

Do migrants displace native-born workers on the labour market?

The role of the latter's parental origin

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Abstract

This article is the first to examine how 1st-generation migrants affect the employment of workers born in the host country according to the latter's parental origin, i.e. distinguishing between natives and 2nd-generation migrants. We rely on Belgian linked panel data and study employment dynamics at the firm level. Our fixed effect estimates, including numerous covariates, do not support the hypothesis that 1st-generation migrants displace workers born in Belgium, regardless of their parents' origin. This is also true for our estimates accounting for endogeneity and considering different levels of analysis (i.e. the 'firm-occupation' and 'region-sector-firm size' levels). Sensitivity tests refine this conclusion. For workers having the same level of education, occupation or region of origin, results show complementarity (i.e. a significantly positive correlation) in employment dynamics. These workers therefore appear to be hired and dismissed jointly. For the others, employment segmentation (i.e. a non-significant relationship) tends to be more prevalent. The extent of complementarity is also found to depend crucially on the parental origin of workers born in Belgium. In line with segmented assimilation theory, we find that complementarity is more pronounced between 1st- and 2nd-generation migrants than between 1st-generation migrants and natives (especially when controlling for education and sector).

Keywords

Employment dynamics, worker' origin, linked panel data, Belgium.

JEL classifications

J15, J24, J62.

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1. Introduction

Over the past fifty years, the number of migrants worldwide has more than tripled, reaching approximately 281 million people in 2020, representing 3.6% of the world's population (International Organization for Migration, 2024). This increase has placed the impact of migrant workers on the labour markets of host countries at the centre of concerns for citizens, the media, political parties, and researchers alike. The central, hotly debated question is whether migrant workers substitute for or complement workers born in the host country (Constant, 2014; Edo, 2019; Özgüzel and Edo, 2023).

The academic literature offers no consensus on this relationship. Indeed, some studies conclude in favour of substitutability, where an increase in the number of migrants decreases the employment of native-born workers¹; others suggest complementarity, where both groups are hired and fired jointly; and still others find no significant relationship, which would indicate a segmented labour market. This lack of consensus can be attributed, at least in part, to the use of varied methodologies applied in different contexts, but also probably to the often fairly aggregated datasets used in existing studies (Dustmann et al., 2016; Özgüzel and Edo, 2023; Dustmann et al., 2025), i.e. which tend to focus on changes in labour supply at the country, sectoral and/or regional level in order to analyse the consequences of 1st-generation migrants on the labour market of receiving countries.

To our knowledge, two main studies have used more disaggregated data to explore the employment consequences at the firm level. Estimating a competing risks duration model for job spells of native-born workers, Malchow-Moller et al. (2009) distinguished between job-to-job and job-to-unemployment transitions and found no evidence of migrants actively displacing native-born workers in Denmark. Using Portuguese linked employer-employee data and several model specifications, Martins et al. (2018) further support the hypothesis of complementarity between the employment of migrants and native-born workers at the firm level. Interestingly, they also find that low-educated native-born workers are not negatively affected by the presence of migrants.

¹ By 'migrants' and 'native-born workers', we respectively refer to workers born abroad (also known as 1st-generation migrants) and workers born in the host country (i.e. natives and 2nd-generation migrants).

Another limitation of existing studies lies in the diversity of migration backgrounds among workers born in the host country. Indeed, this group includes, on the one hand, natives (i.e. workers whose parents were also born in the host country) and, on the other hand, 2nd-generation migrants (i.e. workers born in the host country with at least one parent born abroad). Empirical evidence shows that 2nd-generation migrants tend to resemble natives more than 1st-generation migrants (particularly in terms of education, language proficiency, professional network and legal status) (Edo, 2019). Accordingly, their employment rates and earnings often approach or even match those of natives, particularly when controlling for education and experience (Liebig and Widmaier, 2009; Devos et al., 2025). However, despite these similarities, notable differences persist in many advanced economies (OECD and EU, 2018; Pineda-Hernández et al., 2025a). In line with segmented assimilation theory, 2nd-generation migrants, particularly those from developing countries, are still often found to be less educated, over-represented in low-wage occupations and sectors, less likely to have a solid professional network and more discriminated against. Accordingly, it is very likely that the answer to the question: “Do 1st-generation migrants displace workers born in the host country?”, will differ significantly depending on whether one considers the perspective of natives or 2nd-generation migrants. However, to our knowledge, there is no empirical evidence to either confirm or refute this assumption of varying consequences among native-born workers.

Our paper therefore aims to fill this gap by examining how 1st-generation migrants affect the employment of workers born in the host country according to the latter’s parental origin, i.e. by distinguishing between the consequences for natives and 2nd-generation migrants. To do so, we rely on longitudinal linked employer-employee data for Belgium over almost two decades (between 1999 and 2016) and study employment dynamics following the methodology applied by Martins et al. (2018). More precisely, in our benchmark specification, we regress, at the firm-level with a fixed effect estimator (i.e. a mean-differentiated model accounting for firm unobserved time-invariant heterogeneity), the number of hours worked by the native-born (overall and according to their parents’ origin), on those of 1st-generations, while controlling for a wide range of worker, job and firm characteristics. Robustness tests are conducted to account for potential endogeneity and to examine whether a more aggregated or disaggregated level of analysis (i.e. when regressions are run respectively at the ‘region-sector-firm size’ and ‘firm-occupation’ levels) affects our conclusions. Moreover, many sensitivity tests are carried out to examine the moderating role of workers’ level of education, occupation and sector of activity,

as well as the region of origin of migrants (i.e. whether they originate from developed or developing countries).

From a theoretical perspective, different outcomes can be expected depending on the structure of the labour market (Özgüzel and Edo, 2023). The standard neoclassical model, which assumes perfect competition, predicts that an increase in the supply of migrant labour leads to a drop in equilibrium wages, prompting some native-born workers to leave their jobs, thereby creating a displacement effect. However, this model is probably not the most appropriate to understand the functioning of labour markets characterized by strong institutional rigidities.

Another branch of economic thought, postulating imperfect competition, offers more nuanced perspectives. First, from a Keynesian viewpoint where wages are downwardly rigid, an increase in the migrant labour supply can result in unemployment, accompanied either with a decrease in the employment of native-born workers if migrants find employment there (substitutability), or with a null impact on native-born employment if newcomers do not find a job. In the latter case, the ‘insider-outsider’ theory (Lindbeck and Snower, 1989) suggests that unions may protect *insiders* (who are predominantly native-born) by preventing the entry of *outsiders* (migrants), reducing substitutability. Second, the dual labour market theory posits that migrants are often confined to a precarious secondary market, while native-born workers operate in a protected primary market (Piore, 1979). If these two segments are disconnected, migration will have no effect on the employment of native-born workers; if they are complementary, it could even increase it. A third prediction stems from the increase in monopsony power that could result from the rising labour supply (Amior and Manning, 2020). In this case, firms could reduce wages at given productivity. If the new wage is lower than the reservation wage of some native-born workers, they could be replaced by migrants. However, the presence of unions often counterbalances this monopsony power by protecting workers’ wages and reducing the substitution effect. Furthermore, complementarity in the employment of migrants and native-born can be expected if the latter have different skills and specialise in specific tasks that complement each other in the production function (Manacorda et al., 2012). Imperfect competition theories therefore offer no clear answer to the question of whether migrants displace native-born workers. The predicted relationship could be positive, negative or null, depending on the assumptions made.

In addition, there are good reasons to assume that 1st-generation migrants will have a differing effect on the employment of natives and 2nd-generation migrants, especially if the latter encounter significant issues in integrating the labour market. Two theories are relevant in this regard. The classical assimilation theory posits that, since 2nd-generation migrants were born, educated and socialised in the host country, they should exhibit similar productive characteristics and labour market outcomes to those of natives (Card, 2005; Mattoo et al., 2008; Nielsen, 2011). If this were the case, one would expect 1st-generation migrants to influence their employment in the same way as that of natives. However, most empirical research supports the segmented assimilation theory (e.g. Portes and Rumbaut, 2001), which suggests that the descendants of immigrants continue to face barriers to integration, such as occupational and sectoral segregation and wage discrimination (Phalet and Heath, 2010; Blau et al., 2013; Blau, 2015). In Belgium, studies also show that 2nd-generation migrants outperform their parents in terms of qualifications and labour market outcomes, but that they do not completely catch up with natives (Pina et al., 2015; Piton and Rycx, 2021; Eurostat, 2024a, Pineda-Hernández et al., 2025a).

These differences, particularly in terms of human capital and job characteristics, suggest that the employment of 1st-generation migrants could have a different effect on that of natives and 2nd-generation migrants. Although some factors generating wage rigidity (e.g. automatic wage indexation²) apply to both groups, implying possible comparable impacts, other mechanisms could play out differently. For instance, unions may give greater priority to protecting the jobs of native *insiders* instead of those of 2nd-generation migrants. As a result, the effect of 1st-generation migrants could be more detrimental for 2nd-generation migrants than for natives. Secondly, firms' increased monopsony power (e.g. following an influx of 1st-generation migrants) could have a greater displacement effect on 2nd-generation migrants than on natives as the former are more likely to be employed in monopsonistic firms. Yet, if natives and 2nd-generation migrants are employed in the same monopsonistic firms, the additional labour supply from 1st-generation migrants could be more detrimental for natives' employment if the latter had higher reservation wages. Furthermore, arguments related to skill complementarity, task specialization, and market segmentation may be less relevant to explain the employment

² This is a system that automatically adjusts salaries in Belgium upwards when inflation (excluding items like alcohol, tobacco and fuel) either exceeds a predefined threshold or at regular intervals, depending on the category of workers

relationship among 2nd-generation migrants than among 1st-generation migrants and natives, as differences in human capital and job characteristics between the two groups are less marked. Overall, this could lead to reduced complementarity, a non-significant relationship, or even greater substitutability between the employment of 1st- and 2nd-generation migrants. However, it remains to be determined whether this is indeed the case.

From an empirical perspective, Belgium is a particularly interesting country to investigate whether migrants displace native-born workers. At the beginning of the 20th century, many foreigners entered the Belgian territory to meet the demand for low-skilled labour. From the 1970s onwards, migrants mainly arrived in Belgium on family reunification visas, and since the 1990s, two new types of migrants have gained importance: asylum seekers and undocumented workers (Piton and Rycx, 2021). In 2024, 1st- and 2nd-generation migrants accounted for respectively 23.3% and 12.5% of the population aged 20-64, which makes this country one of the most multicultural in the EU area (Eurostat, 2024b). Unfortunately, it is also one of the worst-performing OECD countries in terms of migrant employment. The employment rate in Belgium is much lower among 1st- and 2nd-generation migrants than among natives (64.5 and 65.6% versus 77.1% in 2024), and the opposite is true for the unemployment rate (9.6 and 8.6% versus 3.3% in 2024) (Eurostat, 2024c,d). Human capital differences are also significant. In 2021, among people aged 20-64, 30.6% of 1st-generation migrants, 18.5% of 2nd-generation migrants, and 13.3% of natives had no more than lower secondary education. As for the proportion of people with a tertiary qualification in the same age group, it was 46.3% among the natives, and 37% and 35.9% among 1st-generation and 2nd-generation migrants respectively (Eurostat, 2024a).

Meanwhile, Belgium has a highly regulated labour market, characterized by strong downward wage rigidity due to a relatively high minimum wage, automatic wage indexation, and fairly centralised collective bargaining, combined with a trade union density of 49% and a coverage rate of 96% (du Caju et al., 2007; OECD and AIAS, 2021; OECD, 2023a). Belgium is also considered to have relatively strict legislation on employment protection, particularly in the case of collective redundancies (OECD, 2023b). These institutional characteristics reinforce the relevance of imperfect competition theories for analysing the impact of migration in the Belgian context.

The remainder of this article is organized as follows. The next section presents our dataset and descriptive statistics. Section 3 describes our methodology and econometric results. Section 4 presents our sensitivity tests, while Section 5 concludes.

2. Data and descriptive statistics

In order to assess the relationship between the employment of 1st-generation migrants and that of native-born according to the latter's parental origin, we drew on two large datasets. The first is the Structure of Earnings Survey (SES), which provides information on a large representative sample of workers in Belgium over the period 1999-2016. The SES contains detailed information, provided by the HR departments of firms, on the characteristics of both firms (e.g. sector, level of collective bargaining, type of financial and economic control, region) and the people who work there (e.g. education, tenure, age, gender, working time, occupation, employment contract). The second dataset contains information on the country of birth of workers and of their parents. This information allows us to identify: i) workers born in Belgium whose parents were both born in Belgium (i.e. natives), ii) workers born in Belgium with at least one parent born abroad (i.e. 2nd-generation migrants), and iii) workers born abroad (i.e. 1st-generation migrants). This information, extracted from the Belgian Population Register (PR), has been merged with the SES by Statistics Belgium using the VAT numbers of firms. To address our research question, we aggregated the SES-PR data at the firm level in all our specifications (except, admittedly, when testing the sensitivity of our results to other levels of analysis, namely the 'firm-occupation' and 'region-sector-firm size' levels). This resulted in a panel of 61,779 firm-year observations, representative of all firms operating in Belgium, employing at least 10 workers and whose economic activities fall under sections B to N of the NACE Rev. 2 classification (i.e. the private sector).

[Insert Table 1 here]

Table 1 presents the means and standard deviations of selected variables in this firm-level dataset. Results in column (1) show that, on average within each firm, the number of hours worked per month by employees born in Belgium is equal to 2,699. Of these, 2,335 are worked by natives, and 364 by 2nd-generation migrants. For 1st-generation migrants, the average number

of hours stands at 398, and about half of these hours are worked by employees born in developed and developing countries respectively.

As far as our control variables are concerned, we find that on average around 73% of hours within firms are worked by employees with at most a degree from upper secondary education. About 34% of hours are worked by employees with more than 10 years of tenure and almost 60% by employees aged between 30 and 49. Women account for approximately 30% of working hours, and part-time workers for 13%. The share of blue collars stands at 47% and that of temporary contracts at less than 5%. Most hours are worked in the manufacturing, construction and wholesale sectors, as well as in firms located in Flanders.

In order to examine the differences between natives, 1st- and 2nd-generation migrant workers, their respective characteristics are presented in columns (2) to (4) of Table 1. These descriptive statistics (at the worker level) show that, on average, 1st-generation migrants are less educated, have less tenure, are older and more often employed in low-skilled jobs (e.g. elementary or craft and related trades occupations) and in low-paying industries (e.g. construction, accommodation or catering sectors) than 2nd-generation migrants, and even more so than natives. They thus back up the hypothesis of segmented assimilation.

3. Methodology and benchmark results

For comparison purposes (i.e. to be able to evaluate our results in light of those previously obtained in the literature), we first estimate the *ceteris paribus* influence of 1st-generation migrants' employment on that of all native-born workers. To do so, we rely on the following equation at the firm level:

$$(hours_{native-borns,j,t}) = \beta_0 + \beta_1 hours_{mig1,j,t} + \beta_2 X_{j,t} + \beta_3 Y_{j,t} + \delta_t + \varepsilon_{j,t} \quad (1)$$

where the dependent variable, $hours_{native-borns,j,t}$, refers to the number of hours worked by native-born workers in firm j at time t . Our main explanatory variable, $hours_{mig1,j,t}$, corresponds to the number of hours worked by 1st-generation migrants in firm j at time t . $X_{j,t}$ is a vector of control variables for worker characteristics (aggregated at the firm level), namely 2

variables for education (i.e. the respective shares of hours worked by employees: i) with at most a secondary education qualification, and ii) with a higher education qualification; employees with no degree, a primary or a lower secondary degree being the reference category), 3 variables for tenure (i.e. the respective shares of hours worked by employees with 2 to 4, 5 to 9, and at least 10 years of tenure; employees with at most 1 year of tenure being the reference category), 2 variables for age (i.e. the respective shares of hours worked by employees aged under 30 and employees over 49 years; employees aged between 30 and 49 being the reference category), a variable for the share of hours worked by female employees, 1 variable for working time (i.e. the share of hours worked by part-time employees; full-time employees being the reference category), 1 variable for the occupation (i.e. the share of hours worked by blue-collars; white-collars being the reference category), and 3 variables for the employment contract (i.e. the respective shares of hours worked by employees on fixed-term contracts, employees on apprenticeship contracts and employees on interim contracts; employees with an open-ended contract being the reference category). $Y_{j,t}$ is a vector of control variables for firm characteristics, i.e. 16 dummies for the sector of activity (i.e. dummies for mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage, waste management and remediation activities; construction; wholesale and retail trade; transportation and storage; accommodation and food service activities; information and communication; financial and insurance activities; real estate activities; professional, scientific, and technical activities; administrative and support service activities; education; human health and social work activities; and arts, entertainment and recreation; other service activities being the reference category), a dummy for the presence of a firm-level collective agreement (being covered solely by an industry-level collective agreement is the reference category), a dummy for the type of financial and economic control (i.e. a dummy for firms that are more than 50% privately-owned), and 2 dummies for the region in which the firm is located (i.e. dummies for being located in Brussels and Wallonia, respectively; being located in Flanders being the reference category). δ_t is a set of 17 year dummies, and $\varepsilon_{j,t}$ is the error term.

[Insert Table 2 here]

Equation (1) has been estimated with a fixed effect (FE) estimator (i.e. a mean-differentiated model). The FE estimate of parameter β_1 is reported in column (1) of Table 2. It is statistically significant and equal to 0.818. Its interpretation is as follows: if the number of hours worked by

1st-generation migrants increases by 1 unit in a given firm, on average, the number of hours worked by native-born employees in that same firm will also increase, but slightly less than proportionally, by 0.818 units. This result is consistent with that of previous studies conducted at the firm level, in particular those of Malchow-Moller et al. (2009) and Martins et al. (2018). It does not support the hypothesis of substitutability between the employment of these two groups of workers, but rather that of complementarity (i.e. that these workers are jointly hired and dismissed).

Next, we split our dependent variable, namely the number of hours worked by native-born workers, into two groups based on parental origin. More precisely, we estimate the impact of 1st-generation migrants respectively on i) the number of hours worked by natives, and ii) the number of hours worked by 2nd-generation migrants. We therefore relied on the following equations:

$$hours_{nat,j,t} = \beta_{0a} + \beta_{1a}hours_{mig1,j,t} + \beta_{2a}X_{j,t} + \beta_{3a}Y_{j,t} + \delta_t + \varepsilon_{j,t} \quad (2)$$

$$hours_{mig2,j,t} = \beta_{0b} + \beta_{1b}hours_{mig1,j,t} + \beta_{2b}X_{j,t} + \beta_{3b}Y_{j,t} + \delta_t + \varepsilon_{j,t} \quad (3)$$

where $hours_{nat,j,t}$ and $hours_{mig2,j,t}$ refer to the numbers of hours worked by natives and 2nd-generation migrants in firm j at time t , respectively. Our variable of interest remains $hours_{mig1,j,t}$, i.e. the number of hours worked by 1st-generation migrants in firm j at time t . $X_{j,t}$ and $Y_{j,t}$ are the vectors of covariates, as defined as in Equation (1). However, in Equation (2), $Y_{j,t}$ also contains the number of hours worked by 2nd-generation migrants, and in Equation (3) the number of hours worked by natives.

Our FE estimate of parameter β_{1a} in Equation (2) is shown in column (2) of Table 2. It is statistically significant and amounts to 0.181. This suggests that if hours worked by 1st-generation migrants increase by 1 unit within a given firm, on average, the number of hours worked by natives will increase by 0.181.

The FE estimate of parameter β_{1b} in Equation (3) is presented in column (3) of Table 2. It is also statistically significant and suggests that if hours worked by 1st-generation migrants

increase by 1 unit within a given firm, on average, the number of hours worked by 2nd-generation migrants will increase by 0.245. This result supports the assumption that 1st-generation migrants complement 2nd-generation migrants on the Belgian labour market, and that this complementarity is slightly higher than the one estimated between 1st-generation migrants and natives.³

4. Sensitivity tests

4.1 Level of education

The level of education among workers varies considerably depending on their origin. Descriptive statistics (see columns (2) to (4) in Table 1) show that natives are much more educated than 1st-generation migrants, and that a significant gap (albeit smaller) persists between 2nd-generation migrants and natives. Given that the educational level of 1st-generation migrants is closer to that of 2nd-generation migrants than to that of natives, one might expect greater complementarity between the former (insofar as they might be hired and fired more indistinctly than 1st-generation migrants and natives, whose jobs might be more segmented). However, it could also be argued that, as skill differences are more pronounced between 1st-generation migrants and natives⁴, these workers may in fact be more complementary in the production function (Lazear, 1999; Akerlof and Kranton, 2000). Along the same lines, one might expect complementarity in employment flows between workers of different origins to be reinforced when accounting for their level of education (due to greater similarity in their characteristics) or, conversely, weakened (due to less marked differences in their skill sets).

³ Even though Equations (1), (2) and (3) include a large number of covariates, we cannot exclude that our FE estimates may suffer from an endogeneity bias, as the relationship between the employment of 1st-generation migrants and that of native-born (according to the origin of their parents) may notably be subject to reverse causality. To address this potential issue, we adopt a fixed effects two-stage least squares (FE-2SLS) estimator, using as instrumental variables (IVs) the level of i) the lagged number of hours worked by 1st-generation migrants in the firm under consideration, and ii) the average number of hours worked by 1st-generation migrants in the same sector and region as the firm in question, excluding the firm itself. The rationale for using these instruments is inspired by previous studies (including Giuliano et al. (2013), Garnero (2015) and Kampelmann and Rycx (2016)). Because of space constraints, our results, including various diagnoses tests, are presented and discussed in Supplementary Appendix 1. The FE-2SLS results refine the conclusion of our benchmark FE estimates. Again, they do not support the hypothesis of substitutability between 1st-generation migrants and the native-born (regardless of their parent's origin), but rather that of complementarity or employment segmentation.

⁴ As reflected by differences in education, but perhaps also by other related skills, such as manual dexterity, stamina, problem-solving abilities and knowledge of languages.

To examine the validity of these hypotheses, Equations (2) and (3) have been re-estimated by differentiating workers according to their educational attainment, i.e. whether they had completed at most upper secondary education or attained a higher level.⁵

[Insert Table 3 here]

Columns (1) and (2) of Table 3 present the FE estimates of parameter β_{1a} . They show the effects of 1st-generation migrants' employment on that of natives by level of education. The only coefficient that proves statistically significant attests to the complementarity of employment between 1st-generation migrants and natives, when both have a tertiary education level. In contrast, the relationship turns out to be non-significant when they: i) both have at most upper secondary education, or ii) have different levels of education. In most cases, our results therefore suggest that employment dynamics of these two groups of workers are largely segmented.

Columns (3) and (4) of Table 3 present the FE estimates of β_{1b} , i.e. of the relationship between 1st- and 2nd-generation migrants' employment by level of education. Results are quite different from those just discussed for natives. Indeed, they are now statistically significant in all cases, suggesting employment complementarity between 1st- and 2nd generation migrants, regardless of their level of education. However, results also show that complementarity is stronger when both groups of workers have the same level of education, i.e. when they are highly or less educated.

4.2 Migrants' origin

The nexus between the employment of 1st-generation migrants and that of the native-born is also likely to vary depending on whether migrants originate from developed or developing countries. Evidence for advanced economies shows that 1st-generation migrants are generally much better off when they were born in a developed country. More precisely, they tend to be better educated, have less difficulty getting their qualifications recognised in the host country, face less occupational and sectoral segregation, experience less discrimination and, ultimately, earn significantly more than their 1st-generation counterparts born in developing countries. The same

⁵ As it is difficult to find instrumental variables that are both relevant and exogenous for each of our sensitivity tests, we will focus in the section on FE estimates. These should be interpreted as conditional correlations rather than causal effects. This is also the case for the estimates reported in Martins et al. (2018?), which is probably the study closest to ours.

is often true for 2nd-generation migrants (OECD and EU, 2018). Difficulties in integrating into the labour market therefore mainly affect 1st-generation migrants from developing countries and, to a lesser extent, their descendants (Devos et al., 2025). This is also the case in Belgium (Pineda-Hernández et al., 2025a,b), as also illustrated by our descriptive statistics regarding educational attainments (see Supplementary Appendix 2).

Given that labour market characteristics of natives are generally closer to those of 1st-generation migrants born in developed countries than to those born in developing countries, we might expect employment complementarity to be greater between the former (in that their hirings and dismissals are more positively correlated). However, arguments based on relevant differences in skill sets might suggest the opposite outcome. By the same token, the degree of complementarity could also vary depending on whether 1st- and 2nd-generation migrants originate from the same area or not.

To examine this issue, Equations (2) and (3) have been re-estimated by differentiating 1st- and 2nd-generation migrants according to their region of origin, i.e. whether they originate from a developed or a developing country.⁶

[Insert Table 4 here]

Column (1) of Table 4 presents the FE estimates of parameter β_{1a} , i.e. the relationship between the employment of 1st-generation migrants, depending on whether they were born in developed or developing countries, and that of natives. Results suggest that employment of 1st-generation migrants from developed countries is complementary to that of natives. In contrast, employment of 1st-generation migrants coming from developing countries appears to be non-significantly related to that of natives, pointing to job segmentation.

FE estimates of parameter β_{1b} , i.e. the effect of 1st-generation migrants by region of origin on the employment of 2nd-generation migrants (taken as a whole), are reported in column (2) of Table 4. They suggest that 1st-generation migrants born in both developed and developing countries are complementary (in fairly equivalent ways) to 2nd-generation migrant workers.

⁶ To determine the origin of 2nd-generation migrants, following common practice (FPS Employment, Labour and Social dialogue and Unia, 2019; Pineda-Hernández et al., 2025a, b), we relied on the father's country of birth. Put differently, the father's country of birth has been used to define the origin of a 2nd-generation migrant, unless the father was born in Belgium and the mother abroad. In this case, the mother's country of birth has been retained.

When dividing 2nd-generation migrants according to their region of origin, estimates (shown in columns (3) and (4) of Table 4) indicate substantial employment complementarity between 1st- and 2nd-generation of the same origin (both from developed or developing countries). However, for 1st- and 2nd-generation migrants of different origins, the regression coefficients are close to zero and not always statistically significant, which is more consistent with a segmented model.

4.3 Sector of activity

The sector of activity is also likely to play a significant role in the relationship between the employment of 1st-generation migrants and that of the native-born. In particular, one might expect the substitutability hypothesis to be more valid in sectors where 1st-generation migrants are overrepresented. In order to test if this is indeed the case, we re-estimated Equations (2) and (3) separately for four specific sectors where the number of hours worked by 1st-generation migrants is highest in our data set, namely (i) manufacturing, (ii) construction, (iii) accommodation and food services, and (iv) administrative and support services.

[Insert Tables 5.1 and 5.2 here]

Our FE estimates, by sectors, regarding the relationship between the employment of 1st-generation migrants and that of natives are presented in Table 5.1. The only sector where the regression coefficient is significant is manufacturing. Moreover, as it is positive, it suggests a complementary relationship rather than substitutability. In the other three sectors, the employment of 1st-generation migrants appears to be unrelated to that of natives, and therefore segmented.

Results for 1st- and 2nd-generation migrants are shown in Table 5.2. They differ substantially from those presented for natives as they are now statistically significant in all four sectors. Moreover, they back up the complementarity hypothesis, as regression coefficients are always positive.⁷

⁷ Two additional sensitivity tests have been performed. The first one, reported in Supplementary Appendix 3, refers to the level of analysis. The point is that while our analysis at the firm level provides key insights into the employment dynamics of 1st-generation migrants and the native-born, considering different levels of analysis is likely to yield complementary information. Indeed, different mechanisms may be at work and therefore produce different results when investigating these dynamics at more aggregated and disaggregated levels. Accordingly, we

5. Conclusion

A large body of research has examined the impact of 1st-generation migrants on the employment of native-born workers (Constant, 2014; Edo, 2019; Özgüzel and Edo, 2023). The findings are mixed, ranging from a negative, positive or null relationship between the employment of these workers. These divergent results could be explained in particular by the use of fairly aggregated data (with the notable exception of Malchow-Møller et al. (2009) and Martins et al. (2018)) and by the fact that, to our knowledge, the different origins of native-born workers have not yet been explicitly taken into account. However, numerous studies have shown that native-born people whose parents were also born in the host country (i.e. ‘natives’) and native-born people with at least one parent born abroad (i.e. ‘2nd-generation migrants’) generally do not have the same productive characteristics (notably assessed through their human capital) nor always the same employment opportunities (Liebig and Widmaier, 2009; OECD and EU, 2018), and that this is particularly the case in Belgium (Pina et al., 2015; FPS Employment, Labour and Social Dialogue and Unia, 2019; Piton and Rycx, 2021; Pineda-Hernández et al., 2025a,b). As a result, it is likely that the relationship between the employment of 1st-generation migrants and that of the native-born will depend significantly on the latter’s migration background, i.e. the country of birth of their parents.

In this paper, we therefore contribute to the existing literature by examining separately the effect of 1st-generation migrants on the employment of natives and 2nd-generation migrants. To do so, we rely on detailed matched employer-employee data covering Belgian firms over almost two decades (1999-2016). Our benchmark results, based on a fixed effect (i.e. mean-differentiated) estimator and controlling for many covariates, capture employment dynamics at the firm level. Interestingly, they do not support the hypothesis that 1st-generation migrants displace native-born workers, regardless of their parents’ origin (i.e. neither natives nor 2nd-generation immigrants). This is also true for our estimates accounting for potential endogeneity and considering more aggregated and disaggregated levels of analysis (i.e. when running

re-estimated Equations (2) to (3) respectively at the ‘region-sector-firm size’ and ‘firm-occupation’ levels. Our FE estimates corroborate the hypothesis of complementarity between the employment of 1st-generation migrants and that of both natives and 2nd-generation migrants. They also suggest that the increase in 1st-generation migrants’ employment leads to some re-allocation of work *between* firms (for both natives and 2nd-generation migrants) and *within* firms (only for natives). The second additional sensitivity test examines the moderating role of workers’ occupation (classified into 8 categories according to the ISCO nomenclature at the 1-digit level). The results, detailed in Supplementary Appendix 4, again support the hypothesis of employment complementarity between 1st-generation migrants and the native-born, whatever their parental origin, in each of these 8 occupations.

regressions respectively at the: i) ‘region-sector-firm size’, and ii) ‘firm-occupation’ levels). Further sensitivity tests, examining the moderating role of workers’ level of education, region of origin, occupation and sectoral affiliation, refine this conclusion. Indeed, for workers (i.e. 1st-generation migrants, on the one hand, and natives and 2nd-generation migrants respectively, on the other) having the same level of education, occupation or region of origin, results actually show substantial complementarity (i.e. a significantly positive correlation) in employment dynamics.⁸ This suggests that firms hire and dismiss these different categories of workers jointly in response to changes in market conditions. In contrast, for workers with different levels of education and regions of origin, results display weaker or non-significant relationships, which rather tends to indicate labour market segmentation. Finally, in sectors where migrants are overrepresented, results show complementarity between 1st- and 2nd-generation migrants. Conversely, no significant relationship is observed between 1st-generation migrants and natives (except in manufacturing), which suggests that employment segmentation is more pronounced among the latter.

Overall, our findings support the hypothesis of employment complementarity. However, they also show that the extent of complementarity depends crucially on the parental origin of workers born in the host country (alongside other covariates reflecting the proximity between workers, notably in terms of human capital and job profiles). Indeed, complementarity appears to be more pronounced between 1st- and 2nd-generation migrants than between 1st-generation migrants and natives. Put differently, in line with segmented assimilation theory, results (especially by level of education and sector of activity) suggest that the labour market for 1st-generation migrants is more segmented relative to natives than it is compared to second-generation immigrants.

Declarations and ethics statements

Due to legal restrictions, supporting data is not available.

No statement of interest.

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⁸ Except for low-educated 1st-generation migrants and natives, for whom the absence of a significant relationship suggests employment segmentation.

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Table 1: Firm- and worker-level descriptive statistics

<i>Variables:</i>	Firm level	Worker level		
		Natives	2 nd - generation migrants	1 st - generation migrants
Average monthly hours worked by workers:	(1)	(2)	(3)	(4)
Born in Belgium:	2,698.9 (3,305.3)	-	-	-
Natives	2,335.2 (2,967.4)	100	-	-
2 nd -generation migrants	363.8 (567.2)	-	100	-
From a developed country	270.3 (441.7)	-	73.3	-
From a developing country	93.5 (234.8)	-	26.7	-
1 st -generation migrants	398.1 (664.8)	-	-	100
Born in a developed country	197.8 (346.7)	-	-	48.5
Born in a developing country	200.3 (465.1)	-	-	51.5
Workers and job characteristics (%)				
No degree, primary/lower secondary	30.5	28.0	31.8	43.7
General upper secondary, technical/artistic/professional upper secondary	42.9	43.5	44.9	35.7
Higher non university, university and postgraduate	26.6	28.5	23.3	20.1
Up to 1 year of tenure	23.6	23.0	29.0	30.2
From 2 to 4 years of tenure	22.3	20.8	22.6	24.9
From 5 to 9 years of tenure	20.5	19.8	19.7	19.7
10 years or more of tenure	33.6	36.4	28.7	25.2
Younger than 30 years	22.2	24.8	31.6	16.2
Between 30 and 49 years	59.5	60.2	56.9	64.1
Older than 49 years	18.3	15.0	11.5	19.7
Women	30.4	32.9	31.1	32.2
Part-time work	12.9	18.1	21.9	25.3
Blue-collar work	47.3	42.6	45.6	57.8
Manager	4.1	3.8	2.8	3.6
Professional	11.2	12.3	9.7	9.6
Technicians and associate professionals	9.5	10.5	9.6	6.4
Clerical support workers	19	20.6	19.3	13.1
Services and sales workers	8.9	10.1	13.0	9.5
Craft and related trades workers	20.7	17.7	18.7	20.2
Plant and machine operators and assemblers	16.0	16.0	15.2	14.1
Elementary occupations	10.5	8.9	11.6	23.4
Open-term contract	95.6	93.5	90.3	90.9
Fixed-term contract	3.8	5.1	8.2	8.2
Apprenticeship contract	0.1	0.2	0.3	0.1
Interim contract	0.5	1.2	1.2	0.8

Firm characteristics

Mining and quarrying (NACE B)	0.4	0.4	0.4	0.3
Manufacturing (NACE C)	37.0	36.7	34.1	30.9
Electricity, gas, steam and air conditioning supply (NACE D)	0.6	1.6	1.3	0.4
Water supply, sewerage, waste management and remediation activities (NACE E)	1.3	1.4	1.2	1.3
Construction (NACE F)	9.7	7.6	7.2	9.0
Wholesale and retail trade (NACE G)	18.8	18.3	19.0	14.3
Transportation and storage (NACE H)	7	9.0	8.7	7.4
Accommodation and food service activities (NACE I)	3	1.9	3.1	5.6
Information and communication (NACE J)	4	4.7	4.5	3.5
Financial and insurance activities (NACE K)	1.5	1.4	1.7	1.3
Real estate activities (NACE L)	0.5	0.3	0.4	0.3
Professional, scientific, and technical activities (NACE M)	5.6	5.1	4.5	5.1
Administrative and support service activities (NACE N)	7.5	8.5	11.1	17.6
Education (NACE P)	0.3	0.3	0.6	0.3
Human health and social work activities (NACE Q)	1.8	2.1	1.6	1.5
Arts, entertainment, and recreation (NACE R)	0.3	0.2	0.3	0.2
Other service activities (NACE S)	0.6	0.5	0.6	0.7
Firm-level collective agreement	20.2	25.8	26.5	21.8
Private sector	97.2	93.9	94.4	96.7
Flanders	58.3	66.0	39.5	45.4
Wallonia	25.2	21.4	39.5	25.9
Brussels	16.5	12.6	21	28.7
Number of observations	61,779	950,902	152,489	170,186

Data source: SES-PR 1999–2016.

Table 2: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by the native-born, overall and according to their parents' origin

<i>Dependent variable:</i> hours worked by:	Native-born	Natives	2 nd -generation migrants
	(1)	(2)	(3)
1 st -generation migrants	0.818*** (0.103)	0.181** (0.071)	0.245*** (0.019)
(Within) Adjusted R ²	0.46	0.48	0.32
Number of observations	61,779	61,779	61,779
Sig. Model (<i>p</i> -value)	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables covering worker characteristics, firm characteristics and year dummies.

Table 3: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by natives and 2nd-generation migrants, according to their level of education

<i>Dependent variable:</i>		Natives		2 nd -generation migrants	
hours worked by		At most upper secondary degree (1)	Tertiary degree (2)	At most upper secondary degree (3)	Tertiary degree (4)
1 st -generation migrants	At most upper secondary degree	0.149 (0.127)	0.020 (0.015)	0.221*** (0.018)	0.011** (0.004)
	Tertiary degree	0.013 (0.050)	0.386*** (0.090)	0.038** (0.019)	0.202*** (0.034)
Within adjusted R ²		0.69	0.55	0.32	0.31
Number of observations		61,779	61,779	61,779	61,779
Sig. Model (<i>p</i> -value)		0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering worker characteristics, firm characteristics and year dummies.

Table 4: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by native and 2nd-generation migrant workers, according to their region of origin

<i>Dependent variable:</i>		Natives	2 nd -generation migrants		
hours worked by		All	All	Developed countries	Developing countries
		(1)	(2)	(3)	(4)
1 st -generation migrants	Developed countries	0.443*** (0.121)	0.294*** (0.040)	0.230*** (0.037)	0.040*** (0.013)
	Developing countries	0.075 (0.096)	0.215*** (0.018)	0.001 (0.012)	0.182*** (0.014)
Within adjusted R ² (within)		0.58	0.32	0.29	0.21
Number of observations		61,779	61,779	61,779	61,779
Sig. Model (<i>p</i> -value)		0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering worker characteristics, firm characteristics and year dummies.

Table 5.1: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by natives in specific sectors

<i>Dependent variable:</i> hours worked by <u>natives</u>	Manufacturing	Construction	Accommodation and food service activities	Administrative and support service activities
	(1)	(2)	(3)	(4)
1 st -generation migrants	0.157** (0.067)	0.055 (0.140)	-0.060 (0.047)	0.205 (0.144)
Within adjusted R ²	0.29	0.12	0.57	0.42
Number of observations	22,878	5,987	1,835	4,653
Sig. Model (<i>p</i> -value)	0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering worker characteristics, firm characteristics and year dummies.

Table 5.2: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by 2nd-generation migrants in specific sectors

<i>Dependent variable:</i> hours worked by <u>2nd generation migrants</u>	Manufacturing	Construction	Accommodation and food service activities	Administrative and support service activities
	(1)	(2)	(3)	(4)
1 st -generation migrants	0.323*** (0.054)	0.222*** (0.052)	0.158*** (0.018)	0.180*** (0.027)
Within adjusted R ²	0.18	0.14	0.35	0.40
Number of observations	22,878	5,987	1,835	4,653
Sig. Model (<i>p</i> -value)	0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering worker characteristics, firm characteristics and year dummies.

Supplementary Appendix 1: Sensitivity test accounting for potential endogeneity

Our benchmark specification, presented in Section 3 of the manuscript, is based on a fixed-effects estimator (i.e. a mean-differentiated model that accounts for firm unobserved time-invariant heterogeneity) and includes numerous covariates. Corresponding results therefore provide interesting insights into the relationship, at firm level, between the employment of 1st-generation migrants and that of the native-born, depending on the parental origin of the latter. However, they should be taken with caution as they may suffer from an endogeneity bias, e.g. because of reverse causality. To address this potential problem, we relied on a fixed effects two-stage least squares (FE-2SLS) estimator, using as instrumental variables (IVs) the level of i) the lagged number of hours worked by 1st-generation migrants in the firm under consideration, and ii) the average number of hours worked by 1st-generation migrants in firms operating in the same sector and region as the firm in question, excluding the firm itself.

The implicit assumption underlying the first instrument is that the firm-level number of hours worked by 1st-generation migrants at time $t-1$ is likely to be correlated with the numbers of hours worked by these workers at time t , but not with the number of hours worked by the native-born at time t . The rationale behind the second instrument, inspired in particular by Giuliano et al. (2013), Garnero (2015) and Kampelmann and Rycx (2016), is that firms in the same sector and region are generally subject to similar production constraints (due to the technology used and nature of the work), which in turn requires them to employ specific types of workers. Therefore, we expect the average number of hours worked by 1st-generation migrants in the same region and sector (excluding the firm concerned) to be correlated with the number of hours worked by 1st-generation migrants in the firm under consideration. At the same time, we do not anticipate this second instrument to be significantly related with the number of hours worked by the native-born (split according to the latter's parental origin) in that firm.

[Insert Supplementary Appendix 1 – Tables 1 and 2]

To assess the soundness of our instrumental approach, various statistical tests have been performed (see Supplementary Appendix 1 – Tables 1 and 2). Results are as follows: first-stage regression coefficients associated with our IVs are found to be significant, thus indicating that the latter are not weak (see Table 2). This is also suggested by the Kleibergen-Paap rk Wald F statistics (see Table 1), which are all above 10, i.e. the standard critical value (van Ours and

Stoeldraijer, 2011). The regression coefficients associated with our IVs also have the expected sign, i.e. they confirm that the number of hours worked by 1st-generation migrants within a firm is positively correlated with its lagged value, but also with the average number of hours worked by 1st-generation migrants in the same sector and region (excluding the firm concerned). Moreover, we can reject the null hypothesis that our first-stage equation is under-identified, as the p -values of Kleibergen-Paap rk LM statistics are highly significant. Concerning the quality of our instruments, we further find that the p -values associated with the χ^2 statistic of the Sargan overidentification test are all above 0.10, which suggests that our instruments are valid. Accordingly, our FE-2SLS estimates deserve to be discussed.

The latter, which account for the same covariates as in benchmark Equations (1) to (3), are presented in Table 1. They suggest (see column (1)) that following a 1-unit increase in the number of hours worked by 1st-generation migrants, on average, the hours worked by all native-born workers increase by 0.885 units. Moreover, the results (see columns (2) and (3)) show that the estimated coefficient for natives, although remaining positive, loses statistical significance, whereas the coefficient associated with 2nd-generation migrants remains both positive and statistically significant. All in all, these results refine our main conclusion derived from the benchmark FE specification. Indeed, once again, they do not support the hypothesis of substitutability between 1st-generation migrants and the native-born (regardless of their parent's origin), but rather that of complementarity or employment segmentation.

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Supplementary Appendix 1 – Table 1: FE-2SLS estimates of the impact of hours worked by 1st-generation migrants on hours worked by the native-born, overall and according to the latter's parental origin

<i>Dependent variable:</i> hours worked by	Native- born	Natives	2 nd - generation migrants
	(1)	(2)	(3)
1 st -generation migrants	0.855*** (0.288)	0.221 (0.245)	0.236*** (0.043)
Adjusted R ²	0.16	0.48	0.33
Number of observations	21,705	21,705	21,705
Sig. Model (<i>p</i> -value)	0.0	0.0	0.0
<u>Diagnoses tests for 2SLS:</u>			
Underidentification test:			
<i>p</i> -value Kleibergen-Paap rk			
LM statistic	0.0	0.0	0.0
Weak identification test:			
Kleibergen-Paap rk Wald F			
statistic	218.9	200.3	218.9
Overidentification test:			
<i>p</i> -value Sargan-Hansen's χ^2			
statistic	0.61	0.86	0.61

Data source: SES-PR 1999-2016. Bootstrap standard errors are in parentheses, which are estimated using 100 repetitions. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables for worker characteristics, firm characteristics and year dummies.

Supplementary Appendix 2 – Table 1: Complementary worker-level descriptive statistics – shares of workers by education and origin

	(In %)
Workers born in Belgium (i.e. the native-born)	
No degree, primary/lower secondary	28.5
General upper secondary, technical/artistic/professional upper secondary	43.7
Higher non university, university and postgraduate	27.8
<i>Natives</i>	
No degree, primary/lower secondary	28.0
General upper secondary, technical/artistic/professional upper secondary	43.5
Higher non university, university and postgraduate	28.5
<i>2nd-generation migrants</i>	
No degree, primary/lower secondary	31.8
General upper secondary, technical/artistic/professional upper secondary	44.9
Higher non university, university and postgraduate	23.3
<i>with at least 1 parent born in a developed country</i>	
No degree, primary/lower secondary	32.7
General upper secondary, technical/artistic/professional upper secondary	44.6
Higher non university, university and postgraduate	22.7
<i>with at least 1 parent born in a developing country</i>	
No degree, primary/lower secondary	29.2
General upper secondary, technical/artistic/professional upper secondary	45.8
Higher non university, university and postgraduate	25
1st-generation migrants	
No degree, primary/lower secondary	43.7
General upper secondary, technical/artistic/professional upper secondary	35.7
Higher non university, university and postgraduate	20.6
<i>Born in a developed country</i>	
No degree, primary/lower secondary	38.0
General upper secondary, technical/artistic/professional upper secondary	35.4
Higher non university, university and postgraduate	26.6
<i>Born in a developing country</i>	
No degree, primary/lower secondary	49.2
General upper secondary, technical/artistic/professional upper secondary	36.0
Higher non university, university and postgraduate	14.8

Data source: SES-PR 1999–2016.

Supplementary Appendix 3: Sensitivity test for the level of analysis

While our analysis at the firm level provides key insights into the employment dynamics of 1st-generation migrants and native-born workers, considering different levels of analysis is likely to yield complementary information. Indeed, different mechanisms may be at work and therefore produce different results when investigating these dynamics at more aggregated and disaggregated levels (i.e. at the ‘region-sector-firm size’ and ‘firm-occupation’ levels).

Comparing our estimates at the firm level with those at the ‘firm-occupation’ level could reveal different employment patterns *within* firms. If the same outcome (i.e. a positive, negative or non-significant relationship) is obtained at the firm and firm-occupation levels, this would suggest that employment dynamics (whether complementary, substitutable or segmented) at the firm level are consistent with (and result from) those at work within occupations in those firms. However, if different results emerge at the firm and firm-occupation levels, this may indicate some reallocation of labour across firm-occupations. For instance, if no significant relationship is found between the employment of 1st-generation migrants and natives at the firm level, but a negative one at the firm-occupation level, this would suggest that the substitutability within a particular firm-occupation goes hand in hand with an increase in native employment in another firm-occupation, resulting in a null relationship at the firm level. Similarly, if complementarity is observed at the firm level but a null relationship at the firm-occupation level, this would imply that the increase in the employment of 1st-generation migrants within a specific firm-occupation is not associated with a corresponding increase in native employment in the same occupation, but rather in other firm-occupations, resulting in a positive relationship at the firm level.

Comparing our estimates at the firm level with those at the ‘region-sector-firm size’ level may in turn reveal different employment patterns *between* firms. The intuition is very similar to the one just explained for the firm and firm-occupation levels: if a similar outcome is obtained at the two levels, it would suggest that employment dynamics at the region-sector-firm size level are consistent with (and result from) those at work within firms, while different outcomes would instead suggest that labour is re-allocated across firms.

[Insert Supplementary Appendix 3 – Table 1]

To examine whether our results vary according to the level of aggregation considered, we pooled our data at the following levels: i) region-sector-firm size, and ii) firm-occupation. This led to panel datasets of respectively: i) 2,208 region-sector-firm size-year observations and ii) 47,092 firm-occupation-year observations.⁹ Supplementary Appendix 3 – Table 1 presents the means and standard deviations of selected variables for the region-sector-firm size panel dataset in column (1), and for the firm-occupation panel dataset in column (2). Our benchmark Equations (2) and (3) have been re-estimated at these two levels with a FE estimator.¹⁰

[Insert Supplementary Appendix 3 – Table 2]

Our FE estimates of parameter β_{1a} in Equation (2), respectively at the ‘region-sector-firm size’, ‘firm’ and ‘firm-occupation’ levels, are reported in columns (1) to (3) of Supplementary Appendix 3 – Table 2. They are all statistically significant and amount to 0.343, 0.181 and 0.326. These suggest that following a 1-unit increase in the number of hours worked by 1st-generation migrants at the i) region-sector-firm size, ii) firm, and iii) firm-occupation levels, the number of hours worked by natives increases on average by 0.343, 0.181 and 0.326 units, respectively. These results support the hypothesis that the employment of 1st-generation migrants and that of natives are complementary, regardless of the level of analysis considered. They also indicate that the extent of complementarity is greater at the firm-occupation than at the firm level ($t=14.5$). In turn, this suggests that hiring a 1st-generation migrant for a specific occupation in a firm is associated with a reorganisation of the native workforce between firm-occupations, i.e. an increase in native employment in the same firm-occupation and, to a smaller extent, a decrease in native employment in another firm-occupation. Results also show that the complementarity between 1st-generation migrants and natives is greater at the region-sector-firm size level than at the firm level ($t=3.7$). This suggests that hiring 1st-generation migrants within a firm is accompanied by the hiring of natives within the same firm, but also in one or more other firms located in the same region, the same sector and of similar size.

⁹ Regions, sectors and occupations are defined at the one-digit level of the NUTS, NACE and ISCO nomenclatures (resulting in 3, 17 and 8 different categories respectively). For firm size, we considered the following 3 categories: less than 50, between 50 and 99, and more than 99 workers.

¹⁰ As it is difficult to find instruments that are both relevant and exogenous for each of level of analysis, we only present FE estimates in this section. Therefore, they should be interpreted as conditional correlations rather than causal effects.

As regards employment dynamics between 1st- and 2nd generation migrants (i.e. our FE estimates of parameter β_{1b} in Equation (3)) at the 3 levels of analysis, they are reported in columns (4) to (6) of Supplementary Appendix 3 – Table 2. The latter are all positive and statistically significant, supporting again complementarity regardless of the level of analysis. More precisely, they suggest that following a 1-unit increase in the number of hours worked by 1st-generation migrants at the i) region-sector-firm size, ii) firm, and iii) firm-occupation levels, the number of hours worked by 2nd-generation migrants increases on average by 0.329, 0.245 and 0.216 units, respectively. The estimated coefficients are similar at the firm and firm-occupation levels, suggesting no reallocation of 2nd-generation migrants between firm-occupations. The complementarity observed at the firm level therefore seems to result from that at work at the firm-occupation level. In contrast, the estimated coefficient appears to be greater at the region-sector-firm size level than at the firm level. This suggests that the hiring of 1st-generation migrants within a firm leads to the hiring of 2nd-generation migrants in the same firm, but also in one or more other firms of the same region, sector and size.

Supplementary Appendix 3 - Table 1: Descriptive statistics at the ‘region-sector-firm size’ and ‘firm-occupation’ levels

	Region-sector- firm size level	Firm- occupation level
<i>Variables:</i>	(1)	(2)
Average monthly hours worked by employees:		
Born in Belgium:	78,455.3 (171,148.9)	2,189.1 (2,516.8)
Natives	67,812.2 (155,408)	1,883.8 (2,274.1)
2 nd -generation migrants	10,643 (18980.2)	305.3 (452.7)
From a developed country	7,921.2 (15,232.9)	222.4 (348.1)
From a developing country	2,721.8 (4,555.6)	82.9 (208.7)
1 st -generation migrants	11,649.9 (19,430.8)	340.2 (591.8)
Born in a developed country	5,822.6 (9,931.5)	159.6 (303.7)
Born in a developing country	5,827.2 (10,381.5)	180.7 (434.8)
Workers and job characteristics (%)		
No degree, primary/lower secondary	27.7	35.5
General upper secondary, technical/artistic/professional upper secondary	40.5	43.8
Higher non university, university and postgraduate	31.8	20.7
Up to 1 year of tenure	23.7	23.9
From 2 to 4 years of tenure	21.6	21.8
From 5 to 9 years of tenure	20.0	19.9
10 years or more of tenure	35.7	34.4
Younger than 30 years	21.5	23.8
Between 30 and 49 years	58.6	59.0
Older than 49 years	19.9	17.2
Women	32.3	29.3
Part-time work	11.0	15.1
Blue-collar work	33.7	56.3
Open-term contract	94.3	94.0
Fixed-term contract	4.5	5.1
Apprenticeship contract	0.1	0.1
Interim contract	1.1	0.8
Firm characteristics		
Mining and quarrying (NACE B)	5	0.4
Manufacturing (NACE C)	7.3	36.5
Electricity, gas, steam and air conditioning supply (NACE D)	6.4	1.2
Water supply, sewerage, waste management and remediation activities (NACE E)	6.9	1.3
Construction (NACE F)	17.3	10.0
Wholesale and retail trade (NACE G)	7.3	15.4
Transportation and storage (NACE H)	7.3	8.7
Accommodation and food service activities (NACE I)	7.3	2.8
Information and communication (NACE J)	7.3	4.7

Financial and insurance activities (NACE K)	7.3	1.5
Real estate activities (NACE L)	5.5	0.3
Professional, scientific, and technical activities (NACE M)	7.3	5.3
Administrative and support service activities (NACE N)	7.3	9
Education (NACE P)	3.6	0.3
Human health and social work activities (NACE Q)	1.2	0.2
Arts, entertainment, and recreation (NACE R)	1.2	0.1
Other service activities (NACE S)	4	0.6
Firm-level collective agreement	21.2	24.6
Private sector	90.0	95.9
Flanders	34.4	60.5
Wallonia	34.1	23.9
Brussels	31.5	15.6
Number of observations	2,208	47,092

Data source: SES-PR 1999–2016

Supplementary Appendix 3 – Table 2: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by natives and 2nd-generation migrants at different levels of analysis

<i>Dependent variable:</i> hours worked by:	Natives			2 nd -generation migrants		
	Region- sector-firm size level	Firm level	Firm- occupation level	Region- sector-firm size level	Firm level	Firm- occupation level
	(1)	(2)	(3)	(4)	(5)	(6)
1 st -generation migrants	0.343* (0.197)	0.181** (0.071)	0.326*** (0.070)	0.329*** (0.061)	0.245*** (0.019)	0.216*** (0.018)
Within adjusted R ²	0.75	0.48	0.41	0.75	0.32	0.30
Number of observations	2,208	61,779	47,092	2,208	61,779	47,092
Sig Model (<i>p</i> -value)	0.0	0.0	0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering worker characteristics, firm characteristics and year dummies.

Supplementary Appendix 4: Sensitivity test for the occupation

In order to verify whether our benchmark results are sensitive to workers' occupations, we broke down the number of hours worked by our different categories of workers according to their occupation, using the ILO's International Standard Classification of Occupations (ISCO) (2012) at the 1-digit level. Our FE estimates, presented in columns (1) to (8) of Supplementary Appendix 4 – Tables 1 and 2, show the relationship between the employment of 1st-generation migrants and that of the native-born (according to their parents' origin) in the same occupation. All regression coefficients are found to be statistically significant and positive, suggesting that the complementarity hypothesis holds true within occupations, i.e. when 1st-generation migrants and the native-born (whether natives or 2nd-generation migrants) are employed in the same occupation.

Reference

International Labour Office, & International Labour Organization. (2012). *International Standard Classification of Occupations: ISCO-08*. Geneva, Switzerland: International Labour Office.

Supplementary Appendix 4 – Table 1: FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by natives according to their occupation

<i>Dependent variable:</i> hours worked by natives with the following occupation:	Manager	Professional	Technicians and associate professionals	Clerical support workers	Services and sales workers	Craft and related trades workers	Plant and machine operators and assemblers	Elementary occupations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 st -generation migrants with the same occupation	0.732*** (0.073)	0.859*** (0.114)	0.912*** (0.164)	0.856*** (0.129)	0.681*** (0.189)	0.393*** (0.114)	0.465*** (0.093)	0.233*** (0.071)
Within adjusted R ²	0.24	0.33	0.30	0.46	0.43	0.35	0.31	0.28
Number of observations	61,779	61,779	61,779	61,779	61,779	61,779	61,779	61,779
Sig. Model (<i>p</i> -value)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering the number of hours worked by native and migrant workers with different occupations than the one studied in each column, but also worker characteristics, firm characteristics and year dummies.

Supplementary Appendix 4 – Table 2. FE estimates of the impact of hours worked by 1st-generation migrants on hours worked by 2nd-generation migrants according to their occupation

<i>Dependent variable:</i> hours worked by <u>2nd- generation migrants</u> with the following occupation:	Manager	Professional	Technicians and associate professionals	Clerical support workers	Services and sales workers	Craft and related trades workers	Plant and machine operators and assemblers	Elementary occupations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 st -generation migrants with the same occupation	0.076*** (0.014)	0.181*** (0.034)	0.288*** (0.043)	0.305*** (0.026)	0.339*** (0.045)	0.258*** (0.024)	0.286*** (0.029)	0.115*** (0.015)
Within adjusted R ²	0.15	0.30	0.31	0.41	0.44	0.30	0.25	0.27
Number of observations	61,779	61,779	61,779	61,779	61,779	61,779	61,779	61,779
Sig. Model (<i>p</i> -value)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Data source: SES-PR 1999-2016. Robust standard errors in brackets. ***, **, * significant at 1, 5 and 10% levels, respectively. All specifications include control variables, covering the number of hours worked by native and migrant workers with different occupations than the one studied in each column, but also worker characteristics, firm characteristics and year dummies.