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The impact of migration on regional labour markets in Australia

This paper provides novel evidence on the regional impact of international migration on native employment and wages in Australia, using unique administrative individual-level panel data covering all residents from 2011 to 2018. Employing a differences-in-differences estimation strategy and a well-established shift-share instrumental variable (IV) approach based on census data from 1981, the study addresses potential endogeneity concerns related to migrant settlement patterns. The analysis reveals a positive impact of migration on native employment across all skill levels, ages, and genders, while wages remain unaffected. Examining the drivers of the employment effect shows that the arrival of migrants leads to a substantial increase of newly employed natives in the region and a decrease in the number of previously employed natives, with the former outweighing the latter. Most of the dynamic results from geographic mobility rather than labour market transition.

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Keywords: Australia, migration, employment, wages, regions

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Contact: Cem Özgüzel- cem.ozguzel@oecd.org and Jasper Hesse- jasper.hesse@oecd.org

Executive summary

Migrants are an integral part of the labour force in Australia. In 2021, Australia hosted over 5.1 million working-age migrants, corresponding to one-third of its total working-age population. On average, working-age migrants in Australia are highly educated and well-integrated into the labour market.

Australian regions with larger increases in the labour supply due to migration tend to have higher native employment growth. On average, a one percentage point increase in the annual migrant inflow into employment leads to a 0.53% rise in native employment. The effect of migrants on native employment does not vary across different native skill or age groups. In contrast to the positive employment effect, the inflow of migrants does not seem to affect the wages of native workers.

The arrival of migrants boosts native geographical mobility, resulting in higher regional employment of natives. The positive effect of migration on native employment is mainly driven by a substantial inflow of natives who were previously employed or unemployed in other regions. While migration also leads to the departure of previously employed natives from the region, the arrival of new natives to the region outweighs this effect.

The overall positive effect of migration on regional labour market outcomes of natives confirms the positive contribution of migrants to the Australian economy. The analysis suggests that the influx of predominantly higher-skilled migrants in past decades has benefited the Australian labour market and native workers of all skill levels and ages by boosting employment.

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Cem Özgüzel, Economist at CFE, coordinated the preparation of the paper under the guidance of Ana Moreno-Monroy, Head of the Statistics and Territorial Analysis Unit (CFE) and the supervision of Rüdiger Ahrend, Head of the Economic Analysis, Data and Statistics Division at CFE. Jasper Hesse and Cem Özgüzel (all CFE) drafted the paper. Gabriel Chaves Bosch (CFE) provided drafting contributions throughout the entire paper. The authors are thankful to Nadim Ahmad, Alison Weingarden (all CFE) and Ana Damas de Matos (OECD Directorate for Employment, Labour and Social Affairs, ELS) for their valuable comments. Diego Faurès (CFE) provided statistical support. Pilar Philip (OECD) prepared the paper for publication.

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This paper is the third output of a multi-annual collaboration between the Australian Centre for Population and the OECD. The first working paper of the project provides a detailed descriptive overview of migrants in Australia and the context of productivity and the labour market (OECD, 2023[1]). The second paper evaluates the impact of migration on regional labour productivity differences (OECD, 2023[2]). The fourth paper asses the impact of migration on regional innovation (OECD, 2024[3]).

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1 Introduction

In 2021, Australia hosted over 5.1 million migrants aged between 15 and 64 years, corresponding to one-third of the working-age population.[1] Since the 1900s, migrants have played a significant role in the growth of Australia's workforce. However, despite being an integral part of the workforce, little is known about the regional impact of migrants. This paper examines the impact of migrants on native employment and wages in Australian Statistical Area 4 (SA4) regions.[2]

Whether migrants boost or harm native wages and employment is one of the most central issues in policy debates. Extensive empirical evidence from OECD countries and beyond has shown that migrants can have both positive and negative impacts on native employment and wages. Migrants who bring new skills or fill labour market shortages can complement the native workforce and increase productivity, resulting in more employment opportunities and higher wages for natives. But, migrants and natives with similar characteristics may also compete for the same jobs and potentially harm native employment prospects and salaries. Existing evidence also suggests that migrants can negatively affect the employment prospects of certain native workers while simultaneously improving opportunities for others. However, the impact of migration on native employment and wages may fade over time as capital stocks adjust to the changes in labour supply induced by migrants.

This paper examines the regional impact of migrants on native wages and employment in Australia, using large-scale administrative data from various Australian ministries and departments. The analysis relies on over 27 million individuals covering the entire universe of workers employed across Australian regions from 2011 to 2018. To estimate the regional impact of migration, the study compares changes in native labour market outcomes in Australian regions that have received more migrants to those that have received fewer migrants over time.

Estimating the wage and employment effect of migrants is empirically challenging, as migrants tend to live in large metropolitan areas that generally have higher wages and better employment opportunities (OECD, 2023[1]). This may make the impact of migration on labour markets appear larger than it actually is. To address this reverse causality, the analysis uses an instrument for migrant inflows based on past settlement patterns, which allows to identify the actual influence of migrant inflows on labour market outcomes across regions.

[1] The terms “migrants” and “foreign-born” are used interchangeably throughout this paper. Migrants are defined by place of birth. The migrant population is defined as the population born in a country different from the one of residence. Unlike citizenship, this criterion does not change over time, it is not subject to country differences in legislation and it is thus adequate for international comparisons. Due to data limitations, the paper does not differentiate migrants based on their visa status, country of origin or number of years spent in Australia.

[2] The Australian Bureau of Statistics (ABS) has designed Statistical Areas 4 (SA4) regions by considering a range of criteria that balance various factors. The two main criteria are population size and commuting patterns. As a result, the 88 SA4 regions considered in this analysis cover the whole of Australia and represent all regional labour markets. SA4 regions exhibit a functional characteristic in terms of capturing labour supply and demand. Throughout this paper, the term “region” refers to SA4 regions unless indicated otherwise.

The paper makes three key findings:

- **The inflow of migrants into the labour supply has a lasting positive impact on native employment in Australian regions.** A one percentage point increase in the annual regional migrant inflow (measured as the share of the total employed population), on average, leads to a 0.53% rise in native employment. While the effect is uneven across regions, it indicates that, on average, regions with higher migrant intakes tend to experience faster employment growth, considering the positive overall trend in native employment in Australia from 2011 to 2018 (OECD, 2023[1]). The positive employment effect benefits all native skill and age groups. Moreover, the positive employment effect persists over a five-year period.
- **Migrants do not affect native wages.** The analysis finds no evidence of a significant regional effect of the migrant inflow on native wages.
- **The arrival of migrants boosts regional employment by attracting natives from other regions.** An increase in the employed migrant population in a region attracts natives employed in other regions while also leading to the departure of some natives from the region. As the number of native workers arriving exceeds those leaving, migration has a positive regional employment effect overall.

The paper is organized as follows. The next section provides a brief review of the relevant migration literature. Section 3 presents the data used in the analysis and descriptive findings. Section 4 details the empirical strategy. Section 5 presents the results, Section 6 details the underlying mechanisms, and Section 7 concludes.

2 Literature

The impact of migration on the labour market outcomes depends on the skill and education levels as well as demographic characteristics (such as age and sex) of both migrants and native workers, the prevailing economic conditions in the receiving country, and the overall size of the inflow of migrants into the labour market (Dustmann, Schönberg and Stuhler, 2016[4]; Foged and Peri, 2016[5]; Edo, 2019[6]).

When migrants and native workers possess similar skill sets, migration may exert downward pressure on native employment and wages in the short term as job competition intensifies. Empirical studies focusing on Europe, the US, and Germany support these predictions, indicating that in the short term, migrants generally have an adverse impact on the labour market outcomes of natives, particularly those with lower levels of skills (Angrist and Kugler, 2003[7]; Dustmann, Schönberg and Stuhler, 2017[8]; Borjas, 2017[9]; Monras, 2020[10]; Jaeger, Ruist and Stuhler, 2018[11]).

However, migration can also increase the complementarity of workers and enhance the efficient use of labour resources, as migrants and natives often have different skills and specialisations. For example, lower-educated migrants[3] in the United States often choose manual-intensive jobs, while comparably educated natives specialise in communication-intensive tasks that typically pay higher salaries. This specialisation of tasks can result in a mutually beneficial relationship between migrants and natives, ultimately improving labour market outcomes for both groups (Peri and Sparber, 2009[12]). Additionally, migration can push natives to occupations requiring more complex skills (D'Amuri and Peri, 2014[13]). For instance, recent evidence for Denmark shows that the inflow of lower-skilled migrants increases wages for both lower- and higher-skilled native workers through "upskilling" (Foged and Peri, 2016[5]).

The effect of migration on native employment and wages might also vary depending on the education and skill levels of natives. Evidence from Europe and the United States suggests that higher-educated natives benefit from increased migration, while lower-educated natives experience adverse effects. (Jaeger, Ruist and Stuhler, 2018[11]; Ottaviano and Peri, 2012[14]; Borjas, 2003[15]; Borjas and Edo, 2021[16]; Özgüzel and Edo, 2023[17]). Lower-educated migrants or those who work in jobs that are below their skill level ("downgrading")[4] may substitute similar native workers, resulting in more competition in the labour market and downward pressure on wages (Dustmann, Frattini and Preston, 2013[18]). However, lower-educated migrants might complement high-educated native workers rather than substitute them, which can ultimately improve the labour market outcomes of higher-educated native workers (Peri and Sparber, 2011[19]).

Migration's impact on the labour market might decrease over time as firms adjust to changes in the labour supply. Increased worker supply can lead to capital reallocation and investment, resulting in higher labour productivity and demand in the longer run (Ottaviano and Peri, 2012[14]). Studies show that while native wages may temporarily decrease due to the arrival of migrants, the impact tends to dissipate over time, with wages returning to or even exceeding pre-migration levels within a decade (Cohen-Goldner and Paserman, 2011[20]; Borjas, 2017[9]; Jaeger, Ruist and Stuhler, 2018[11]; Edo, 2020[21]).

[3] This paper defines primary- and secondary-educated individuals as lower educated, whereas tertiary-educated individuals are defined as higher educated.

[4] While many factors can lead to downgrading, discrimination in the labour market and administrative difficulties in the recognition of foreign qualifications play an important role.

Despite the importance of migration in Australia, causal evidence on the effect of migration on natives' employment is limited. While some studies suggest minimal or no impact on native employment in Australia (Breunig, Deutscher and Thi, 2017[22]; Sinning and Vorell, 2011[23]; Addison and Worswick, 2002[24]), one study finds an overall positive effect on the labour market outcomes of natives that also applies to high-school graduates (Bond and Gaston, 2011[25]). These findings differ from studies in Europe and the US, which find adverse effects on low-educated natives (Borjas, 2003[15]; Dustmann, Frattini and Preston, 2013[18]). Recent evidence on the regional impact of higher-skilled migrants suggests that migrants and natives specialize in different occupations, resulting in higher native wages (Crown, Faggian and Corcoran, 2020[26]). The unique context of Australia, characterised by a selective migration system and highly educated migrants (OECD, 2023[1]), may account for these differences. This paper extends previous research by using novel administrative data covering the entire Australian population, allowing to assess the causal impact of migrants on native workers' wages and employment, and examine the drivers of these effects.

3 Data and descriptive correlations

This section explains the data and sample used in the analysis. First, it details how the individual-level data and sample were constructed. Second, it provides an overview of migration patterns in Australia and discusses the correlation between migration and regional labour market outcomes of natives.

Data and the sample

Constructing the individual-level sample

This study uses rich individual-level administrative panel data provided by the Australian Bureau of Statistics (ABS). The Multi-Agency Data Integration Project (MADIP) dataset compiles information from various ministries related to health, education, government payments, income and taxation, employment, population demographics, migration, as well as Census data. It covers every Australian resident who contributed to social security, paid income tax, or interacted with the health system between 2006 and 2020, resulting in 27.1 million individual records. The dataset's panel dimension allows for tracking individuals over time and across Australia. A detailed description of the data sources is provided in Annex A.

The analysis combines individual-level information on the native-born population, including gender, age, personal yearly wages, industry and occupation of employment, place of usual residence, and country of birth. The final sample is limited to the employed native-born population aged 15-64. Following the literature, the analysis excludes public sector workers (or rather activities with high shares of public sector workers, such as health) – as their wages do not necessarily follow market mechanisms – and agriculture and mining workers – as their productivity (and to a lesser extent wage growth) highly depend on natural resources.[5] After dropping individuals with missing information, the final dataset contains almost 26 million individual-year observations for 2011-2018. More details on the sample construction and individual wages are presented in Annex A.

This paper exploits variation in the migrant inflows across SA4 regions. Australia is disaggregated into 89 SA4 regions with a population between 100 000 and 500 000. The ABS constructed the SA4 classification based on commuting information, mirroring local labour market areas. As in the OECD territorial grid, the "Other territories" region is excluded, resulting in 88 analysed SA4 regions.

Constructing the variables and historical settlement patterns

Following the literature, the migrant inflow is measured as the net change of migrant workers in the region over the total number of workers. This variable uses the tax-paying employed population in Australia, excluding workers in the public, health, agriculture, and mining sectors. Since MADIP does not provide the individual country of birth as a variable, the information is retrieved by combining data from the Department

[5] Based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 Divisions, the analysis excludes the following sectors: Agriculture, Forestry and Fishing (A), Mining (B), Public Administration and Safety (O), Education and Training (P), and Health Care and Social Assistance (Q).

of Home Affairs and the Census 2016. Australian Tax Office (ATO) and MADIP core data provide information on the declared salary and location, respectively. Workers with no tax record in a given year or without reliable information about their country of birth are excluded from the analysis.

Regional average wage and employment growth are measures of the labour market outcomes of native workers at the regional level. Regional native employment growth is the percentage change in the number of employed natives, and regional native wage growth is the logarithmic change of regional or group average wages. The variables combine data from the Department of Home Affairs, Australian Tax Office, Census 2016, and MADIP core. Section 4 and Annex B detail the construction of the variables.

Lastly, as explained in Section 4, establishing a causal relationship between migration and native employment or wages required the use of instrumental variables. In this analysis, the instrument builds on historical settlement patterns of migrants. As the Australian Census takes place every five years and participation is mandatory, it provides high-quality regional data on the historical population decomposition going back in time. This study uses Census data from 1981, 1986, 1991, and 2001, adjusted to 2016 borders by the ABS, containing information on the total employed population of the respective year disaggregated by country of birth, the industry of employment, and highest post-school qualification. 1981 is the first census wave adjustable to the SA4 regional classification.

Descriptive evidence: The relevance of migrants in Australia

Australia's population is unequally spread across the country, with one of the world's lowest population densities. In 2021, 26 million people lived on 7.7 million square kilometres. Yet regional population densities differ substantially across Australia. While some regions have less than one person per square kilometre, metropolitan areas, such as Melbourne (around 405 people per square km), Sydney (372 people per square km), and Brisbane (130 people per square km) are more densely populated.

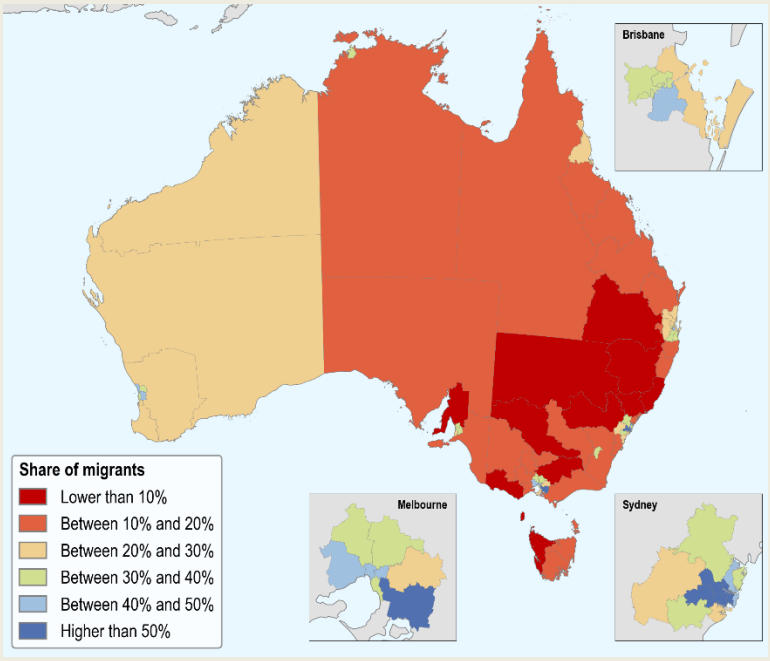
Box 1. The geographical distribution of migrants

Australia is one of the largest migrant-receiving countries in the OECD. In 2021, Australia had the third-highest share of migrants (29%) among OECD countries, after Luxembourg (49%) and Switzerland (30%). This share is substantially higher than the migrant share in Canada (21%), Germany (16%), the UK (14%), and the United States (14%) (OECD, 2023[27]). Moreover, the share of migrants in Australia increased by six percentage points from 23% in 2000. Over the same period, the migrant share across the total OECD increased by just four percentage points from 10% to 14%.

The presence of migrants has a pronounced regional dimension in Australia. About 82% of all Australian migrants concentrate in large and midsize metropolitan areas, such as Brisbane, Melbourne, Perth, and Sydney, compared to 66% of natives. Consequently, only 18% of the migrant population lives in non-metropolitan areas, compared to almost one-third (33%) of natives. As a result, migrants constitute a high share of the population in large metropolitan areas (40%) such as Brisbane, Melbourne, Perth, and Sydney. Similarly, in midsize metropolitan regions, the migrant share is around 29%. In non-metropolitan areas, however, less than one-fourth of the population is born abroad, with some regions in the southeast exhibiting values of less than 10% (OECD, 2023[1]).

Figure 1. Share of migrants across Australian regions

Share of migrants among the total working-age population across Australian regions, 2016



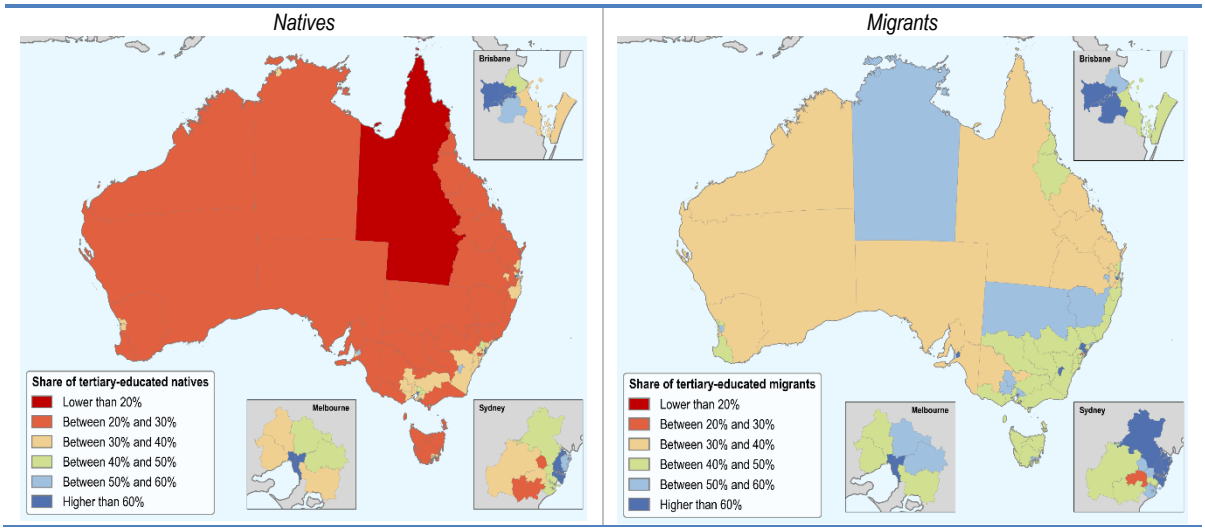
Note: The figure presents the share of migrants among the total working-age population (15-64 years) at the regional level. Data are for 2016.
Source: OECD calculations based on the Australian Census of Population and Housing 2016 accessed via ABS Census TableBuilder (accessed May 2022).

Across Australia, high-educated individuals tend to cluster in certain regions. The left panel of Figure 2 shows that tertiary-educated natives concentrate primarily in and around cities along the coast, with the highest concentration in Brisbane, Melbourne, and Sydney. Conversely, regions in Western Australia and the northeast exhibit the lowest share of tertiary-educated natives. The migrant population (right panel) exhibits a similar pattern, where migrants in regions near the coast generally possess the highest education levels. However, differences between regional education levels of migrants are less pronounced since the regional share of highly educated rarely falls below 30%.

On average, migrants are more educated than the native-born. The regional share of high-educated migrants among the migrant working-age population surpasses the share of natives by an average of 13 percentage points. Nonetheless, the gap ranges from 33 percentage points in the Outback of the Northern Territory to -1 percentage points in South West Sydney, the sole region exhibiting a marginally higher average education level among natives compared to the migrant population.

Figure 2. Share of tertiary-educated natives and migrants across Australian regions

Share of tertiary-educated natives (left panel) and migrants (right panel) across Australian regions, 2016



Note: The figure presents the share of natives (left panel) and migrants (right panel) with tertiary education among the respective population aged 25-64 years. Data are for 2016.
Source: OECD calculations based on the Australian Census of Population and Housing 2016 accessed via ABS Census TableBuilder (accessed May 2022).

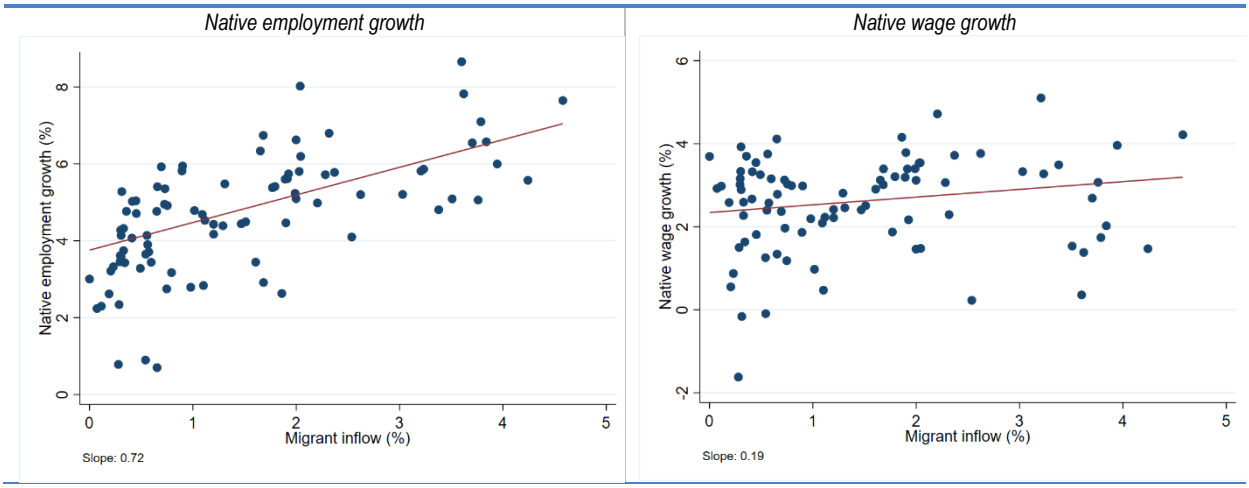
Regional migration is positively correlated with wage growth and employment growth

Regional migrant inflows show a positive association with native employment and wage growth across Australian regions. Figure 3 presents the correlation between the inflow of migrants at the regional level in 2015 and the annual native employment (left panel) and wage growth (right panel). While correlations provide insights into the relationship between migration and regional labour market outcomes, they do not reveal the true impact of migration on regional labour market outcomes. On average, a higher inflow of migrants is associated with an increase in native employment. Taken at face value, the slope of the trendline (0.72) on the left panel would indicate that a one percentage point increase in migrant inflow corresponds, on average, to a 0.72% increase in native employment. Moreover, regions with stronger migrant inflows generally also experience a more pronounced increase in native wages. Again, taken at face value, the estimated correlation (slope of the trendline) on the right panel would suggest that a one percentage point increase in migrant inflow is, on average, associated with a 0.19% increase in native wages. Compared to the employment growth (left panel), the correlation between migration and wages is weaker.

However, possible statistical issues, such as reverse causality or unconsidered confounding factors, could inflate the observed positive correlation between migration and labour market outcomes. For instance, migrants tend to settle in booming regions, creating a potential mutual influence between migration inflows and labour market outcomes, which may result in overestimated correlations. Accurately identifying the true causal impact of migrant arrivals on native employment and wages requires advanced econometric methods. Section 4 describes how the empirical approach addresses potential endogeneity problems.

Figure 3. Correlation between migration and native employment or native wages

Scatterplot and correlation between the inflow of migrants and the employment growth (left panel) or wage growth (right panel) of natives in Australian regions, 2015



Note: The figures show the correlation between the net inflow of migrants over the total population in the previous year (horizontal axis) and the native employment growth (left panel) or the native wage growth (right panel), respectively. The employment growth rate in region *j* at time *t* is calculated: $Emp_{j,t}^{native} = (Emp_{j,t}^{native} - Emp_{j,t-1}^{native}) / Emp_{j,t-1}^{native}$. The wage growth in region *j* at time *t* is calculated: $\Delta \ln w_{j,t}^{native} = \ln(w_{j,t}^{native}) - \ln(w_{j,t}^{native})$. Data are for 2015. Dots correspond to Australian regions. The trendline represents the correlation across all regions. The note on the bottom left corner indicates the estimated correlation (i.e., the slope of the trendline) of the full sample. All estimated correlations are weighted by the native population size.
Source: OECD calculations based on data from the Multi-Agency Data Integration Project (MADIP) (accessed March 2023).

Box 2. Migration and regional innovation in Australia

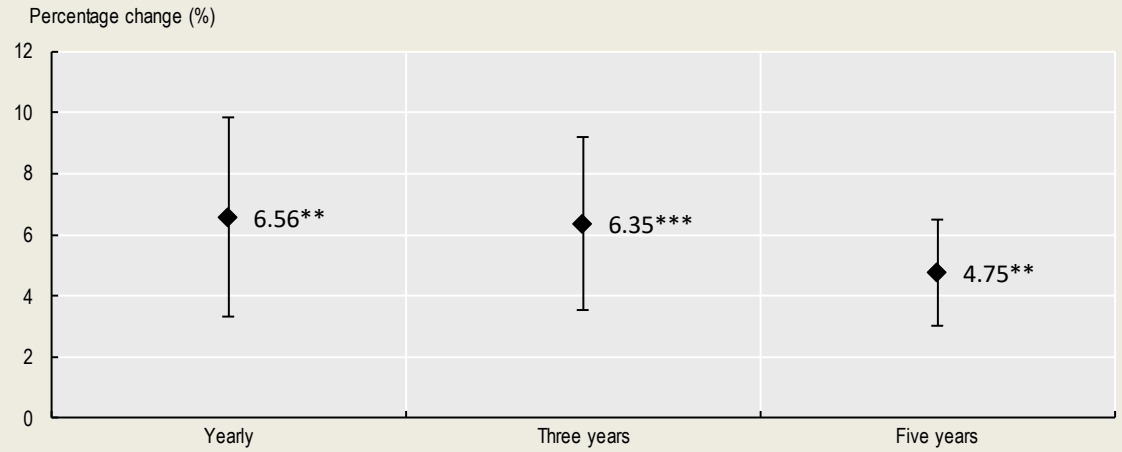
The regional impact of migration is not limited to the labour market. Migrants also play a prominent role in driving economic growth through various channels, for instance, by bringing in new skills, ideas, and fostering innovation. A companion paper evaluates the impact of migration on regional innovation in Australia (OECD, 2024[3]).

Migrants have a positive effect on patent applications across Australian regions. Figure 4 shows that, on average, a one percentage point increase in the regional employment share of higher-educated migrants relative to total employment leads to a 6.6% rise in regional patent applications in the short run (one year). These effects persist in the medium run (five years).

Patent applications typically encapsulate innovation in STEM industries. However, there is no effect on other types of innovation, such as trademarks or design rights, used more intensively by other industries. Additionally, the paper shows that the effect of migration is positive across migrants of all backgrounds, although those in scientific occupations have the largest effect.

Figure 4. The regional innovation effects of migration in Australia

Estimated effect of a one percentage point increase in employment due to highly educated migration on regional patent application across Australian regions, 2011-2018



Note: The figure presents IV estimates for the impact of a one percentage point increase in the workforce due to highly educated migration on regional patent applications per worker, annually and using 3 and 5 years. IV estimations use the predicted increase in the workforce due to highly educated migrants (i.e., the shift-share) as the instrument. All specifications are weighted by the number of employed natives in the considered region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. Standard errors are clustered at the regional level in all columns. ***, **, * denote statistical significance at the 1%, 5% and 10% levels respectively.
Source: OECD calculations based on MADIP (accessed July 2023).

4 Empirical strategy

This section outlines the empirical strategy adopted in this paper. Firstly, it introduces the main econometric equation and describes the variables used in the analysis. Secondly, it discusses potential econometrical challenges and the employed approach to address them.

Main econometric equation

To measure the impact of migration on regional labour market outcomes of native workers, the analysis adopts a well-established spatial approach comparing regions which have received more migrants with those which received fewer migrants. Specifically, the analysis examines variation in the regional increase of employed migrants and the labour market outcomes of native workers within the region and over time. Moreover, it uses a first-differences regression model, eliminating the influence of regional characteristics (e.g., regional infrastructure or population density) or group-based characteristics (e.g., age, sex, or education), which may affect the relationship between migration and labour market outcomes of natives, leading to biased results. Accounting for these regional- and group-specific characteristics helps to eliminate endogeneity threatening the causality of the analysis. The main estimation equation is:

$$\Delta Emp_{g,j,t}^{native} = \beta_g \Delta foreign_{j,t} + \alpha_t + \epsilon_{j,t} \quad (1)$$

$$\Delta \ln w_{g,j,t}^{native} = \beta_g \Delta foreign_{j,t} + \alpha_t + \epsilon_{j,t} \quad (2)$$

where

$\Delta Emp_{g,j,t}^{native} = \frac{Emp_{g,j,t}^{native} - Emp_{g,j,t-1}^{native}}{Emp_{g,j,t-1}^{native}}$; $\Delta \ln w_{g,j,t}^{native} = \ln(w_{g,j,t}^{native}) - \ln(w_{g,j,t-1}^{native})$; and $\Delta foreign_{j,t} = \frac{M_{j,t} - M_{j,t-1}}{M_{j,t-1} + N_{j,t-1}}$.

$\Delta Emp_{g,j,t}^{native}$ and $\Delta \ln w_{g,j,t}^{native}$, respectively, denote changes in employment and wage of natives in group g (age, gender, skill)[6] and region j at time t. $\Delta Emp_{g,j,t}^{native}$ presents percentage changes in the number of employed natives, and $\Delta \ln w_{g,j,t}^{native}$ presents changes in the natural logarithm of regional average wages of natives. $\Delta foreign_{j,t}$ refers to the regional annual net change in the employed migrant population ($M_{j,t}$), normalized by the regional employed migrants ($M_{j,t-1}$) and native ($N_{j,t-1}$) population in the previous year. α_t represents time-fixed effects and $\epsilon_{j,t}$ is the error term. Time fixed-effects capture time-specific dynamics that equally affect all regions in the country. The analysis clusters the standard errors at the regional level (SA4), following Moulton (1990[28]) to account for the possible within-region correlation. β is the coefficient of interest indicating the effect of a change in the regional employed migrant population on the employment and wage growth of native workers.

[6] The skill level is defined based on occupation-level information provided by the Australian and New Zealand Standard Classification of Occupations (ANZSCO), 2013: Workers employed in the Major Groups "Managers" and "Professionals" are considered higher skilled.

Defining the migration-induced increase in the labour supply at the regional level (instead of assigning migrants to skill groups) is preferred because available and observable characteristics might be less accurate for migrants (Dustmann, Frattini and Preston, 2013[18]). The concern is particularly relevant when classifying skill levels based on occupational information. For instance, higher-skilled migrants might be working in occupations with lower skill requirements due to a lack of recognition of foreign diplomas. In cases of misclassification, migrants are compared to natives in the same skill group despite having different qualifications. Therefore, using the changes in the total employed migrant population as the variable of interest allows a better assessment of the wage and employment effects resulting from an increase in the employed migrant population. Additionally, addressing endogeneity due to the non-random settlement of migrants is harder for subgroups of migrants. Finally, dividing the size of the regional employed migrant population by the total regional employed population helps account for differences in regional dynamics that may matter for accurate measurement of the relationship between migration and labour market outcomes of natives.[7]

Endogeneity of the regional migrant share

Migrants typically do not settle randomly within their receiving country but consider individual and labour market factors when choosing their location. This phenomenon is well-documented in the migration literature. In the context of Australia, recent work by the OECD shows that migrants often prefer large metropolitan regions, which host prosperous local labour markets with high employment rates and wages (OECD, 2023[1]).

The non-random settlement behaviour of migrants across the country might bias the estimation. Since migrants tend to settle in booming labour markets, their disproportionate presence in these regions can create a reverse causality problem. For example, if regions with higher wages or better employment prospects attract more migrants, the estimated regional impact of migration on these labour market outcomes would be inflated (Card, 2001[29]).

To establish causality and mitigate endogeneity concerns, this paper employs an Instrumental Variable (IV) approach in the spirit of Bartik (1991[30]). The Bartik instrument, or so-called “shift-share instrument”, is widely used in the literature (Altonji and Card, 1991[31]; Card, 2001[29]; Jaeger, Ruist and Stuhler, 2018[11]). It considers that the location choices of migrants are influenced not only by economic factors but also by existing migrant networks (Gross and Schmitt, 2003[32]; Epstein and Gang, 2010[33]). The approach uses historical settlement patterns to predict where newly arrived migrants settle, netting out the influence of contemporary economic factors. To accurately estimate the effect of migration using the shift-share instrument, it is crucial to ensure that historical settlement patterns do not directly influence current native wage and employment growth (i.e. satisfy instrument exogeneity).

Building the shift-share instrument follows these steps (see Annex C for further details):

1. Split the migrant population of 1981 into 60 countries or regions of origin (See Table A.1 for a detailed list).
2. Calculate the regional distribution (settlement pattern) of each origin using the 1981 Census.
3. For each country and region of origin, predict the population in each region and year using the total annual migrant population by origin between 2011 and 2018 (i.e., the shift) and the regional distribution of migrants by origin in 1981 (i.e., the share).

[7] Correlation between the economic outcomes and the inflow of migrants driven by scale effects might arise when the average and standard deviation of both variables are proportional to the region's population. Normalising helps mitigate this issue by controlling for regional size differences. As a result, the analysis measures the impact of migrant inflows on native labour market outcomes more accurately.

4. Sum up predicted migrant settlements across countries and regions of origin to obtain the predicted total number of migrants living in a given region and year.
5. Apply the same process to obtain the predicted number of natives to avoid the instrument capturing the mobility response of natives due to the migrant inflow.
6. Use the predicted migrant population to compute the predicted change in population due to migrants in each region and year.

Validity of the instrumental variable approach

To obtain unbiased estimates, the instrumental variable must influence current wage and employment growth only through its impact on current migration inflows. This implies that historical settlement patterns should have no direct association with current native employment and wage growth (instrument exogeneity), yet they must be associated with current changes in migration (instrument relevance). For shift-share instruments, recent literature has shown that instrument exogeneity can be satisfied from either exogeneity of the aggregate "shifts" (Borusyak, Hull and Jaravel, 2022[34]) or exogeneity of the baseline "shares" (Goldsmith-Pinkham, Sorkin and Swift, 2018[35]). This study relies on identification based on exogeneity of the baseline shares, which means that the initial settlement of migrants across regions in 1981 should have no correlation with persistent omitted factors that could also determine changes in native employment and wages.[8]

Previous analyses have relied on a long time lag to counteract the potential correlation between previous settlement patterns used to construct the shift-share and current labour market outcomes (Dustmann, Fabbri and Preston, 2005[36]). However, recent literature shows that this strategy does not provide sufficient support for the instrument exogeneity and calls for additional evidence (Jaeger, Ruist and Stuhler, 2018[11]; Goldsmith-Pinkham, Sorkin and Swift, 2018[35]).

This analysis conducts three tests to provide supporting evidence for the instrument exogeneity assumption. First, settlement patterns in 1981 should be independent of contemporary regional characteristics (Goldsmith-Pinkham, Sorkin and Swift, 2018[35]). Table A.4 in Annex C shows that the shares of the four strongest-growing nationalities between 2011-2018 (India, China, Philippines, and Korea) and the instrument built upon these shares have no relevant correlation with a set of regional characteristics reflecting the workforce and industry decomposition in 1981. Second, migrant inflows prior to the study period should not influence current wages and employment growth (Jaeger, Ruist and Stuhler, 2018[11]). Table A.5 (Annex C) shows that the estimated effects do not change when adding past migrant inflows to the baseline estimation equations (Equations 1 and 2). Consequently, the impact of migration on wages and employment stems from current migration inflows rather than long-term adjustments to past migration inflows. Finally, spurious correlation between the predicted migrant flows (i.e., the instrument) and pre-existing wage and employment trends could explain the estimated effects. Table A.6 (Annex C) shows that the instrument has no correlation with previous wage or employment growth. Annex C provides a detailed discussion of the results of these tests.

In conjunction, these tests provide evidence supporting the exogeneity of the baseline shares in 1981. The instrument seems to have no relevant correlation with other characteristics determining the impact of migration on wages and employment. Therefore, it is plausible to assume that changes in migration, as predicted by the instrument, affect wages and employment only through their effect on actual changes in migration.

[8] The reforms in the migration policies led to an increase in migration as of 2005 (Nguyen and Parsons, 2018[41]). While this dramatic increase also creates an exogenous "shift", this study relies on the exogeneity of the "shares" to identify the causal effects of migration on native wages and employment.

5 Results

This section discusses the findings of the analysis. First, it details the average migration effect on native wages and employment. Next, it presents uneven effects for different subpopulations before testing the robustness of the estimates.

Average effect across regions and workers

Migration may impact either native employment, wages, or both simultaneously. Economic theory suggests that a migrant-induced increase in the labour supply might influence native employment, particularly if wages remain inflexible and unresponsive to shifts in labour supply (Dustmann, Schönberg and Stuhler, 2017[8]). Conversely, if wages adapt to changes in labour supply, the effect on employment could be less pronounced. Hence, to understand the overall impact of migration, it is crucial to consider both potential channels of adjustment.

Moreover, economic theory suggests that the impact of migration on native labour market outcomes might change as firms adjust their capital stock. The arrival of migrants increases the total labour supply in the region and might have an immediate short-run impact on native wages and employment as the capital stock remains unchanged. However, over time, as the capital stock gradually adjusts to new labour market conditions, it may reduce and equate the impact of migration on native wages and employment.

The tendency of migrants to settle in thriving regional labour markets might introduce reverse causality, which potentially inflates the observed positive relationship between migration and native labour market outcomes. Economically booming regions might attract more migrants due to the availability of employment opportunities and higher wages, creating reverse causality as the migrant inflow might not be the source for the wage and employment increase but rather a consequence. This potential reverse causality might be challenging for measuring a causal relationship. A well-established approach to address the reverse causality problem is to use instrumental variables based on historical settlement patterns, as discussed in Section 4.

Table 1 provides estimates of the average regional effects of migration on native employment and wages, considering various timeframes between 2011 and 2018. Panel A presents estimates for the native wage effect, where Columns 1-3 show Ordinary-Least-Square (OLS) estimates and Columns 4-6 show Two-Stage-Least-Square (2SLS) results, correcting for potential endogeneity. Column 1 regresses annual regional average wage growth rates on annual migrant inflows, while Columns 2 and 3 examine triannual and five-year changes. Columns 4-6 present the corresponding 2SLS results. Likewise, Panel B follows the same structure but analyses the migrant effect on native employment.

Migration has no effect on native wages after addressing for potential endogeneity

Without accounting for potential endogeneity, the analysis finds a positive correlation between regional migration and native wages in the short run. Columns 1-3 (Table 1, Panel A), representing annual, triannual and five-year intervals, exhibit a positive correlation between migrant inflows to the labour supply and native wage growth, ranging from 0.13 (1 year) to 0.03 (5 years). The estimate for the annual changes would suggest that, on average, native wages are associated with an increase of 0.13% if the inflow of

migrants relative to the regional employed population rises by one percentage point. While the estimated correlation for annual changes is significant at the 5% level, estimates for triannual and five-year changes are not significant at any conventional level. While these findings suggest varying but non-negative effects of migration on native wages over time, it is important to note that concerns related to endogeneity might limit the causality of these estimates.

Addressing reverse causality reveals that migration has no discernible effect on native wages. The significant positive effect of migration on native wages vanishes when potential endogeneity in the migrant inflow is taken into account. The estimated effects for annual, triannual, and five-year intervals (Columns 4-6, Panel A) lack a consistent direction and are all statistically insignificant. Consequently, the analysis finds no evidence of either a positive or negative causal regional effect of migration on native wages.

Migration seems to enhance native employment

The regional inflow of migrants is positively correlated with native employment growth, yet the correlation diminishes over time. According to OLS estimates, which do not address potential endogeneity, regional migrant inflows are positively associated with native employment growth, regardless of the length of the time intervals (Columns 1-3, Table 1, Panel B). The correlation is highest for annual changes and marginally decreases as the time intervals widen. The estimate based on annual changes would indicate that a one percentage point regional increase in the migrant inflow is, on average, associated with an increase of 0.62% in native employment.

The positive impact of migration on native regional employment persists when correcting for potential endogeneity, albeit the estimated effects are slightly smaller. Like the OLS estimates, the 2SLS estimates (Columns 4-6, Panel B) are positive and highly significant at the 1% level. Specifically, the estimates suggest that a one percentage point increase in the annual migrant flow boosts native regional employment by 0.53%, on average. However, unlike the OLS results, the positive effect is not diminishing but rather constant for longer time intervals. As annual changes are most common in the literature, this paper will focus on one-year changes as the preferred estimate. However, estimates for triannual and five-year changes are available in the Annex or on request.

Table 1. Average effect of migration on native wages and employment

Estimated average effect of migration inflows on native wages and employment at the regional level, 2011-2018

	1-year	3-years	5-years	1-year	3-years	5-years
	OLS	**OLS**	**OLS**	**2SLS**	**2SLS**	**2SLS**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Wages						
ΔMigrants	0.12942**	0.06564	0.02777	0.00915	-0.00655	0.04610
	(0.057)	(0.060)	(0.099)	(0.081)	(0.096)	(0.115)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	616	176	88	616	176	88
R^2	0.579	0.056	0.002	0.572	0.047	0.001
F-stat				299.341	197.824	224.378
Panel B: Employment						
ΔMigrants	0.62342***	0.58028***	0.56718***	0.53270***	0.52871***	0.56906***
	(0.073)	(0.094)	(0.110)	(0.080)	(0.100)	(0.116)

Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	616	176	88	616	176	88
R^2	0.904	0.371	0.277	0.904	0.371	0.277
F-stat				299.341	197.824	224.378

Note: The table presents OLS (Columns 1-3) and 2SLS (Columns 4-6) estimates based on Equation 1. The independent variable is the percentage inflow of employed migrants. In Panel A, the dependent variable is the changes in the logarithm of native wages, while in Panel B, the dependent variable is the percentage changes in the number of employed natives. The columns present different time intervals for both the dependent and independent variables. Columns 1 and 4 represent annual changes, Columns 2 and 5 represent three-year changes (2012-2015, 2015-2018), and Columns 3 and 6 represent five-year changes (2013-2018). No intervals overlap. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Uneven effects across workers

Previous research finds that the impact of migration on native labour market outcomes depends on the individual characteristics of natives, particularly their education or skill levels. High similarity in the education or skill levels of migrants and natives most likely increases labour market competition, resulting in lower wages or employment of natives, or both. In contrast, differently skilled migrants and natives might complement each other, leading to higher overall productivity and better wages and employment chances. Unlike Australia, many OECD countries encompass predominantly lower-skilled migrants (OECD, 2022[37]), who might harm labour market outcomes of lower-skilled natives while boosting the wages and employment of high-skilled natives. Additionally, the impact on natives might vary depending on their age and gender.

The average effect presented previously potentially masks uneven effects across native subgroups. To understand how arriving migrants affect natives based on their skill level and demographics, it is essential to estimate the impact for each subgroup separately. Table 2 groups workers by skill level (Columns 2 and 3), gender (Columns 4 and 5), and age (Columns 6 and 7) and presents the estimated impact on wages and employment in Panel A and Panel B, respectively.

The positive effect on native employment applies to all subgroups

Regardless of the characteristics, native employment benefits from migration. The estimated effect of migration on native employment is significant and positive across all native subgroups. However, the differences in the magnitudes across groups are not statistically significant. For instance, the estimated effects for higher- and lower-skilled natives (Columns 2 and 3) are slightly lower than the average effect (Column 1), yet they remain positive and highly significant. The regression results indicate that a one percentage point increase in the migrant inflow, on average, boosts the employment of higher- and lower-skilled workers by 0.46% and 0.44%, respectively.

Migrant inflows do not affect the native wages of any subgroups. The estimated effects on native wages are negligible and statistically insignificant for all subgroups, including higher-skilled (-0.03) and lower-skilled natives (-0.02). Notably, the estimates are negative for most subgroups, except for more experienced workers above the age of 39. However, these differences among subgroups are not statistically significant at any conventional level.

The results indicate that natives experience similar positive employment effects, regardless of their characteristics (e.g., age, skill, and gender), while their wages do not change. The results indicate that no

native subgroup is particularly vulnerable to an inflow of migrants, neither in the short nor longer run.[9] These findings contrast evidence from Europe and the United States, where the labour market effects of migration tend to concentrate on lower-skilled and young natives, while higher-skilled natives are less affected (OECD, 2022[37]). While various factors might drive these unique results, selective migration policies in Australia could play a decisive role. Immigrants in Australia are more educated than those in other OECD countries or even the native population in Australia (OECD, 2023[1]).

Table 2. Uneven effects of migration by native characteristics

Estimated impact of migration inflows on native wages and employment by native subgroups at the regional level, 2011-2018

	All	Higher-skilled	Lower-skilled	Male	Female	Below 40	Over 39
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Wages							
ΔMigrants	0.009	-0.031	-0.021	-0.005	-0.044	-0.085	0.075
	(0.081)	(0.074)	(0.085)	(0.085)	(0.055)	(0.085)	(0.081)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	616	616	616	616	616	616	616
R^2	0.572	0.450	0.625	0.528	0.548	0.623	0.403
F-stat	299.341	270.574	289.084	292.753	308.093	274.062	329.765
Panel B: Employment							
ΔMigrants	0.533***	0.460***	0.438***	0.537***	0.494***	0.460***	0.625***
	(0.080)	(0.100)	(0.080)	(0.078)	(0.094)	(0.098)	(0.081)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	616	616	616	616	616	616	616
R^2	0.903	0.838	0.894	0.891	0.893	0.892	0.866
F-stat	299.341	270.574	289.084	292.753	308.093	274.062	329.765

Note: The table presents 2SLS estimates based on Equation 1. The independent variable is the percentage inflow of employed migrants. In Panel A, the dependent variable is the annual changes in the logarithm of native wages, while in Panel B, the dependent variable is the annual percentage changes in the number of employed natives. The table includes different subpopulations for the calculation of the dependent variable. Column 1 presents the baseline results based on the total employed native population. Columns 2 and 3 restrict the sample to higher- and lower-skilled employed natives, respectively. Columns 4 and 5 restrict the sample to male and female employed natives, respectively. Columns 6 and 7 restrict the sample to employed natives below 40 and above 39, respectively. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Uneven effects across sectors

The impact of migrants on native workers can vary across sectors. Different sectors have specific skills and work requirements, which means that native workers may face varying levels of competition from incoming migrant workers. Additionally, the Australian migration system selects migrants partially based on their skills and professions, leading to more migrants entering certain occupations. As a result, the

[9] Estimation tables for triannual and five-year changes are provided upon request.

overall effect of migration on native wages and employment may hide significant differences across sectors.

Analysing the labour market impact of migration at the sectorial level provides a more detailed perspective, uncovering their potentially uneven effects across sectors. Table 3 presents the migrant effect on native wages and employment by sector. Column 1 shows the baseline results of the analysis for comparison. Column 2 shows the wage effect of migration on the secondary sector, encompassing mostly workers in construction and manufacturing. Column 3 shows the effect on the tertiary sector, which mainly contains service jobs. The employment effect follows the same structure (Columns 4-6). The analysis defines the sectors following the ANZSIC Division.[10]

The migrant-induced employment effect is particularly strong in the service sector. Although the effect of migration on native employment is positive in all subgroups, the effect on service jobs (tertiary) is larger than on manufacturing and construction jobs (secondary). Specifically, a one percentage point increase in the regional migrant inflow, on average, leads to a 0.51% increase in native employment in the secondary sector and a 0.79% increase in the tertiary sector. In contrast and similar to the baseline results (Column 4), the impact of migration on native wages remains insignificant in both sectors.[11]

Table 3. Uneven effects of migration by sector

Estimated impact of migration inflows on native wages and employment by sectors at the regional level, 2011-2018

	Wages			Employment		
	All	**Secondary**	**Tertiary**	**All**	**Secondary**	**Tertiary**
	(1)	(2)	(3)	(4)	(5)	(6)
ΔMigrants	0.00915	0.16079	-0.10978	0.53270***	0.50685***	0.79438***
	(0.081)	(0.138)	(0.070)	(0.080)	(0.101)	(0.117)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	616	616	616	616	616	616
R^2	0.572	0.481	0.550	0.903	0.826	0.897
F-stat	299.341	208.859	159.123	299.341	208.859	159.123

Note: The table presents 2SLS estimates based on Equation 1. The independent variable is the percentage inflow of employed migrants. In Columns 1-3, the dependent variable is the annual changes in the logarithm of native wages, while in Columns 4-6, the dependent variable is the annual percentage changes in the number of employed natives. The table includes different subpopulations for the calculation of the dependent variable. Columns 1 and 4 present the baseline results based on the total employed native population excluding the sectors A, B, O, P, and Q. Columns 2 and 5 restrict the sample to the secondary encompassing the sectors Manufacturing (C), Electricity, Gas, Water and Waste Services (D), and Construction (E). Columns 3 and 6 encompass native workers in the sectors Wholesale Trade (F), Retail Trade (G), Accommodation and Food Services (H), Transport, Postal and Warehousing (I), Information Media and Telecommunications (J), Financial and Insurance Services (K), Rental, Hiring and Real Estate Services (L), Professional, Scientific and Technical Services (M), Administrative and Support Services (N), Arts and Recreation Services (Q), and Other Services (S). All specifications are weighted by the number of employed natives in the subgroup in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

[10] The secondary sector contains natives employed in Manufacturing (C), Electricity, Gas, Water and Waste Services (D), and Construction (E). The remaining natives are assigned to the tertiary sector except for workers in excluded sectors.

[11] Note that the ANZSIC sectors Agriculture, Forestry and Fishing (A), Mining (B), Public Administration and Safety (O), Education and Training (P), and Health Care and Social Assistance (Q) are excluded from the sample. Including these sectors does not change the results.

Robustness checks

Alternative definitions to measure the migrant inflow can provide insights into the robustness of the findings. While this analysis employs the standard definition employed in the literature, replicating the estimations using alternative definitions helps to ensure the consistency of the results.

Alternative measures of the migrant inflows confirm the findings

The literature offers various definitions for measuring migrant inflows. Table 4 includes estimates for the standard baseline measure (Column 1) as well as alternative measurements from the literature (Columns 2-4). Column 2 defines the inflow as the net change of migrants over the native population in year *t-1*, $\frac{M_{j,t}-M_{j,t-1}}{N_{j,t-1}}$. In contrast, the definition introduced by Friedberg (2001[38]) in Column 3 uses the native population in year *t*, $\frac{M_{j,t}-M_{j,t-1}}{N_{j,t}}$. Column 4 employs the measure of Hunt (1992[39]), which uses the total population in year *t* as the denominator, $\frac{M_{j,t}-M_{j,t-1}}{M_{j,t}+N_{j,t}}$. The estimates for the employment effect are displayed in Columns 5-8.

The estimates for the alternative measures validate the baseline results. Irrespective of the inflow definition, the estimated wage effects are insignificant and small, while the employment effect remains consistently positive and highly significant. The estimated effects range from 0.27 to 0.58, with Hunt's estimate (0.58) closest to the baseline (0.53). Using only the native population in the denominator yields lower results, regardless of whether in year t (0.30) or t-1 (0.27), as they exclude migrants from the denominator.[12] Similar patterns are obtained when examining triannual or five-year changes and can be provided upon request.

Table 4. Alternative measures for migrant inflows

Estimated impact of migration inflows on native wages and employment using different migration definitions at the regional level, 2011-2018

	Wages				Employment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\frac{M_{j,t}-M_{j,t-1}}{M_{j,t-1}+N_{j,t-1}}$. (Baseline)	0.009				0.533***			
	(0.081)				(0.080)			
$\frac{M_{j,t}-M_{j,t-1}}{N_{j,t-1}}$		0.012				0.274***		
		(0.044)				(0.042)		
$\frac{M_{j,t}-M_{j,t-1}}{N_{j,t}}$			0.011				0.299***	
			(0.047)				(0.047)	
$\frac{M_{j,t}-M_{j,t-1}}{M_{j,t}+N_{j,t}}$.				0.006				0.585***
				(0.089)				(0.090)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pop. Weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	616	616	616	616	616	616	616	616
F-stat	299.341	134.562	124.609	296.472	299.341	134.562	124.609	296.472

[12] For the same total inflow of migrants, using only the native population in the denominator leads to higher relative migrant inflow measures. Hence, their estimates are smaller by construction.

Note: The table presents 2SLS estimates based on equation 1. In Columns 1-4, the dependent variable is the annual changes in the logarithm of native wages, while in Columns 5-8, the dependent variable is the annual percentage changes in the number of employed natives. The independent variable is the percentage inflow of employed migrants. The table includes different definitions of the percentage inflow of migrants. Columns 1 and 5 use the standard approach, Columns 2 and 6 employ the native population in year t-1 in the denominator, Columns 3 and 7 employ the native population in year t in the denominator following Friedberg (2001[38]), and Columns 4 and 8 employ the native and migrant population in year t in the denominator following Hunt (1992[39]). The different definitions are explained in Annex B. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Results remain unchanged when using alternative instrumental variables

An appropriate instrumental variable is crucial for addressing endogeneity concerns and establishing causal evidence. The instrumental variable consists of a shift and a share component. The adequate selection of the baseline year - which provides the historical settlement patterns (*share*)- is subject to debate in the literature. A sufficient time span between the analysis and baseline years is essential to avoid a correlation between historical settlement behaviour and labour market outcomes, which could bias the analysis. As historical data is scarce, data availability is a common limitation to the selection of the baseline year. In the case of Australia, data is limited to Census waves available for 1981, 1986, and 1991.

Considering alternative IV strategies validates the robustness of the employed IV strategy. The analysis relies on the year 1981 as it represents the furthest point in time that fulfils the conditions for constructing the instrument, as discussed in Section 4. However, it is essential to consider alternative base years to confirm that the analysis results are not influenced solely by the choice of the base year. For this purpose, Table 5 presents estimates for the wage (Panel A) and employment effects (Panel B) for alternative instruments using different base years. Column 1 shows the preferred specification based on the 1981 Census, while Columns 2 and 3 use the Census years 1986 and 1991, respectively. Columns 1-3 predict migrant inflows based on the contemporary total tax-paying population, excluding workers in the public and health sector or in fishery, mining, and forestry. Columns 4-6 use alternative definitions of the contemporary population, relying on the 1981 Census as the baseline year. Column 4 includes the total working-age population in Australia. Column 5 uses the tax-paying population, excluding workers in fishery, mining, and forestry workers. Column 6 includes the total tax-paying population without any sector exclusion.

The findings remain robust regardless of the instrumental variable used. The estimated native wage effects are generally insignificant and negligible across all instrumental variable specifications. In contrast, the effects on native employment growth consistently demonstrate a positive and highly significant impact with little variation in magnitude. Employment effects range from 0.47 (Column 5, Panel B) to 0.53 (Column 1, Panel B), depending on the specification. Annex F presents alternative instruments for triannual and five-year changes.

Table 5. Alternative instrumental variables

Estimated impact of migration on annual native wages and employment using different instrumental variables at the regional level, 2011-2018

	Baseline	1986	1991	1981 WAP	1981 OPQ	1981 Employed
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Wages						
ΔMigrants	0.009	0.048	0.076	0.011	-0.037	0.012
	(0.081)	(0.075)	(0.070)	(0.081)	(0.095)	(0.080)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	616	616	616	616	616	616
R^2	0.572	0.576	0.577	0.572	0.567	0.573
F-stat	299.341	240.267	214.574	292.637	203.570	284.836
Panel B: Employment						
ΔMigrants	0.533***	0.506***	0.503***	0.533***	0.467***	0.529***
	(0.080)	(0.081)	(0.081)	(0.080)	(0.097)	(0.080)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	616	616	616	616	616	616
R^2	0.903	0.902	0.902	0.903	0.901	0.903
F-stat	299.341	240.267	214.574	292.637	203.570	284.836

Note: The table presents 2SLS estimates based on Equation 1. In Panel A, the dependent variable is the annual changes in the logarithm of native wages. In Panel B, the dependent variable is the annual percentage changes in the number of employed natives. The independent variable is the percentage inflow of employed migrants. Column 1 presents the preferred instrumental variables using the baseline year 1981. Columns 2 and 3 use the baseline years 1986 and 1991, respectively. In Columns 4-6, different native populations in the years of analysis are used. Column 4 uses the whole working-age population regardless of employment status. Column 5 relies on employed natives except for those working in the public sector (Sectors O, P, Q). Column 6 relies on all employed workers. The different definitions are explained in Annex D. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Native workforce composition and regional characteristics do not impact the results

Regional variation in wage and employment growths might be due to differences in the regional workforce composition or regional characteristics. Depending on the average age or skill level of the regional workforce, wage and employment growths might react differently to the migrant inflow. Furthermore, differences in the native population density and regional characteristics could affect the economic potential in the region, influencing the native wage and employment effect.

Accounting for workforce and regional characteristics supports the robustness of the migrant effect on native labour market outcomes. Panel A (Table 6) shows the effect of migration on native wages, controlling for the average age of native workers and the share of higher-skilled natives (Columns 2 and 3).[13] Moreover, Column 4 controls for the native population density in the region. Lastly, Column 5 controls for time-invariant characteristics applying to the entire state or territory by including State and Territory fixed-effects. Panel B presents the effect on native employment, following the same structure.

[13] In the absence of educational or skill information for the total Australian population, the share of higher-skilled natives is calculated based on occupation-level information. Following the ANZSCO, workers employed in the Major Groups “Managers” and “Professionals” are considered higher-skilled.

Regional and workforce characteristics do not drive the positive effect of migration on labour market outcomes. Controlling for workforce characteristics reduces the estimated effect of migration on native employment, suggesting that the inflow of migrants is correlated with the native age and skill composition. Yet, the employment effect remains significant when netting out such workforce characteristics, supporting the robustness of the results. Similarly, regional population density or state and territory characteristics do not substantially alter the migration effect. In contrast, the wage effect remains insignificant when controlling for workforce characteristics or population density. The estimation yields a positive and weakly significant effect only when including State and Territory fixed-effects. However, as demonstrated, this slight positive effect is not robust.

Table 6. Netting out workforce and regional characteristics

Estimated impact of migration inflows on native wages and employment controlling for workforce and regional characteristics, 2011-2018

	(1)	(2)	(3)	(4)	(5)
Panel A: Wages					
ΔMigrants	0.00915	0.04602	0.03845	-0.04794	0.09954**
	(0.081)	(0.080)	(0.080)	(0.101)	(0.047)
Time FE	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes
Controls	No	Age	Age, Skill	Density	State
N	616	616	616	616	616
R^2	0.572	0.577	0.578	0.568	0.635
F-stat	299.341	369.002	366.536	244.815	345.951
Panel B: Employment					
ΔMigrants	0.53270***	0.44827***	0.45158***	0.59505***	0.50570***
	(0.080)	(0.092)	(0.093)	(0.099)	(0.083)
Time FE	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes
Controls	No	Age	Age, Skill	Density	State
N	616	616	616	616	616
R^2	0.903	0.903	0.903	0.905	0.912
F-stat	299.341	369.002	366.536	244.815	345.951

Note: The table presents 2SLS estimates based on Equation 1. The independent variable is the percentage inflow of employed migrants. In Panel A, the dependent variable is the annual changes in the logarithm of native wages, while in Panel B, the dependent variable is the annual percentage changes in the number of employed natives. The table includes different variables to control for the potential effects of the native workforce and regional characteristics on the migration effect. In both panels, Column 1 presents the baseline results with no additional controls except for the time fixed-effects. Column 2 presents the estimates when controlling for the average age in the regional native workforce. Column 3 controls for the average age and the share of high-skilled natives among the regional native workforce. Column 4 controls for the population density in the region, while Column 5 includes state and territory fixed-effects, controlling for time-invariant characteristics that apply to all regions within the state and territory. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

The migration effect is not driven by the size of the geographical units

The definition of the geographical unit might influence the estimated impact of migration on labour market outcomes. Using an area classification that builds on regional commuter patterns, such as the employed SA4 regions, is ideal when focusing on regional labour market effects. However, as data at this geographical level is unavailable in many countries, similar analyses frequently use geographical units defined by administrative borders, such as municipalities or states. To validate the baseline estimates and

ensure that the results are not driven by a specific geographical unit of analysis, this subsection presents estimated effects using alternative regional classifications.

In addition to the employed SA4 regions, the study presents two alternative regional classifications. The baseline analysis uses geographical units that build on regional commuter patterns. Moreover, the states' capital regions (e.g. Melbourne, Sydney) are further split into individual regions to obtain geographical units that have comparable population sizes. The alternative OECD Territorial Level 3 (TL3) classification follows the same approach yet does not disaggregate the states' capitals, resulting in 50 regions. SA4 regions are identical to TL3 regions outside the states' capital regions. Comparing estimates based on SA4 and TL3 regions ensures that mobility across SA4 regions in the capital cities does not affect the results. The analysis further considers Australian States and Territories, equivalent to the OECD Territorial Level 2 (TL2) regions, to investigate the subnational impact of migration at a more aggregated level.[14] Table 7 presents the baseline estimates for annual changes following the SA4 classification (Columns 1 and 4) along with estimates based on TL3 regions (Columns 2 and 5) and the States and Territories (Columns 3 and 6).

Different geographical units of analysis do not change the estimated migration effects. The regional impacts of migration on native employment at the SA4 and TL3 levels are almost identical, whereas the estimate at the State and Territory level is slightly higher. The effect of migration on native wages is insignificant regardless of the regional classification. This suggests that the definition and borders of the SA4 regions do not drive the baseline results. Triannual and five-year changes yield similar results.

Furthermore, the weighting strategy also does not drive the estimated effects. To avoid overrepresenting less populated regions, the baseline regression weights the labour market outcome by the employed native population in each region. However, the effect does not substantially vary if regressions use alternative or no weights, which gives equal importance to all regions. Annex G presents the relevant regression tables.

Table 7. Alternative geographical units of analysis

Estimated impact of migration inflows on native wages and employment at the regional level (SA4), TL3 level, and State and Territory level, 2011-2018

	Wage			Employment		
	SA4	**TL3**	**State / Territory**	**SA4**	**TL3**	**State / Territory**
	(1)	(2)	(3)	(4)	(5)	(6)
ΔMigrants	0.00915	0.01196	-0.16969	0.53270***	0.55233***	0.70495***
	(0.081)	(0.198)	(0.478)	(0.080)	(0.093)	(0.206)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	616	350	56	616	350	56
R^2	0.572	0.575	0.634	0.904	0.934	0.977
F-stat	299.341	282.337	18.769	299.341	282.337	18.769

Note: The table presents 2SLS estimates based on Equation 1. The independent variable is the percentage inflow of employed migrants. In Columns 1-3, the dependent variable is the annual changes in the logarithm of native wages, while in Columns 4-6, the dependent variable is the annual percentage changes in the number of employed natives. The table presents the baseline analysis using different geospatial classifications, SA4, TL3, and State/Territory. Columns 1 and 4 present the baseline results based on SA4 regions. Columns 2 and 5 use TL3 regions, which are similar to SA4 but aggregate the SA4 regions in the capital region of the states and territories. Columns 3 and 6 use the Australian State and Territory regions for the analysis. All specifications are weighted by the number of employed natives in the considered region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the considered regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

[14] For more information on the OECD TL3 and TL2 classification see territorial-grid.pdf (oecd.org).

6 Mechanisms

This section delves into the mechanisms behind the observed outcomes from the previous section. It examines the margins of the employment and wage effect to provide insight into the underlying mechanisms.

Margins of the employment effect

The paper shows that, on average, migration increases native employment in the region. However, there are different potential reasons behind this effect. For instance, more unemployed natives in the region might find jobs because of migration. Alternatively, employed natives might be less likely to lose their jobs due to the arrival of migrants. Also, natives with jobs from other regions might move to places with more migrants, boosting regional employment. Additionally, some natives who would have left the region might choose to stay because of the migrants. Understanding these reasons is crucial for grasping how migration affects job markets and for creating effective policies.

To understand what is driving the change in employment, the analysis breaks it down into two components: i) the number of native workers entering employment in the region (*inflows*) and ii) the number of those leaving employment (*outflows*) in the region. This distinction follows the literature (Dustmann, Schönberg and Stuhler, 2017[8]):

$$\Delta Emp_{j,t}^{native} = \frac{Emp_{j,t}^{native} - Emp_{j,t-1}^{native}}{Emp_{j,t-1}^{native}} = \frac{Inflow_{j,t}}{Emp_{j,t-1}^{native}} - \frac{Outflow_{j,t}}{Emp_{j,t-1}^{native}} \quad (4)$$

Equation 4 splits the net change in native employment in region *j* between *t* and *t-1*, which is the dependent variable of Equation 1, into an inflow and outflow and normalizes them by the employed native population in year *t-1*.[15] Box 3 details on the definitions of the flows.

Equation 5 decomposes the effect further by disaggregating the inflow and outflow into four subflows, respectively:

$$\begin{aligned} Emp_{j,t}^{native} &= \frac{Emp_{j,t}^{native} - Emp_{j,t-1}^{native}}{Emp_{j,t-1}^{native}} = \frac{Inflow_{j,t}}{Emp_{j,t-1}^{native}} - \frac{Outflow_{j,t}}{Emp_{j,t-1}^{native}} \\ &= \left[\frac{Entry\ LM_{j,t}}{Emp_{j,t-1}^{native}} + \frac{Entry\ area_{j,t}}{Emp_{j,t-1}^{native}} + \frac{Entry\ \ LM + area_{j,t}}{Emp_{j,t-1}^{native}} + \frac{Entry\ data_{j,t}}{Emp_{j,t-1}^{native}}\right] \\ &- \left[\frac{Exit\ LM_{j,t}}{Emp_{j,t-1}^{native}} + \frac{Exit\ area_{j,t}}{Emp_{j,t-1}^{native}} + \frac{Exit\ LM + area_{j,t}}{Emp_{j,t-1}^{native}} \frac{Exit\ data_{j,t}}{Emp_{j,t-1}^{native}}\right] \end{aligned} \quad (5)$$

[15] Besides the aforementioned econometrical advantages of normalising the change in the population, it also means that adding up the individual estimates yields the overall effect.

Box 3. The drivers of native employment growth in the region

The total change in employed natives in the region results from two main movements: the number of native workers entering employment in the region (*inflows*) and the number of those leaving employment in the region (*outflows*). The analysis further breaks down these movements into four subflows for a detailed examination.

The *inflow* refers to the count of newly arrived or newly employed native workers in region *j* and year *t*. These individuals worked and lived in region j in year *t* but did not work or live there in the previous year, *t-1*. The analysis distinguishes between four subflows: 1) $Entry\ LM_t$ refers to the number of employed natives who did not change region but transitioned from not employed[16] in *t-1* to employment in *t*; 2) $Entry\ area_t$ refers to the number of employed natives who worked in *t-1* but previously lived in a different region than *j (i ≠ j)*; 3) $Entry\ \ LM + area_t$ refers to the number of employed natives who did not work in year *t-1* and previously lived in a different region *(i ≠ j)*; 4) $Entry\ data_t$ refers to the number of employed natives without specific information about their location and employment status in year *t-1*. This group encompasses young natives who just entered the labour market after turning 15. Moreover, $Entry\ data_t$ contains native-born returning from abroad and workers previously employed in one of the sectors excluded from the analysis (see Section 3).

The *outflow* represents the number of residents who worked and lived in region *j* during year *t-1* but either moved out of employment or left the region in year *t*. The subflows follow the same structure as the *inflow* subflows. $Exit\ data_t$ encompasses previously employed natives who turned 64 or died in year *t*. Moreover, it contains natives who left Australia or started working in one of the sectors excluded from the analysis (see Section 3).

Figure 5. Subflows of the net change in native employment

	Flow	Subflow	Year t-1		Year t	
			Region	Employment	Region	Employment
Net increase	Inflow	Entry LM	j	Not employed	j	Employed
		Entry area	i ≠ j	Employed	j	Employed
		Entry LM + area	i ≠ j	Not employed	j	Employed
		Entry data	N/A	N/A	j	Employed
	Outflow	Exit LM	j	Employed	j	Not employed
		Exit area	j	Employed	i ≠ j	Employed
		Exit LM + area	j	Employed	i ≠ j	Not employed
		Exit data	j	Employed	N/A	N/A

Source: OECD elaboration.

[16] As the data builds on tax records, inactive and unemployed natives cannot be distinguished.

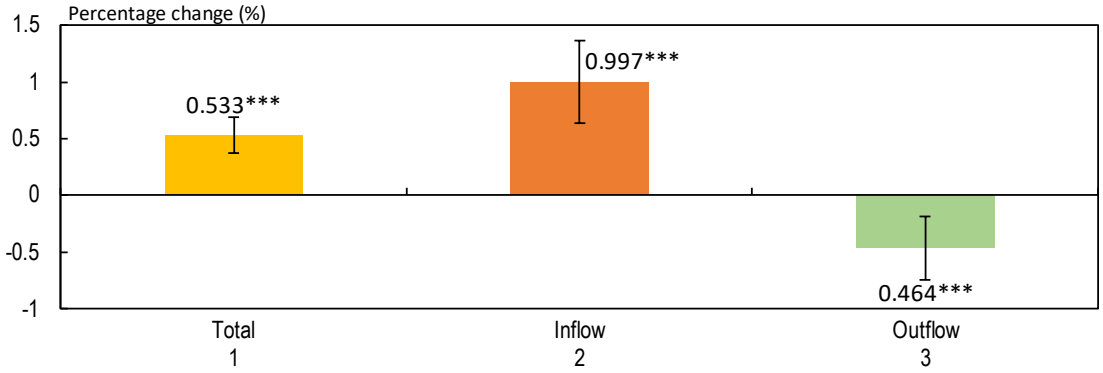
Migrants both attract native workers and lead to their departure

Figure 6 shows the overall effect of migration on native employment growth (Column 1), as well as the effect on the inflow (Column 2) and outflow (Column 3) of employed natives in the region. The estimations employ the IV approach of the main analysis (see Section 4). Annex H shows OLS and 2SLS estimates in Table A.11 and Table A.12.

The arrival of migrants leads to a greater inflow of employed natives than outflow, resulting in a net inflow and an overall positive effect on regional native employment growth. On average, a one percentage point rise in the inflow of migrants to the labour supply increases the inflow of newly employed natives in the region relative to the native workforce by almost 1%. However, as migration also increases the outflow of previously employed natives in the region by 0.46%, the overall effect is at 0.53%.

Figure 6. The regional impact of migration on the inflows and outflows of employed natives

Estimated impact of migration inflows on native employment at the regional level, 2011-2018



Note: The figure presents 2SLS estimates based on Equation 4. The independent variable is the percentage inflow of employed migrants. Column 1 presents the baseline analysis encompassing the annual percentage changes in the number of employed natives as dependent variable. Columns 2 and 3 consider the native inflow and outflow to the labour market relative to the native employed population, respectively. All specifications are weighted by the number of employed natives in the considered region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively.
Source: OECD calculations based on MADIP (accessed July 2023).

Migration boosts the inflow of employed natives in the region through different channels, particularly geographic mobility. To identify the specific drivers of the inflows, Figure 7 (Columns 2-5) further breaks down the effect into four subflows (refer to Box 3 for more details). The regional inflow to the labour force is particularly pronounced for natives who were previously employed in other regions (Column 3). Although migration also boosts the arrival of previously unemployed natives (Column 4), this effect is relatively small. In contrast, migration's impact on labour market transitions is insignificant (Column 2), indicating that migration does not increase the likelihood of unemployed natives in the region finding work in the same region.[17]

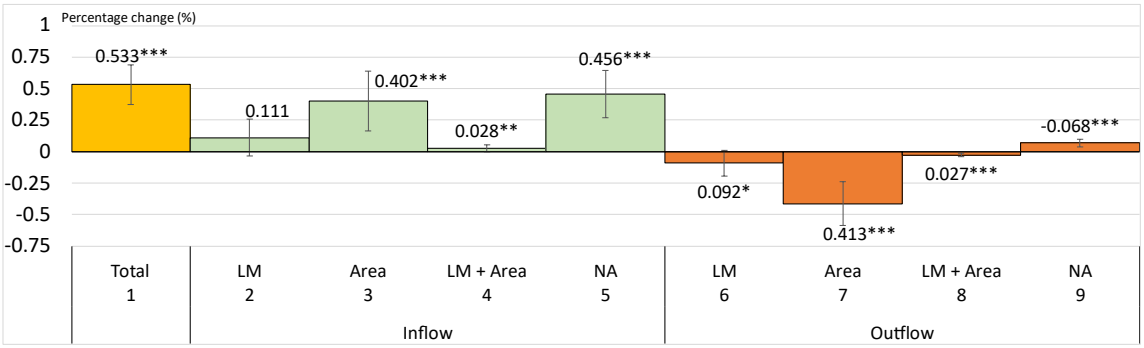
[17]The analysis also captures the effect of migration on the inflow with no previous record in the data. Analysing the mechanisms suggests that regions with higher migrant inflows also exhibit a significant increase of such natives. Moreover, migration also reduces the outflow of natives without additional information. See Box 3 for a list of subgroups.

Migration also increases the outflow of previously employed natives in the region through different channels. This particularly applies to natives who relocate to another region while remaining employed or switching employment (Column 7, Figure 7). However, migration also slightly increases the number of natives transitioning out of employment and leaving the region (Column 8). Similar to the inflow channels, the effect of migration on the labour market transition of natives staying in the region is insignificant (Column 6), suggesting that migration does not increase the likelihood of natives in the region losing employment.

Geographic mobility among natives emerges as the principal driver of the positive employment impact. Examining the underlying mechanisms, the analysis indicates that migration results in both an inflow and an outflow of natives in the region. However, since the increase in native arrivals due to migration is significantly higher than the number of natives leaving, the overall effect on native employment is positive. Breaking down these flows reveals that the arrival of native workers from other regions is the main mechanism through which migration enhances native employment in the region. In contrast, the labour market transitions of natives within the region have a limited impact on the overall effect.

Figure 7. The regional impact of migration on the subflows of employed natives

Estimated impact of migration inflows on native employment at the regional level disaggregated by subflows, 2011-2018



Note: The figure presents 2SLS estimates based on equation 5. The independent variable is the percentage inflow of employed migrants. Column 1 presents the baseline analysis encompassing the annual percentage changes in the number of employed natives as dependent variable. Columns 2-9 consider the different subflows as detailed in Box 3. All specifications are weighted by the number of employed natives in the considered region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively.
Source: OECD calculations based on MADIP (accessed July 2023).

Digging deeper into wage effects

The lack of a wage effect following the arrival of migrants could be due to either wage rigidities or the geographic mobility of natives. Wage rigidities can restrict employers from freely adjusting workers' wages, particularly for existing contracts.[18] Consequently, wages for employees under such contracts might be less sensitive to migration than the wages of newly hired workers. Moreover, as natives in the region might respond to migration by relocating, geographic mobility of native workers, along with resulting changes in the composition of the regional native workforce, may mask a wage effect.

The analysis does not indicate any sort of wage rigidity, which could account for the absence of wage effect. To unveil the underlying mechanism, Columns 2 and 3 (Table 8) estimate the wage effects on

[18] Most prominently, labour market institutions such as labour unions or collective bargaining agreements may limit firms' ability to set wages (Angrist and Kugler, 2003[7]; Özgüzel, 2021[42]).

natives who already lived and worked in the region (*stayers*) and on newly arrived and employed natives (*arrivers*), respectively.[19] While *stayers* are likely to have preexisting contracts and rigid wages, arrivers are more likely to start a new job, making their wages more sensitive to the migrant inflow. Substantial differences in the wage effect for newly hired and existing workers would suggest wage rigidity and explain the lack of an overall wage effect. However, the results for both groups are statistically insignificant, and therefore, wages of natives who are already employed do not respond differently to the inflow of migrants than the wages of natives who are taking new jobs. Hence, the analysis does not find indications of wage rigidity suppressing the wage effect.

Further, the wage effect seems independent of native mobility or changes in the native labour force. Migration might trigger some workers to enter or leave employment or relocate to another region. Any such response to migration could alter the composition of the regional native workforce in terms of individual characteristics (e.g. education, age, or experience). Such changes could drive regional average wages and, consequently, affect the wage effects of migration. To examine the relevance of these factors, the analysis assesses the effect of migration on wages for specific native subgroups with constant worker compositions. Therefore, Column 4 (Table 8) controls for native mobility by categorising employed natives based on their 2011 location and tracking them over the years. Further, Column 5 considers possible shifts in the native workforce composition by limiting the sample to natives who remained employed and resided in the same region from 2011 to 2018, referred to as the "Fixed Cohort". If native mobility or changes in the native workforce composition were causing the wage effect to be overlooked, the estimates would differ significantly from the baseline. However, both estimates are statistically insignificant, indicating that neither native mobility nor alterations in the native workforce composition impact the overall wage effect. [20]

Table 8. Margins of the wage effect

Estimated impact of migration inflows on native wages for different subgroups at the regional level, 2011-2018

	All	Stayers	Arrivers	First Location	Fixed Cohort
	(1)	(2)	(3)	(4)	(5)
ΔMigrants	0.00915	0.03956	-0.00921	0.05339	0.11998
	(0.081)	(0.105)	(0.190)	(0.081)	(0.077)
Time FE	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes
N	616	528	528	616	616
R^2	0.572	0.586	0.616	0.721	0.627
F-stat	299.341	325.010	325.010	299.341	299.341

Note: The table presents 2SLS estimates based on Equation 1. The independent variable is the percentage inflow of employed migrants. The dependent variable is the annual changes in the logarithm of native wages. The table presents the baseline analysis using different subgroups. Column 1 presents the baseline results for the full population. Column 2 considers those native workers in the region who did not move between the previous and considered years. Column 3 considers only native workers who changed location or transitioned to employment between the previous and considered years. Column 4 considers all native workers recorded in 2011 and groups them by their initial SA4 region. Column 5 considers only native workers, who never left the region and remained employed throughout. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

[19] The wage growth of *stayers* is calculated based on a sample of natives who did not change the region in the previous year, whereas the wage growth of *arrivers* builds on a sample of newly arriving natives for each year.

[20] Notably, the effect of migration on native wages of the fixed cohort might be biased by a selection effect since benefiting natives are less likely to leave.

7 Concluding remarks

Using individual-level administrative data, this paper provides the first causal findings on the labour market effects of migration across Australian regions. The analysis employs a first-differences model and a well-established instrumental variable approach to examine how the inflow of migrants impacts native wages and employment in Australian regions.

The analysis uncovers three key findings. Firstly, migration boosts native employment in Australian regions. On average, a one percentage point increase in the annual migrant inflow (measured as the share of the total employed population) leads to a 0.53% rise in regional native employment, benefiting all natives regardless of their characteristics and skill level. Secondly, the analysis finds no evidence of a migration-induced effect on native wages. Lastly, the positive employment effect is driven by a substantial regional inflow of newly employed natives due to migration, which outweighs a simultaneous outflow of natives. The analysis indicates that this employment effect primarily results from natives changing locations rather than natives located in the region transitioning into employment.

This analysis is an important step in understanding the regional impact of migration, yet future research could refine these findings. Research could exploit how migrants integrate into regional labour markets and analyse potential mismatches between the skill set of migrants and their occupations. Given the large presence of highly qualified migrants in Australia, structural mismatches would leave substantial untapped potential. Additionally, the impact of migrants on native employment may vary depending on their visa type, so further analysis should consider disaggregating migrants by visa class or subclass to inform migration policies. Lastly, investigating how employer-sponsored visas impact the hiring and training of native workers would provide valuable insights.

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Annex A. Data

Multi-Agency Data Integration Project (MADIP)

The Multi-Agency Data Integration Project (MADIP) dataset by the Australian Bureau of Statistics (ABS) is an individual-level panel dataset that provides longitudinal information for more than 27 million individual records between 2011 and 2020. MADIP combines administrative information from different departments, such as the Australian Taxation Office (ATO), the Department of Education, the Department of Health and Aged Care, the Department of Social Services, Services Australia, and the Department of Home Affairs. The availability of the dataset is subject to the agreement of the data custodians of the individual agencies and depends on the individual research question. In addition to administrative data, the MADIP includes one of the quinquennial Australian Census of Housing and Population. Besides the MADIP core data, this analysis relies on tax data by ATO, migration data by the Department of Home Affairs, and the Census 2018. The following subsections describe the individual components of the dataset.

MADIP core data

The MADIP core dataset is at the centre of every analysis using MADIP data. It contains demographic information like date of birth, gender, and date of death, as well as the usual location of residence for all residents in Australia. Moreover, the dataset includes a *spine* ID integral to merging the individual datasets from different agencies. By default, the dataset covers every Australian resident recorded in either *Social Security and Related Information*, *Personal Income Tax* data, or *Medicare Benefits Schedule* data between 2006 and 2020, resulting in a total of 27.1 million individual records. However, not every recorded person is listed in every individual dataset. For instance, income tax data is not available if the person has never reported taxes (e.g., children).

The geographical information is available at different granularity levels, including SA4, SA3, and SA2. Given the overwhelming coverage of the Australian population, the data is expected to be representative at every geographical level. Location information is distinguished by residential and mail address. For migrants, the business address is also reported. In the analysis, the individual location information is based on the residential address or mail address, depending on data availability.

MADIP is expected to cover the vast majority of Australian citizens and residents due to the combination of medicare, social benefits, and income tax records. According to the ABS, the following groups are potentially underrepresented: i) recently arrived migrants without Medicare, ii) non-earning partners and family members of working visa holders, iii) non-earning foreign students, iv) military personnel, v) prisoners, vi) recently born individuals, not yet included in the Medicare Benefits Schedule.

Census of Population and Housing 2016

The Australian Census of Population and Housing is conducted every five years and includes, among others, information on educational attainment, employment and work, family, and personal characteristics. This paper uses data from the Census wave of 2016, the latest available for research, linked to the MADIP

universe.[21] Due to Australian data confidentiality rules, only one Census wave at a time can be used in the MADIP environment. The Census data refers to the data collected on the 9th of August, 2016.

In Australia, participating in the census is mandatory for Australian residents, with very few exceptions. The ABS linked 20.7 million records of the Census 2016 to the MADIP data, which corresponds to 88% of all collected Census records in 2016. According to the ABS, the following groups are not within the scope of the Census: i) Australians overseas, ii) residents for less than six months, iii) visitors, iv) diplomatic personnel and their families. The paper retrieves information on age, occupation, industry, and country of birth from the Census.

Australian Taxation Office

The Australian Taxation Office provides administrative information on all employed individuals in Australia based on official tax returns. The dataset covers around 16.7 million individual records, including everyone with a tax return in Australia in at least one year from 2010/2011 – 2017/2018. The Australian financial tax year ranges from July until June of the following year. However, in order to combine the data with other datasets, the tax records are assumed to follow the calendar year (January-December rather than July-June).[22] Data spans from wages, total income, and insurance payments to job sector information. The variables of interest to this analysis are age, individual wage/salary, the main salary or wage occupation code, and industry. Employed individuals with an income below the threshold imposed by the ATO and, hence, without a tax record, are not considered in the data. This also includes most migrants on a working holiday maker (WHM) visa.

Department of Home Affairs

The *Department of Home Affairs* provides administrative data on the native and migrant populations. The data includes every individual (native- or foreign-born) who crossed the border of Australia between 1990 and 2020. The dataset is used to retrieve information on the country of birth, date (month and year) of birth, and gender. Visa information is not available for all migrants. Moreover, due to changes in the visa status after arriving in Australia, the visa information might not be reliable for all migrants.

Historic Census

As discussed in Section 4, the identification strategy of the paper requires the use of a historical instrument based on the settlement patterns of migrants in the past. The information on the past settlement patterns is obtained from census data from 1981, 1986, 1991, and 2001. The historical data has been adjusted to 2016 borders by the ABS and provides data on the total employed population of the respective year disaggregated by country of birth, the industry of employment, and highest post-school qualification. The country of birth consists of 60 national groupings.

[21] At the time of the analysis, the Census 2021 (published in summer and fall of 2022) was not yet available to a sufficient extent. Further, due to the disruptive effect of COVID-19 and the substantial travel restrictions for travel and immigration to Australia, the results of the analysis would not necessarily represent the situation in Australia.

[22] This means that the tax return for the financial year 2011/12 is treated as the tax return for the year 2012. The age retrieved from the ATO is adjusted accordingly.

Table A.1 Migrant decomposition in terms of country of origins

Share of employed migrants among the employed migrant population, 1981

Country groupings	Share of total foreign-born employed population
Albania, Bulgaria & Romania	0.32%
Argentina & Uruguay	0.51%
Austria	0.87%
Bangladesh	0.03%
Belgium	0.15%
Brazil	0.05%
Cambodia, Laos & Myanmar	0.42%
Canada	0.46%
Chile	0.40%
China	0.99%
Colombia, Ecuador & Peru	0.13%
Cyprus	0.82%
Denmark, Finland, Norway & Sweden	0.87%
Egypt	1.20%
Fiji	0.27%
Former Czechoslovakia	0.63%
Former USSR	1.67%
Former Yugoslavia	5.63%
France	0.42%
Germany	4.52%
Greece	6.00%
Hong Kong & Macau	0.41%
Hungary	1.11%
India	1.44%
Indonesia & Timor-Leste	0.54%
Iran	0.11%
Iraq	0.11%
Ireland	1.62%
Israel	0.21%
Italy	10.97%
Japan	0.27%
Kenya, Malawi, Zimbabwe, Tanzania, Uganda & Zambia	0.27%
Korea	0.13%
Lebanon	1.48%
Malaysia & Brunei	0.76%
Malta	2.32%
Mauritius	0.33%
Mexico	0.01%
Netherlands	3.92%
New Zealand	4.63%
Other Africa	0.37%
Other Middle East	0.05%
Pakistan	0.08%
Papua New Guinea	0.25%
Philippines	0.51%
Poland	2.18%
Portugal	0.40%
Singapore	0.30%

South Africa & Namibia	0.73%
Spain	0.54%
Sri Lanka	0.56%
Switzerland	0.26%
Syria	0.11%
Taiwan	0.03%
Thailand	0.09%
Türkiye	0.66%
United Kingdom	33.58%
United States of America	0.96%
Vietnam	0.82%
All other countries	0.54%

Note: Share of the foreign-born employed population in 1981. The countries of origin are aggregated into 60 national groupings. Grouping was conducted by the ABS and refers to the international borders of 1981.
Source: Australian Bureau of Statistics (ABS).

Annex B. Construction of variables

This section presents the variables, including alternative definitions, used in the analysis.

Alternative measures

The following table presents the variables used in the analysis.

Table A.2 Baseline variables

Variable name	Formula	Definition
Wage growth	$\Delta \ln w_{g,j,t}^{native} = \ln(w_{g,j,t}^{native}) - \ln(w_{g,j,t-1}^{native})$	Change in the logarithm of individual wages of employed natives
Employment growth	$\Delta Emp_{g,j,t}^{native} = \frac{Emp_{g,j,t}^{native} - Emp_{g,j,t-1}^{native}}{Emp_{g,j,t-1}^{native}}$	Percentage change in the number of employed natives in group g and region j, between t and t-1
Migrant inflow	$\Delta foreign_{j,t} = \frac{M_{j,t} - M_{j,t-1}}{M_{j,t-1} + N_{j,t-1}}$	Inflow of employed migrants between t and t-1 in region j over the total employed population in t-1

Alternative measures

The following table presents alternative measures of the migrant inflow used in the literature.

Table A.3 Alternative measures of the migrant inflow

Variable name	Formula	Definition
Migrant inflow	$\Delta foreign_{j,t} = \frac{M_{j,t} - M_{j,t-1}}{M_{j,t-1} + N_{j,t-1}}$	Inflow of employed migrants between t and t-1 in region j over the total employed population in t-1
Migrant inflow by Hunt (1992[39])	$\Delta foreign_{j,t} = \frac{M_{j,t} - M_{j,t-1}}{M_{j,t} + N_{j,t}}$	Inflow of employed migrants between t and t-1 in region j over the total employed population in t
Migrant inflow by Friedberg (2001[38])	$\Delta foreign_{j,t} = \frac{M_{j,t} - M_{j,t-1}}{N_{j,t}}$	Inflow of employed migrants between t and t-1 in region j over the native employed population in t
Migrant related to Friedberg (2001[38]), with denomiator in year t-1	$\Delta foreign_{j,t} = \frac{M_{j,t} - M_{j,t-1}}{N_{j,t-1}}$	Inflow of employed migrants between t and t-1 in region j over the native employed population in t-1

Annex C. Construction and validity of the instrumental variable strategy

Construction of the instrumental variable

The instrument is constructed in several steps. First, the migrant population is split into 60 origin groups (the exact national groupings are reported in Annex A). Second, the distribution of each of these groups across regions (i.e., the share) is calculated based on their distribution in 1981, which is the earliest with regional data matchable to the borders used in the analysis (SA-2016).[23] The *share* component of the instrument is calculated as follows:

$$Share_{n,j}^{1981} = \frac{Migrants_{n,j}^{1981}}{\sum Migrants_{n,j}^{1981}} \tag{6}$$

The numerator, $Migrants_{n,j}^{1981}$, is the number of employed migrants in 1981 by 60 national grouping *n* in region *j*. The denominator, $\sum Migrants_{n}^{1981}$, refers to the total employed migrant population by national grouping *n* in 1981 across Australia.

Next, migrants from each national grouping *n* living in Australia during the period of analysis *t* ($Migrants_{n}^{t}$), are distributed across regions using their share in the past ($Share_{n,j}^{1981}$):

$$\widehat{Migrants}_{n,J}^{t} = Share_{n,j}^{1981} * Migrants_{n}^{t} \tag{7}$$

By distributing migrants from each country across different regions, we can obtain an estimate of the expected number of migrants in each region based on settlement patterns from 1981. Next, the predicted number of migrants ($\widehat{Migrants}_{n,J}^{t}$) are aggregated by region to obtain the predicted number of total migrants:

$$\widehat{Migrants}_{j}^{t} = \sum_{n}^{N} \widehat{Migrants}_{n,J}^{t} \tag{8}$$

Similar to the migrant population, the settlement decision of natives may not be random as natives might also be attracted to places offering better wages and employment chances. Furthermore, natives potentially react to the arrival of migrants by moving out of more affected regions. Therefore, native population numbers, used in the denominator of the migrant share $\left(\text{i.e.,} \frac{M_{j,t}-M_{j,t-1}}{M_{j,t-1}+N_{j,t-1}}\right)$ may also suffer from endogeneity problems. To address this concern, the current regional native population ($Natives_{j}^{t}$) is also predicted based on the settlement patterns in 1981:

[23] The Census 1981 contains headcounts of the employed population disaggregated by country of birth, industry of employment, and education level.

$$\widehat{Natives}_{J,t} = \frac{Natives_j^{1981}}{\sum Natives_j^{1981}} * Natives_j^t \quad (9)$$

Finally, the predicted numbers of migrants and natives are used to predict the inflow of migrants, which is used to instrument variables for the migrant inflow relative to the total population:

$$\Delta \widehat{foreign}_{J,t} = \frac{\widehat{Migrants}_{J,t} - \widehat{Migrants}_{J,t-1}}{\widehat{Migrants}_{J,t-1} + \widehat{Natives}_{J,t-1}} \quad (10)$$

Validity of the instrument

Validity test 1: Past settlement patterns are not correlated with past regional characteristics

The first test in support of the exogeneity of the shares consists of checking whether baseline migrant shares in 1981 are associated with regional characteristics that can, in turn, be correlated with current changes in wages and employment (Goldsmith-Pinkham, Sorkin and Swift, 2018[35]). Implementing this test requires checking that the initial shares of the top origin countries that explain most of the variation during the 2011-2018 period, i.e., India, China, Philippines, and Korea[24], are not associated with regional characteristics in 1981.

Origin country shares are mostly not associated with regional characteristics in 1981. The following table shows the results of regressions of top origin-specific shares on regional labour market variables and industry composition in 1981. These include shares of highly educated workers, the distribution of workers across sectors, and the logarithm of wages and employment. Columns 1 to 4 highlight that out of 20 coefficients, only 2 exhibit statistically significant. Additionally, as shown by Column 5, origin shares of these four top nationalities combined together are not correlated with regional characteristics. In consequence, the instrument is not correlated with regional characteristics in 1981. Columns 6 to 8 assess the association of regional variables in 1981 with the predicted migrant increase, i.e., the instrument. Neither the share of highly educated individuals nor the sectoral shares or wage or employment levels are correlated with the instrument. Taken together, these results provide further support to the assumption that the instrument is affecting current changes in wages and employment only through its effect on migration flows.

Table A.4 Explanatory variables in 1981

	India	China	Philippines	Korea	Top 4	Δ Predicted Migrant		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share high-educated	0.038	-0.116*	-0.127**	-0.120	-0.205	0.008	0.117	-0.758
	(0.067)	(0.063)	(0.056)	(0.144)	(0.135)	(0.286)	(0.367)	(0.731)
Share primary sector	0.023	0.010	0.027	0.047	0.059		-0.036	-0.307
	(0.028)	(0.026)	(0.023)	(0.060)	(0.056)		(0.233)	(0.276)
Share secondary sector	0.042	-0.021	0.028	0.043	0.050		0.380	0.352
	(0.035)	(0.033)	(0.029)	(0.075)	(0.071)		(0.299)	(0.299)
Wages (log)	0.100	-0.084	-0.066	-0.015	-0.050			0.256
	(0.064)	(0.061)	(0.054)	(0.139)	(0.130)			(0.395)
Employment (log)	-0.025	0.053	0.048	0.009	0.076			0.568
	(0.037)	(0.035)	(0.032)	(0.081)	(0.076)			(0.612)

[24] These are the four nationalities that contributed the most to the increase in migration during the 2011-2018 period.

Note: The table presents results based on estimating each dependent variable on a set of regional characteristics, including the share of highly-educated workers, the shares of workers in the primary or secondary sector (the tertiary sector is omitted to avoid perfect multicollinearity), and wages and employment in logarithm, across regions in 1981. Columns 1-4 use as dependent variables the share of Indian, Chinese, Filipino or Korean individuals in each region in 1981, respectively. Column 5 sums the shares of these four nationalities within each region. Columns 6-8 use the predicted change in migrant population over the total baseline population from 2011 to 2016. Standard errors in parenthesis. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively.
Source: OECD calculations based on MADIP (accessed July 2023).

Validity test 2: The effect is not driven by adjustment to previous migrant inflows

The short-term impact of migration may be different from that in the long run. If migration waves in the years before the period of study have long-term effects, the effects of these can be conflated with the effects of current migration inflows. To overcome this problem, accounting for past migration flows - the so-called lags - allows to separately identify their effect on contemporary outcomes (Jaeger, Ruist and Stuhler, 2018[11]).

To investigate the presence of such a bias, the following model is estimated, which adds the lagged migration increase in Equation 1:

$$\Delta Emp_{g,j,t}^{native} = \beta_g \Delta \widehat{foreign}_{j,t} + \pi_g \Delta foreign_{j,t-1} + \alpha_t + \epsilon_{j,t} \quad (11)$$

$$\Delta \ln w_{g,j,t}^{native} = \beta_g \Delta \widehat{foreign}_{j,t} + \pi_g \Delta foreign_{j,t-1} + \alpha_t + \epsilon_{j,t} \quad (12)$$

The equation is estimated for the period 2011 to 2016 using a 5-year change. The specification is similar to the baseline equation in Section 4 but adds $\Delta foreign_{j,t-1}$ which represents the increase in the migrant population from 2001 to 2006.

Considering previous migration waves does not change the results. The following table shows the regression estimates from regression current changes in employment and wages on current and past migration increases. The estimates on current migration inflows are positive for employment and non-significant for wages, similar to the main results. In contrast, the effects of past migration waves are not statistically different from zero. Therefore, the baseline estimates are not driven by long-term effects of previous migration inflows.

Table A.5 Controlling for lagged migration flows

	Wages	Employment
	(1)	(2)
ΔMigrants	-0.076	0.450***
	(0.068)	(0.133)
ΔMigrants, past	0.166	0.459
	(0.206)	(0.469)

Note: The table presents results based on estimating Equation 2 using as outcomes either changes in the logarithm of wages (Column 1) or changes in native employment (Column 2). The independent variables are the increase in employment due to migrants both in 2011-2016 and in 2001-2006. Instruments include predicted migration in 2011-2016 and in 2001-2006. All specifications are weighted by the number of employed natives in the region at the baseline year. Standard errors in parenthesis. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively.
Source: OECD calculations based on MADIP (accessed July 2023).

Validity test 3: Trends in labour market outcomes are not associated with current predicted migrant flows

Another potential concern is the presence of pre-existing trends in regional labour market outcomes. The effect of migration on wages and employment could be driven by regions experiencing higher growth in wages or employment even before the arrival of migrants. In consequence, if the instrument is correlated with these pre-existing levels, then the exogeneity condition is violated. To test whether the instrument is related to the previous trend, the following reduced-form regression is estimated:

$$\Delta Emp_{g,j,t-1}^{native} = \beta_g \Delta \widehat{foreign}_{j,t} + \alpha_t + \epsilon_j \quad (13)$$

$$\Delta \ln w_{g,j,t-1}^{native} = \beta_g \Delta \widehat{foreign}_{j,t} + \alpha_t + \epsilon_j \quad (14)$$

Where the explanatory variable is the predicted change migration, $\Delta \widehat{foreign}_{j,t}$, which is the instrumental variable, and the outcomes are measured from 2001 to 2006.

The instrument is not correlated with trends in regional labour market outcomes. The following table shows that the instrument is not associated with changes in wages or employment. None of the coefficients is significant, indicating that the instrument is not associated with trends in the outcomes.

Table A.6 Reduced form impact on lagged wages and employment changes

	Past Wages	Past Employment
	(1)	(2)
Δ Predicted Migrants	-0.012	-0.006
	(0.051)	(0.095)

Note: The table presents results based on estimating Equation 3 using as outcomes either wage changes (Column 1) or employment changes (Column 2), from 2001 to 2006. The main independent variable is the predicted change in migration from 2011 to 2016, divided by the predicted population in 2011, which represents the instrument for 5-year differences. All specifications are weighted by the number of employed natives in the region at the baseline year. Standard errors in parenthesis. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively.
Source: OECD calculations based on MADIP (accessed July 2023).

Annex D. Alternative instrumental variables

Alternative instruments are constructed by amending different aspects of the shift-share approach. A detailed explanation of the shift-share instrument is presented in Section 4. The following table shows the preferred specification and the alternative instruments.

Table A.7 Alternative instruments

Variable name	Formula	Definition
IV 1981 (ABOPQ) Baseline	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{1981}}{\sum Migrants_{n,j}^{1981}} * Migrants_n^t$ $\widehat{Natives}_{j,t} = \frac{Natives_j^{1981}}{\sum Natives_j^{1981}} * Natives_j^t$	In the preferred specification, 1981 serves as the baseline year. $Migrants_n^t$ and $Natiness_n^t$ refer to employed tax-paying workers (15-64 years), excluding workers in sectors A, B, O, P, and Q.
IV 1986 (ABOPQ)	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{1986}}{\sum Migrants_{n,j}^{1986}} * Migrants_n^t$ $\widehat{Natives}_{j,t} = \frac{Natives_j^{1986}}{\sum Natives_j^{1986}} * Natives_j^t$	1986 serves as the baseline year. $Migrants_n^t$ and $Natiness_n^t$ refer to employed tax-paying workers (15-64 years), excluding workers in sectors A, B, O, P, and Q.
IV 1991 (ABOPQ)	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{1991}}{\sum Migrants_{n,j}^{1991}} * Migrants_n^t$ $\widehat{Natives}_{j,t} = \frac{Natives_j^{1991}}{\sum Natives_j^{1991}} * Natives_j^t$	1991 serves as the baseline year. $Migrants_n^t$ and $Natiness_n^t$ refer to employed tax-paying workers (15-64 years), excluding workers in sectors A, B, O, P, and Q.
IV 2001 (ABOPQ)	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{2001}}{\sum Migrants_{n,j}^{2001}} * Migrants_n^t$ $\widehat{Natives}_{j,t} = \frac{Natives_j^{2001}}{\sum Natives_j^{2001}} * Natives_j^t$	2001 serves as the baseline year. $Migrants_n^t$ and $Natiness_n^t$ refer to employed tax-paying workers (15-64 years), excluding workers in sectors A, B, O, P, and Q.
IV 1981 WAP	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{1981}}{\sum Migrants_{n,j}^{1981}} * Migrants_n^t$ $\widehat{Natives}_{j,t} = \frac{Natives_j^{1981}}{\sum Natives_j^{1981}} * Natives_j^t$	1981 serves as the baseline year. $Migrants_n^t$ and $Natiness_n^t$ refers to the working-age population (15-64 years)
IV 1981 OPQ	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{1981}}{\sum Migrants_{n,j}^{1981}} * Migrants_n^t$	1981 serves as the baseline year. $Migrants_n^t$ and $Natiness_n^t$ refer to employed tax-paying workers (15-64 years), excluding workers in sectors the public sector (O, P, and Q).

	$\widehat{Natives}_{j,t} = \frac{Natives_j^{1981}}{\sum Natives_j^{1981}} * Natives_j^t$	
IV 1981 sample	$\widehat{Migrants}_j^t = \sum_n^N \frac{Migrants_{n,j}^{1981}}{\sum Migrants_{n,j}^{1981}} * Migrants_n^t$ $\widehat{Natives}_{j,t} = \frac{Natives_j^{1981}}{\sum Natives_j^{1981}} * Natives_j^t Natives_j^t$	1981 serves as the baseline year. $Migrants_n^t$ and $Nativess_n^t$ refer to employed tax-paying workers (15-64 years).

Annex E. First stage regression results

Table A.8 First stage regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IV 1981 (ABOPQ)	1.01151***						
	(0.058)						
IV 1986 (ABOPQ)		0.99798***					
		(0.064)					
IV 1991 (ABOPQ)			0.93743***				
			(0.064)				
IV 2001 (ABOPQ)				0.89504***			
				(0.074)			
IV 1981 OPQ					1.03702***		
					(0.061)		
IV 1981 WAP						1.13856***	
						(0.08)	
IV 1981 sample							1.09375***
							(0.065)
Constant	-0.00043	0	0.00058	0.00192*	-0.00046	0.00202*	-0.00115
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	616	616	616	616	616	616	616
R^2	0.781	0.791	0.799	0.778	0.781	0.673	0.78

Note: The table presents the first stage of the 2SLS estimates following Section 4. The inflow of migrants over the total employed population is the dependent variable. Each column presents another IV specification, which is detailed in Annex D. All the specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Annex F. Alternative instruments

Table A.9 Five-year changes using alternative instrumental variables

Estimated impact of migration on five-year native wage and employment growth using different instrumental variables at the regional level, 2011-2018

	Baseline	1986	1991	1981 WAP	1981 OPQ	1981 Employed
	(1)	(2)	(3)	(5)	(6)	(7)
Panel A: Wages						
ΔMigrants	0.04610	0.10766	0.14496	0.04717	0.02599	0.04921
	(0.115)	(0.107)	(0.097)	(0.115)	(0.122)	(0.115)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	88	88	88	88	88	88
R^2						
F-stat	224.378	191.401	173.656	218.221	209.546	210.583
Panel B: Employment						
ΔMigrants	0.56906***	0.52549***	0.51929***	0.56969***	0.57579***	0.57116***
	(0.116)	(0.114)	(0.113)	(0.116)	(0.117)	(0.116)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	88	88	88	88	88	88
R^2	0.277	0.276	0.275	0.277	0.277	0.277
F-stat	224.378	191.401	173.656	218.221	209.546	210.583

Note: The table presents 2SLS estimates based on Equation 1. In Panel A, the dependent variable is the five-year changes in the logarithm of native wages. In Panel B, the dependent variable is the five-year percentage changes in the number of employed natives. The independent variable is the five-year percentage inflow of employed migrants. Different definitions of the percentage inflow of migrants are used. Column 1 presents the preferred instrumental variables using the baseline year 1981. Columns 2 and 3 use the baseline years 1986 and 1991, respectively. In Columns 4-6, different native populations in the years of analysis are used. Column 4 uses the whole working-age population regardless of employment status. Column 5 relies on employed natives except for those working in the public sector. Column 6 relies on all employed workers. The different definitions are explained in Annex D. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 individual observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Table A.10 Triannual changes using alternative instrumental variables

Estimated impact of migration on triannual native wage and employment growth using different instrumental variables at the regional level, 2011-2018

	Baseline	1986	1991	1981 WAP	1981 OPQ	1981 Employed
	(1)	(2)	(3)	(5)	(6)	(7)
Panel A: Wages						
ΔMigrants	-0.00655	0.04831	0.08863	-0.00556	-0.01799	-0.00491
	(0.096)	(0.090)	(0.084)	(0.096)	(0.112)	(0.095)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	176	176	176	176	176	176
R^2	0.047	0.055	0.055	0.047	0.044	0.047
F-stat	197.824	162.797	145.976	192.939	189.759	186.004
Panel B: Employment						
ΔMigrants	0.52871***	0.48979***	0.48318***	0.52910***	0.51397***	0.53223***
	(0.100)	(0.101)	(0.101)	(0.100)	(0.108)	(0.100)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes	Yes	Yes
N	176	176	176	176	176	176
R^2	0.369	0.364	0.363	0.369	0.367	0.369
F-stat	197.824	162.797	145.976	192.939	189.759	186.004

Note: The table presents 2SLS estimates based on Equation 1. In Panel A, the dependent variable is the triannual changes in the logarithm of native wages. In Panel B, the dependent variable is the triannual percentage changes in the number of employed natives. The independent variable is the triannual percentage inflow of employed migrants. Different definitions of the percentage inflow of migrants are used. Column 1 presents the preferred instrumental variables using the baseline year 1981. Columns 2 and 3 use the baseline years 1986 and 1991, respectively. In Columns 4-6, different native populations in the years of analysis are used. Column 4 uses the whole working-age population regardless of employment status. Column 5 relies on employed natives except for those working in the public sector. Column 6 relies on all employed workers. The different definitions are explained in Annex D. All specifications are weighted by the number of employed natives in the region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Annex G. Alternative weights

Table A.11 Employment effects

Estimated impact of migration on triannual native wage and employment growth using alternative weights at the regional level, 2011-2018

	1 year			3 years			5 years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Wages									
ΔMigrants	0.00915	0.02082	-0.04727	-0.00655	0.01074	-0.04930	0.04610	0.06510	0.06510
	(0.081)	(0.087)	(0.072)	(0.096)	(0.102)	(0.091)	(0.115)	(0.123)	(0.123)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Native	Total	No	Native	Total	No	Native	Total	No
N	616	616	616	176	176	176	88	88	88
R^2	0.572	0.549	0.582	0.047	0.059	0.012	0.001	0.003	0.003
F-stat	299.341	230.342	302.603	197.824	153.087	216.319	224.378	173.293	173.293
Panel B: Employment									
ΔMigrants	0.53270***	0.52048***	0.60509***	0.52871***	0.50980***	0.61140***	0.56906***	0.54991***	0.65423***
	(0.080)	(0.086)	(0.074)	(0.100)	(0.105)	(0.094)	(0.116)	(0.122)	(0.114)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pop. weights	Native	Total	No	Native	Total	No	Native	Total	No
N	616	616	616	176	176	176	88	88	88
R^2	0.903	0.906	0.889	0.369	0.371	0.418	0.277	0.244	0.334
F-stat	299.341	230.342	302.603	197.824	153.087	216.319	224.378	173.293	215.916

Note: The table presents 2SLS estimates based on Equation 1. In Panel A, the dependent variable is the changes in the logarithm of native wages. In Panel B, the dependent variable is the percentage changes in the number of employed natives. The independent variable is the percentage inflow of employed migrants. The table employs different weighting approaches and considers different time frames. Columns 1-3 consider annual changes, while Columns 4-6 and Columns 7-9 examine triannual and five-year changes. Columns 1, 4, and 7 use the baseline weighting based on the native regional population of employed workers. Columns 2, 5, and 8 use the total population as weights, whereas Columns 3, 6, and 9 use no weights. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Annex H. Margins of the employment effects – 2SLS and OLS estimates

Table A.12 The impact of migration on inflow and outflows in the labour market (OLS)

OLS estimated impact of migration inflows on native employment at the regional level disaggregated by substream, 2011-2018

	(1)	(2)	(3)	(4)
Panel A: Overall				
	Total	**Inflow**	**Outflow**	
ΔMigrants	0.62342***	0.89590***	0.27250***	
	(0.073)	(0.138)	(0.102)	
Time FE	Yes	Yes	Yes	
Pop. weights	Yes	Yes	Yes	
N	616	616	616	
R^2	0.904	0.741	0.338	
Panel B: Inflow				
	LM	**Area**	**Area + LM**	**NA**
ΔMigrants	0.09785**	0.28938***	0.02239**	0.48627***
	(0.049)	(0.081)	(0.010)	(0.086)
Time FE	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes
N	616	616	616	616
R^2	0.887	0.187	0.465	0.626
Panel C: Outflow				
	LM	**Area**	**Area + LM**	**NA**
ΔMigrants	0.04384	0.26607***	0.01501***	-0.05241***
	(0.036)	(0.068)	(0.005)	(0.012)
Time FE	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes
N	616	616	616	616
R^2	0.591	0.196	0.261	0.436

Note: The table presents 2SLS estimates based on equation 5. The independent variable is the percentage inflow of employed migrants. In Panel A, Column 1 presents the baseline analysis encompassing the annual percentage changes in the number of employed natives as dependent variable. Columns 2 and 3 separately consider the native inflow and outflow to the labour market relative to the native employed population, respectively. Panels B and C consider the different subflows as detailed in Box 3. All specifications are weighted by the number of employed natives in the considered region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.
Source: OECD calculations based on MADIP (accessed July 2023).

Table A.13 The regional impact of migration on the inflows and outflows of employed natives (2SLS)

2SLS estimated impact of migration inflows on native employment at the regional level disaggregated by subflow, 2011-2018

	(1)	(2)	(3)	(4)
Panel A: Overall				
	Total	**Inflow**	**Outflow**	
ΔMigrants	0.53270***	0.99708***	0.46437***	
	(0.080)	(0.187)	(0.142)	
Time FE	Yes	Yes	Yes	
Pop. weights	Yes	Yes	Yes	
N	616	616	616	
R^2	0.903	0.740	0.318	
F-stat	299.341	299.341	299.341	
Panel B: Inflow				
	LM	**Area**	**LM + Area**	**NA**
ΔMigrants	0.11138	0.40156***	0.02795**	0.45620***
	(0.074)	(0.121)	(0.014)	(0.096)
Time FE	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes
N	616	616	616	616
R^2	0.887	0.170	0.462	0.625
F-stat	299.341	299.341	299.341	299.341
Panel C: Outflow				
	LM	**Area**	**LM + Area**	**NA**
ΔMigrants	0.09244*	0.41316***	0.02665***	-0.06788***
	(0.051)	(0.090)	(0.007)	(0.015)
Time FE	Yes	Yes	Yes	Yes
Pop. weights	Yes	Yes	Yes	Yes
N	616	616	616	616
R^2	0.588	0.162	0.235	0.429
F-stat	299.341	299.341	299.341	299.341

Note: The table presents 2SLS estimates based on equation 5. The independent variable is the percentage inflow of employed migrants. In Panel A, Column 1 presents the baseline analysis encompassing the annual percentage changes in the number of employed natives as dependent variable. Columns 2 and 3 separately consider the native inflow and outflow to the labour market relative to the native employed population, respectively. Panels B and C consider the different subflows as detailed in Box 3. All specifications are weighted by the number of employed natives in the considered region. Time fixed-effects are applied to account for time-varying events that might affect the entire country or economy. Standard errors are clustered at the regional level in all specifications. The analysis is based on 25 845 298 observations. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. The analysis considers 88 regions, yielding 616 observations over seven years.

Source: OECD calculations based on MADIP (accessed July 2023).