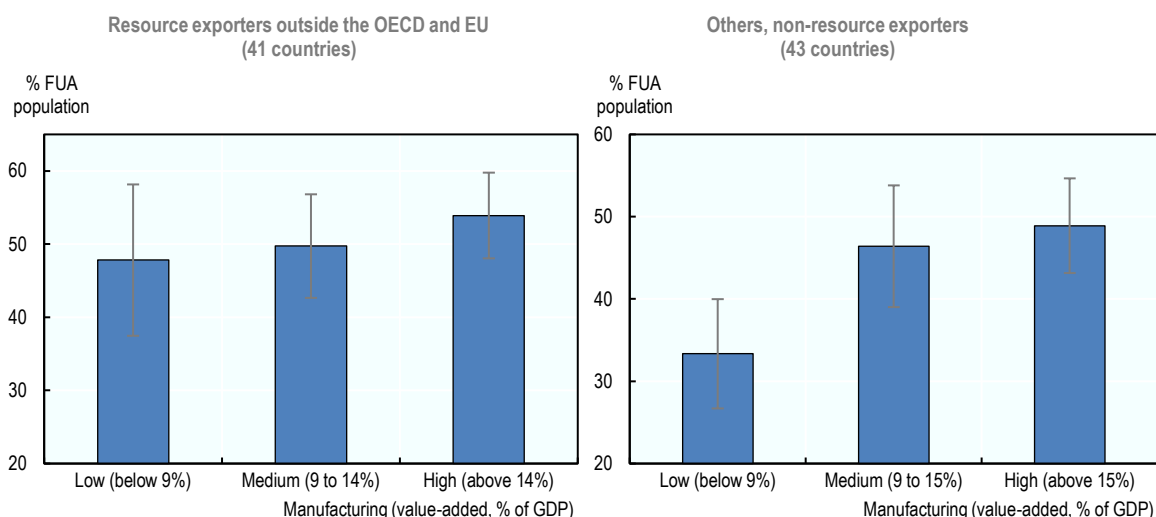

Note: Unweighted average of country values. Horizontal categories are defined using terciles of the ratio of value-added share in the manufacturing sector. Only countries with available sectoral information are included. 90% confidence intervals are reported. Resource exporting countries outside of the EU and OECD are defined using the median value of the share of natural resource exports out of total merchandise exports.

Source: OECD calculations based on sectoral composition data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Annex Figure 3.C.2. The metropolitan system and manufacturing in resource-exporting and non-resource exporting developing countries

Natural resources partly break the association between industrialisation and the growth of metropolitan areas

Note: Unweighted average of country values. Horizontal categories are defined using terciles of the ratio of value-added share in the manufacturing sector. Only countries with available sectoral information are included. 90% confidence intervals are reported. Resource exporting countries outside of the EU and OECD are defined using the median value of the share of natural resource exports out of total merchandise exports.

Source: OECD calculations based on sectoral composition data from the World Bank and population data from the GHSL Data Package 2019, Florczyk, A. et al. (2019[2]), *GHSL Data Package 2019 (database)*, http://dx.doi.org/10.2760/06297.

Annex 3.D. Additional information and tables

Description and construction of regional data

The dataset used for the empirical analysis is the result of the combination and harmonisation of data from different sources. The final product is a panel dataset covering 1 522 regions in 82 countries[1] for the years 1975, 1990, 2000 and 2015. The number of regions/countries included in the analysis may differ depending on the specific year under investigation. Due to limited data availability, different subnational administrative levels were used in different countries.

Information on regional GDP per capita in constant 2005 PPP USD and on years of education[2] come from Gennaioli et al. (2014[47]). This is an unbalanced panel covering at least two points in time between 1950 and 2010. For GDP per capita, a combination of official (National Statistical Offices) and – where unavailable – unofficial sources (estimated measures) was used. Years of education refer to the average years of schooling from primary school onwards for the population aged 15 years or older. This information comes from National Statistical Offices and/or the Integrated Public Use Microdata Series (IPUMS).

For most of the OECD countries[3] in the dataset, the GDP values for years 2000-15 were updated and harmonised using the official estimates from the OECD statistical database.[4] Then, for both GDP and education measures, interpolation and extrapolation methods were used to assign values consistently to the reference years 1975, 1990, 2000 and 2015, if not already available. In particular, linear interpolation between two or more points in time was used with no restrictions. By contrast, out-of-sample linear extrapolation was applied only if the reference year and the closest year with available information were maximum 5 years apart.

Total population and the share of people living in metropolitan areas were computed for each region. Control variables at the regional level such as latitude, distance to coast, malaria indicator, oil and gas production, and indicators for regions that are home to the capital were taken from Gennaioli et al. (2014[47]). For a subset of 687 regions in 33 countries the paper also provides data on the stock of immigrants and emigrants and their level of education at one point in time between 1990 and 2010.

Annex Table 3.D.1. List of countries included in the regional dataset

ISO code	Country name	ISO code	Country name	ISO code	Country name
ALB	Albania	GTM	Guatemala	NOR	Norway
ARE	United Arab Emirates	HND	Honduras	NPL	Nepal
ARG	Argentina	HRV	Croatia	PAK	Pakistan
AUS	Australia	HUN	Hungary	PAN	Panama
AUT	Austria	IDN	Indonesia	PER	Peru
BEL	Belgium	IND	India	PHL	Philippines
BEN	Benin	IRL	Ireland	POL	Poland
BGD	Bangladesh	IRN	Iran	PRT	Portugal
BGR	Bulgaria	ITA	Italy	PRY	Paraguay
BIH	Bosnia and Herzegovina	JOR	Jordan	ROU	Romania
BOL	Bolivia	JPN	Japan	RUS	Russian Federation

ISO code	Country name	ISO code	Country name	ISO code	Country name
BRA	Brazil	KAZ	Kazakhstan	SLV	El Salvador
CAN	Canada	KEN	Kenya	SRB	Serbia
CHE	Switzerland	KGZ	Kyrgyz Republic	SVK	Slovak Republic
CHL	Chile	KOR	Korea	SVN	Slovenia
CHN	China	LKA	Sri Lanka	SWE	Sweden
COL	Colombia	LSO	Lesotho	THA	Thailand
CZE	Czech Republic	LTU	Lithuania	TUR	Turkey
DEU	Germany	LVA	Latvia	TZA	Tanzania
DNK	Denmark	MAR	Morocco	UKR	Ukraine
ECU	Ecuador	MEX	Mexico	URY	Uruguay
EGY	Egypt	MKD	North Macedonia	USA	United States
ESP	Spain	MNG	Mongolia	UZB	Uzbekistan
EST	Estonia	MOZ	Mozambique	VEN	Venezuela
FIN	Finland	MYS	Malaysia	VNM	Viet Nam
FRA	France	NGA	Nigeria	ZAF	South Africa
GBR	United Kingdom	NIC	Nicaragua		
GRC	Greece	NLD	Netherlands		

Notes: 1. Of which 35 are EU and/or OECD members. The reader should refer to Annex Table 3.D.1 for the entire list of countries.

2. Information on years of education in 2000 is not available for 7 countries: BIH, GTM, NGA, NPL, UKR, UZB and VEN.

3. With the exception of CZE, DNK, EST and LVA, for which values from Gennaioli et al. (2014[47]) were used.

4. The procedure highlighted a few inconsistencies between the GDP values from the paper and the OECD measures due to the different GDP accounting standards used by different sources. For this reason, the following 5 regions were considered to be outliers and therefore removed from the sample: Antofagasta (CHL), Campeche (MEX), Oslo (NOR), Delaware (USA) and District of Columbia (USA). Nonetheless, results are robust to the inclusion of these regions.

Source: Gennaioli, N. et al. (2014[47]), "Growth in regions", http://dx.doi.org/10.1007/s10887-014-9105-9; Gennaioli, N. et al. (2013[48]), "Human capital and regional development", http://dx.doi.org/10.1093/qje/qjs050.
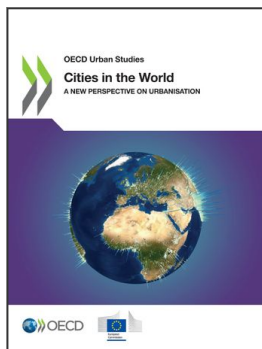
Annex Figure 3.D.1. Per capita income in metropolitan areas relative to their countries, 2015

GDP per capita, OECD only
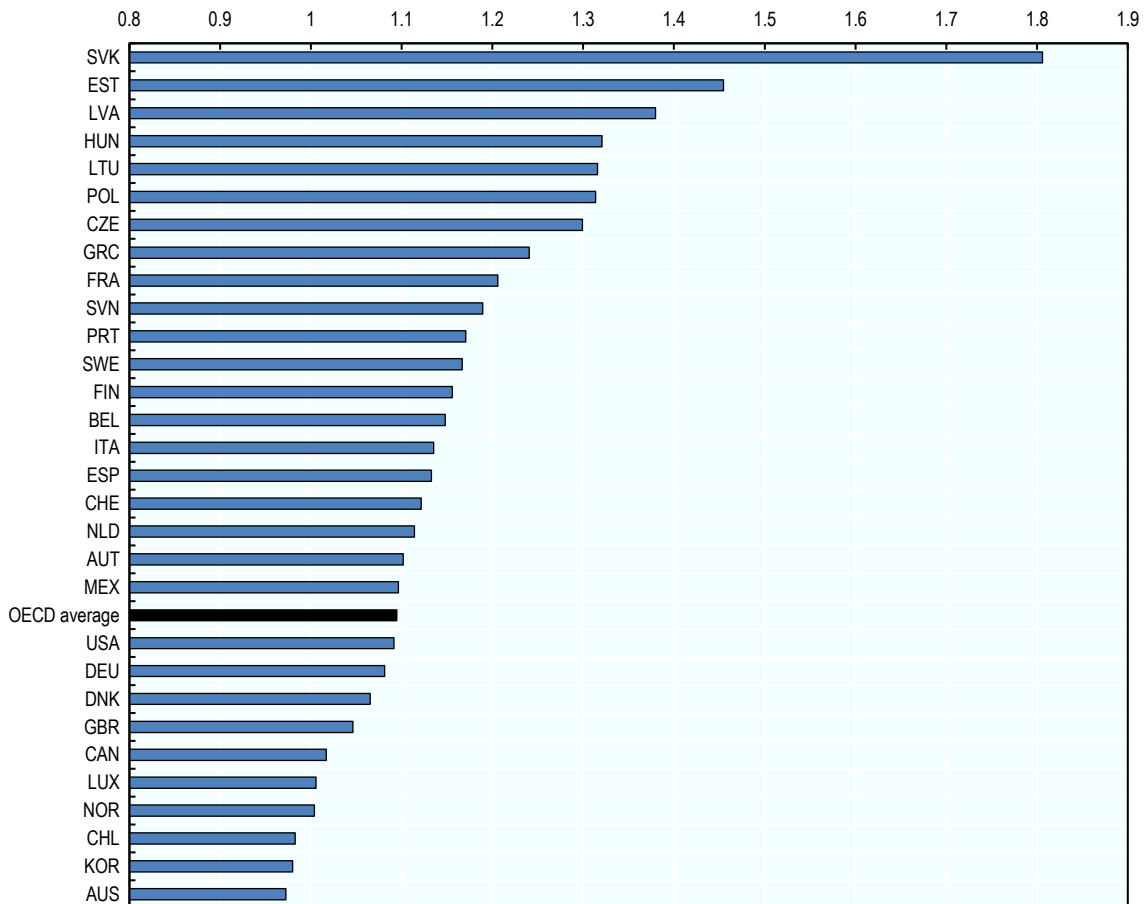
Note: Population-weighted averages of the ratio of GDP per capita in FUAs relative to that of their countries are reported.
Source: OECD (n.d.[52]), *OECD Metropolitan Database*, https://stats.oecd.org/Index.aspx?Datasetcode=CITIES.