4 Regional economic development: The role of migration

Migrants contribute to many aspects of the economy of their host country. Yet, despite growing evidence at the national level, little is known of these effects at the regional scale. This chapter aims to fill this gap by providing novel empirical evidence on the contribution of migrants to regional economies across the OECD using microdata and econometric methods, focusing in particular on critical dimensions of regional development such as income, innovation, international trade and labour markets.

In Brief

Migrants contribute to the regional economy through many channels, increasing the income and well-being of the overall population

- **New analysis for OECD countries shows that migration contributes to regional economic development in various ways**. Despite extensive work on the contribution of migrants to national economies, little is known about the effects at the subnational level. As migrants settle unevenly within countries, empirical analysis at lower geographical scales is essential for assessing how local conditions shape their contribution to local economies and to inform public debate and policy design. This chapter attempts to provide such evidence.
- **Migration contributes to regional economic convergence within and across countries in Europe**. On average, a 10% increase in the migrant population share is associated with a 0.15% higher regional income per capita. However, the effects are stronger for lagging regions, especially in lower-income EU countries. Overall, for the 25% of poorest regions in a country, the positive effect of migration on per capita incomes is more than twice as high (0.36%). As a result, migration can help poorer regions catch up with the rest of the country, in turn contributing to the income convergence across Europe.
- **Migrants bring new ideas to their host regions, fostering local innovation**. Using detailed information on patents and the share of migrants in municipalities, the chapter shows that migrants appear to raise patenting activity in their local area and thus foster local innovation. However, these positive effects are limited to already innovative areas with high patenting levels, mainly located in urban areas.
- **Migration enhances trade connections of regions**. In Europe, migrants help their host regions establish new trade networks and thus boost regional exports and imports. Regions that observe a 10% increase in the number of migrants experience a 3.2% rise in imports, including intermediates used in exports, and a 1.2% rise in exports. The contribution of migration is particularly strong for trade with destinations outside the European Union (EU) and regions with highly educated migrants.
- **As new migrants enter regions' labour markets, they can affect the native-born population's employment in the short term**. In European regions, between 2010 and 2019, growth in native-born employment rates slowed down following increases in the labour force due to migration, especially for low-educated workers in lower-income regions. However, this effect disappears over time, as regional labour markets adjust. Regions with higher levels of gross domestic product (GDP) per capita are faster to absorb new workers, resulting in little or no effect on the native-born workforce, especially those with higher education. In a ten-year period, the effect of the increase in labour force due to migration disappears for less-educated native-born workers, while it turns positive for highly educated workers.
- **Targeted policies could help spread the benefits of migration for regional economies and well-being**. Investing in the upskilling of native-born workers, especially more vulnerable groups such as non-university-educated workers and economically lagging regions, can help address labour market challenges and strengthen regional development.

Introduction

Migrants play a diverse set of roles in and influence all aspects of the economy of their host community. Despite growing evidence at the national level, little is known of these effects at the regional scale. However, subnational analysis is crucial because migrants settle unevenly within countries, concentrating in certain regions and cities. Therefore, empirical analysis at the regional level is essential for assessing the true contribution of migrants to local economies and informing public debate as well as policy design.

This chapter aims to fill the gap of subnational evidence on the role of migrants in regional economies. It provides novel and robust empirical evidence for OECD regions, focusing on key dimensions of regional development such as income, innovation, international trade and labour markets. The analysis relies on microdata and uses rigorous econometric methods to provide novel and causal evidence. Furthermore, it explores whether the effects differ across regions depending on their characteristics. Thus, the chapter aims to support policy making by offering differentiated findings on the regional economic effects of migration.

Migration and regional income

Income per capita is a key determinant of well-being and a dimension of regional development that can be influenced by migration. Based on economic theory, the link between migration and regional income is ambiguous, as the channels through which migration can affect regional development levels might have positive or negative effects. On the one hand, migrants can boost regional income per capita levels because migrants are more likely to be in their working age (defined as those aged between 15 and 64). Moreover, if a larger labour force allows workers to become more specialised (Peri, 2012[1]), all workers benefit from skill complementarities or if migrants fill shortages in critical positions, per capita income can increase further.[1] Migration can contribute to income growth also through firm creation, as the evidence from this chapter shows, or help develop new products or export markets. On the other hand, income per capita can decrease, for example, if employers invest less in technologies when migration provides additional cheap labour supply, limiting productivity growth (Ortega and Peri, 2014[2]) or if the human capital of new migrants is below the average human capital of a region's labour force.

Given the ambiguity of the links between migration and regional income, this section aims to provide new regional evidence from a multi-country perspective.[2] Thus, it offers new evidence for a large set of OECD countries and contributes to the understanding of how migration affects regional income, which has so far been inhibited by the fact that existing studies use different methodologies, country samples and time frames. Finally, this section also examines how the effects of migration might vary across regions with different characteristics.

Box 4.1. Subnational analysis across the OECD: Geographic areas used in the chapter

The chapter features analysis using two geographical scales depending on data availability and the objective of the analysis.

TL2 regions

Most of the regional policy analysis uses data collected for administrative regions, that is, the regional boundaries within a country as organised by governments. Data on administrative regions has the advantage of referring to areas that are often under the responsibility of a certain subnational government. They also correspond to the geographical scale targeted by a specific policy implemented

at the national or subnational level. Regions are classified into two scales: large regions (Territorial Level 2, TL2) and small regions (Territorial Level 3, TL3), which ensure comparability across countries.

Regions within the 38 OECD countries are classified on 2 territorial levels reflecting the administrative organisation of countries. The 433 OECD large (TL2) regions represent the first administrative tier of subnational government, for example, provinces in Canada, *régions* in France or states in the United States (US). There are 2 290 OECD small (TL3) regions, with each TL3 being contained in a TL2 region (except for the US). For example, the TL2 region of Aragon in Spain encompasses three TL3 regions: Huesca, Teruel and Zaragoza. TL3 regions correspond to administrative regions, except for Australia, Canada and the US. All the regions are defined within national borders.

Local administrative units (LAUs)

The level of details, number of municipalities and access to data is very different across countries. Municipalities are often defined by the LAU codes and their number varies across countries from 99 in Denmark to 36 695 in France. For some countries, municipal level data does not exist. Therefore, we used data at a larger scale: *Kreise* in Germany, county councils in Ireland, *Fergusias* in Portugal.

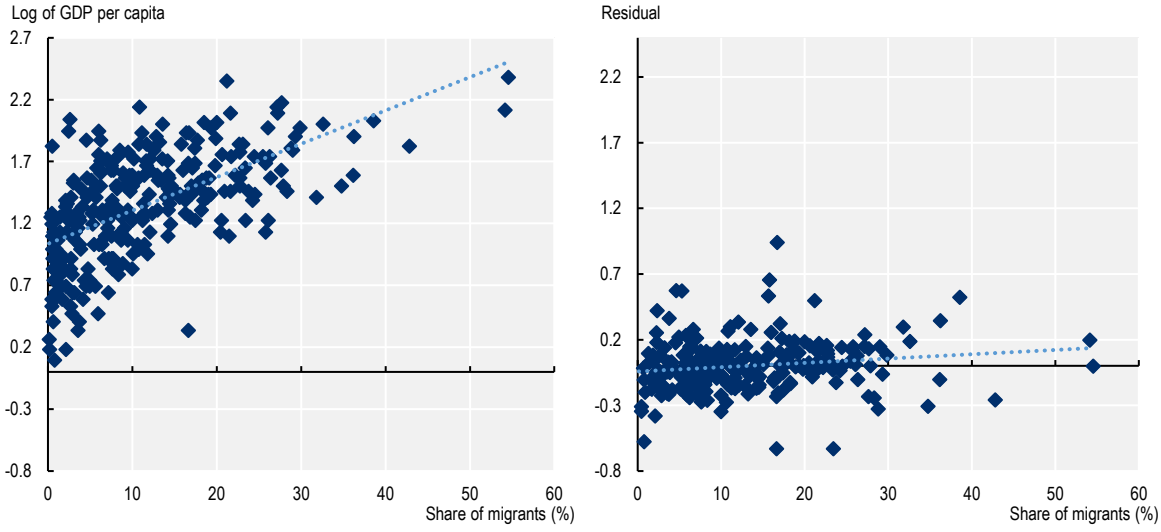
Source: OECD (2020[3]), *OECD Regions and Cities at a Glance 2020*, https://doi.org/10.1787/959d5ba0-en.

OECD regions with higher GDP per capita have larger migrant communities

In general, foreign-born individuals are more likely to be concentrated in dynamic and more prosperous regions that offer better employment opportunities. The left panel of Figure 4.1 shows that across the OECD, regions with a higher share of migrants (horizontal axis) also have a higher per capita income (vertical axis).

Figure 4.1. GDP per capita and share of migrants are correlated

Regional correlations, TL2 regions, most recent data available



Note: Figures plot the correlation between the share of migrants in the region (horizontal axis), and the logarithm of GDP per capita in the region (Panel A) and the residuals (Panel B). The residuals are obtained through a linear regression where the dependent variable is the logarithm of GDP per capita, regressed on a set of variables that account for workforce characteristics. Each marker corresponds to a TL2 region.
Source: OECD calculations based on data from OECD Regional Statistics (database) (accessed December 2020).

This positive correlation, however, can be driven by many factors. For instance, migrants are attracted to regions that offer better employment opportunities, which happen to be richer, more populous or have been experiencing stronger growth even prior to the arrival of migrants. Furthermore, migrants, especially those who are highly educated, tend to concentrate in regions where their native-born counterparts are also highly concentrated (OECD, 2020[3]). The right panel of Figure 4.1 shows the relationship between the share of migrants and income after accounting for the skill composition of native-born residents and migrants, land area and total population to account for any size/agglomeration effect. Indeed, accounting for these factors reduces the strength of the relationship (i.e. flatter trend line).

Within regions, an increase in migration is positively associated with regional income

The correlations discussed above indicate that the share of migrants is larger in more prosperous regions. However, it is unclear whether migration actually boosts regional income or simply results from other regional characteristics that could create spurious correlations or reverse causality. To account for other possible factors, more complex econometric techniques are necessary, as explained in Box 4.2. Figure 4.2 presents the estimates from a regression analysis.[3]

Box 4.2. Empirical strategy

Empirical specification

The analysis in this chapter relies on exploiting the spatial variation in the share of the migrant population relative to the total population in a region (TL2) to explain the differences in the outcome variable of interest. The analyses carried out in this chapter aim to estimate the impact of migrants on regional income, labour market effects and innovation, with the details of the empirical specification varying according to the specific outcome. The baseline approach relies on the following equation standard in the literature (Beine, Bertoli and Moraga, 2016[4]):

$$y_{rt} = \beta_0 + \beta_1 m_{rt} + \theta_r + \theta_t + \mu_{rt} \qquad \text{(Equation 1)}$$

- The dependent variable is the outcome (e.g. GDP, native-born employment or patenting) in region r at time t.
- The change in the migrant population experienced in a particular area is captured by the m_{rt} variable which is equal to the number of working-age migrants (who are likely to participate in the labour market) as a share of the total (working-age) population.[4,5]
- θ_r is a vector of regional dummies capturing any time-invariant regional characteristic.
- θ_t is a vector of time dummies capturing any idiosyncratic shock that may affect all regions at the same time.
- The error term is denoted μ_{rt}.

Threats to identification: Non-random location of migrants

An important limitation of spatial correlations is that migrants generally decide when and where to migrate so that they are unlikely to be randomly distributed across regions and countries. In other words, migrants are very likely to select their residence and move into areas with better labour market opportunities and better economic conditions. Thus, the "endogenous sorting" of migrants across regions creates a positive correlation between migration and outcome variables, thereby contaminating the "average causal" effects of migration on the local outcomes. The introduction of region fixed effects allows capturing the contribution of characteristics that do not change over time. However, fully accounting for the positive correlation between local characteristics and migrants' presence requires more elaborate empirical strategies as explained below.

Network (or past settlement) instrument, aka shift-share

A standard approach to address this endogeneity issue relies on an instrumental variable approach using the network instrument or past settlement (Jaeger, Ruist and Stuhler, 2018[5]). The instrument relies on the observation that immigrants tend to settle in regions with large migrant populations, especially those of their co-nationals. By exploiting the role of networks in attracting migrants to regions, this instrument aims to purge the estimates of the bias arising from the non-random location of migrants across regions. Most estimates presented in this chapter use this instrument and a two-stage least squares (2SLS) method to establish a causal relationship.

The instrument is constructed as follows. First, the migrant population is split into five origin groups (e.g. Western Europe, Eastern Europe, North Africa or East and South of Asia). Second, the spatial distribution for each of these groups is calculated based on their distribution in 2005, using EU Labour Force Survey (EU-LFS) data. Third, the spatial distribution of migrants from a given origin group in 2005 (i.e. the share) is used to allocate the total number of migrants from that origin group living in the country between 2010-19 (i.e. the shift) across regions. The predicted number of migrants living in a given region at a given year is obtained by summing up across countries of origin. Finally, the predicted migrant population is used to compute the predicted fraction of migrants in the region.

Validity of the instrumental variable approach

The network instrument can completely isolate the true labour market impact of immigration if economic conditions that motivated earlier migrants to settle in particular areas are uncorrelated with economic conditions in the period of analysis (Jaeger, Ruist and Stuhler, 2018[5]). A way to minimise the potential correlation between past immigration inflows and economic shocks in the period of analysis would be to use a sufficient time lag to predict the actual number of migrants (Dustmann, Fabbri and Preston, 2005[6]).[6]The analysis related to trade and productivity uses the distribution of migrants in 2004 as the reference year to build the shift-share instrument as it provides the highest country coverage.

The analysis on the labour market effects exploits census data from the Integrated Public Use Microdata Series (IPUMS) and national statistical institutes for a smaller set of 13 European countries from the year 1990, which is distant enough from the period of analysis (e.g. 2010-20) for immigrant shares not to be correlated with past demand adjustments or persistent labour market dynamics. This approach also alleviates the concerns raised by Jaeger, Ruist and Stuhler (2018[5]) by using a longer time lag. The results using the instrument based on the year 2004 for the larger sample also confirm the main findings using an instrument based on the distribution in 1990 (Edo and Özgüzel, forthcoming[7]).

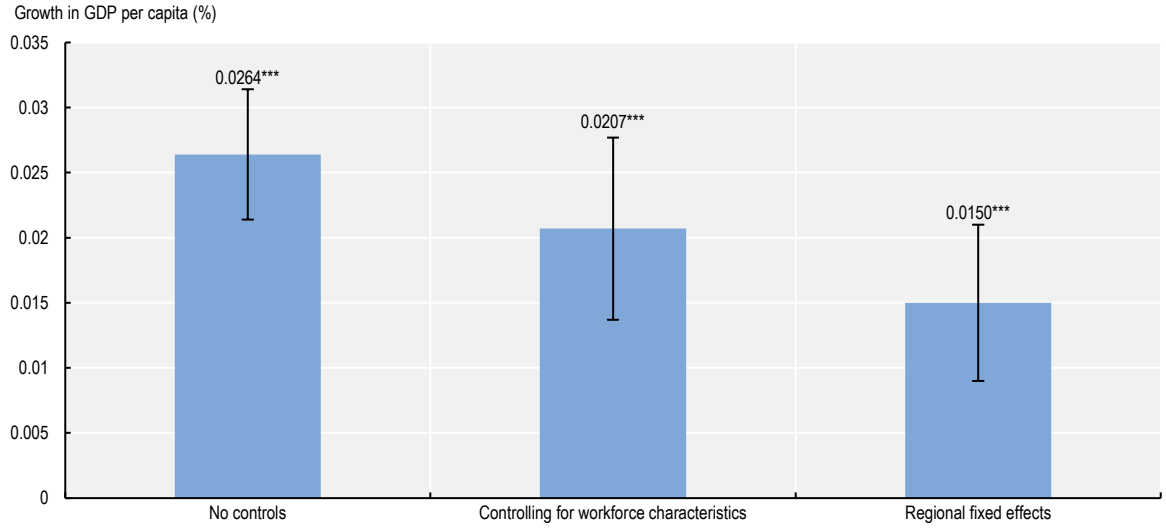
Estimated magnitudes

The analysis on income per capita, trade and labour markets rely on the network instrument, year and region fixed effects to identify the causal effects of migration, which is the state-of-the-art econometric method. Despite extensive use of the instrumental variable approach in empirical studies on migration, recent literature suggests that, in some cases, the approach may not be able to fully isolate the role of economic conditions in the host region. There is no reason to suspect that the instruments used in this study cannot completely isolate the economic conditions. Even if that were to be the case, the findings would hold and results would be qualitatively similar. More precisely, if the instruments used in this study are not able to isolate the economic conditions, this would mean that the estimated effects are slightly larger than they should be (or closer to the estimates obtained through ordinary least squares [OLS]).

Source: Beine, M., S. Bertoli and J. Moraga (2016[4]), "A practitioners' guide to gravity models of international migration", *The World Economy*, Vol. 39/4, pp. 496–512; Edo, A. and C. Özgüzel (forthcoming[7]), "The impact of immigration on employment dynamics: Evidence from Europe", *OECD Regional Development Working Papers*, OECD Publishing, Paris; Jaeger, D., J. Ruist and J. Stuhler (2018[5]), "Shift-share instruments and the impact of immigration", No. w24285, National Bureau of Economic Research; Dustmann, C., F. Fabbri and I. Preston (2005[6]), "The Impact of Immigration on the British Labour Market", *The Economic Journal*, Vol. 115/507, pp. F324-F341.

Figure 4.2. Regional per capita GDP grows with increases in the shares of migrants

Estimated effect of a 1% increase in the share of migrants, selected OECD countries, 2006-19, TL2 regions



Note: Figure columns correspond to the point estimates for the share of migrants in the overall population, obtained through 2SLS regressions. The first column ("No controls") corresponds to a regression without any control variables, while Column 2 ("Controlling for workforce characteristics") controls for the logarithm of the population size, logarithm of land area, the share of native-born workers with a university education or above, and the share of migrant workers with a university education or above. Columns 1-2 include country fixed effects and year fixed effects. The last column ("Regional fixed effects"), in addition to control variables in Column 2, also includes region fixed effects and year fixed effects. All columns use the share of migrants predicted through a shift-share as instruments. Residuals are clustered by TL2 regions, for 41 countries in the sample. See Endnote 2 for the list of countries included in the analysis. The number of observations varies depending on the model between 1 619 and 4 538.

***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.

Source: OECD calculations based on data from OECD Regional Statistics (database) and European Labour Force Survey (accessed June 2021).

On average, regions with higher migrant population shares tend to have higher GDP per capita. Following the econometric strategy detailed in Box 4.2. Figure 4.2 present the results from the instrumental variable approach, which addresses the endogeneity issue and helps to identify a causal relationship between the presence of migrants and regional income. A 10% increase in the share of migrants in a region is associated with 0.26% higher regional income per capita (i.e. GDP per capita) (Figure 4.2, Column 1).[7] To have a sense of the magnitude in percentage points, the following calculation offers an illustrative example. The Saxony region in Germany corresponds to the median in the sample in terms of the share of migrants. Saxony has a migrant share of 8% and a GDP per capita of EUR 37 988. A 10% increase in the migrant share would increase Saxony's migrant share by 0.8 percentage points to 8.8% (corresponding to an additional 32 505 migrants given its population of 4.1 million according to the EU-LFS), which would be associated with an increase of almost EUR 100 in GDP per capita (EUR 98,7).

The positive relationship between migration and regional GDP per capita holds even when taking into account local and workforce characteristics. As discussed earlier, regions with a higher share of migrants tend to be populous places, where both native-born and foreign-born workforces have on average a higher level of education. To ensure that the positive effects are not driven by a region's population size or skill composition, Column 2 in Figure 4.2 controls for the skill composition of native-born workers and migrants, land area and total population size. Furthermore, these controls also ensure that the estimate captures the effects due to an increase in the migrant population and not due to changes in the skill composition of the migrants. Accounting for such characteristics slightly reduces the magnitude of the estimated coefficients

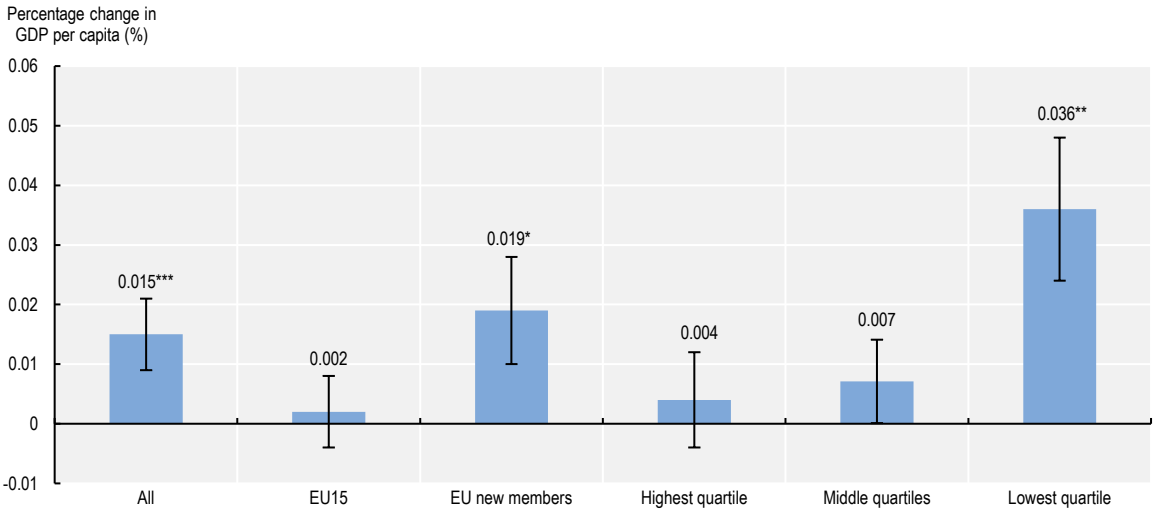
but do not significantly alter the results. One potential explanation that could contradict the findings is that specific regional factors drive both higher regional migration and higher income. To address this concern, Column 3 presents results that take into account regional characteristics that are constant over time (i.e. regional fixed effects). Even when accounting for regional fixed effects, the link between migration and regional income remains clear. A 10% increase in the share of migrants in a region indicates a 0.15% higher income per capita even after accounting for time-variant and invariant regional characteristics (Column 3).

Lagging regions benefit the most from migrants

While migration contributes to regional income in European regions, its exact effects vary across countries or regions with different characteristics. Overall, migrants seem to contribute to regional economic convergence as they benefit regions with lower income levels the most. Figure 4.3 presents regression results where the relationship between the migrant share and the regional income are estimated separately for sub-samples of regions within European countries.[8] Splitting the regions into various groups reveals that the positive effects of migration on income can vary substantially. For example, while an increase in the migrant share does not affect regional income growth in the EU15 countries (Figure 4.3, Column "EU15"), it has a positive and statistically significant effect on the EU member countries that joined after 2007 ("EU new members").[9] In fact, these countries, which have lower average income levels, drive the observed positive effects, suggesting that migration can contribute to income convergence between EU countries.[10]

Figure 4.3. Migrants help lagging regions catch up with more affluent regions

Estimated effect of a 1% increase in the share of migrants, select sample of OECD countries, 2006-19, TL2 regions



Note: Figure columns correspond to the point estimates for the share of migrants in the overall population, obtained through 2SLS regressions. The first column ("All") corresponds to the last column in Figure 4.3. "EU15" includes all EU15 countries and the United Kingdom (UK). "EU new members" include all countries that joined the EU after 2007. Regions that are in the highest income quartile relative to their countries are grouped as "Highest quartile" (25% of the regions with the highest income per capita), those in the second and third quartiles (regions between 25% and 75%) as "Middle quartiles" and those in the lowest quartile (25% of the regions with the lowest income per capita) are grouped in "Lowest quartile". All regressions control for the logarithm of the population size, logarithm of land area, the share of native-born workers with university education and above and the share of migrant workers with university education and above. All regressions use the share of migrants predicted through a shift-share as an instrument. All regressions include region fixed effects and year fixed effects. Residuals are clustered by TL2 regions, for 41 countries in the sample. See Endnote 2 for the list of countries included in the analysis. The number of observations varies depending on the model between 1 619 and 4 538.
***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.
Source: OECD calculations based on data from OECD Regional Statistics (database) and European Labour Force Survey (accessed June 2021).

Within countries, poorer regions benefit the most from migration. Splitting regions into three groups by their income levels relative to the other regions within the country helps to understand which regions benefit the most from migration. Results show that the positive effects of migration are driven by regions in the lowest income quartile within their countries (i.e. the 25% of regions with the lowest income per capita). More precisely, a 10% increase in the migrant share in these regions is associated with a 0.36% higher income. These positive effects indicate that increase in the migrant share helps lagging regions catch up with other regions in their country.

Migration promotes regional income convergence

The empirical evidence presented in this section supports the idea that migration contributes to regional economic convergence. Moreover, this finding holds even after accounting for the fact that migrants tend to settle in areas with higher income per capita (i.e. the non-random location choice of migrants). Indeed the results show that increasing the number of migrants relative to the total regional population boosts income per capita, especially in lower-income regions. As a result, these findings indicate that migrants can contribute to helping poorer regions catch up with the rest of the country and accelerate income convergence across Europe.

The positive effect of migrations on regional income documented in this section reflects the outcome of multiple vehicles that allow migrants to contribute to local economies. For example, beyond working in firms as employees or setting up firms as entrepreneurs, migrants can connect their regions to their country of origin, resulting in larger bilateral trade or fostering innovation through new ideas (Box 4.4). The following sections of this chapter shed further light on specific drivers of regional economic development and thus present evidence on various aspects of migrants' contribution to their regional economy.

Box 4.3. Birthplace diversity and long-run economic growth

The socio-economic effect of diversity associated with migration has raised interest in the academic literature due to two potential and contradictory consequences in destination countries. On the one hand, higher diversity could lead to a wider range of languages, norms and behaviours, which could have a negative economic or social effect due to a rise in communication costs and an overall reduction of social cohesion and trust (Putnam, 2007[8]). On the other hand, higher diversity can expand societies' skillset, which could lead to positive economic gains and growth. Indeed, previous studies have shown that diversity of migrants has been a boost to economic performance at different aggregation levels, including for countries (Bove and Elia, 2017[9]), regions (Trax, Brunow and Suedekum, 2015[10]), cities (Ottaviano and Peri, 2006[11]) and firms (Hjort, 2014[12]). In particular, it has been shown that diversity among migrants with a university education or above has a stronger positive economic effect due to their broader knowledge (Alesina, Harnoss and Rapoport, 2016[13]; Bahar, Rapoport and Turati, 2020[14]).

Using panel data of the 51 US states over the 1960-2010 period, Docquier et al. (2020[15]) study the skill-specific effect of diversity among migrants on states' economic growth. Diversity is computed using a birthplace diversity index, which captures the probability to draw randomly two individuals born in different countries from the reference population. The analysis relies on the sizeable and exogenous variations in size and composition of the migrant population after implementing the Immigration and Nationality Act in 1965, which surpassed the former quota system, generating an upsurge of migrants from a broader set of origins.

The paper shows that diversity among migrants with a university education or above positively affects the macroeconomic performance of US states, while diversity has almost no effect for migrants with high school or lower education.

Source: Alesina, A., J. Harnoss and H. Rapoport (2016[13]), "Birthplace diversity and economic prosperity", *Journal of Economic Growth*, Vol. 21/2, pp. 101-138; Bahar, D., H. Rapoport and R. Turati (2020[14]), "Birthplace diversity and economic complexity: Cross-country evidence", *Research Policy*, p. 103991; Bove, V. and L. Elia (2017[9]), "Migration, diversity and economic growth", *World Development*, Vol. 89, pp. 227-239; Docquier, F. et al. (2020[15]), "Birthplace diversity and economic growth: Evidence from the US states in the Post-World War II period", *Journal of Economic Geography*, Vol. 20/2, pp. 321-354; Hjort, J. (2014[12]), "Ethnic divisions and production in firms", *Quarterly Journal of Economics*, Vol. 129/4, pp. 1899-1946; Ottaviano, G. and G. Peri (2006[11]), "The economic value of cultural diversity: Evidence from US cities", *Journal of Economic Geography*, Vol. 6/1, pp. 9-44; Putnam, R. (2007[8]), "E pluribus unum: Diversity and community in the twenty-first century the 2006 Johan Skytte Prize Lecture", *Scandinavian Political Studies*, Vol. 30/2, pp. 137-174; Trax, M., S. Brunow and J. Suedekum (2015[10]), "Cultural diversity and plant-level productivity", *Regional Science and Urban Economics*, Vol. 53, pp. 85-96.

Migration and local innovation

This section examines whether migration contributes to innovation at the regional and local levels in OECD countries. Innovation is a vital driver of economic prosperity and growth. It boosts the adoption of new technologies or more efficient work practices or products, ultimately enhancing income and productivity. Like migration, innovation is a very geographically concentrated phenomenon. Within OECD countries, specific regions or cities often account for large proportions of research and development as well as the development of new products or the invention of new technologies.

Despite extensive evidence on the link between migration and innovation, subnational analysis involving multiple countries remains scant.[11] In fact, only two studies have focused on the relationship between innovation and immigration in a multi-country context. One of these studies, based on a sample of 20 European countries covering the period between 1995 and 2008, finds that a larger pool of skilled migrants is associated with a higher number of patent applications (Bosetti, Cattaneo and Verdolini, 2015[16]). The second study provides the first and the sole analysis looking at the question across regions of 12 countries in Europe but their results are inconclusive (Ozgen, Nijkamp and Poot, 2012[17]).

This section presents novel and unique evidence on the relationship between migration and patenting at an extremely granular level in a multi-country setting covering almost three decades.[12] It investigates the relationship between innovation, as captured by the number of patent applications from inventors, and the local presence of migrants.[13] To do so, it uses highly fine-grained information that includes the co-ordinates (latitude and longitude) of inventor locations as provided by de Rassenfosse, Kozak and Seliger (2019[18]) and the share of foreign-born individuals at the LAU level (municipal level hereafter). The latter data on the share of migrants originate from a novel dataset gathered by the OECD, which is presented in Chapter 1. Combining the two data sources generates a unique sample that covers 21 OECD countries, thus dealing with a diverse array of small areas over the 1990-2014 period.[14] In contrast to the analysis in the rest of the chapter, this analysis considers the total resident population rather than the working-age population.

While the analysis on the link between migrants and patenting activity benefits from the use of highly granular data, it also suffers the drawback of involving municipalities with very different characteristics and economic activity. The local factors such as industrial structure, types of occupations and population density may affect innovation activities (Carlino and Kerr, 2015[19]). Therefore, the analysis in this section splits municipalities into four groups (quartiles) based on their number of patents per capita to elicit meaningful patterns of the relationship between migration and innovation at the local level. The resulting quartiles help discern differences across more or less innovative municipalities and the extent to which migrants contribute to their respective innovation activities. For this purpose, the average patents per

capita in each municipality is calculated over the whole period of time for which the data on both patents and total population are available.[15]

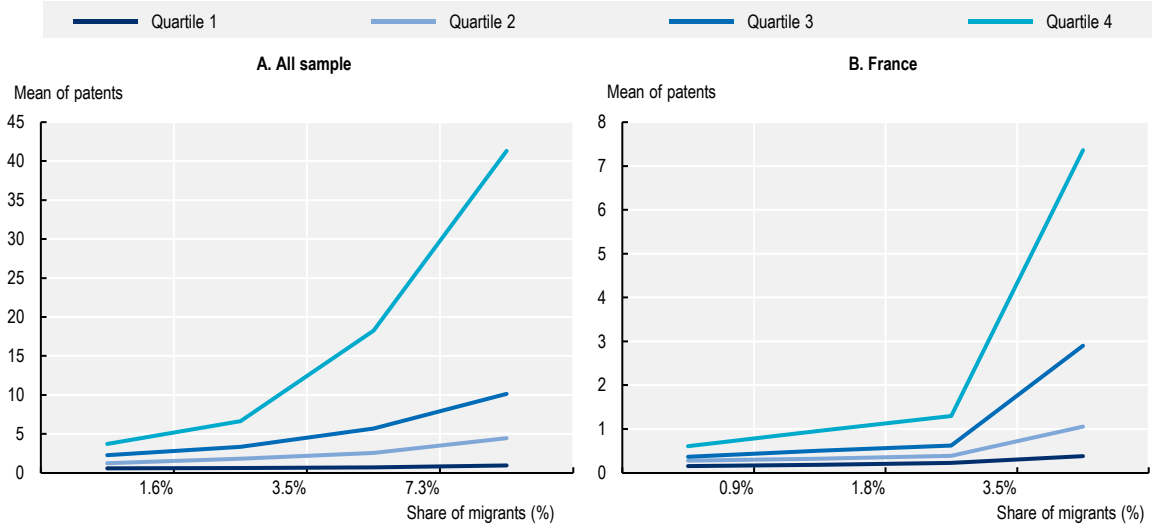
Patents and migrants are highly concentrated

Municipalities with higher shares of migrants report higher numbers of patents per capita. The left panel of Figure 4.4 visualises how the average number of patents for each group of municipalities (i.e. each line corresponds to a quartile) changes as the share of foreign-born individuals increases (horizontal axis). For low shares of migrants (2%), the number of patents tends to increase similarly across more or less innovative municipalities. However, as the share of migrants increases, the municipalities with the highest patenting activities (i.e. Quartiles 3 and 4) diverge significantly from the less innovative municipalities. In France, the divergence starts at slightly higher levels of population shares of migrants (i.e. 3%), though the general pattern still holds (right panel of Figure 4.4).

These figures using raw data reveal that the relationship between the share of migrants and patenting may vary across spatial units depending on their initial patenting activity. More precisely, it seems that the increase in the migrant share is associated with disproportional increases in patenting in specific types of patent-intensive local areas, highlighting the importance of the local ecosystem for patenting activity and the high geographical concentration of patents. The following section employs econometric tools that allow investigating this relationship in more depth.

Figure 4.4. Highly innovative localities benefit the most from an increase in the migrant share

The average number of patents per municipality group and the share of the migrant population in the total sample (Panel A) and in France (Panel B), 1990-2014



Note: Figures plot the relationship between the mean number of patents (vertical axis) and the share of the migrant population (horizontal axis) for each municipality quartiles for all samples (Panel A) and only France (Panel B). The sample includes municipalities from 21 countries and data for 1990-2014 with gaps. Quartile 1 includes 25% of municipalities with the lowest patenting activity. Quartiles 2 and 3 include the municipalities that are between 25-50% and 50-75% in terms of patenting respectively. Quartile 4 includes 25% of municipalities with the highest patenting activity.

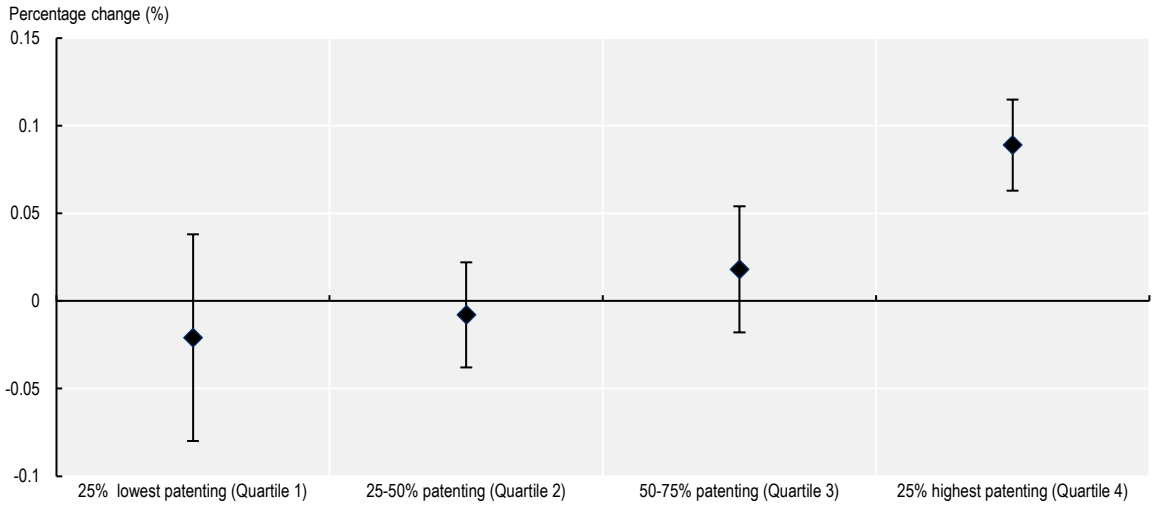
Source: OECD calculations based on data from De Rassenfosse, G., J. Kozak and F. Seliger (2019[18]), (2019), "Geocoding of worldwide patent data", http://dx.doi.org/10.1038/s41597-019-0264-6 and Astruc-Le Souder, M. et al. (forthcoming[20]), "Going granular: A municipal migration database", *OECD Regional Development Working Papers*, OECD Publishing, Paris.

Migrants contribute to patenting only in areas that are already innovative

A higher share of migrants appears to result in more patents but only in areas active in patenting.[16] A 10% increase in the share of migrants in a locality that is part of the 25% of most patent-intensive municipalities (Figure 4.5, Quartile 4), is linked with 1% more patents per capita in the same spatial unit. These results remain qualitatively similar when accounting for GDP per capita, indicating that the positive relationship does not depend solely on factors related to economic development.[17]

Figure 4.5. An increase in migrant share boosts innovation only in highly innovative areas

Estimated effect of a 1% increase in the share of migrants, select sample of OECD countries, 1990-2014, municipalities



Note: The markers correspond to the point estimates obtained from regression estimates carried out separately for each group and the vertical lines indicate the standard errors. All points refer to the group-specific coefficient associated with the share of foreign-born individuals in the total population. Quartile 1 includes 25% of municipalities with the lowest patenting activity. Quartiles 2 and 3 include the municipalities that have between 25-50% and 50-75% in terms of patenting respectively. Quartile 4 includes 25% of municipalities with the highest patenting activity. Regressions control for municipality, year and TL3-year fixed effects. The number of observations varies depending on the model between 67 470 and 68 865. Residuals are clustered by TL2 regions. See Endnote 11 for the list of countries included in the analysis.
***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.
Source: OECD calculations based on data from De Rassenfosse, G., J. Kozak and F. Seliger (2019[18]), "Geocoding of worldwide patent data", http://dx.doi.org/10.1038/s41597-019-0264-6 and Astruc-Le Souder, M. et al. (forthcoming[20]), "Going granular: A municipal migration database", *OECD Regional Development Working Papers*, OECD Publishing, Paris.

Highly urbanised areas record the strongest links between migration and patenting

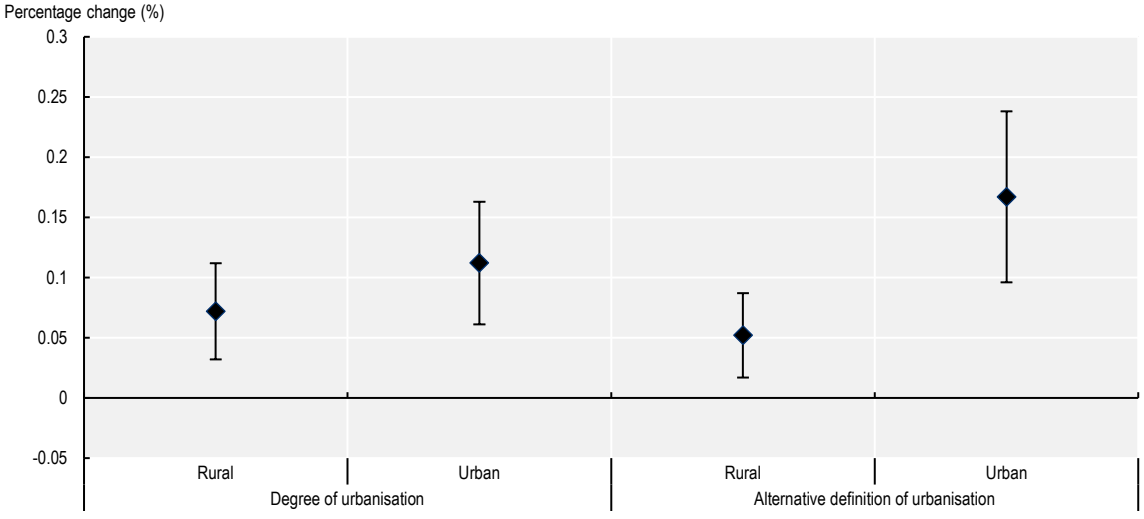
Migration appears to boost local innovation mainly in urban areas. The results presented above suggest that highly innovative municipalities are those where migration plays a role in further promoting patenting activities. Regrouping municipalities based on their degree of urbanisation[18] (Figure 4.6) shows that the positive relationship between innovation and the share of foreign-born individuals is much stronger in more urbanised areas.[19] Such a positive relationship is the consequence of several factors available in these localities. The local factors driving the observed positive effect cannot be identified in this analysis, although the literature provides important insights. For example, more urbanised areas tend to attract migrants who are relatively more educated or working in occupations that are related to scientific activities or patenting. Alternatively, a higher number of migrants in an urban area may amplify agglomeration economies, which are especially beneficial for innovative activities (Carlino and Kerr, 2015[19]). The fact that positive effects

are triggered in urban areas also suggests that local factors, such as industrial structure, types of occupations or population density, may also play an important role. While the empirical strategy (i.e. fixed effects) used in the analysis accounts for these factors partially, a complete understanding of the factors driving the established relationship requires more detailed data, which is unavailable at the moment at such a granular level.

Granular geographic information is crucial for understanding migrants' contribution to patenting activities. The evidence presented above shows that while there is practically no correlation between migrant shares and patenting in most local units, such correlation becomes strong for the group of highly urbanised areas. These findings highlight the importance of local factors such as local industrial structure, types of occupations or population density that are crucial for innovation.

Figure 4.6. Urban areas are driving the positive effect

Estimated effect of a 1% increase in the share of migrants, select sample of OECD countries, 1990-2014, municipalities by the degree of urbanisation



Note: The first two point estimates correspond to those obtained with the standard degree of urbanisation as explained in Endnote 17. For simplicity, urban refers to cities and towns and semi-dense areas. The last two represent results where municipalities with more than 25% of the population located in thinly populated areas (i.e. areas with a population density below 300 inhabitants per km^2) are assumed to be rural. All points refer to the fourth-group coefficient associated with the share of migrants in the total population. Residuals are clustered by TL2 regions. See Endnote 11 for the list of countries included in the analysis.

Source: OECD calculations based on data from De Rassenfosse, G., J. Kozak and F. Seliger (2019[18]), (2019), "Geocoding of worldwide patent data", http://dx.doi.org/10.1038/s41597-019-0264-6 and Astruc-Le Souder, M. et al. (forthcoming[20]), "Going granular: A municipal migration database", *OECD Regional Development Working Papers*, OECD Publishing, Paris.

By using granular information never used before, the analysis is able to highlight the strong local variation in the relationship between migration and innovation. Using detailed information on patents and newly collected data on the share of migrants at the municipal level, the analysis provides evidence from a multi-country setting over two decades. Consequently, the results also indicate that analyses that rely on national-level information or data for large regions risk concealing these heterogeneous effects, which can be crucial for policy makers.

Migration and regional trade

International trade is another dimension of regional development that has close links with migration. Migrants can boost trade in their host economy through various channels. Since the seminal work of Gould (1994[21]), evidence from many countries has shown that migration networks are associated with larger trade flows. A burgeoning literature investigates the channels behind the impact of migrants on trade. For example, the presence of migrants can improve trade by reducing information costs or creating additional demand for the goods produced in their countries of origin (Felbermayr and Toubal, 2012[22]). Immigration also causes an increase in the diversity of productive skills, leading to a rise in total factor productivity and thus its competitiveness in the international markets (Ortega and Peri, 2014[2]). Furthermore, migration can stimulate knowledge transfer. As migrants move across countries, they bring along productive knowledge that is an essential element in boosting the production and trade capacity of the country (Bahar and Rapoport, 2018[23]). Finally, migrants may boost the creation of low capital-intensive firms (Casabianca, Lo Turco and Maggioni, 2021[24]).

Despite extensive evidence on the contribution of migrants to higher trade flows between their countries of origin and host countries, little is known about their effects at the subnational level. Most of the evidence focuses on the contribution of migrants to national trade flows, with evidence at the subnational level remaining limited. The study by Herander and Saavedra (2005[25]) constitutes an early example of subnational evidence and investigates the impact of migrants' networks established within US states on US export volume. Similarly, focusing on the case of French provinces, Briant et al. (2014[26]) study the effect of immigration on the trade volumes in French *départements*. Their key finding is that the pro-trade effect of migrants is observed only when the migrants originate from countries with weak institutions. More recently, Parsons and Vézina (2018[27]) exploit the natural experiment of emigration from Viet Nam to the US and find that US states with larger Vietnamese diaspora trade more with Viet Nam. However, no comprehensive analysis of the subnational effects of migration on trade for multiple countries so far exists.

This section presents the first multi-country evidence on the impact of migration on trade flows at the regional level ever.[20] This unique dataset covers trade flows between 267 TL2 regions across the 21 European countries and the rest of the world in 2013. Using trade flow data between 267 TL2 regions across the 21 European countries and the rest of the world, the section first shows the contribution of migrants to import and export flows of their host region.[21] Second, it examines the role of migrants in lowering transaction channels and boosting bilateral trade between their hosting region and their country of origin. Third, it presents evidence on the knowledge transfer channel by differentiating the effects of migrants by their education levels as well as the knowledge intensity of their sector. Finally, the section searches deeper and presents evidence at the firm level using French customs data.

Migrants promote international trade of their host region

Migrants contribute to the internationalisation of their host economy by promoting trade flows of their host economy and boost total imports and exports of their host region. On average, European regions experiencing a 10% increase in the overall number of migrants see a rise of 3.4% in their imports (Column 1) and 1.5% in their exports (Column 3). As migrant communities are likely to be larger in more populous regions, part of the observed effects could be driven by the region's population size. To address this potential omission, results in Columns 2 and 4 also account for the size of the local native-born population. The inclusion of the native-born population reduces the magnitudes of the point estimates from 1.4% to 1.2% for exports and from 3.2% to 2.5% for imports. In all cases, the estimated relationship remains robust and statistically significant.

Box 4.4. Empirical strategy: Gravity equation

The analysis in this section relies on an augmented gravity-like specification. In fact, a similar estimation strategy is the default approach in the international trade literature (Chaney, 2008[28]; Mayer and Head, 2013[29]) but also in the literature exploring the effects of migration on trade.

$$\ln(\text{trade}_{ijod}) = \beta_0 + \beta_1 \ln(\text{number of migrants}_{io}) + \beta_2 \ln(\text{number of natives}_{io}) + \beta_3 X_{ij} + \theta_i + \theta_j + \mu_{ijod} \quad \text{(Equation 2)}$$

- where the subscripts i and j denote country of origin and country of destination respectively. The subscripts o and d refer to the regions in these countries.
- The dependent variable is the logarithm of regional-level trade flows.
- $number\ of\ migrants_{io}$ is the number (or total population) of migrants from a country of origin i, located in region o.
- $number\ of\ natives_{io}$ is the number (or total population) of native-born from the country of origin i, located in region o.
- X_{ij} is a vector of control variables that are standard in the gravity estimations. Among those controls, the bilateral distance is measured as the geographical distance between capitals of origin and destination, while the GDP captures the size of the country of origin and destination region. The Regional Trade Agreement, common border, common language and colonial links dummies reflect the trade-promoting factors.
- θ_i is a vector of regional dummies capturing any origin-specific characteristics that are time-invariant.
- θ_j, is a vector of time dummies capturing any destination-specific characteristics that are time-invariant.

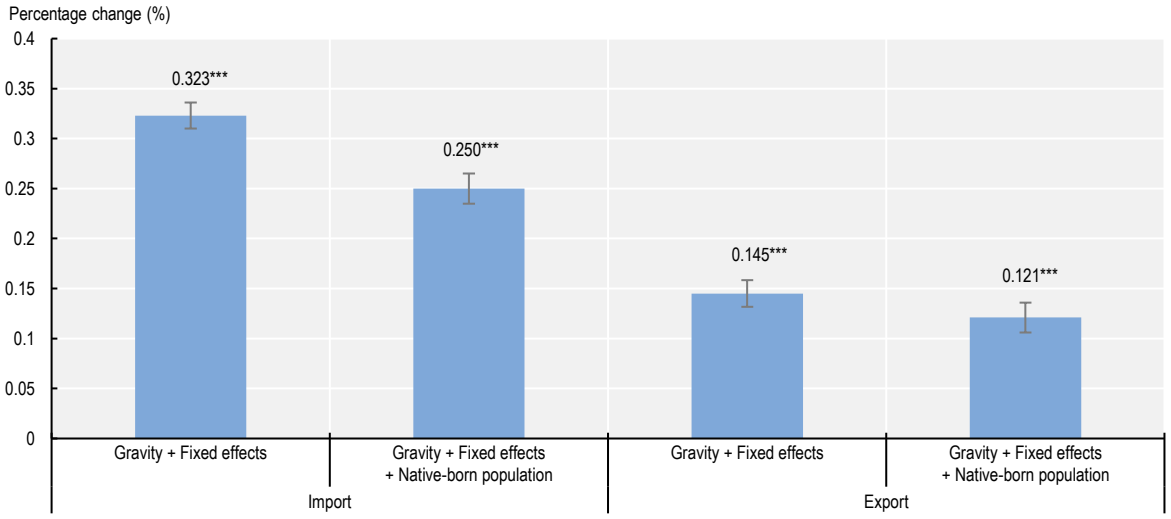
Source: Chaney, T. (2008[28]), "Distorted gravity: The intensive and extensive margins of international trade", *American Economic Review*, Vol. 98/4, pp. 1707-21; Mayer, T. and K. Head (2013[29]), *Gravity Equations: Workhorse, Toolkit and Cookbook*.

By raising regions' international trade, migration enhances regions' international competitiveness. The estimates suggest that an increase in the number of migrants in a region positively affects trade flows, particularly the imports. The impact of migrants on imports is roughly twice larger than on exports. This finding is in line with the literature, which also finds stronger effects on imports. The magnitudes estimated in the analysis are comparable to those found at the national level (Genç, 2014[30]) yet remain smaller compared to those found at the subnational level for single-country analyses (Briant, Combes and Lafourcade, 2014[26]; Parsons and Vézina, 2018[27]).

While the larger effects on imports may harm the trade balance in the short run, it can also lead to larger exports in the medium to long run. In the short run, migrants increase demand for consumer goods from their country of origin or other types of goods that are not available in their host region. While the larger set of consumption varieties increases the welfare of the population, these imports could also benefit exports in the medium to long run. For example, imports could involve cheaper intermediary products or machinery, which can improve the productivity of the industries in the host economy and translate into higher exports in the medium or long run (Bas and Strauss-Kahn, 2014[31]). Moreover, exposure to imported products can accelerate learning and innovation in local firms.

Figure 4.7. Migrants boost both imports and exports of the region where they settle

Estimated effect of a 1% increase in the number of migrants, European countries, 2013, TL2 regions



Note: Figure presents 2SLS estimates for the impact of an increase in the number of migrants (or migrant population) on regional trade flows for European countries. Gravity controls include the logarithm of the bilateral distance between region and trade partner, the logarithm of GDP in both origin and destination. All results present 2SLS results where the regional native-born and migrant population are instrumented using predicted population numbers. Fixed effects include origin and destination fixed effects. Residuals are clustered by TL2 regions. Residuals are clustered by TL2 regions. See Endnote 20 for the list of countries included in the analysis.
***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.
Source: OECD calculations based on data from European Labour Force Survey (accessed October 2020) and Thissen, M. et al. (2019[32]), "European NUTS 2 regions: Construction of interregional trade-linked supply and use tables with consistent transport flows", *JRC Working Papers on Territorial Modelling and Analysis*.

Migrants' contribution to exports is particularly important as it indicates an immediate increase in regions' production capabilities and competitiveness. Since regions can only compete in global markets once they have become productive enough, an increase in the export volumes can suggest important gains in the production capabilities of the region, which is crucial for economic development and income (Irwin and Terviö, 2002[33]). For this reason, the rest of the section focuses on regional exports.

Migrants, in particular those with a university degree, contribute to regional exports

Not only country-level characteristics but also the heterogeneity among migrants could matter for trade flows. The recent literature consistently reports larger marginal effects on trade flows for migrants with a university degree or above. For example, migrants with higher educational attainment can transfer knowledge better (Bahar and Rapoport, 2018[23]; Bahar et al., 2019[34]). Highly skilled migrants might also bring new and different skills to their host region that can complement the production, particularly in high-value, knowledge-intensive sectors, making firms more productive and competitive in trade (Nathan and Lee, 2013[35]). As with trade flows, skilled migrants can also provide domestic investors with additional information on "home" market investment opportunities (Pandya and Leblang, 2012[36]).

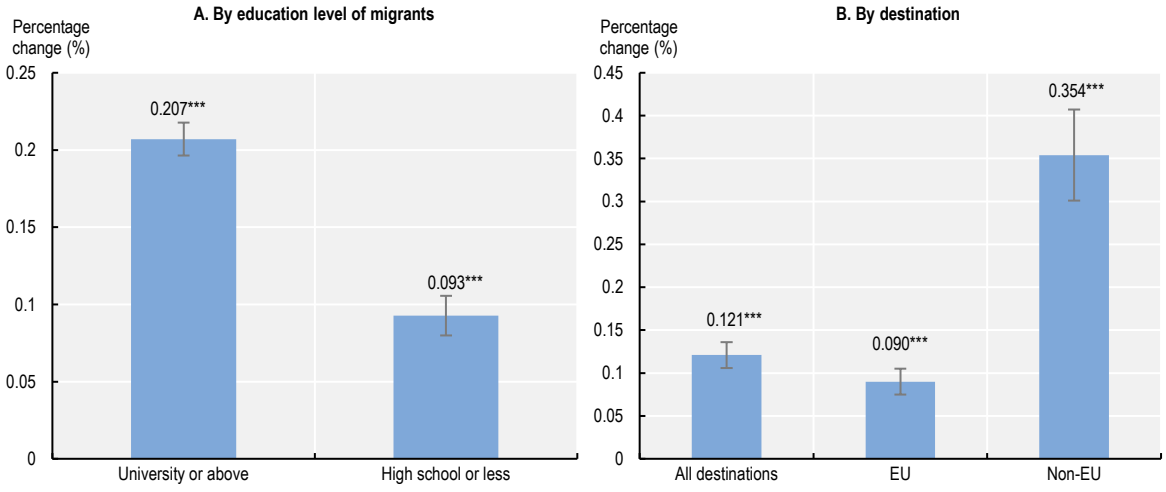
The marginal effect of migrants with a university degree or above on regional exports is twice as strong as for those who have a high school education or less. Regions that observe a 10% increase in the number of migrants with a university education or above (Figure 4.8, Panel A) experience a rise in their regional exports by 2.1%, while a similar increase in the high school or less-educated migrant population would have a more moderate effect of 0.9%.

Migration appears to boost exports in particular to non-EU destinations

Migrants appear to boost exports to all destinations but, in particular, to non-EU countries and regions. Overall, the analysis carried out in this section suggests that a 1% increase in the number of migrants is follower by an increase of 0.12% in international exports. Exports directed to regions located in other EU countries increased by 0.09%. In comparison, the effects of trade with regions outside the EU are more than three times larger (Figure 4.8, Panel B).[22] While understanding the underlying mechanisms requires further analysis, these differential effects might be driven by several factors. First, migrants might boost regional trade by increasing the probability of starting new export relationships between countries. Migrants can bring improved international market knowledge, which allows buyers and sellers in both countries to match better. Given the strong existing trade links between regions in the EU, it is natural that the marginal effects associated with an increase of migrants are stronger for trade with non-EU destinations. Second, migrant networks allow establishing trade links that overcome trade barriers, particularly for destinations with weaker institutional quality by reducing the transaction costs. Diasporic/co-ethnic networks offer an effective means of contract management and enforcement (Javorcik et al., 2011[37]). Over time, migration may also attract foreign direct investment (FDI) flows between host and home countries, translating into an increase in trade. Since barriers are lower for trade with other EU regions, exports to non-EU regions benefit disproportionately more from migration.

Figure 4.8. The marginal effects of migration on exports are stronger for regions with more university-educated migrants and to non-EU destinations

Estimated effect of a 1% increase in the number of migrants, European countries, 2013, TL2 regions



Note: Both panels present 2SLS estimates for the impact of an increase in the number of migrants (or migrant population) on regional trade flows for European countries. All regressions include gravity controls (the logarithm of the bilateral distance between region and trade partner, the logarithm of GDP in both origin and destination) and fixed effects (origin and destination). All results present 2SLS results where the regional population of migrants are instrumented using predicted population numbers. Residuals are clustered by TL2 regions. See Endnote 20 for the list of countries included in the analysis.

***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.

Source: OECD calculations based on data from European Labour Force Survey (accessed October 2020) and Thissen, M. et al. (2019[32]), "European NUTS 2 regions: Construction of interregional trade-linked supply and use tables with consistent transport flows", *JRC Working Papers on Territorial Modelling and Analysis*.

Migration supports trade diversification

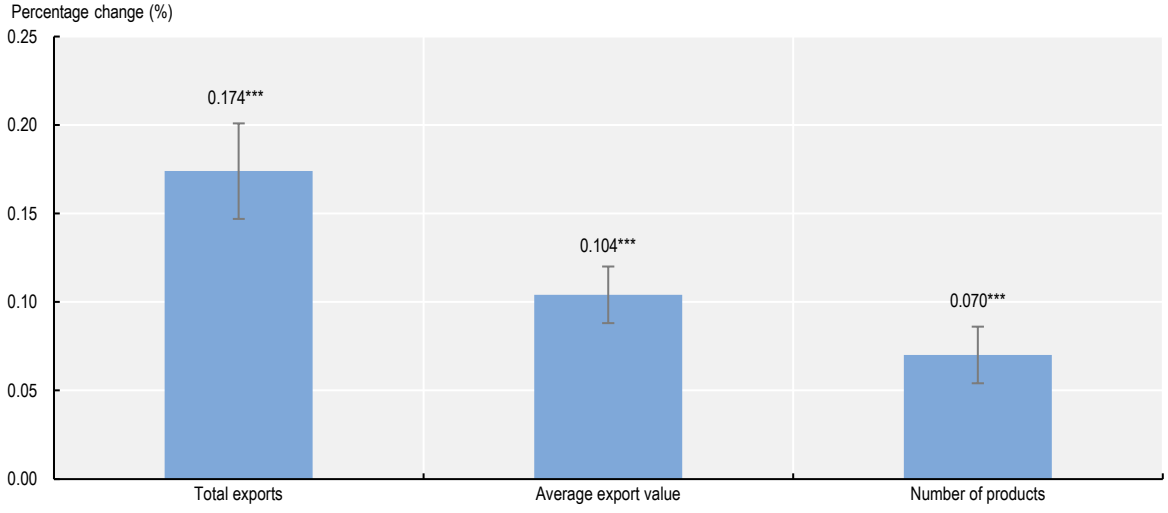
The aggregate effect of migration on trade observed at the regional level can result from a combination of three main channels. First, individual firms can directly benefit from the presence of migrant workers, who can help create new multi-border networks and business relationships (Felbermayr and Toubal, 2012[22]; Ortega and Peri, 2014[2]). Second, migrants can work as employees or start their own exporting companies to boost the region's total exports (Horwitz and Horwitz, 2016[38]). Third, they could help their firm export new products or boost product quality (Grossman and Maggi, 2000[39]).

Firm-level analysis can help identify the mechanisms through which migrants affect the trade flows. Due to confidentiality concerns, accessing firm-level microdata is often very difficult, making a multi-country analysis difficult or, in most cases, impossible. Focusing on the case of France, this chapter uses microdata covering the universe of French exporters. The analysis shows that migrants in French provinces (TL3 regions, *départements* in French) increase exports from the province to the country of origin of the migrant. More precisely, a 1% increase in the number of migrants from a given country increases the total exports from the French province to the country of origin of the migrant by 0.17% (Figure 4.9).

Migrants help firms export more types of products and products of higher quality (Peri and Requena-Silvente, 2010[40]). The presence of migrants in a French province contributes to firms' export performance by increasing the average value of the exported goods (Figure 4.9, second column). Two factors can drive the increase in the average value of exported goods. First, the quality of the exported product might be increasing, which would raise the average export value. Second, the presence of migrants also helps firms to start exporting more product varieties (Figure 4.9, third column). If these new export products have a higher value, it could also raise the average value of firms' exports.

Figure 4.9. Migrants increase export volumes, export values and the number of products in their host regions

Estimated effect of a 1% increase in the number of migrants in a province on French firms, 1995-2012, TL3 regions



Note: Figure presents the point estimates obtained through 2SLS estimation at the firm level. Each column corresponds to the impact of an increase in the number of migrants located in a French province (TL3 region) from a country of origin on exporting activity of firms located in the province towards the country of origin of the migrant. Each column corresponds to the point estimate of a different outcome variable. All results present 2SLS results where the province-level population of migrants are instrumented using predicted population numbers. Residuals are clustered by TL3 regions.

***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.

Source: OECD calculations based on data from Direction Général des Douanes et Droits Indirects and French Labour Force Survey (INSEE) (accessed November 2020).

Box 4.5. Migration as a channel for knowledge diffusion and industrial development

While most of the economic debate on immigration has focused on the effects in the host country, migrants can also affect outcomes in their country of origin. A growing literature provides evidence that migrants can be drivers of international knowledge diffusion across borders, which can be particularly important for the economic development of countries of origin (e.g. Kerr, 2008[41]; Bahar and Rapoport, 2018[23]; Miguelez and Noumedem Temgoua, 2020[42]).

In recent work, Bahar et al. (2019[34]) explore a novel angle exploring gains from migration and show how migrants, upon their return, can shape the industrial development of their home country. The study exploits a natural experiment in the early 1990s, when about 700 000 citizens of the former Yugoslavia fled to Germany to escape war where they received temporary legal status, *Duldung* (German for "toleration"), which allowed them to stay and, under some circumstances, work in Germany. By working in German industries, Yugoslavian refugees were exposed to German productive know-how. When the war ended in 1995 following the Dayton Peace Treaty, Yugoslavian refugees also started going back. By 2000, the majority of Yugoslavian refugees had been repatriated back to their home country or to other territories of dissolved Yugoslavia.

Upon their return, Yugoslavian migrants put into use their newly acquired foreign knowledge, technologies and best practices. In fact, a few years after their return, Yugoslavian exports started increasing. This increase was particularly strong for industries that received a larger number of returnees, especially those who received more than high school education or worked in occupations that involve analytical skills or managerial roles.

These results indicate that returning migrants can generate substantial industry-specific productivity increases, resulting in changes in the export composition of a country as a whole. In terms of policy implications, these results indicate that having access to labour markets could allow refugees to learn from their receiving countries and put them into use in their country of origin upon their return.

Source: Bahar, D. and H. Rapoport (2018[23]), "Migration, knowledge diffusion and the comparative advantage of nations", http://dx.doi.org/10.1111/ecoj.12450; Bahar, D., A.Hauptmann, C.Özgüzel, and H.Rapoport (2019[34]), "Migration and post-conflict reconstruction: The effect of returning refugees on export performance in the former Yugoslavia" *IZA Discussion Paper Series*; Kerr, W. (2008[41]), "Ethnic scientific communities and international technology diffusion", *The Review of Economics and Statistics*, Vol. 90/3, pp. 518-537; Miguelez, E. and C. Temgoua (2020[42]), "Inventor migration and knowledge flows: A two-way communication channel?", *Research Policy*, Vol. 49/9, p. 103914.

Migration and regional labour markets

Migration has become an increasing source of political tensions in recent years, both within and outside the EU, partly because of concerns about the potential adverse impact of migration on public finance and employment. According to a survey, 55% of the population in the EU believe that migrants are a fiscal burden and 40% express concerns about migrants taking jobs from native-born workers (EC, 2017[43]). While these are perceptions rather than facts (Edo et al., 2018[44]), economists are increasingly investigating how migration affects regional labour markets.

During the past decade, the surge in migration to Europe has triggered new attention among economists on the labour market consequences of immigration and refugee waves by revisiting prior well-known studies or implementing new ones (Edo, 2018[45]). One important question addressed by these studies is about determining the impact of an increase in the local labour supply driven by migrants on the employment of native-born living in that area. From a methodological point of view, the approach to address

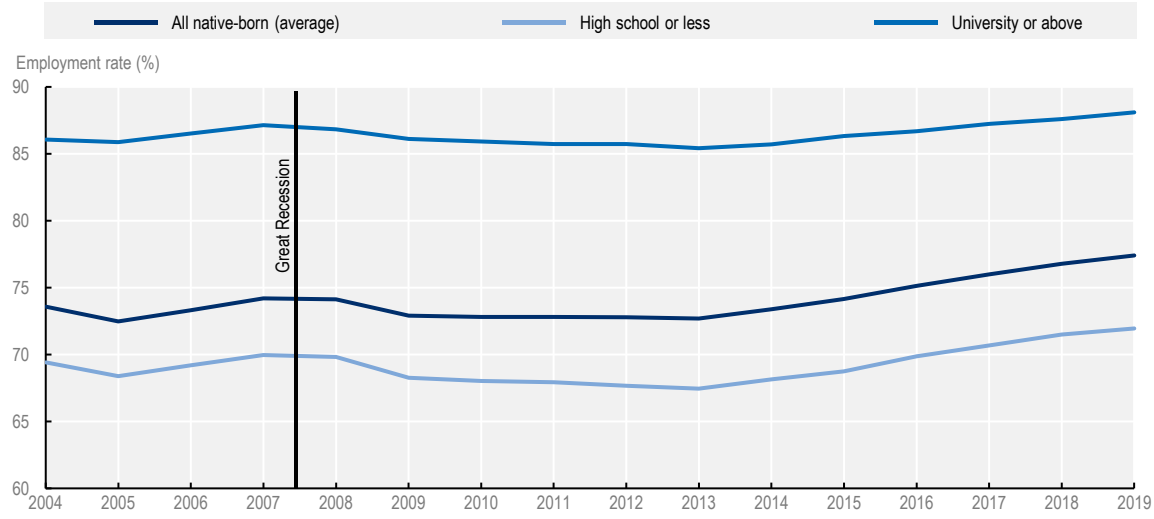
such empirical questions is to compare changes in economic outcomes of places experiencing a higher increase in the local labour supply due to migration relative to other places with smaller increases and exploit the spatial variation econometrically. The main advantage of such a strategy is that it captures all channels through which immigration can affect regional labour markets (Dustmann, Schönberg and Stuhler, 2016[46]).

Despite the strong interest in this topic, empirical evidence at the regional level remains scarce. Most studies either use regional variations within a single country or implement multi-country investigations without introducing any regional dimension (Angrist and Kugler, 2003[47]; D'Amuri and Peri, 2014[48]). The main advantage of cross-regional analyses is to offer a rich set of information to identify the labour market response to immigration. On the other hand, a multiple-country setting allows exploiting the heterogeneity of the sample (in terms of economic performance, welfare system or labour market institutions) to understand the underlying mechanisms through which labour markets can respond to immigration.

This section presents novel insights by investigating the impact of migration on the employment of the native-born population by exploiting data across 136 European TL2 regions in 13 (mainly Western) European countries between 2010 and 2019.[23] This analysis is particularly relevant for Western European countries for two reasons. First, between 2010 and 2019, the native-born employment rate[24] increased by 5.6 percentage points on average across European regions following the decline in the Great Recession (2007-09) (Figure 4.10). Second, as regional economies recovered from the crisis, labour market opportunities also increased, attracting migrants. In fact, during the same period, the share of the migrant (i.e. foreign-born) labour force increased on average by 3.4 percentage points from 12.7% in 2010 to 16.1% in 2019. Increases occurred in all countries considered except for Greece (Figure 4.11). The rise in the share of migrants in the labour force in Western Europe is twice as large as in the US, where the share increased by 1.6 percentage points between 2010 and 2019 (from 15.8 to 17.4%).

Figure 4.10. The employment rate for the native-born population was recovering from the Great Recession

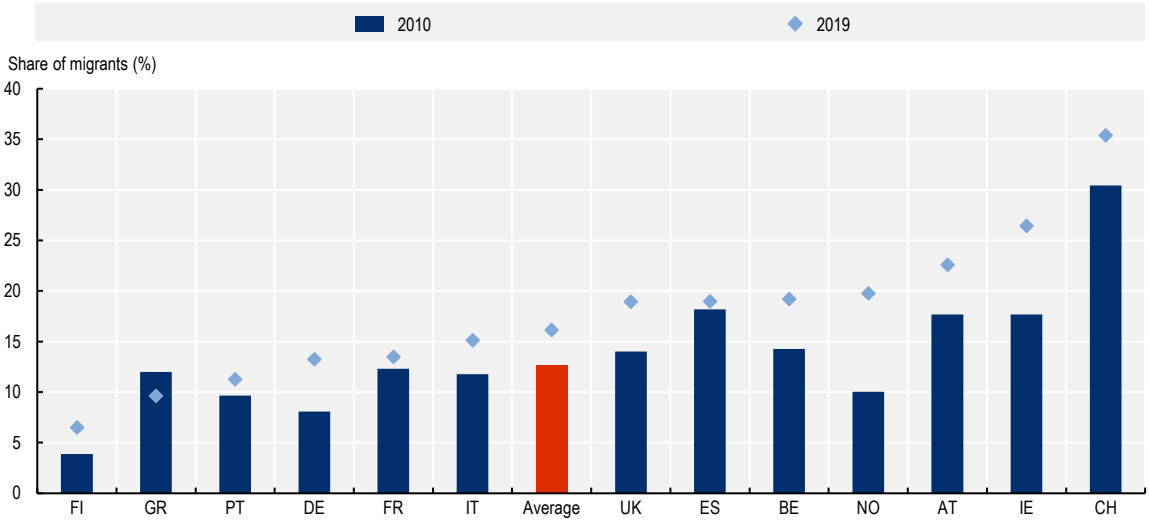
The native-born employment rate in Western European countries, 2004-19



Note: The figure plots the evolution of the employment to population rate for native-born over the 2004-19 period for the sample of 13 European countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK). The university or above education group considers all native-born workers with some tertiary education or more, while the high school or less-educated group considers all native-born workers with secondary education or less.
Source: Author calculations based on EU-LFS.

Figure 4.11. The migrant share increased in all European countries except Greece

The share of migrants in the labour force of Western European countries in 2010 and 2019



Note: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK. The average corresponds to the weighted average of the sample.
Source: OECD calculations based on data from EU-LFS.

The following analysis explores the labour market effects of an increase in the labour supply driven by migration along three dimensions.[25,26] First, it examines the dynamic response of regional native-born employment to labour supply changes over different periods. In theory, possible changes in native-born workers' employment caused by a change in the labour supply resulting from migration could differ between the short and medium to long run, as labour market adjustments are not instantaneous.[27,28]Second, migration may have uneven effects on native-born with different levels of education. Possible short-term effects in native-born workers' employment are often concentrated on low-skilled workers, while they are negligible or even positive for high-skilled, educated ones.[29] The analysis thus tests whether the increase of migrant workers (defined as those born outside of the host country) in European regions had uneven effects across workers with different levels of education over the past decade. Third, it examines how the patterns of employment changes differed by regional characteristics, as the capacity of regions to absorb new labour supply may depend on local firms` ability to adjust their capital stock and the business cycles. For example, if firms cannot adjust their capital or are unwilling (due to lack of demand during an economic downturn), an increase in the labour supply could have a stronger effect on the labour market. Building on this idea, in the final step, the analysis explores whether the short-run impact of immigration on native-born employment is weaker in fast-growing regional economies.

As labour markets adjust over time, the short-term regional impact on growth in domestic employment of an increase in labour supply due to migration disappears

The identification of the regional impact of migration on native-born employment requires accounting for the location choices of migrants. Therefore, Figure 4.12 compares the average effect of an increase in the local labour supply due to immigration on the native-born employment rate, defined as the number of employed native-born over the total native-born population. Columns 1-2 present the estimated relationship, while Columns 3-4 account for the bias in the estimation due to the non-random settlement of migrants across regions. As the effects of migration adjust over time, the short-term (one-year) and long-term (ten-year) effects are considered by separate estimates for the 2010-19 period. Given the increase in the native-born employment rate across European regions during the period (Figure 4.10), these estimates correspond to a deceleration in the growth rate in the employment rate and not a decline.

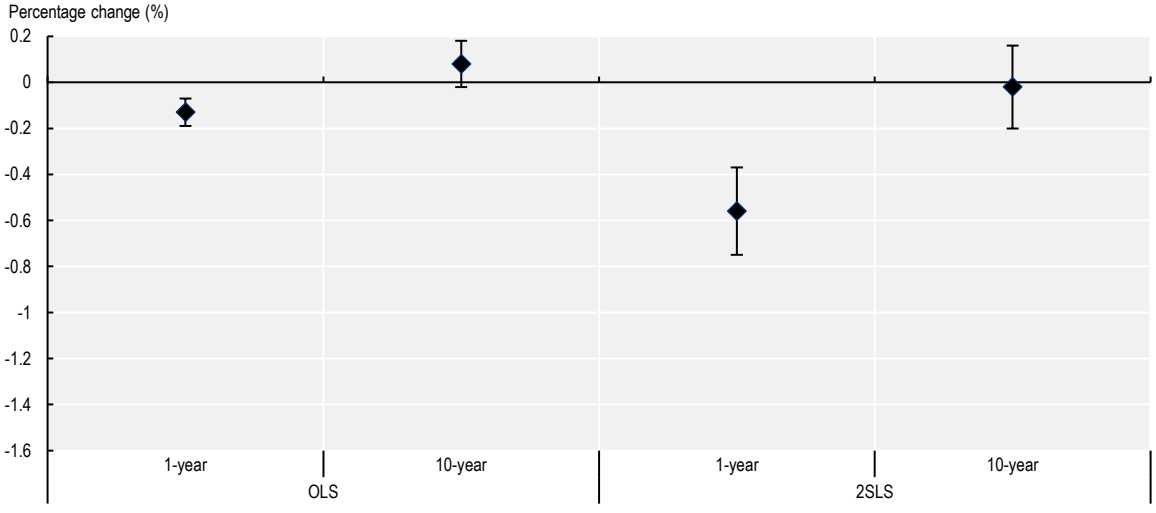
The effects of migration on native-born employment rates diminish over time. The point estimate in Column 3 (using 1-year intervals) implies that a 1% increase in the labour supply due to migration in a given region is associated with a 0.56% slower growth in the native-born employment rate in that region, while in the long term (using 10-year changes, Column 4), the effect on the native-born employment rate completely disappears.[30,3132] Expressed differently, a 1% increase in the labour force due to migration would indicate a 0.13 percentage points lower increase in the employment rate of the native-born population.[33] This result is robust to several specifications and consistent with economic theory predicting that immigration triggers various short- to medium-run adjustments within and across regions/countries that affect native-born employment. Capital accumulation and the adaptation of production techniques are two potential mechanisms explaining why the longer-run impact of immigration on employment is weaker than the short-run employment response.[34] Additionally, migration boosts regional income per capita, as shown in the first section of this chapter, which in turn can then strengthen regional labour markets and compensate for the initial labour market supply changes.

Across regions, the short-term and long-term labour market effects differ for native-born workers with tertiary education and those with lower levels of education

As documented in the preceding sections, migration boosts regional economies through more international trade, higher income and increased innovation. As a consequence, regions benefit from migration economically overall. However, some population groups in OECD regions might be more affected than others by migration, especially in the labour market, which would require targeted policies for supporting those groups.

Figure 4.12. Regional labour markets adjust over time and manage to absorb an increase in the labour force due to migration in the long run

Estimated effect of a 1% increase in the labour supply due to migration on the native-born employment rate, European countries, 2010-19, TL2 regions



Note: The figure presents OLS and 2SLS estimates for the impact of a 1% increase in the labour supply due to migration on the employment rate of the native-born population (i.e. the number of employed native-born over the native-born population), annually and 10-year changes. 2SLS estimations use the predicted increase in the labour supply due to the migration (i.e. the shift-share) as the instrument. Residuals are clustered by TL2 regions. The sample includes the following countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK.
Source: OECD calculations based on data from EU-LFS and national censuses obtained from IPUMS. See Box 4.2 for further details.

Migration may also have uneven effects on the employment rate of the native-born population with different levels of education. While many factors can drive these differences, the effects are more substantial for

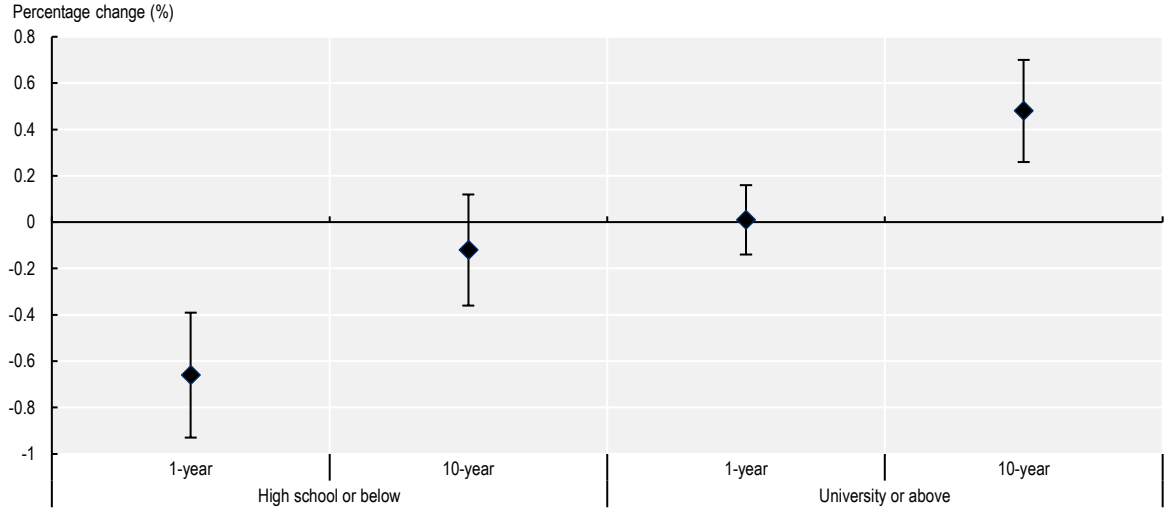
native-born workers with high school or less education because the degree of competition between native-born and migrant workers within the low-skill segment of the labour market is stronger (Orrenius and Zavodny, 2007[49]). Another reason is that the skill complementarity between migrant and native-born workers with a university education or above could benefit educated native-born without increasing the labour market competition (Peri, Shih and Sparber, 2015[50]). As discussed extensively in the literature, the labour market effects of migration are often concentrated on high school or less-educated native-born workers, while they are negligible or insignificant for university-trained (or above) ones.

The analysis carried out in this section reveals that labour market effects of migration are limited to native-born workers with a high school degree or lower education (Figure 4.13). The estimates indicate that in the short run, a 1% increase in the labour supply due to migration slows the growth in the native-born employment rate (i.e. the number of employed native-born workers over the total native-born population) with a high school degree or less by 0.66% while it has no effect on native-born workers with higher levels of education. This asymmetric impact is consistent with the existing empirical evidence that indicates that migrants compete mostly with native-born workers who do not have a university degree (Dustmann, Schönberg and Stuhler, 2017[51]).

The labour market impact of an increase in the migrant population also changes in the long run as labour markets adjust. For native-born workers with a high school degree or less, the short-run effect of an increase in the labour force resulting from migration fades away in the long run as the labour market adjusts. Native-born workers with higher levels of education even see an increase in their employment rate in the long run.[35]

Figure 4.13. The regional labour market effects of migration are uneven across workers with different levels of education

Estimated effect of a 1% increase in the labour supply due to migration on the native-born employment rate by level of education, European countries, 2010-19, TL2 regions



Note: The figure presents 2SLS estimates for the impact of a 1% increase in the labour force due to migration on the employment rate of the native-born population, annually and 10-year changes by education levels of native-born workers. 2SLS estimations use the predicted increase in the labour supply due to migration (i.e. the shift-share) as the instrument. Residuals are clustered by TL2 regions. The sample includes the following countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK.
Source: OECD calculations based on data from EU-LFS and national censuses obtained from IPUMS. See Box 4.2 for further details.

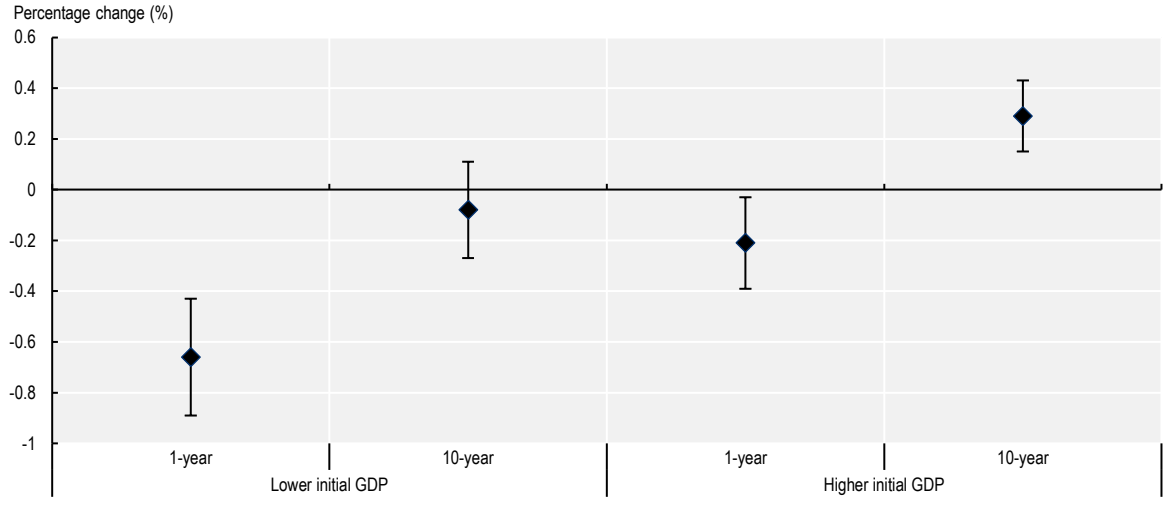
Regions with higher GDP integrate migrant workers more easily

Economically dynamic regions can better absorb an increase in the labour supply induced by migration. The standard economic models assume that the stock of capital in the economy evolves very slowly in the short run. When the capital stock is fixed, a migration-induced increase in labour supply reduces the level of physical capital per worker and negatively affects labour productivity and lowers average wages (Borjas, 2003[52]). As a result, fewer native-born workers will be willing to work and their employment level should decline. However, if capital stock adjusts to changes in the labour supply, neither wages nor employment levels fall. Thus, regions that are economically more dynamic and able to adapt their capital better should absorb the increase in the labour supply more easily, resulting in weaker adverse effects on native-born workers.

The European regions with the highest regional GDP experienced weaker employment effects in response to migration in the short run. The estimates in Figure 4.14 show that in the short run, the marginal impact of a 1% increase in the labour supply due to migration in regions with "Higher initial GDP" (i.e. 25% of regions with the highest GDP in Europe in 2010) is less than one-third the size compared to those with "Lower initial GDP" (i.e. the remaining 75% of regions). Moreover, in the long run, the growth in the native-born employment rate in regions with higher GDP is even accelerated in response to migration. The regions with lower initial GDP, on the other hand, are capable of perfectly absorbing the increase in the labour supply in the long run.[36]

Figure 4.14. More prosperous regions absorb new migrants in the labour force more easily

Estimated effect of a 1% increase in the labour supply due to migration on the native-born employment rate, European countries, 2010-19, TL2 regions



Note: Presents 2SLS estimates for the impact of a 1% increase in the labour supply due to migration on the employment rate of the native-born population (i.e. number of employed native-born over the native-born population), annually and 10-year changes. Regions are grouped according to their GDP in 2010. Twenty-five percent of the regions with the highest GDP in Europe are grouped as "Higher initial GDP" while the remaining 75% are grouped as "Lower initial GDP". Residuals are clustered by TL2 regions. 2SLS estimations use the predicted increase in the labour supply due to migration (i.e. shift-share) as the instrument. The sample includes the following countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK.
Source: OECD calculations based on data from EU-LFS and national censuses obtained from IPUMS. See Box 4.2 for further details.

Targeted policies can help all regions and workers benefit from migration

As documented in this chapter, migration boosts economic development in OECD regions. It leads to an increase in regional income per capita, more international trade and more innovation, which results in greater well-being of the regional population. Migrants arrive in regions with economic opportunities and increase the available labour supply. However, this increase in the labour supply due to immigration can slow the pace of growth in the native-born employment rate in the short term.[37] While this effect gradually diminishes over time as the labour market adjusts, it is more pronounced for some groups (e.g. native-born workers with lower levels of education or located in regions with lower GDP or capacity to absorb migrants) who may be affected more than others. Given the relatively small displacement effects on native-born employment and positive effects on the overall economy, it is reasonable to assume that migrants expand the overall employment in their host region. Still, as the labour market consequences on native-born workers are uneven across groups, targeted policies that take into account the heterogeneous impact of migration and provide effective support for those groups that are most vulnerable in the labour market can ensure that the entire population benefits from positive economic gains associated with migration in OECD regions.

Box 4.6. Does migrant mobility protect native-born employment?

Geographical mobility of workers can reduce income, wage and unemployment differences across regional and local labour markets (Bartik, 1991[53]; Blanchard and Katz, 1992[54]). One important mechanism to consider is the role of migration to cushion the effect of negative shifts in the labour market. The asymmetry in the geographical responsiveness between native-born and migrant workers has attracted a growing interest for economists since the emergence of the last economic crisis in 2008 (Basso and Peri, 2020[55]). The main intuition is that, as migrants tend to be relatively more mobile than native-born workers, they are more likely to move in the presence of an adverse economic shock or negative cycle.

The geographic mobility of migrant workers shields the native-born population against the negative effects of economic shocks. Recent literature showed that areas affected by demand shifts experience a decrease in the total migrant population. Through various channels, the reduction of migrant workers softens the adverse effects of demand shifts on native-born employment opportunities and wages and help the local labour markets recover faster (Cadena and Kovak, 2016[56]; Monras, 2018[57]; Basso, D'Amuri and Peri, 2019[58]; Gálvez Iniesta, 2019[59]; Özgüzel, 2021[60]).

While documenting the change in the migrant population, existing studies do not provide conclusive evidence on the exact drivers of this change. In fact, the population of an area can change through inflows from or outflows to other areas, or both. Understanding how population flows react to the changes in the economic conditions matters for improving our understanding of how local labour markets adjust to demand shifts (Monras, 2018[57]) but also from a policy perspective.

OECD evidence from European regions shows that migrants reduce their inflows to TL2 regions where unemployment rates increase (Figure 4.15, left panel). An increase in the regional unemployment rate reduces the inflow rates of migrants (i.e. the darker blue dotted line). In contrast, the relationship (i.e. the lighter blue dotted line) is close to zero for native-born workers. An increase in the unemployment rate also reduces the outflow of migrants (i.e. the darker blue dotted line), although the relationship is less pronounced than the inflows (Figure 4.15, right panel). Once again, the relationship is very close to zero for the native-born population.

Figure 4.15. An increase in the unemployment rate reduces migrant inflows

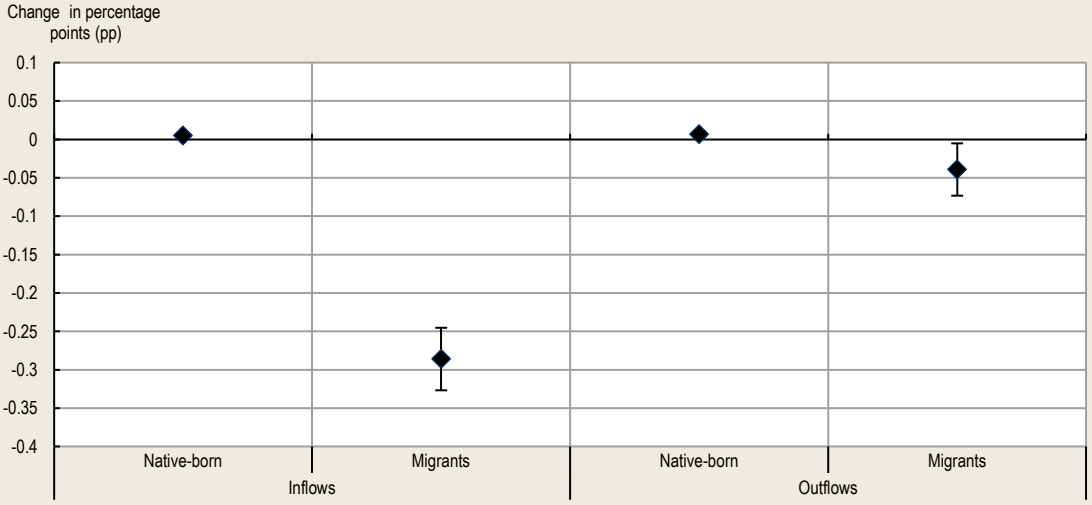
Correlations between 1 percentage point (pp) change in the regional unemployment rate and in the inflow or outflow rates, 2003-17, a select sample of European countries, TL2 regions

Note: The figures plot the raw correlations between two flow margins (inflow and outflow rates, separated for migrants and native-born population) and the region's unemployment rates (defined as the share of unemployed workers over the active labour force), which is a proxy for economic conditions in the region. The inflow rate to region r at time t, as the number of people that live in region r at time t and were living somewhere else at time $t-1$ (within the same country or abroad), divided by the number of people that live in the region r at time t. Similarly, the outflow rate from a region r at time t is defined as the number of people that were living in region r at time $t-1$ and were living in another region (and in the same country) at time t, divided again by the number of people that live in region r at time t. Each marker corresponds to 1 of the 76 regions in a select sample of European countries. Sample of countries: Belgium, Greece, France, Portugal, Spain and Sweden.
Source: OECD calculations based on data from EU-LFS.

Mobility rates and local economic conditions affect each other, making it difficult to establish a causal relationship. As the unemployment rate and mobility rates are likely to be jointly determined (regions with a lower unemployment rate would tend to attract more workers), the correlations suffer from endogeneity issues (or reverse causality), as discussed in the previous sections. An econometric approach relying on the instrumental variable approach (using unemployment rates predicted through a shift-share similar to Bartik (1991[53])) shows that an increase in the unemployment rate in a region reduces migrant inflows to the region, while native-born inflows are not affected. On average, a 1-percentage point increase in the regional unemployment rate reduces the inflow of migrants by 0.286 percentage points, which correspond to a decrease of 12% of the inflows (left panel, first row). The magnitude is comparable to that found by Monras (2018[57]) for metropolitan areas in the US. For native-born workers, the coefficients are always equal to zero in all sub-periods.

Figure 4.16. An increase in the unemployment rate affects migrant inflows but not outflows

Estimated effect of a 1 percentage point change in the regional unemployment rate and in the inflow or outflow rates, 2003-17, a select sample of European countries, TL2 regions



Note: The figure presents the point estimates from a 2SLS estimation where the dependent variable is the change in the group-specific inflow or outflow rates, and the independent variable is the change in the unemployment rate in the region. The independent variable is instrumented using a Bartik instrument. Residuals are clustered by TL2 regions. Analysis based on 1 091 observations. Sample of countries: Belgium, Greece, France, Portugal, Spain and Sweden.
Source: OECD calculations based on data from EU-LFS.

The results show that changes in the unemployment rate do not significantly affect the outflow of migrant or native-born workers to other regions. The unresponsiveness of outflows might be the result of several factors. First, moving away from a region is costly, especially during an economic crisis. In a context of recession, the risk of unemployment and overall uncertainty affect the decision of migrating (Czaika, 2015[61]). Second, the outflows measures used in this section can only capture the outflows directed to another region within the country (i.e. internal migration).[38]

Source: Blanchard, O. and L. Katz (1992[54]), "Regional evolutions", *Brookings Papers on Economic Activity*, No. 23(1), Economic Studies Program, The Brookings Institution; Bartik, T. (1991[53]), "Who benefits from state and local economic development policies?"; Basso, G., F. D'Amuri and G. Peri (2019[58]), "Immigrants, labor market dynamics and adjustment to shocks in the Euro Area", *IMF Economic Review*, Vol. 67/3, pp. 528-572; Basso, G. and G. Peri (2020[55]), "Internal mobility: The greater responsiveness of foreign-born to economic conditions", *Journal of Economic Perspectives*, Vol. 34/3, pp. 77-98; Cadena, B. and B. Kovak (2016[56]), "Immigrants equilibrate local labor markets: Evidence from the Great Recession", *American Economic Journal: Applied Economics*, Vol. 8/1, pp. 257-90; Czaika, M. (2015[61]), "Migration and economic prospects", *Journal of Ethnic and Migration Studies*, Vol. 41/1, pp. 58-82; Gálvez Iniesta, I. (2019[59]), *The Role of Immigration in a Deep Recession: The Case of Spain*; Prieto-Rosas, V., J. Recaño and D. Quintero-Lesmes (2018[62]), "Migration responses of immigrants in Spain during the Great Recession", *Demographic Research*, Vol. 38, pp. 1885-1932; Monras, J. (2018[57]), "Economic shocks and internal migration"; Özgüzel, C. (2021[60]), "The cushioning effect of immigrant mobility", *CESifo Working Paper Series*.

Conclusion

This chapter presented evidence on the contribution of migrants to the economic development of their host region. Using microdata and state-of-the-art econometric tools, the analysis in this chapter presented novel evidence on the contribution of migrants at the subnational level and from a multi-country perspective. As such, the chapter aims to expand and nuance the understanding of the subnational effects of migrants on regional income, innovation, trade and labour markets.

This chapter shows that migrants contribute to the regional economy in different ways and through different mechanisms that change across space and characteristics of regions as well as the level of education of the regional labour force. While most studies measure the average effect of migration in the whole national economy, the results in this chapter show the need for a more nuanced look as the effects can be highly uneven across regions. Similarly, while migration may affect the overall economy, their effects may be more concentrated on certain groups (e.g. high school or less-educated native-born workers). These findings can help design effective policies to spread the benefits of migration to all places.

While this chapter contributes to the evidence base on migration's contribution to regional development, currently limited data availability leaves scope for future research. Such work could examine how the local industrial structure affects regions' capacity to absorb new migrants and make use of their skills. Furthermore, understanding how migration affects local wages, in particular that of the native-born labour force, could complement the presented evidence on the impact of migration on regional labour markets. Detailed regional data on the sectors where new migrants work could shed further light on how migration might help alleviate labour shortages for specific occupations. Finally, future analysis could try to examine how the contribution of migration to regional development may depend on the specific country of origin or the length of stay of migrants. With greater data availability, such analysis may help to further enrich the empirical evidence on the regional economic effects of migration and, thus, support more effective policy design.

References

Alesina, A., J. Harnoss and H. Rapoport (2016), "Birthplace diversity and economic prosperity", *Journal of Economic Growth*, Vol. 21/2, pp. 101-138. [13]

Angrist, J. and A. Kugler (2003), "Protective or counter-productive? Labour market institutions and the effect of immigration on EU natives", *Economic Journal*, Vol. 113/488, pp. F302-F331, http://dx.doi.org/10.1111/1468-0297.00136. [47]

Astruc-Le Souder, M. et al. (forthcoming), "Going granular: A municipal migration database", *OECD Regional Development Working Papers*, OECD Publishing, Paris. [20]

Bahar, D. et al. (2019), "Migration and post-conflict reconstruction: The effect of returning refugees on export performance in the former Yugoslavia", *IZA Discussion Paper Series* 12412. [34]

Bahar, D. and H. Rapoport (2018), "Migration, knowledge diffusion and the comparative advantage of nations", *Economic Journal*, Vol. 128/612, pp. F273-F305, http://dx.doi.org/10.1111/ecoj.12450. [23]

Bahar, D., H. Rapoport and R. Turati (2020), "Birthplace diversity and economic complexity: Cross-country evidence", *Research Policy*, p. 103991. [14]

Bartik, T. (1991), "Who benefits from state and local economic development policies?". [53]

Bas, M. and V. Strauss-Kahn (2014), "Does importing more inputs raise exports? Firm-level evidence from France", *Review of World Economy*, Vol. 150, pp. 241-275. [31]

Basso, G., F. D'Amuri and G. Peri (2019), "Immigrants, labor market dynamics and adjustment to shocks in the Euro Area", *IMF Economic Review*, Vol. 67/3, pp. 528-572. [58]

Basso, G. and G. Peri (2020), "Internal mobility: The greater responsiveness of foreign-born to economic conditions", *Journal of Economic Perspectives*, Vol. 34/3, pp. 77-98. [55]

Beine, M., S. Bertoli and J. Moraga (2016), "A practitioners' guide to gravity models of international migration", *The World Economy*, Vol. 39/4, pp. 496–512. [4]

Blanchard, O. and L. Katz (1992), "Regional evolutions"*, Brookings Papers on Economic Activity*, No. 23(1), Economic Studies Program, The Brookings Institution. [54]

Borjas, G. (2003), "The labor demand curve is downward sloping: Reexamining the impact of immigration on the labor market", *The Quarterly Journal of Economics*, Vol. 118/4, pp. 1335-1374, http://dx.doi.org/10.1162/003355303322552810. [52]

Borjas, G. and A. Edo (2021), "Gender, Selection into Employment, and the Wage Impact of Immigration", http://www.nber.org/papers/w28682 (accessed on 24 September 2021). [71]

Bosetti, V., C. Cattaneo and E. Verdolini (2015), "Migration of skilled workers and innovation: A European Perspective", *Journal of International Economics*, Vol. 96/2, pp. 311-322, http://dx.doi.org/10.1016/J.JINTECO.2015.04.002. [16]

Bove, V. and L. Elia (2017), "Migration, diversity and economic growth", *World Development*, Vol. 89, pp. 227-239. [9]

Bratsberg, B. and O. Raaum (2012), "Immigration and Wages: Evidence from Construction", *Economic Journal*, Vol. 122/565, pp. 1177-1205, http://dx.doi.org/10.1111/j.1468-0297.2012.02540.x. [70]

Bratti, M. and C. Conti (2014), "The Effect of (Mostly Unskilled) Immigration on the Innovation of Italian Regions". [66]

Briant, A., P. Combes and M. Lafourcade (2014), "Product complexity, quality of institutions and the protrade effect of immigrants", *World Economy*, Vol. 37/1, pp. 63-85, http://dx.doi.org/10.1111/twec.12109. [26]

Brücker, H. et al. (2014), "Migration and imperfect labor markets: Theory and cross-country evidence from Denmark, Germany and the UK", *European Economic Review*, Vol. 66, pp. 205-225, http://dx.doi.org/10.1016/j.euroecorev.2013.11.007. [72]

Cadena, B. and B. Kovak (2016), "Immigrants equilibrate local labor markets: Evidence from the Great Recession", *American Economic Journal: Applied Economics*, Vol. 8/1, pp. 257-90. [56]

Carlino, G. and W. Kerr (2015), "Agglomeration and innovation", *Handbook of Regional and Urban Economics*, Vol. 5, pp. 349-404, http://dx.doi.org/10.1016/B978-0-444-59517-1.00006-4. [19]

Casabianca, E., A. Lo Turco and D. Maggioni (2021), "Do migrants affect the local product mix? An analysis of the effects and underlying mechanisms", *Journal of Economic Geography*. [24]

Chaney, T. (2008), "Distorted gravity: The intensive and extensive margins of international trade", *American Economic Review*, Vol. 98/4, pp. 1707-21. [28]

Czaika, M. (2015), "Migration and economic prospects", *Journal of Ethnic and Migration Studies*, Vol. 41/1, pp. 58-82. [61]

D'Amuri, F. and G. Peri (2014), "Immigration, jobs, and employment protection: Evidence from Europe before and during the Great Recession", *Journal of the European Economic Association*, Vol. 12/2, pp. 432-464, http://dx.doi.org/10.1111/JEEA.12040. [48]

De Rassenfosse, G., J. Kozak and F. Seliger (2019), "Geocoding of worldwide patent data", http://dx.doi.org/10.1038/s41597-019-0264-6. [18]

Docquier, F. et al. (2020), "Birthplace diversity and economic growth: Evidence from the US states in the Post-World War II period", *Journal of Economic Geography*, Vol. 20/2, pp. 321-354. [15]

Dustmann, C., F. Fabbri and I. Preston (2005), "The impact of immigration on the British labour market", *The Economic Journal*, Vol. 115/507, pp. F324-F341. [6]

Dustmann, C., T. Frattini and I. Preston (2013), "The effect of immigration along the distribution of wages", *Review of Economic Studies*, Vol. 80/1, pp. 145-173, http://dx.doi.org/10.1093/restud/rds019. [74]

Dustmann, C., U. Schönberg and J. Stuhler (2017), "Labor supply shocks, native wages and the adjustment of local employment", *Quarterly Journal of Economics*, Vol. 132/September, pp. 435-483, http://dx.doi.org/10.1093/qje/qjw032.Advance. [51]

Dustmann, C., U. Schönberg and J. Stuhler (2016), "The impact of immigration: Why do studies reach such different results?", *Journal of Economic Perspectives*, Vol. 30/4, pp. 31-56, http://dx.doi.org/10.1257/jep.30.4.31. [46]

EC (2017), "Integration of immigrants in the European Union", *Report - Special Eurobarometer 469*, European Commission, https://europa.eu/eurobarometer/surveys/detail/2169. [43]

Edo, A. (2018), "The impact of immigration on the labor market", *Journal of Economic Surveys*, Vol. 0/0, pp. 1-27, http://dx.doi.org/10.1111/joes.12300. [45]

Edo, A. and C. Özgüzel (forthcoming), "The impact of immigration on employment dynamics: Evidence from Europe", *OECD Regional Development Working Papers*, OECD Publishing, Paris. [7]

Edo, A. et al. (2018), "The effects of immigration in developed countries: Insights from recent economic research", *2 CEPII-Policy Brief*, p. 22. [44]

Felbermayr, G. and F. Toubal (2012), "Revisiting the trade-migration nexus: Evidence from new OECD data", *World Development*, Vol. 40/5, pp. 928-937. [22]

Gálvez Iniesta, I. (2019), *The Role of Immigration in a Deep Recession: The Case of Spain*. [59]

Genç, M. (2014), "The impact of migration on trade", *IZA World of Labor*. [30]

Gould, D. (1994), "Immigrant links to the home country: Empirical implications for US bilateral trade flows", *The Review of Economics and Statistics*, pp. 302-316. [21]

Grossman, G. and G. Maggi (2000), "Diversity and trade", *American Economic Review*, Vol. 90/5, pp. 1255-1275. [39]

Guichard, L., C. Özgüzel and L. Kleine-Rueschkamp (forthcoming), "Migrants and Innovation across OECD Municipalities". [68]

Herander, M. and L. Saavedra (2005), "Exports and the structure of immigrant-based networks: The role of geographic proximity", *Review of Economics and Statistics*, Vol. 87/2, pp. 323-335. [25]

Hjort, J. (2014), "Ethnic divisions and production in firms", *Quarterly Journal of Economics*, Vol. 129/4, pp. 1899-1946. [12]

Horwitz, S. and I. Horwitz (2016), "The effects of team diversity on team outcomes: A meta-analytic review of team demography", *Journal of Management*, Vol. 33/6, pp. 987-1015, http://dx.doi.org/10.1177/0149206307308587. [38]

Hunt, J. and M. Gauthier-Loiselle (2010), "How much does immigration boost innovation", *American Economic Journal: Macroeconomics*, Vol. 2/2, pp. 31-56, http://dx.doi.org/10.1257/mac.2.2.31. [63]

Irwin, D. and M. Terviö (2002), "Does trade raise income?: Evidence from the twentieth century", *Journal of International Economics*, Vol. 58/1, pp. 1-18, http://dx.doi.org/10.1016/S0022-1996(01)00164-7. [33]

Jaeger, D., J. Ruist and J. Stuhler (2018), "Shift-share instruments and the impact of immigration", No. w24285, National Bureau of Economic Research. [5]

Javorcik, B. et al. (2011), "Migrant networks and foreign direct investment", *Journal of Development Economics*, Vol. 94/2, pp. 231-241, http://dx.doi.org/10.1016/j.jdeveco.2010.01.012. [37]

Kerr, W. (2008), "Ethnic scientific communities and international technology diffusion", *The Review of Economics and Statistics*, Vol. 90/3, pp. 518-537. [41]

Mayer, T. and K. Head (2013), *Gravity Equations: Workhorse, Toolkit and Cookbook*. [29]

Miguelez, E. and C. Temgoua (2020), "Inventor migration and knowledge flows: A two-way communication channel?", *Research Policy*, Vol. 49/9, p. 103914. [42]

Monastyrenko, E. and C. Özgüzel (forthcoming), "The Migrants, networks and regional trade: Evidence from European regions". [69]

Monras, J. (2018), "Economic shocks and internal migration". [57]

Nathan, M. (2015), "Same difference? Minority ethnic inventors, diversity and innovation in the UK", *Journal of Economic Geography*, Vol. 15/1, pp. 129-168, http://dx.doi.org/10.1093/jeg/lbu006. [67]

Nathan, M. and N. Lee (2013), "Cultural diversity, innovation, and entrepreneurship: Firm-level evidence from London", *Economic Geography*, Vol. 89/4, pp. 367-394, http://dx.doi.org/10.1111/ECGE.12016. [35]

Niebuhr, A. (2010), "Migration and innovation: Does cultural diversity matter for regional R&D activity?", *Papers in Regional Science*, Vol. 89/3, pp. 563-585, http://dx.doi.org/10.1111/j.1435-5957.2009.00271.x. [65]

OECD (2020), *OECD Regions and Cities at a Glance 2020*, OECD Publishing, Paris, https://doi.org/10.1787/959d5ba0-en. [3]

Orrenius, P. and M. Zavodny (2007), "Does immigration affect wages? A look at occupation-level evidence", *Labour Economics*, Vol. 14/5, pp. 757-773, http://dx.doi.org/10.1016/j.labeco.2006.09.006. [49]

Ortega, F. and G. Peri (2014), "Openness and income: The roles of trade and migration", *Journal of International Economics*, Vol. 92/2, pp. 231-251, http://dx.doi.org/10.1016/j.jinteco.2013.11.008. [2]

Ottaviano, G. and G. Peri (2012), "Rethinking the effect of immigration on wages", *Journal of the European economic association*, Vol. 10/1, pp. 152-197. [73]

Ottaviano, G. and G. Peri (2006), "The economic value of cultural diversity: Evidence from US cities", *Journal of Economic Geography*, Vol. 6/1, pp. 9-44. [11]

Ozgen, C., P. Nijkamp and J. Poot (2012), "Immigration and innovation in european regions", *Migration Impact Assessment: New Horizons* 5676, pp. 261-300, http://dx.doi.org/10.4337/9780857934581.00017. [17]

Özgüzel, C. (2021), "The cushioning effect of immigrant mobility", *CESifo Working Paper Series*. [60]

Pandya, S. and D. Leblang (2012), *Deal or No Deal: Explaining the Rise of International Venture Capital Investment*, University of Virginia, Charlottesville. [36]

Parsons, C. and P. Vézina (2018), "Migrant networks and trade: The Vietnamese boat people as a natural experiment", *Economic Journal*, Vol. 128/612, pp. F210-F234, http://dx.doi.org/10.1111/ecoj.12457. [27]

Peri, G. (2012), "The effect of immigration on productivity: Evidence from U.S. states", *The Review of Economics and Statistics*, Vol. 94/1, pp. 348-358, http://dx.doi.org/10.1162/REST_a_00137. [1]

Peri, G. and F. Requena-Silvente (2010), "The trade creation effect of immigrants: Evidence from the remarkable case of Spain", *Canadian Journal of Economics/Revue canadienne d'économique*, Vol. 43/4, pp. 1433-1459, http://dx.doi.org/10.1111/j.1540-5982.2010.01620.x. [40]

Peri, G., K. Shih and C. Sparber (2015), "STEM workers, H-1B visas, and productivity in US cities", *Journal of Labor Economics*, Vol. 33/S1, pp. S225-S255, http://dx.doi.org/10.1086/679061. [50]

Prieto-Rosas, V., J. Recaño and D. Quintero-Lesmes (2018), "Migration responses of immigrants in Spain during the Great Recession", *Demographic Research*, Vol. 38, pp. 1885-1932. [62]

Putnam, R. (2007), "E pluribus unum: Diversity and community in the twenty-first century the 2006 Johan Skytte Prize Lecture", *Scandinavian Political Studies*, Vol. 30/2, pp. 137-174. [8]

Stephan, P. and S. Levin (2001), *Exceptional contributions to US science by the foreign-born and foreign-educated*. [64]

Thissen, M. et al. (2019), "European NUTS 2 regions: Construction of interregional trade-linked supply and use tables with consistent transport flows", *JRC Working Papers on Territorial Modelling and Analysis*. [32]

Trax, M., S. Brunow and J. Suedekum (2015), "Cultural diversity and plant-level productivity", *Regional Science and Urban Economics*, Vol. 53, pp. 85-96. [10]

Notes

[1] An increase in the migrant population can also lead to a culturally more diverse population, which can be positively associated with higher income (Alesina, Harnoss and Rapoport, 2016[13]).

[2] The analysis in this section uses TL2 level regional data from 41 countries for the period 2006-19. The countries include Austria, Australia, Belgium, Bulgaria, Canada, Chile, Colombia, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Germany, Hungary, Iceland, Ireland, Israel, Italy, Korea, Lithuania, Luxembourg, Latvia, Malta, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the UK and the US. The analysis using instrumental variables rely on a reduced set of countries due to data availability.

[3] Each column corresponds to the point estimate and the error bars correspond to the standard errors, which indicates that the precise magnitude can be somewhere within the range. All regressions include country fixed effects to account for any country characteristics that is time-invariant and would affect the estimated relationship. The results can also be affected by some factors that have affected all countries at the same time (e.g. a global financial crisis). Introducing year fixed effects addresses this concern and makes it possible to compare the relationship using data from many years.

[4] Using annual migration flows would be a better measure for estimating the effects of migrant inflows. However, such data do not exist at the subnational level. Consequently, the analysis in this chapter uses the standard approach in the economic literature of using annual changes in the number of migrants. In addition to data availability, using the number of migrants is more precise in terms of measurement. Furthermore, the inclusion of region fixed effects allows capturing the impact of the change in the share of migrant between two periods.

[5] In the final section of this chapter focusing on the labour market effects of migration, the specific measure used to capture the presence of migrants differs slightly. As explained in further detail in the section (or in Edo and Özgüzel (forthcoming[7])), the independent variable measures the increase in the local labour supply induced by migration.

[6] Using a base year further in the past is important for two reasons. First, it increases the likelihood that the unobserved factors that determined the location choice of migrants in the base year are less likely to be shaping the settlement patterns in the period of analysis. Second, past migrant waves could spark labour market dynamics. If the time between the base year and the period of analysis is too narrow, medium- or long-term dynamics induced by past immigration, such as capital adjustment, may affect current labour market outcomes.

[7] The analysis uses GDP per capita data (deflated in 2010 prices) collected from OECD Regional Database. Using regional deflated GDP per capita is impossible as such data are unavailable for 41 countries and 13 years (2006-2019) in the sample. However, using country or regional fixed effects should partially alleviate these concerns. For example, the use of country fixed effects ensures that the regions

located within the same country are compared in the estimation. Similarly, by using the regional fixed-effects, the estimates capture the change in the regional GDP per capita between two periods.

[8] To make estimates comparable, all regressions account for skill composition of native-born and migrant workers, total population size, calendar effects that have affected all of the regions in the sample similarly in a given year and region characteristics that are fixed over time. It is also important to note that the regional fixed effects account for all region-specific factors that are stable over time. As such, the estimated relationship indicates the change in GDP driven by an increase in the migrant share of the region net of region-specific factors.

[9] Countries that joined the EU after 2007 have low shares of immigrants, which can create imprecision in the estimated magnitude. The estimated magnitudes should be considered with caution.

[10] Migrants' contribution to local income may be larger in New Member countries than in EU15 countries for two reasons. First, it is possible that migrants are able to contribute more in regions (or countries) when the income levels are lower or the local economy is less advanced. In fact, country-level evidence shows that migrants boost income per capita and productivity in middle-income countries rather than in high-income countries (Alesina, Harnoss and Rapoport, 2016[13]; Bahar, Rapoport and Turati, 2020[14]). Second, it is also possible that the returns to an increase in the share of migrants might be decreasing. In other words, the added benefit of an increase in migrant share on local income might be larger when the migrant share is lower. As regions that have higher levels of income also have higher share of migrants, it is hard to disentangle these two factors and determine which factor is driving the differences in the estimates.

[11] Most of the literature on innovation and immigration corresponds to micro-analyses, which mostly have as focal point the US, where the positive contribution of foreign-born workers with a university education or above and foreign graduate students to patenting activities has been highlighted (Hunt and Gauthier-Loiselle, 2010[63]; Stephan and Levin, 2001[64]; Kerr, 2008[41]). Some papers use data across regions to examine the question in the context of single European countries, such as Niebuhr (2010[65]) for Germany, Bratti and Conti (2014[66]) for Italy and Nathan (2015[67]) for the UK.

[12] The findings presented in this section are based on Guichard, Özgüzel and Kleine-Rueschkamp (forthcoming[68]) who use municipality level data from 21 countries for the period 1990-2014. Countries include Australia, Austria, Belgium, Denmark, Finland, France, Germany, Italy, Ireland, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the US. Please see the paper for further technical details and more results.

[13] Innovation comes in different forms that are only imperfectly captured by patenting activity. There could be innovations in business models or use of technology which the analysis does not capture.

[14] The findings of this chapter extend the existing knowledge and understanding of the topic in three ways. First, the analysis goes beyond the available evidence with respect to both the spatial granularity and time coverage due to the use of highly detailed geographical information that allows examining whether migrants contribute to local innovation across 17 countries over 25 years. Second, the analysis exploits the richness and granularity of the data by applying an econometric framework that relies on a restrictive set of fixed effects to capture the influence exerted by potential confounding factors. Third, the analysis shows that results are heterogeneous across urbanisation levels or characteristics of the local economy, aspects that would not be captured with less granular data.

[15] Total sample of municipalities are divided into four equal groups in terms of number of observations based on the patents per capita. The first group corresponds to municipalities with and less than

0.76 patents per 10 000 inhabitants. Similarly, Group 2 includes municipalities with more than 0.76 patents per 10 000 and less than 1.69. Group 3 includes municipalities between 1.69 and 3.52 patents per 10 000 inhabitants and Group 4 includes those with more than 3.52.

[16] As migrants locate to richer areas, one might suspect the positive relationship between migrants and innovation to be driven other confounding factors. To account for any possible factors that could drive the positive correlation, it is possible to include the logarithm of GDP at the municipality level in the regressions as a control variable. The results remain virtually unchanged.

[17] While not presented, the positive relationship is remarkably stable across the different countries of the sample suggesting that the results are not driven by specific countries. Moreover, the effects hold across alternative specifications accounting for a set of fixed effects that reduces significantly potential biases due to confounding factors.

[18] The degree of urbanisation definition acknowledges the urban-rural continuum and proposes three classes of settlements instead of the traditional urban vs. rural dichotomy. The three classes are: i) cities (or densely populated areas); ii) towns and semi-dense areas (or intermediate density areas); and iii) rural areas (or thinly populated areas).

[19] Municipalities are grouped by the degree of urbanisation using two alternative definitions to ensure that the estimated effects are not driven by choice of definition. For more details on the definitions, please see Guichard, Özgüzel and Kleine-Rueschkamp (forthcoming[68])

[20] The analysis uses a novel dataset that measures trade flows for European TL2 regions prepared by Thissen et al. (2019[32]).[20] This unique dataset covers trade flows at the sectoral level between 267 TL2 regions across the 21 European countries and the rest of the world in 2013.

[21] The findings presented in this section are based on Monastryenko and Özgüzel (forthcoming[69]) who use TL2 level regional data from 21 European countries for the year 2013. Countries include Belgium, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, France, Greece, Hungary, Ireland, Lithuania, Luxembourg, Latvia, Malta, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain and Sweden. Please see the paper for further technical details and more results.

[22] The analysis pools together migrants from all origins when calculating the regional number of migrants. It is possible that one might worry that the observed differences between EU and non-EU destinations are driven by the fact that non-EU migrants constitute a larger share of the total number of migrants and leading to larger magnitudes. To alleviate this concern, Monastryenko and Özgüzel (forthcoming[69]) also estimate these regressions splitting the number of migrants into EU and non-EU. The results remain unchanged.

[23] The findings presented in this section are based on Edo and Özgüzel (forthcoming[7]) who use TL2 level regional data from 13 Western European countries for the period 2010-19. Countries include Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK. Please see the paper for further technical details, more results and additional robustness tests.

[24] The dependent variable is the logarithm of the employment rate to the native-born population in region r at time t (i.e. the logarithm of employed native-born over the native-born population). The use of the native-born population in the denominator ensures that native-born residents who are in the labour force (employed or unemployed) and also those in inactivity are captured.

[25] The analysis defines the change in the labour supply in a region driven by immigration by $\log(1 + \mathrm{M_{rt}}/\mathrm{N_{rt}})$, where $\mathrm{M_{rt}}$ and $\mathrm{N_{rt}}$ are the respective number of migrants and native-born residents in the labour

force in region r at time t. Also used in Bratsberg and Raaum (2012[70]) or Borjas and Edo (2021[71]), this algebraic definition is derived from simple labour demand theory (Borjas, 2003[52]), facilitates the interpretation of the estimates and avoids any undefined observations due to zeros in the data. The conclusions of this analysis are robust to using (M_{rt}/N_{rt}) as an alternative measure of sudden regional supply changes or the use of total population in the denominator $(M_{rt}/M_{rt}+N_{rt})$. For further discussion on the robustness of the results please see Edo and Özgüzel (forthcoming[7]).

[26] The analysis in this section measures the labour market effects of migrants as an average of all sectors. However, as some sectors rely more on migrant labour than others, the sector-level labour market effects may also vary.

[27] The most basic economic models assume that the stock of capital in the economy is fixed in the short run. Hence, a migration-induced increase in labour supply reduces the level of physical capital per worker and negatively affects labour productivity, lowering the wages (Borjas, 2003[52]). At this lower wage, fewer native-born workers will be willing to work and their employment level should decline.

[28] Given the lack of empirical evidence on how the labour market adjusts over time to such changes in the labour supply, this analysis aims to fill this gap by examining how employment adjusts following an increase in the migrant population in the European context.

[29] A higher reduction in the earnings of high school or less-educated native-born workers due to immigration as compared to native-born workers with university education and above is documented in many studies (Borjas, 2003[52]; Dustmann, Schönberg and Stuhler, 2017[51]). While the reasons behind these uneven effects might be complex, an important element driving the difference is that substitution is likely to be easier for high school or less-educated workers as these workers are more interchangeable and training costs are lower than for skilled workers. An additional set of studies even show that native-born workers with university education and above could gain from low- and high-skilled immigration (Peri, Shih and Sparber, 2015[50]).

[30] The estimated elasticity captures the percentage change in the employment rate due to a 1% increase in the labour supply driven by immigration. For example, labour supply in Île-de-France (containing Paris) is around 5.5 million people. If immigration increases the labour supply by 1% (i.e. corresponding to an inflow of 56 000 migrants), the native-born employment rate would decrease by 0.45% (i.e. decreasing from 81% to 80.7%).

[31] Beyond the changes in the native-born employment rate, it is possible to calculate the number of native-born residents who are affected by an increase in the migrant labour supply. The analysis in this chapter indicates a displacement rate of approximately 0.3 to 0.4. The estimate from Column 3 in Panel A of Figure 4.12 translates into a short-term displacement rate of 0.45. Annex Figure 4.A.1, which estimates the relationship directly using the native-born employment rate (and not its logarithm) as the dependent variable and the ratio of migrant to native-born workers in the labour force as an explanatory variable corresponds to a short-run displacement rate of 0.16. In real terms, these magnitudes indicate that ten additional migrants in the local labour force reduce the number of employed native-born in the local market by roughly three to four in the short run and but have no effect in the long run.

[32] These headline estimates correspond to the average effect of a 1% increase in the labour supply due to migration across regions regardless of the size of the migrant community. However, the marginal effect of a 1% increase in the labour supply may differ depending on the share of migrants in the local labour market. In fact, the impact of an increase of migration on native employment is larger in regions with a higher share of migrants.

[33] This estimate comes from a complementary estimation using a specification where both the dependent and independent variables are in levels rather than in logarithmic form. More information are provided in Annex 4.A.

[34] Another possible explanation is that native-born internal migration across regions (within countries) spread the economic impact of immigration to other local labour markets, thereby dissipating the sudden shift through national economies. To neutralise the impact of these multi-regional adjustments, it is possible to estimate the impact of immigration on the native-born employment rate at the country level (i.e. exploiting multi-country variations instead of regional variations). As shown in Edo and Özgüzel (forthcoming[7]), even at the country level, the short-run estimated effect from annual variations is half the size of the ten-year changes, which confirms that the immediate impact of migration on employment is stronger than in the longer-run.

[35] The positive effect on the employment rate of the high-skilled native-born workers suggests that migrants are complementary to native-born, especially those with higher levels of education. If migrant and native-born workers are found to be imperfect substitutes, then they would complement one another and raise average wages (Ottaviano and Peri, 2012[73]; D'Amuri and Peri, 2014[48]; Brücker et al., 2014[72]). Given that this complementarity is more likely to happen between workers with higher levels of education, it could also explain part of the effect (Dustmann, Frattini and Preston, 2013[74]).

[36] These results also hold when regions are grouped relative to their GDP growth during the period. This indicates that the regions with higher initial GDP were also those who experienced the strongest growth during the period.

[37] The analysis in this section evaluates the labour market effects of migrants on the overall economy. However, changes in the labour supply due to migration may affect sectors differently depending on the reliance of these sectors to migrant labour. For instance, migrants may play a crucial role in addressing labour shortages in certain sectors (e.g. agriculture workers or truck drivers). The lack of sufficient migrant labour in such sectors could cause disruptions to the sector which can negatively affect the overall economy (e.g. delays in the national production, supply issues for firms or higher prices for goods).

[38] A key limitation to using such microdata is that they can only capture outflows to other regions within the country. Several papers documented that an important fraction of migrant outflows during the crisis were outflows abroad (for Spain, see Özgüzel, 2021[60]; or Prieto-Rosas, Recaño and Quintero-Lesmes, 2018[62]). As such, the null effects for the outflow rate could be driven by this undercounting.

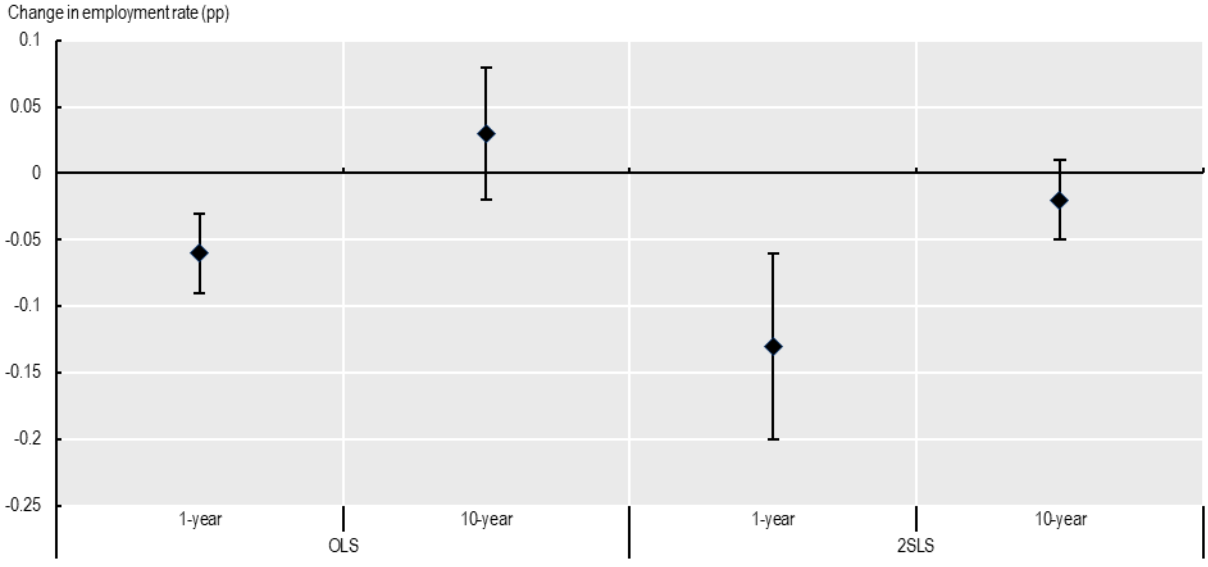
Annex 4.A. Additional results without logarithmic transformation

The benchmark specification uses the logarithm of the employment rate as the dependent variable, and $log(1 + M_{rt}/ N_{rt})$ to measure the regional migrant supply shock. Annex Figure 4.A.1 uses directly the employment rate and the ratio of migrants to natives (M_{rt}/ N_{rt}) instead of using a logarithm transformation. Therefore, it shows how the employment rate of the native-born workers in a region reacts to an increase in the ratio of migrants to native-born.

Considering the average labour market conditions in the sample for 2010. The average employment rate of native-borns throughout the sample is 72.8%, the unemployment rate 6.4%, and the inactivity rate 20.8%. The estimate of the effect of an 1 percentage point increase in the ratio of migrants to native-born on the native-born employment rate reduces the emplomeyment rate of natives by -0.13 percentage points in the short-run (Column 3). Combining the average labour market numbers and the estimate yields that the arrival of 10 migrants in the labour market reduces the number of employed native-borns in the short run by less than 2 (1.6). The displacement effect is calculated by multiplying the estimate and the ratio of the native population to the native labour force. In the long run, this effect is much more modest and insignificant (-0.02, Column 4).

This level-level specification shows that the previous conclusions are not sensitive to the log-log specification and allows to better quantify the short-run crowd out effect due to migration.

Annex Figure 4.A.1. Effect of an increase in the ratio of migrants to native-born on the native-born employment rate



Note: Presents OLS and 2SLS estimates for the impact of a 1 percentage point increase in the ratio of migrants to native-born on the employment rate of native-born workers, annually and over a 10-year period. 2SLS estimations use the predicted increase in the labour supply due to migration (i.e. shift-share) as the instrument. Residuals are clustered by TL2 regions. The sample includes the following countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Switzerland and the UK.
Source: OECD calculations based on data from European Labour Force Survey and national censuses obtained from IPUMS (accessed December 2020). See Box 4.2 for further details.