Short-stay High-skilled Migration and the Globalization of Firms

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Abstract

This paper shows that access to temporary high-skilled migrants shapes firms' employment and global sourcing decisions. Using a 2012 reform in the Netherlands that reduced the cost of hiring short-stay, high-skilled non-EU workers and matched employer–employee and trade data, we find that firms expand employment without displacing native or EU workers, increase offshoring to non-EU countries, and grow exports. Effects are strongest for small, skill-intensive firms typically facing high costs of sponsoring long-term migrants. Return migrants strengthen international linkages that facilitate offshoring. Temporary high-skilled migration thus operates as an input-market liberalization, reshaping firms' participation in global value chains.

JEL Codes: F22, F16, J61, F66, F68.

Keywords: Immigration, Offshoring, Globalization.

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1 Introduction

High-skilled workers are central to modern knowledge economies, and policies that shape firms' access to such workers are increasingly viewed as instruments of economic competitiveness. Much of the academic and policy debate treats high-skilled migration as a long-term phenomenon, abstracting from differences in migration duration (Görlach et al., 2022; OECD, 2008).[1] Many prominent programs—such as the EU Blue Card—are explicitly designed with long-term settlement in mind. Yet in practice, migration spells are often short. Around 15 percent of immigrants in OECD countries leave within a year, and more than half exit Europe within a decade (Görlach et al., 2022; OECD, 2008). Despite their prevalence, little is known about how temporary access to high-skill migrants affects firms' employment and global sourcing decisions.

Temporary high-skilled migration differs from permanent migration along two economically important dimensions. First, short-stay workers provide firms with flexible access to specialized skills without the fixed costs associated with long-term sponsorship. This flexibility could be particularly valuable for small firms, which often face binding constraints in recruiting permanent non-EU workers. Second, temporary migrants are more likely to return to their home countries or move across destinations, potentially generating international linkages that shape firms' sourcing and offshoring decisions (Moriconi et al., 2020; Olney and Pozzoli, 2019). As a result, temporary migration may affect not only firms' employment choices, but also their participation in global value chains.

This paper studies how access to temporary high-skilled migrants affects firms' employment, offshoring, and export behavior. We exploit a 2012 reform in the Netherlands that sharply reduced the cost of hiring short-stay, high-skilled non-EU workers by extending the existing Highly Skilled Migrants Scheme (Kennismigrant program) to contracts shorter than two months. The reform preserved existing skill and salary requirements but removed duration-based restrictions that previously made short-term hiring costly and slow. Using matched employer–employee data linked to firm-level trade records and migration histories, we trace how firms adjust along multiple margins in response to this policy-induced change in access to global talent.

Our empirical analysis is organized around three questions: How do firms adjust employment in response to lower costs of hiring temporary workers? How does expanded access to immigrant workers affect offshoring? And how do these changes in labor and offshore inputs reshape export participation?

First, we examine firm-level labor market responses. Using a difference-in-differences design that compares high-skill-intensive firms to low-skill-intensive firms before and after the reform, we show that firms respond to the reform by increasing employment of skilled non-EU workers without

[1] There is extensive work on temporary migration of unskilled workers. See Bossavie and Özden (2023) for a review.

displacing native or EU workers, leading to an overall expansion of firm-level employment. These effects are concentrated among small, skill-intensive firms, which typically face higher fixed costs of sponsoring long-term migrants and disproportionately benefit from flexible access to short-stay workers. Small high-skill-intensive firms hire 5% more non-EU workers than their low-skill counterparts following the policy. Many of these workers separate from firms within a year, consistent with firms' need for short-term project-based specialized labor. This finding aligns with reports of critical short-term skill shortages in the Dutch labor market, especially in ICT sectors (for e.g. software Developers, Data Analysts, Cybersecurity Experts, and Cloud Engineers, often needed on project basis).[2] Large firms, typically less budget constrained than the small firms, do not immediately hire temporary non-EU workers using this scheme. Employment at large firms also rises, but with a delay: we observe a 6.7% increase in workers transitioning from small to large firms several years after the reform. Wages rise across all worker types (non-EU, EU, and native), confirming that short-stay high-skill non-EU workers are complements rather than substitutes for EU and native workers. Conversations with immigration law firms reveal a common pattern: high-skill industries need workers for limited-duration projects. These workers complete short on-site assignments in the Netherlands before returning home or moving to other countries. Using a return migration survey, we document a 22% increase in the return migration of non-EU workers post-2012 from Dutch firms hiring high-skill-intensive workers, compared to their low-skill-intensive counterparts.

Second, building on evidence that immigrants facilitate offshoring through knowledge transfer (Lodefalk, 2016; Moriconi et al., 2020; Olney and Pozzoli, 2019; Parsons and Vézina, 2018; Steingress, 2018), we study how expanded access to high-skilled migrants affects firms' offshoring decisions. As we document, short-stay migrants are more likely to return to their home countries or move across destinations, potentially creating new international linkages. To isolate the effect of immigrant hiring on offshoring from confounding firm-level shocks, we instrument changes in immigrant employment using the policy-induced variation from the 2012 reform interacted with firms' pre-existing exposure to immigrant networks. We follow the widely-used method of using import data to construct offshoring measures (Hummels et al., 2014) based on whether firms import products from a non-EU country to which they also export at the HS4 level, where exports are proxy for the existence of the firm's domestic production capacity in that particular HS4. Firms with greater access to temporary high-skilled migrants become one and half times more likely to offshore inputs to migrants' home countries, with no corresponding increase in offshoring to EU destinations. The increased offshoring is concentrated in differentiated goods—particularly among small firms—consistent with the knowledge-transfer role of immigrant networks.

[2] See, for example, De Nederlandsche Bank (2024), International Monetary Fund (2024), ThinkEurope (2024), and Berkhout et al. (2015).

Third, we examine downstream effects on firm exports. The combination of expanded labor input and improved access to foreign intermediate inputs enables firms—especially smaller, skill-intensive firms—to enter export markets. The increase in exports is driven by new export relationships rather than expansion along existing ones, and is concentrated in differentiated goods. These export gains are not offset by reductions in domestic or EU sales, indicating an overall expansion in firm activity rather than reallocation across markets.

Taken together, these findings show that temporary high-skilled migration operates as a flexible input-market liberalization. By lowering the fixed costs of accessing specialized labor, short-stay migration policies relax constraints on small firms and reshape firms' participation in global value chains. More broadly, the results highlight that the duration structure of migration policy matters for how firms organize production and engage with international markets. The three parts of our paper relate to three separate but related literature.

First, we contribute to work on the labor-market effects of temporary migration in receiving countries, a topic that has received far less attention than permanent high-skilled migration (Dustmann and Görlach, 2016). Existing evidence on temporary migration programs largely focuses on low-skilled workers (Mobarak et al., 2021; Muñoz, 2023; Naidu et al., 2016).[3] We study a policy margin that is quantitatively important but understudied: the easing of duration-based restrictions for *high-skilled, short-stay* non-EU workers. Consistent with the idea that the effects of immigration depend on complementarity versus substitutability with native workers (Ottaviano and Peri, 2012; Peri and Sparber, 2009), we show that expanded access to temporary high-skilled migrants increases firm employment without displacing native or EU workers, with the strongest responses among small, skill-intensive firms that face high fixed costs of sponsoring long-term migrants.[4] This finding highlights the importance of distinguishing migration policies by duration requirements: short-stay workers provide firms with flexible access to specialized skills without the fixed costs of long-term sponsorship.

Second, this paper contributes to the literature on the role of immigrants in fostering trade using credible instruments (Burchardi et al., 2019; Cohen et al., 2017) or natural experiments (Ariu, 2022; Parsons and Vézina, 2018; Steingress, 2018), often using firm-level matched employer-employee data (Cardoso and Ramanarayanan, 2022; Erbahar and Gencosmanoglu, 2021).[5] Immigrants, especially skilled ones, reduce information costs, boosting trade (Bahar and Rapoport, 2018; Cardoso and Ramanarayanan, 2022; Peri and Requena-Silvente, 2010), particularly with countries with weaker institutions (Vézina, 2012). They also stabilize buyer-supplier relationships (Egger

[3]For comprehensive reviews, see Dustmann and Görlach (2016) and Bossavie and Özden (2023).

[4]Recent work emphasizes that the labor-market effects of immigration are highly heterogeneous and shaped by institutional context, skill composition, and the margins along which firms and workers adjust (Dustmann and Schönberg, 2025).

[5]Earlier studies addressed this question using more aggregated data (Felbermayr and Toubal, 2012; Gould, 1994; Head and Ries, 1998; Rauch, 1999; Rauch and Trindade, 2002).

et al., 2019) and improve the quality of inputs sourced from their origin countries (Ariu, 2022). While most studies focus on exports and imports, fewer examine immigration's impact on offshoring (Fan et al., 2022; Olney and Pozzoli, 2019; Ottaviano et al., 2018).[6] We focus on a unique policy that reduces the costs of hiring *short-stay, high-skilled* workers, who typically return to their home countries more quickly than permanent migrants. Using an instrumental variable approach, we isolate the policy's impact on firm offshoring and exports.[7] The reform is particularly informative because it expands access to highly mobile workers who frequently return home, providing evidence of how migrant networks shape firm sourcing decisions.

Third, we connect immigration policy to firm export performance through firms' access to inputs. Prior work shows that importing intermediate inputs is tightly linked to firms' export variety and quality (Bas and Strauss-Kahn, 2014; Feng et al., 2016; Kasahara and Lapham, 2013; Kasahara and Rodrigue, 2008). We complement this evidence by showing that an immigration policy that lowers the fixed cost of accessing temporary high-skilled labor can also expand firms' participation in export markets—particularly for differentiated goods—consistent with increased access to both skilled labor and foreign inputs through offshoring. Taken together, our results imply that the duration structure of high-skilled migration policy can reshape how firms organize production and participate in global value chains.

The paper is organized as follows. In section 2, we discuss the change in the Dutch high-skilled immigration policy in 2012. In section 3, we describe the various data sources we use to study the effect of this policy on firm-level hiring, offshoring, and exports. Section 4 describes our empirical strategy, including identification and results. This section is divided into three parts: First, we show how the high-skilled migrants policy affects firm-level employment across different firms and worker types. Second, we investigate how the expanded access to high-skilled workers affects firm-level offshoring. Finally, we examine how the resulting change in labor inputs—through firm-level employment and offshoring—affects firm exports. Section 5 discusses the robustness checks, including restricting the analysis to various sub-samples and the threats to identification from concurrent policy changes. Section 6 concludes.

2 Background

The institutional setting for migration to the Netherlands differs fundamentally between European Union member states (EU) and non-EU nationals. Every EU national has the right to settle in the

[6] Offshoring involves importing inputs that could have been produced domestically, making it distinct from pure imports or exports (Hummels et al., 2018).

[7] A closely related work Glennon (2020) finds that H-1B restrictions in the U.S. increased foreign affiliate employment. However, changes in affiliate employment do not capture arms-length transactions, typically captured by our offshoring measure(Grossman et al., 2006; Hummels et al., 2018).

Netherlands and seek employment in the Dutch labor market. Non-EU migrants need to apply for residence and work permits in the Netherlands. There are different schemes for different purposes of immigration. Most high-skilled migrants gain access to the Netherlands through the "Highly Skilled Migrants Scheme" (HSMS, Kennismigrantenregeling in Dutch), introduced in 2004, which guarantees quick processing and high acceptance rates for migrants whose wages are above a certain threshold (Berkhout et al., 2015).

However, high-skilled workers seeking short-stay employment on an initial contract lasting less than two months are not eligible to work using this scheme. A new scheme was started in January 2012 for high-skilled workers who want to come to the Netherlands to work for less than two months. According to European Migration Network (2013), in order to gain admission on the grounds of this pilot project, the following requirements were set: (1) the employer has been admitted to the Highly Skilled Migrants Scheme; (2) the salary must be at least proportionally equivalent to the salary as demanded for high-skilled migrants of 30 years and older; (3) it must be apparent that the job relates to one that can be deemed to be that of a highly qualified worker.

It should be noted that all these provisions existed even before 2012. The only change this policy introduced was to include short-stay workers in this scheme: workers who came to work in the Netherlands for less than two months. Generally, work permit applications are subject to a labor market test, which entails that the employer submits information to the Dutch immigration authorities about the company, the job contract, and the recruitment process to show the position could not be filled by an EU/EEA or Swiss national. The extension of the knowledge migrant scheme to short-stay workers relaxed these restrictions as long as they met the above salary and education requirements. This scheme made it easier for firms to employ high-skilled migrants from non-EU countries on a short-stay basis post-2012.

A flexible and fast short-stay feature of job contracts is important for the Dutch labor market to hire non-EU workers, as the use of workers with temporary contracts by firms is a typical feature of the Dutch labor market. Most industries have about 20% to 50% temporary contract holders among foreign workers and slightly less among native workers (10% to 40%).[8] Workers typically go through several fixed-term temporary contracts to achieve a permanent contract. Before 2012, the option of a less than 2 months contract was only possible for intra-corporate cross-border transfer, the total processing time of which was about 6 to 8 weeks. After the 2012 short-stay project was implemented, the total processing time of the intra-corporate transfer was shortened by about half, while a more substantial change was the possibility of hiring high-skilled non-EU workers from any company abroad. This change in policy allowed firms access to a flexible pool of high-skilled workers whom they could hire much faster than before the change and without any restriction on the contract duration. In conversations with the Ministry of Justice and Security and law firms

[8] In service-oriented sectors, the percentage of temporary contracts can be as high as 70%.

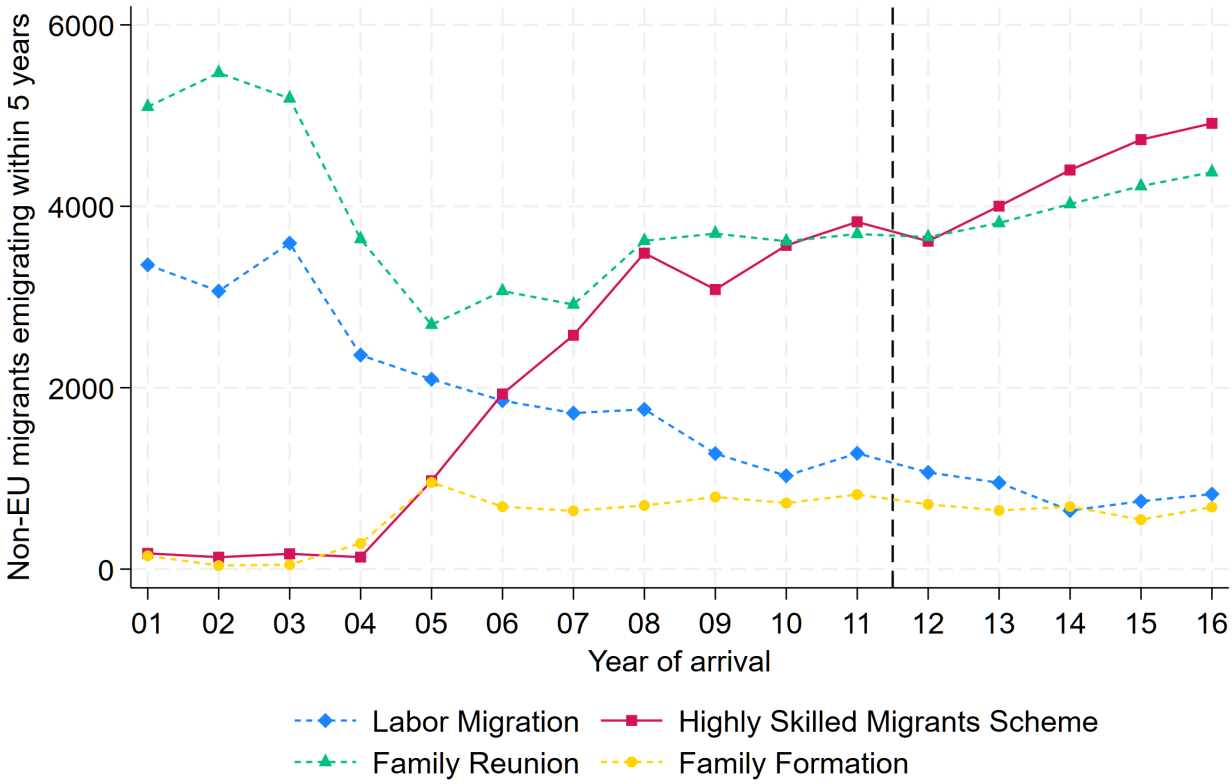
specialized in global recruitment, we found out that there was a long-standing need for such global workers in firms that recruit highly-skilled workers on a project basis. For example, an IT worker working on a specific project for a year may have to work in the Netherlands for 2 months and then move to a different country. The Dutch Highly Skilled Migrants scheme primarily targets workers in high-demand sectors requiring specialized skills, such as IT, engineering, research, specialized roles in manufacturing such as automation specialists, technical managers, equipment installation, and calibration experts. Recent work by Timm et al. (2025) shows that in fact 40% of all eligible migrants who qualify for the 30% tax break in the HSMS scheme work in business services. 90% of workers who come to the Netherlands under HSMS work in the following 6 sectors: (1) consultancy, research, business service; (2) education; (3) wholesale and retail trade; (4) manufacturing; (5) information and communication; (6) renting and business support service. After 2012, we find that short-stay HSMS workers still follow very similar sectoral distribution.

Importantly for our analysis of the link between immigration and offshoring, short-stay non-EU workers exhibit greater mobility than those migrating for longer-term contracts or family reasons. They are more likely to leave the Netherlands, either to undertake short-term assignments in other countries or to return home, potentially bringing new international networks to the Dutch firms they previously worked for. In this case, firms may develop better global connections that might lead them to change trade or offshoring activities. Figure 1 shows the overall mobility of different visa holders by plotting the total number of non-EU immigrants who leave the Netherlands within 5 years. As work and family reasons are two major motivations for migration and labor supply in the Netherlands, we distinguish four types of migration motivation: Highly skilled Migrants scheme, labor migration, family reunion, and family formation. Following the introduction of HSMS in 2004, migration under this scheme rose steadily until 2008, remained stable for several years, and then increased sharply from 2012 onward. This post-2012 rise is not evident in the labor migration or family formation categories. Family reunification exhibits a modest upward trend resembling that of HSMS, which is consistent with expectations: it is common for one high-skilled migrant to enter under HSMS and for their partner to subsequently join under a family reunion visa.[9]

According to the Ministry of Justice and Security and law firms specialized in global recruitment, the new scheme for short-stay high-skill workers started as a pilot project in 2012 and became regular in 2014. This paper uses this scheme to study how firms respond to changes in the relative cost of hiring high-skilled non-EU immigrants. This policy facilitating short-stay high-skilled workers relaxes the requirements for obtaining a high-skilled visa in the Netherlands, similar to the U.S. H-1B visa but with significantly shorter processing times and no per-person filing fee,

[9]Family reunification is the reunification of an existing family. So, for example, if a person is already in the Netherlands and his/ her family comes to the Netherlands, the migration motive of the family will be regarded as family reunification. Family formation is about the formation of a family. A person therefore specifically comes to the Netherlands to marry or enter into a partnership with someone in the Netherlands.

Figure 1: Temporariness by migration motives



Notes: The Y-axis shows the total number of immigrants in the Netherlands who emigrate within 5 years. We use this restriction (5 years) to eliminate non-EU workers who have settled in the Netherlands for a long time. This information is obtained from the migration motives dataset.

making it an attractive option for hiring short-stay talent. It resembles some prevalent temporary migration schemes worldwide which aim to hire workers abroad for a limited duration but mainly targeting low-skilled occupations. Prominent examples are Kafala system in UAE, EU job posting policy and guest worker programmes implemented in many countries (Mobarak et al., 2023; Muñoz, 2023; Naidu et al., 2016).

3 Data

Our datasets are mainly integrated from various sources provided by Statistics Netherlands for firms and workers.[10] We construct a panel dataset of 571,732 firm-year observations with firm

[10]An exhaustive list of data sources in Statistics Netherlands is shown in appendix table A1. Results are based on calculations by Erasmus University Rotterdam using non-public microdata from Statistics Netherlands. Under certain

characteristics from 1999 to 2016 in all sectors. This data is primarily used to study labor market outcomes. We also construct a panel dataset of 1,450,390 firm-year-country observations from 2010 to 2016 in the manufacturing sector. This dataset includes manufacturing firms' offshoring and export outcomes to all countries. This data is primarily used to study trade outcomes for manufacturing firms.[11] All firms have at least 10 employees. We provide detailed explanations on the definitions of all variables in the following subsections.

3.1 Firm-year level dataset

The firm-year dataset includes detailed information on annual firm attributes and workforce characteristics. We describe below the variables from this dataset we use to study the effects of the High-skilled migrants scheme on labor market outcomes. *Multi-establishment*: a dichotomous variable equal to 1 if the firm has multiple establishments. *Capital*: the total purchase value of the tangible fixed assets per worker. *Industry*: the Dutch standard industrial classification in 2008 ("Standaard Bedrijfsindeling" or SBI in Dutch) for industry categories is used. We create dummy variables for 84 categories of the 2-digit industry code. *Region*: we adopt the Nomenclature of Territorial Units for Statistics (NUTS) code for regions and create a dummy variable for each NUTS3 region in the Netherlands. *Big firm*: We define a firm as small if the employment size is below 50 and large otherwise in 2009, as per the official criterion used by the Dutch government.[12] By linking the personal identifiers to firms, we obtain aggregate characteristics of the workforce. *Male*: share of male workers among all workers. *Age*: the average age of all workers. *Bachelor*: share of native workers with a bachelor's degree among all native workers.[13] *Tenure*: average workers' tenure at a firm. *Work experience*: average years of work experience of all workers. *Productivity*: the log of average daily income per employee. *Sales*: value of sales tax return reported by firms. Most importantly, since we are interested in exploiting the response of high-skill firms in response to the expansion of the Highly Skilled Migrants Scheme in 2012, we need to define the skill intensity of each firm. Here we use the share of native workers with a bachelor's degree among all native workers in 2004 to define whether a firm is high-skill or not. 2004 is the starting year of the Highly Skilled Migrants Scheme. We pick this year to ensure that our high-skill definition should be least affected by any accumulating impacts from the scheme. More specifically, we use the top

conditions, this microdata is accessible for statistical and scientific research. For further information: microdata@cbs.nl.

[11] Standard customs datasets in most countries primarily capture manufacturing firms.

[12] This definition is largely based on the European Union Commission Recommendation for the definition of small firms and is important because it determines eligibility for various EU and national support programs aimed at businesses of different sizes. We set the baseline year to 2009 for this measure, about 1 year after the global financial crisis so that our results are least affected by the recession.

[13] The information on education level is only available for native workers because the majority of them completed bachelor's degrees at Dutch universities with records. However, for foreign workers, this information is not precise.

quarter (25%) as the threshold value, and we create a variable *HS firm*: equal to 1 if a firm is in the top quarter of skill intensity among all firms and 0 otherwise.

The firm-year dataset also includes many firm-level labor maket outcomes which have been aggregated from the matched employer-employee data. We define a person to be an immigrant if she is born in a foreign country. *Employment*: firm-level employment of workers for non-EU migrants, EU migrants, and natives respectively. *Share of workers*: firm-level share of workers among total employment for non-EU migrants, EU migrants, and natives respectively. *New hires*: total number of new hires at the firm throughout a year for non-EU migrants, EU migrants, and natives respectively. *Job separations*: total number of separated workers from the firm throughout a year for non-EU migrants, EU migrants, and natives respectively. *Average wage*: Average taxable wage of the firm for non-EU migrants, EU migrants, and natives respectively. *Job switch to bigger firms*: total number of job switches of separated workers to bigger firms in the next year for non-EU migrants, EU migrants, and natives respectively. *Returnees*: total number of new hires that leave the Netherlands and return to home country within 3 years for non-EU migrants and EU migrants respectively. *Emigrants*: total number of new hires that leave the Netherlands for *any* country within 3 years for non-EU migrants and EU migrants respectively.

3.2 Firm-year country dataset

The firm-year-country dataset in manufacturing sector includes annual offshoring and export outcomes of Dutch firms at the bilateral country level. *Offshore*: a dummy variable equal to 1 if the firm offshores to a country, i.e., if firms import the same HS4 category products from a non-EU country to which they also export.[14] *Offshoring value*: the total value of the offshored products if the firm offshores to a country. We create the same set of variables for differentiated goods and homogeneous goods respectively based on Rauch classification (Rauch, 1999). Following the same manner, we create variables related to export performances both at the extensive and intensive margin. *Export*: a dummy variable equal to 1 if the firm exports to a country. *Exporting value*: the total value of exports if a firm exports to a country. We create the same set of variables for high unit-value goods, low unit-value goods, differentiated goods and homogeneous goods respectively.

[14]The Harmonized System (HS) is an internationally standardized system of names and numbers to classify traded products. This code has a direct correspondence with the code of goods (Combined Nomenclature) in our data. The definition of offshoring comes from a well-established method as discussed in Hummels et al. (2014) and Bernard et al. (2020). The central idea is that exports are proxy for the existence of the firm's domestic production capacity in that particular HS4 category. This firm-level measure of offshoring is generally regarded as the "gold standard for accuracy" (Hummels et al., 2018).

3.3 Summary statistics

Appendix table A2 presents descriptive statistics of the firm-year dataset in all sectors between 1999 and 2016. There are 571,732 observations. Males make up 64% of the workforce, with an average age of about 38. About 23.5% of native workers hold a bachelor degree. 32% of firms are big firms with above 50 employees in 2009, and 21% of them are highly-skilled firms. The average employment size is about 112 employees. The average yearly wage per worker is 30,306 euros. Non-EU workers have the lowest yearly wage as well as the lowest wage inequality. Natives account for approximately 92.2%, while non-EU workers represent 5.6%, and EU workers make up 2.1% of a firm's yearly employment.

Appendix table A3 presents descriptive statistics of offshoring, export, and sales in the manufacturing sector. Offshoring and export data are extracted from the firm-destination-year dataset (2010–2016) with 1,452,239 observations in 43 non-EU countries (where immigrants make up at least 0.1% of the Dutch population). 2.58% of observations involve offshoring to a non-EU country, with an average annual value of 2 million euros per firm. 6.53% of observations involve exporting to a non-EU country, with an average annual export value of 1 million euros per firm. We also present these variables for subsets of differentiated and homogeneous goods. Finally, we show summary statistics for sales revenues from the firm-year dataset (2007–2016), with 30,802 observations. The average annual sales tax return per firm for all products is approximately 24 million euros.

4 Empirical strategy and results

In this section, we first analyze the effects of reductions in the costs of hiring skilled temporary migrants in the Netherlands on the Dutch labor market. Specifically, does the scheme affect the extent and duration of hiring of non-EU workers by firms in high-skill-intensive industries? We then consider the effects on native employment and wages, in view of the fact that the scheme only gives firms access to temporary high-skilled non-EU workers.

We then analyze how firm-level offshoring responds to changes in the cost of hiring immigrant workers. A-priori, it is unclear whether increasing access to a pool of high-skilled short-stay workers induces the firm to reduce offshoring and acquire more inputs domestically, or the global connections these highly mobile short-stay workers bring about lead firms to offshore more. Finally, since both offshoring and immigration change the effective pool of foreign workers a firm can access, we analyze the impact of the short-stay high-skilled migrants policy on firms-level exports. Access to more labor inputs can expand firm's production capacity and hence, exports.

4.1 Effect on the labor market

We first examine whether there was any change in the composition of workers hired by Dutch firms after the Highly Skilled Migrants Scheme. To quantify the differential trend in non-EU immigrant employment in high-skill relative to low-skill-intensive firms, we estimate the following:

$$Imm_{ijmt} = \beta_o + X'_{ijmt}\gamma_1 + W'_{ijmt}\gamma_2 + \gamma_i + \gamma_j + \gamma_m + \gamma_t + \sum_{t \neq 2011} \alpha_t * \gamma_{si} + \epsilon_{ijmt} \quad (1)$$

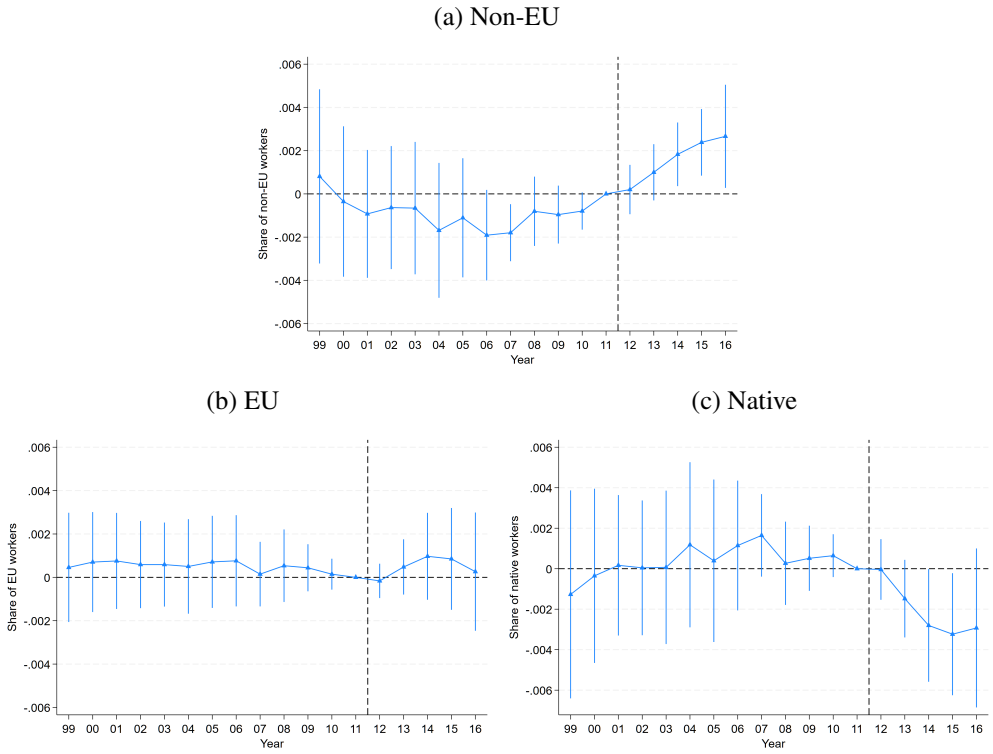
Imm_{ijmt} is the share of non-EU immigrant/ EU/ native employment out of total employment by firm i in industry j in region m in year t. The dummy variable γ_{si} indicates whether firm i is in the top quartile (25%) of skill intensity across all firms—those more likely to be affected by expanded access to high-skilled migrants. X_{ijmt} includes a set of firm characteristics that are available throughout 1999-2016, namely, *Average wage, Capital*, and *Employment*. The vector W_{ijmt} includes detailed workforce characteristics, including variables *Male, Age*, and *Bachelor*. We also include firm, industry, region, and time-fixed effects. Since the 2012 policy directly increased the ease of hiring non-EU high-skilled immigrants, we expect α_t to be positive and significant from 2012 only for non-EU immigrants. We cluster the standard errors at the industry level since the 2012 scheme targeted firms in high-skill industries. We show the event study graphs for the shares of non-EU employment in panel a, figure 2, and the shares of EU and native employment in panels b and c of figure 2. Figure 2 panel a) shows that between 1999 to 2011, there was no increasing trend in non-EU employment share in high-skill relative to low-skill firms. However, after the introduction of the high-skilled immigration scheme in January 2012, the share of non-EU immigrants in high-skill relative to low-skill firms started increasing every year.[15] The average annual increase in the share of non-EU immigrants was 4% more post-2012 in highly-skilled firms relative to low-skilled firms compared to their pre-period difference.[16]

The share of EU immigrant employment in high-skill relative to low-skill firms does not show any pattern before and after the 2012 policy change (panel b, figure 2). It shows an insignificant increase from 2012-2014 and a decrease from 2014 to 2016 (panel b, figure 2). Native employment share reduces after the 2012 policy change, consistent with the fact that the employment shares should add up to 1 (panel c, figure 2).

[15]There is a slight increase in non-EU immigrant share from 2010 to 2011, but the pairwise t-test confirms that the difference in magnitudes is statistically insignificant. The year 2009 is a year of structural break in the data because of the recovery from the financial crisis. Both the non-EU and EU immigrant unemployment rates increased greatly during the recession (Cerveny and Van Ours, 2013). After the recovery, both the shares of EU and non-EU immigrant employment rose, especially in high-skill industries primarily affected by the recession.

[16]This calculation is obtained by dividing the yearly coefficient by the average firm-level hiring of non-EU immigrants, 5.7%

Figure 2: Event study of firm shares of employment over time



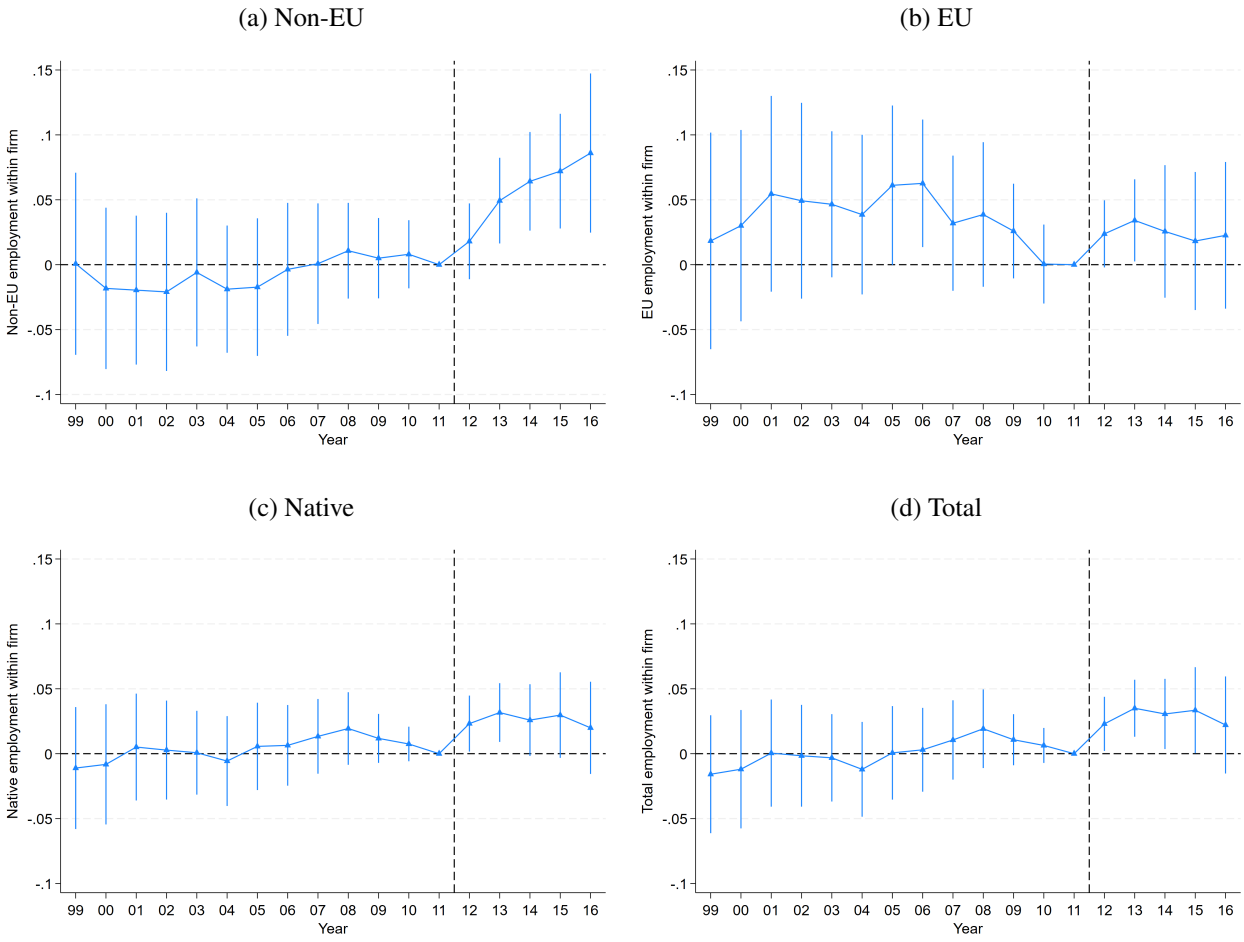
Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the share of employment of non-EU, EU, native workers within a firm.

However, the increase in the shares of non-EU immigrant hiring does not reveal anything about the patterns of changes in total employment, the rates of worker hiring and separations, and the type of firm that is hiring these workers. In 2009, the non-EU immigrant share was 6.6% for small firms and 10.1% for big firms on average. The fact that larger firms historically hire more immigrant workers has been documented using matched employer-employee data in the Netherlands (Berkhout et al., 2015) as well as in other countries such as Germany (Brinatti and Morales, 2021). EU immigrant share is quite similar for small and big firms, possibly because there are no additional costs of hiring EU immigrants over hiring native workers. It is, therefore, possible that the small firms were the primary beneficiaries of the short-stay high-skilled migrants scheme as it allowed them to hire high-skilled workers on a short-stay basis without incurring any substantial immigration-related hiring costs. If true, this policy would have significant distributional implications by helping ease the hiring constraints for smaller firms, which typically find it harder to bear the fixed costs of sponsoring non-EU immigrants (Orrenius et al., 2020). To test this, we run regression 1 by considering log total employment by EU, non-EU, and native workers by firm type (small and large firms) as the dependent variable.

From figure 3, we see that right after the 2012 policy change, non-EU employment started increasing in small firms, from a 5% increase in employment in 2013 to about an 8% increase in 2016 relative to the baseline year 2011 . We do not find any similar patterns for EU and native employment. There is also no evidence of any displacement of native or EU workers (panels b and c). As a result, we see that total employment expands at the firm-level (panel d). From figure 4, we do not find any evidence of changes in either non-EU, EU, or native employment for big firms. We do observe a slight increase in non-EU employment from 2014, but this increase is insignificant.

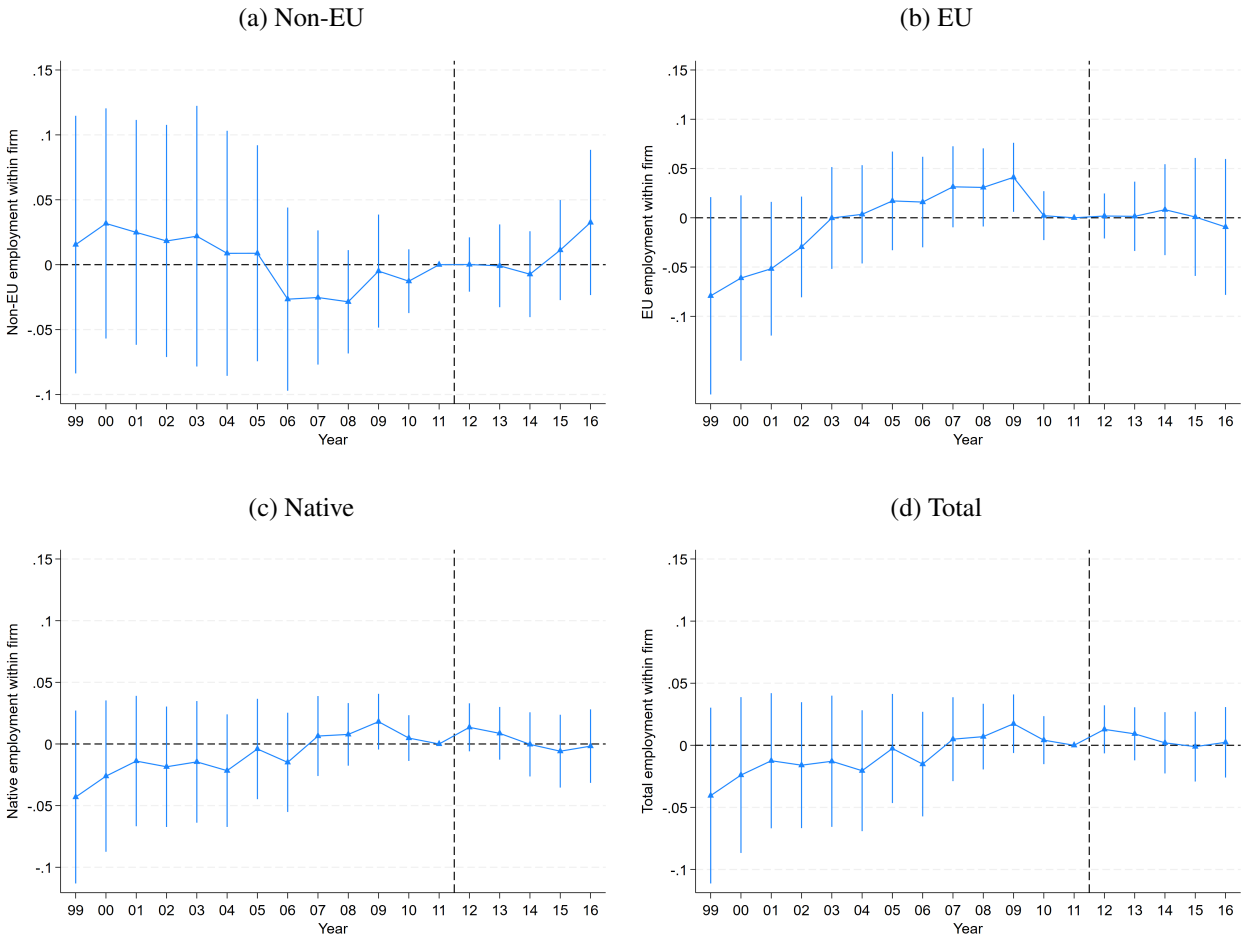
The rise in total non-EU employment at small firms does not tell us anything about the duration of employment. If this rise in non-EU employment is indeed driven by the short-stay migrants' scheme and small firms, typically budget-constrained in sponsoring long-term non-EU immigrants, take advantage of this scheme by hiring short-stay workers, we would expect to see both a rise in the number of new hires and separations from small firms. We, therefore, conduct event study regressions using equation 1, where we look at the number of new hires and the number of job separations. New hires are the total number of workers who started working in a firm in a year. Job separations are the total number of workers who leave a firm in a year. We aggregate this firm-level information from daily individual job data.

Figure 3: Event study of employment in small firms over-time



Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the log total employment of non-EU, EU, native, and all workers within a small firm. The variable *Employment* is excluded from the list of control variables.

Figure 4: Event study of employment in big firms over-time



Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the log total employment of non-EU, EU, native, and all workers within a big firm. The variable *Employment* is excluded from the list of control variables.

From figure 5, we can see that right when the policy was implemented in 2012, there was a discrete jump in the number of non-EU workers hired by small firms (panel A, sub-figure a), accompanied by a rise in the number of job separations for non-EU workers (panel A, sub-figure b). Appendix figure A1 shows that for EU (panel A) and native (panel B) workers we do not see any such change either in job separations or new hires.[17]. Panel B, sub-figure c in figure 5 shows that for big firms, we do not find any increase in the number of non-EU new hires right after the implementation of the policy in 2012. However, starting in 2015, a few years after the policy was implemented, we find a 10% increase in the number of new non-EU hires. Appendix figure A2

[17]We observe a small and mostly insignificant increase in native job separation rate, but from figure 3 we know that this increase is small enough, as the total native employment in small firms actually increases.

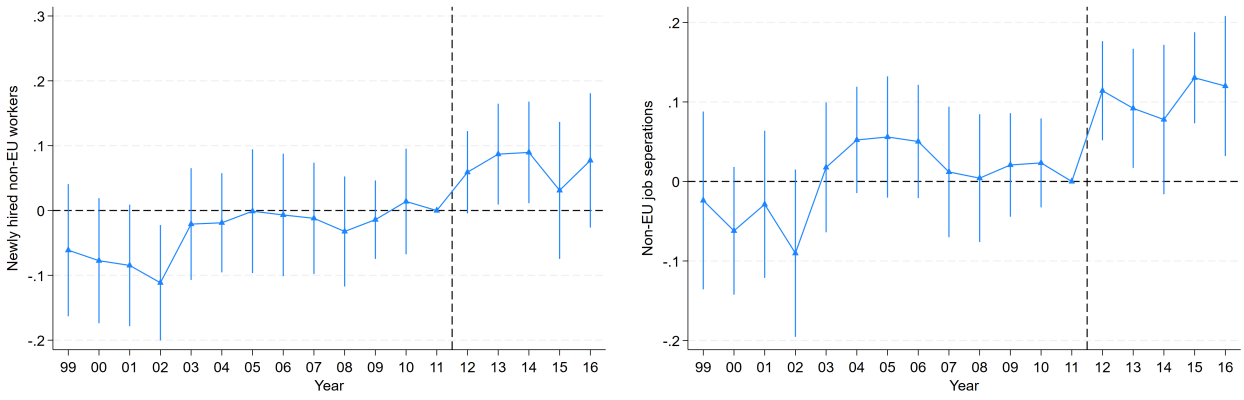
shows that the pattern of hiring of new EU and native workers is very volatile over the entire time period from 1999-2016, without showing any clear pattern of change in the post relative to the pre-policy period. Panel B, sub-figure d, figure 5 shows a very small and delayed increase in the job separation rate for non-EU workers in big firms. The finding that smaller, more constrained firms gain more from the reduction in immigrant hiring costs is similar in spirit to the result in Brinatti et al. (2023) which shows that the employment effects of winning the H1-B lottery in the US are much stronger for smaller compared to larger firms, as small firms might be more constrained in their ability to find alternate workers in the event of losing the lottery.

Figure 5: Event study of job dynamics of non-EU workers over-time

Panel A: Small firms

(a) New hires

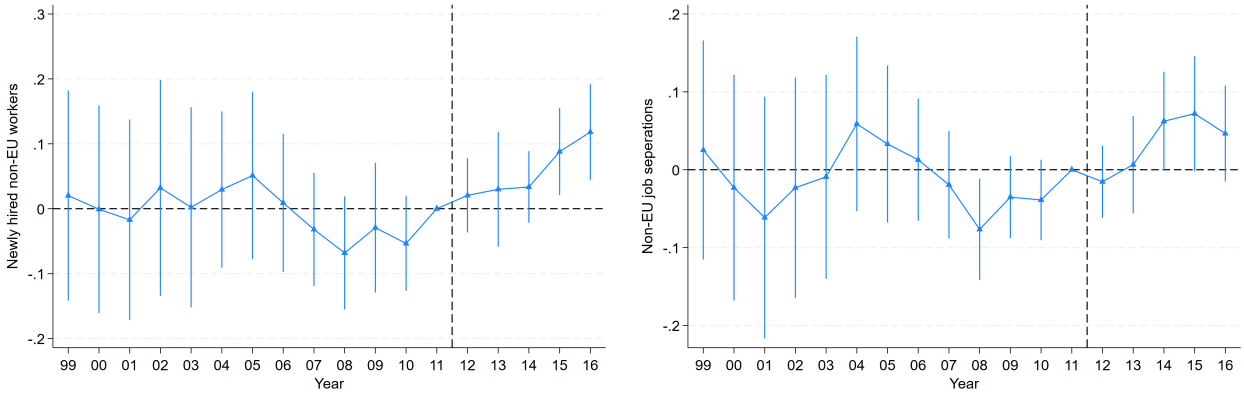
(b) Job separations



Panel B: Big firms

(c) New hires

(d) Job separations



Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the new hires/ job separations of non-EU workers.

In table 1 below, we show that the extensive margin outcomes all go in the same direction as

the intensive margin outcomes estimated above. We run regression 2 below:

$$D_{ijmt} = \beta_o + X'_{ijmt}\gamma_1 + W'_{ijmt}\gamma_2 + \gamma_i + \gamma_j + \gamma_m + \gamma_t + \alpha post_t * \gamma_{si} + \epsilon_{ijmt} \quad (2)$$

where the dependent variables are whether a firm i in industry j, region m, and year t newly hired any non-EU worker, whether a firm had any job separation of non-EU workers, and for those firms that did, whether any of the non-EU workers moved to big firms. The dummy γ_{si} indicates whether firm i is a high or a low-skill firm. The $post_t$ dummy takes the value 1 if $t \geq 2012$. X_{ijmt} includes a set of firm characteristics, namely, *Average wage, Capital, Employment*. The vector W_{ijmt} includes detailed workforce characteristics, including variables *Male, Age*, and *Bachelor*. We also include firm, industry, region, and time-fixed effects.

Table 1: Labor market outcomes on the extensive margin

	(1) New hires	(2) Job separations	(3) New hires	(4) Job separations	(5) Small to Big
HS*Post	0.0206***	0.0206***	0.00987	0.0226***	0.0127**
	(0.00640)	(0.00700)	(0.00791)	(0.00781)	(0.00553)
Observations	297,121	297,121	144,546	144,546	442,950
R-squared	0.405	0.394	0.445	0.442	0.459
Firm Size	small	small	big	big	NA
Industry/ Region/ Year Fixed Effects	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes	yes

Notes: The table reports the results of labor market in section 4.1 on the extensive margin as shown in equation 2. The dependent variables are whether a firm employed non-EU workers in columns (1) and (4), whether a firm hired non-EU workers in columns (2) and (4), whether a firm had a job separation of non-EU workers in columns (3) and (5), and whether there is at least 1 job separation of non-EU workers from small to big firms in column (7). In columns (1) to (6), the sample include firms in all sectors in the firm-year dataset 1999-2016. The omitted category is HS*Year 2011. In columns (7), the sample is further restricted to firms that have at least 1 job separation in a year and we additionally control for the total job separations from small to big firms in a year in W_{ijmt} to reflect the overall firm-level job losses. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

We find that small highly-skilled firms had a 2.06% higher probability of hiring a non-EU worker compared to their low-skilled counterparts in the post-period (column 1). Non-EU workers in these firms had a similar probability of separating after the high-skilled scheme. For big firms there is an insignificant increase in the probability of hiring new non-EU workers and a 2.26% increase in the probability of job separation. Given the delayed increase in non-EU employment in large firms from event study figure 5, panel B, and given that many workers start their careers at small firms and later move to bigger firms (Burdett and Mortensen, 1998; Haltiwanger et al., 2015; Kahn and McEntarfer, 2014; Moscarini and Postel-Vinay, 2012), we check whether the probability of these newly separated workers joining the large firms increased.[18] Column (5) suggests that

[18]In our data, for firms with at least 1 job separation in a year, the share of non-EU workers moving from small to large firms among all non-EU separated workers is 68%. The share of native workers moving to larger firms among all native separated workers is 72%.

there is a 1.2% increase in the probability of separated workers moving from small to big firms. In appendix table A5 where we estimate equation 2 using the number of workers separating from small to big firms, we show that this effect persists at the intensive margin. While there is no increase in the number of native or EU workers from small firms joining big firms, there is a 6.7% increase in the number of workers moving from small to big firms after the scheme.

Since the scheme broadens access to a very special type of worker (skilled short term worker), these workers are complementary rather than substitutes for more long-term non-EU, EU, and native workers. In appendix table A4 we provide evidence of this, showing that average firm-level wages increase across all groups of workers (EU, non-EU, and native) and across small and large firms, consistent with the evidence of no displacement of native and EU employment. [19]

In summary, we find evidence of significant churning in the labor market for non-EU workers with an overall increase in total employment, with no displacement effect for either native or EU worker. The impact is strongest for small firms, which hire more short-stay high-skilled workers. As many of these workers are on temporary contracts, some later transition to large firms. We next turn to studying whether some of these temporary workers leave the country and return to their home countries.

Networks of return migrants While there is a sizable literature showing that increasing immigration can lead to growing trade between host and origin countries through knowledge transfer via ethnic networks, it is hard to find direct evidence of this mechanism by tracing the return migrants. The reason for the difficulty in directly testing this mechanism lies in the scarcity of data to track return migration. We rely on merging our firm-level trade data with the foreign migration movement data, which tracks first-generation migrants in the Netherlands and records whether they return to their home countries. We select all first-generation immigrants who have reported emigration and have a duration of fewer than 3 years in the Netherlands. We do this sample restriction to minimize the impact of non-EU immigrant workers who have settled in the Netherlands for a long time. We merge them with the matched employer-employee dataset using personal ID and the earliest year of employment in the Netherlands. We collapse the employer-employee matched dataset to firm-year data.[20] The outcome variables we are interested in are the total number of short-stay emigrants who leave the country and the total number of short-stay emigrants who return to their home countries. Note that the total number of short-stay emigrants who leave the country includes workers who

[19] These results are consistent with our own findings that the effects are concentrated among smaller, more constrained firms as well as the recent literature which shows that high-skilled immigrants can improve native productivity, wages, and employment by making it easier for firms to find workers with specialized skills, especially for constrained firms (Beerli et al., 2021; Brinatti et al., 2023). The findings also align with increasing policy concerns in the Netherlands regarding shortages of high-skilled workers.

[20] For the analysis, we only include firms that have at least 1 new hire leaving the Netherlands within 3 years, which makes up about 13% of all firms.

return to their home countries or emigrate to other countries. We check whether return migration increased after the short-stay high-skilled migrants scheme was implemented by running equation 2 using as dependent variables 1) the number of non-EU emigrants from firm i in industry j in region m who leave the Netherlands within 3 years of year t and 2) the number of non-EU emigrants from firm i in industry j in the region m who leave the Netherlands and return to their home countries within 3 years of year t.

Despite the rare wealth of information on return migration in the data, there are a few limitations of this data, which restrict the types of analysis we can do, and therefore our results here are suggestive. The source of the return migration information is the foreign migration movement dataset described in section 3. About a third of non-EU individuals in the data do not deregister when they leave the country and therefore do not appear in our data. When we merge the return migration data to the employer-employee data and then further to the firm-year data, we are left with a small sample of firms as reported in the regression results in table 2. From table 2, we see that after the short-stay high-skilled migrants policy was implemented, non-EU workers employed in high-skill firms returned to their home countries at a higher rate than non-EU workers in low-skilled firms (columns 1 and 2). We do not find similar patterns for EU return migrants (columns 3 and 4). To summarize, we find evidence that smaller firms take advantage of the high-skilled short-stay migrants scheme. They hire and fire a large number of non-EU workers, and at least some of these workers go back to their home countries.

Table 2: Emigrants and returnees by origin country (EU or non-EU)

	(1) Emigrants	(2) Returnees	(3) Emigrants	(4) Returnees
HS*Post	0.189***	0.226**	0.0371	0.0559
	(0.0701)	(0.0938)	(0.159)	(0.177)
Observations	6,180	2,656	4,197	2,807
R-squared	0.754	0.733	0.690	0.672
Worker type	Non-EU	Non-EU	EU	EU
Industry/ Region/ Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes

Notes: We report the results from estimating equation 2 with dependent variables being the log number of emigrants in columns (1) and (3), and the log number of returnees in columns (2) and (4). The samples in columns (1) and (2) are firms that have at least 1 non-EU new hire emigrating within 3 years. The samples in columns (3) and (4) are firms that have at least 1 EU new hire emigrating within 3 years. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Recent empirical work has shown that increasing immigration can increase offshoring to mi-

grants' home countries through ethnic networks (Moriconi et al., 2020; Olney and Pozzoli, 2019). In the following section, we analyze the effects of immigration on offshoring by exploiting the high-skilled migrants scheme of 2012.

4.2 Effects on offshoring

In this section, our main goal is to study how firm-level offshoring responds to changes in the costs of hiring immigrant workers. Following Olney and Pozzoli (2019), we estimate the following equation:

$$Off_{ijmt,d} = \beta_o^{'} + \beta_1^{'} Imm_{ijmt-1,d} + X_{ijmt-1}^{'}\gamma_1^{'} + W_{ijmt-1}^{'}\gamma_2^{'} + \gamma_i^{'} + \gamma_j^{'} + \gamma_m^{'} + \gamma_{dt}^{'} + \beta_4^{'} post * \gamma_{si} + \varepsilon_{ijmt,d} \quad (3)$$

$Off_{ijmt,d}$ is offshoring by firm i in industry j in region m at time t to destination country d. Our analysis focuses on narrow offshoring at both the extensive and intensive margins. γ_{si} is a dummy indicating whether the firm is high-skilled (firms in the top quartile of skilled hiring, i.e., share of natives with bachelor or higher) or low-skilled. All control variables and fixed effects are as defined in the previous sections. $Imm_{ijmt-1,d}$ is the share of non-EU immigrants from destination country d in total hiring of firm i in industry j in region m in year $t-1$. Note that $Imm_{ijmt-1,d}$ includes all the non-EU immigrants from country d hired by the firm i in $t-1$, not just short-stay workers. There are two main reasons for this: First, we do not have information in the data on the exact contract duration of workers agreed initially with employers. Second, focusing only on short-stay workers would underestimate the scheme's impact, as many transition to permanent contracts or arrive as partners of high-skilled migrants on separate visas, despite being high-skilled immigrants themselves. To understand the overall impact of this short-stay migrants scheme on high-skilled non-EU employment, we instead turn to an instrumental variable strategy described in section 4.2.1 below where we estimate the change in non-EU immigrant employment driven by this scheme. An instrumental variable strategy is essential because in equation 3 both immigrant hiring and offshoring are jointly determined in equilibrium by the firm. As such, common shocks, for e.g. firm growth, international expansion, or product specialization requiring foreign skills, could drive both. To address this endogeneity, we instrument immigrant hiring using the 2012 policy change.

4.2.1 Identification

Using a two-stage least squares framework, we exploit policy-driven changes in immigrant hiring to estimate how reduced hiring costs from the 2012 reform affected firms' equilibrium offshoring

decisions. To do this, we use two sources of variation: First, we use the fact that the 2012 policy primarily affected the high-skill firms. Second, we use historical variations in firm-level immigrant employment as these variations can affect future immigrant employment. Our empirical strategy, formally described below, uses a two-stage least squares framework using these two variations.

First Stage:

$$Imm_{ijmt-1,d} = \beta_o + X^{'}_{ijmt-1}\gamma_1 + W^{\prime}_{ijmt-1}\gamma_2 + \gamma_i + \gamma_j + \gamma_m + \gamma_{t-1} + \gamma_{dt} + \alpha_1 post * Img_{id} + \alpha_2 \gamma_{si} * Img_{id} + \alpha_3 post * \gamma_{si} * Img_{id} + \alpha_4 post * \gamma_{si} + \epsilon_{ijmt-1,d} \quad (4)$$

Second stage:

$$Off_{ijmt,d} = \beta^{'}_o + \beta^{'}_1 Imm_{ijmt-1,d} + X^{'}_{ijmt-1}\gamma^{'}_1 + W^{\prime}_{ijmt-1}\gamma^{'}_2 + \gamma^{'}_i + \gamma^{'}_j + \gamma^{'}_m + \gamma^{'}_{dt} + \alpha^{'}_4 post * \gamma_{si} + \varepsilon_{ijmt,d} \quad (5)$$

where post=1 if year $\geq$ 2012. Img_{id} is the proportion of non-EU immigrants in firm i in year 2007 from origin country d out of total firm hiring. γ_{si} is a dummy indicating whether the firm is high or low-skill. This is a triple difference setup where: α_1 measures the differential trend in how the past network of immigrant employees in firm i affects immigrant hiring post-2012. α_2 measures the differential effect of the past network of immigrant employees on future immigrant hiring in high relative to low-skill firms. α_3 is the triple difference term that measures how the effect of the past network of immigrant workers on immigrant hiring by high-skill firms relative to low-skill firms changed post 2012.

If firms with a higher network of past immigrant employees also attract more employees after the high-skill migrants scheme, as is consistent with the network effect of immigration, we expect α_1 to be positive. The a priori expected sign of α_3 is ambiguous. Network effects, similar to the literature that use the historical tendency of immigrants to settle in already immigrant-intensive areas, would imply that high-skill firms that were already immigrant-intensive would hire more immigrants.[21] On the other hand, if the short-stay migrants scheme primarily helped small high-skill firms, which historically could not afford to hire long-term high-skilled non-EU workers due to several costs associated with employing immigrants, the high-skilled migrants scheme would have the opposite effect. Our results in section 4.1 find overwhelming evidence for the second hypothesis. In this situation, as we have already showed, small firms in the high-skilled sector would benefit more from the short-stay migrants scheme and hire more high-skilled non-EU immigrant workers compared to both large firms in high-skilled sectors and small firms in low-skilled sectors. The

[21] This theory was pioneered by Card (2001) and has been extensively used thereafter. See, for example, Cascio and Lewis (2012), Boustan (2010) as examples in this large literature.

2SLS estimate of β_1' thus measures the changes in the firm's equilibrium offshoring in response to changes in the cost of hiring immigrants. The identification assumption behind the instrument is that if we see a differential change in firm-level offshoring in high-skill relative to low-skill firms after the 2012 policy change depending on the existing network of immigrant employees, it must be because firms adjust their offshoring activities in response to a reduction in the cost of hiring high-skilled immigrants.

4.2.2 Results

In table 3, columns (1) and (2) we report the OLS and IV results respectively of estimating equation 5, where the dependent variable is a dummy indicating whether a firm engages in offshoring, that is, the extensive margin of offshoring. The results from the IV and OLS specification are close: We find that even after accounting for firm, region, destination, and year fixed effects and a battery of firm and workforce controls, firms respond to the reductions in the costs of hiring immigrants by hiring more immigrant workers from the same country and increasing offshoring. In column (2), the immigration coefficient of 0.28 implies that a one percentage point (.01) increase in the immigrant share is associated with a 0.0028 increase in the probability that a firm will offshore, which represents a 7.37% increase relative to the mean. Given that as a result of the scheme the non-EU immigrant share increased on average by 0.002 percentage points, offshoring increased by 1.47% relative to the mean.

The dependent variable in columns (3) and (4) in table 3 is the log value of offshoring, conditional on the firm participating in offshoring. From the IV estimates in column (4), we see that a one percentage point increase in the immigrant share is associated with a 12.12% increase in offshoring.

Table 3: Offshoring to non-EU countries

	(1) OLS Extensive	(2) IV Extensive	(3) OLS Intensive	(4) IV Intensive
Lagged immigrant share within firm	0.241***	0.280***	11.84***	12.12**
	(0.0651)	(0.0704)	(3.884)	(4.812)
Observations	1,180,909	918,136	34,637	32,512
Industry/ Region/ Destination-Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes
Mean of Offshoring Dummy Variable or Log (Offshored Value)	0.0310	0.0380	9.738	9.766
Mean of Lagged Immigrant Share	0.00200	0.00200	0.00300	0.00300
First stage: KP F-stat		845.1		107.5

Notes: The table reports the results of estimating equation 5. Columns (1) and (2) show the extensive margin results. The dependent variable is a dummy variable indicating whether firms offshored to a non-EU country in a year. The samples are all manufacturing firms in the firm-destination-year dataset 2010-2016. Columns (3) and (4) show the intensive margin results. The dependent variable is log (offshored value) for offshoring firms to a non-EU country in a year. The samples are manufacturing firms in the firm-destination-year dataset 2010-2016 that had at least one offshoring activity both before 2012 and after 2012. In instrumental variable estimations in columns (2) and (4), lagged immigrant shares are instrumented following the strategy described in section 4.2.1. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Appendix table A6 reports the results from the first stage of the IV estimation for both the extensive margin in column (1) and intensive margin in column (2). The estimates in row (1) indicate that the network effect of immigrants is generally stronger in high-skill–intensive firms. Row (2) shows that higher historical immigrant shares tend to attract more future immigrants. Row (3) suggests that non-EU immigrant hiring increased in high-skill–intensive firms after 2012; however, this effect was weaker for high-skill firms with already large immigrant hiring—namely, the larger firms—consistent with our labor market results in section 4.1. Following the literature showing that immigrant employees boost the probability of offshoring through knowledge transfer (Moriconi et al., 2020; Olney and Pozzoli, 2019), we test whether the increased probability of offshoring is stronger for more differentiated goods. From table 4 which reports the probability of offshoring, we see that indeed the rise in offshoring is driven mostly by small firms offshoring more differentiated goods, as measured by the Rauch classification. In column (1), the immigration coefficient of 0.231 implies that a one percentage point increase in the immigrant share is associated with a 0.0023 increase in the probability that a firm will offshore, which represents a 17.69% increase relative to the mean. The results in columns (3) and (4) show an increase in the probability of offshoring homogeneous goods with a much smaller magnitude.

Table 4: Offshoring to non-EU countries with product characteristics

	(1) Differentiated	(2) Differentiated	(3) Homogeneous	(4) Homogeneous
Lagged immigrant share within firm	0.231**	0.173	0.0522*	0.140**
	(0.0908)	(0.123)	(0.0296)	(0.0648)
Observations	472,656	419,637	472,656	419,637
Firm Size	small	big	small	big
Industry/ Region/ Destination-Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes
Mean of Offshoring Dummy Variable	0.0130	0.0550	0.00200	0.0150
Mean of Lagged Immigrant Share	0.00200	0.00200	0.00200	0.00200
First stage: KP F-stat	381.3	432.3	381.3	432.3

Notes: The table reports the results of estimating equation 5. The dependent variables are dummy variables indicating whether firms offshored differentiated or homogeneous goods to a non-EU country in a year. The samples in columns (1) and (3) are small manufacturing firms in the firm-destination-year dataset 2010-2016. The samples in columns (2) and (4) are big manufacturing firms in the firm-destination-year dataset 2010-2016. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Appendix table A7 shows that firms do not increase off-shoring to EU countries. If anything, there is evidence of a weak fall in offshoring to EU countries. Overall, we provide compelling evidence that firms hire more non-EU immigrant workers in response to a reduction in the cost of hiring non-EU immigrants and increase the amount of off-shoring to non-EU countries. Combining our findings of increased probability of offshoring differentiated goods consistent with the trade boosting effects of immigrants (Lodefalk, 2016; Moriconi et al., 2020; Olney and Pozzoli, 2019; Parsons and Vézina, 2018; Steingress, 2018) and the increased return migration of non-EU workers (section 4.1), we find strong evidence that these effects stem from high-skilled immigrants linking local firms back home to Dutch offshoring partners.

4.3 Effects on firm exports

The expansion in employment and access to offshoring could help firms expand production and exports. Since we do not have domestic production data, we study the impact of the scheme on firm-level exports.[22] In contrast to offshoring which embodies the notion of inputs that the firm could have produced in-house but instead chose to import and is therefore a type of access to inputs, exports indicate a firm's ability to produce output and sell abroad. In table 5 we report the results of estimating equation 5, where instead of offshoring we look at exports. For the extensive margin regression, the dependent variable is a dummy indicating whether firm i exported to destination country d at time t. For the intensive margin regression, the dependent variable is the total value

[22] In the robustness section 5, we show that the increase in exports at the firm-level does not come at the cost of reduced domestic sales by utilizing firm-level sales tax return data.

of exports from firm i to destination country d at time t, conditional on exporting at all. From column (2) in table 5, which reports the results of the IV estimation, we see that a 1 percentage point increase in the immigrant share (.01) is associated with a 0.0025 increase in the probability that a firm will export, which represents a 2.66% increase relative to the mean. From column (4), we find a rather small and insignificant coefficient of immigrants on exports, conditional on firm participation in the export market. The increase in exports is therefore driven by firms starting to export to newer non-EU destinations rather than by existing exporters increasing the value of exports. This is consistent with the findings of Cardoso and Ramanarayanan (2022) and Bahar and Rapoport (2018) who find that immigrants, especially high-skilled ones, increase the likelihood that a country starts exporting a new good.

Appendix table A8 below reports the results from the first stage regression. Similar to the first stage results in table A6, results for both the extensive (column 1) and the intensive margins (column 2) using the mean firm-level non-EU immigrant share in 2007 as instrument show that non-EU immigration increased in high-skilled industries post-2012, and it increased more in firms that had less non-EU immigrant employment to begin with, that is, mostly small firms. Since the scheme primarily expands access to skilled workers, we study the impact on exports by product differentiation, for small and big firms separately.

Table 5: Exports to non-EU countries

	(1) OLS Extensive	(2) IV Extensive	(3) OLS Intensive	(4) IV Intensive
Lagged immigrant share within firm	0.246***	0.254***	1.118	-0.367
	(0.0325)	(0.0706)	(1.456)	(1.829)
Observations	1,180,909	918,136	89,695	83,190
Industry/ Region/ Destination-Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes
Mean of Export Dummy Variable or Log (Export Value)	0.0790	0.0940	10.93	11
Mean of Lagged Immigrant Share	0.00200	0.00200	0.00300	0.00300
Second Stage: F-stat p value		7.40e-06		6.63e-07
First stage: KP F-stat		845.1		808.7

Notes: The table reports the results of estimating equation 5. Columns (1) and (2) show the extensive margin results. The dependent variable is a dummy variable indicating whether firms exported to a non-EU country in a year. The samples are all manufacturing firms in the firm-destination-year dataset 2010-2016. Columns (3) and (4) show the intensive margin results. The dependent variable is log (exported value) for offshoring firms to a non-EU country in a year. The samples are manufacturing firms in the firm-destination-year dataset 2010-2016 that had at least one export activity both before 2012 and after 2012. In instrumental variable estimations in columns (2) and (4), lagged immigrant shares are instrumented following the strategy described in section 4.2.1. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

From table 6, column (1), we see that the increase in exports is primarily driven by smaller firms,

who increase the exports of differentiated products, which are typically more skill-intensive, to their home countries. A 1 percentage point increase in immigrant share is associated with a 0.0015 increase in the probability that a small firm will export differentiated products, which represents a 4.17% increase relative to the mean. Given that as a result of the scheme the non-EU immigrant share increased on average by 0.002 percentage points, the probability of exporting differentiated goods increased by 0.83% relative to the mean. This is consistent with the trade-fostering effects of immigration, especially for differentiated goods which entail larger information costs. (Peri and Requena-Silvente, 2010).

Table 6: Export to non-EU countries with product characteristics

	(1) Differentiated	(2) Differentiated	(3) Homogeneous	(4) Homogeneous
Lagged immigrant share within firm	0.149**	0.173	0.00738	0.0106
	(0.0610)	(0.182)	(0.0241)	(0.107)
Observations	472,656	419,637	472,656	419,637
Firm Size	small	big	small	big
Industry/ Region/ Destination-Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes
Mean of Export Dummy Variable	0.0360	0.132	0.00700	0.0550
Mean of Lagged Immigrant Share	0.00200	0.00200	0.00200	0.00200
First stage: KP F-stat	381.3	432.3	381.3	432.3

Notes: The table reports the results of estimating equation 5 with the dependent variables being dummy variables indicating whether firms exported differentiated or homogeneous goods to a non-EU country in a year. The samples in columns (1) and (3) are small manufacturing firms in the firm-destination-year dataset 2010-2016. The samples in columns (2) and (4) are big manufacturing firms in the firm-destination-year dataset 2010-2016. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Appendix table A9 reports the effects of increased access to non-EU immigrants on EU exports, showing a null effect. Combining the evidences, the increased access to immigrant workers and offshoring helped firms expand exports, particularly of differentiated goods, and export to non-EU countries, driven by increased connections between these countries and the Netherlands.

5 Robustness checks

In this section, we do several types of robustness checks. The first robustness check addresses some potential threats from concurrent immigration policy changes between 2010 and 2016. The second type of robustness check replicates our offshoring results using some alternative definitions of offshoring. In the last type of robustness check we address the concern that the increase in exports could come at the cost of domestic sales. We also test the sensitiveness of our results on exports to different sub-samples, demonstrating that our results are not driven by firms concentrated in big cities.

5.1 Concurrent labor market policies

We first test whether other concurrent policies implemented around the same time confound our results on labor market outcomes. We check two potential threats to our identification, by considering two other immigration-related policies taking place during the analysis period 2010-2016.

First, we take into account one concurrent policy on the Dutch expatriate tax regime (known as the 30% ruling). Foreign workers with special skills or expertise which are scarce in the Dutch labor market are entitled to tax subsidies. Some amendments were issued in 2012, among which EU immigrant workers living close to the Dutch border are directly affected. The amendment stated that foreign workers living in the border area of 150 kilometers from the Dutch borders no longer qualify for the 30% ruling. This distance range mainly applies to Belgium, Germany, and Luxembourg. If high-skilled immigrant workers from the three countries respond strongly and stop working at Dutch companies, firms' hiring strategy for foreign workers might differ under a high-skilled EU worker shortage. Here we explicitly test for the change in firm-level immigrant share from Belgium, Germany, and Luxembourg. Appendix figure A3, panel a, shows that employment shares from these three countries do not decline after the 2012 policy change.

Second, we consider another concurrent policy taking place in 2014. The migration restriction lift was issued for Romanians and Bulgarians working in EU countries in 2014. Although Romanians and Bulgarians have had the right to settle freely in the EU since the countries' accession in 2007, they still needed a permit to work in EU member states. This permit restriction was lifted in 2014. Since the average percentage of high-skilled workers from Romania and Bulgaria is higher than the national average for the foreign population in the Netherlands, it is important to check if this policy led to changes in firm-level hiring of Romanians and Bulgarians differently across high and low-skill industries. If we see an increasing pattern after 2014, this might also directly affect the firm-level hiring of non-EU immigrant workers. However, panel b of appendix figure A3 does not show significant changes, alleviating the concern about the impact of this migration restriction lift on firm-level hiring outcomes.

5.2 Alternative definitions of offshoring

Following Bernard et al. (2020) who show that firms do not necessarily only offshore inputs but can also offshore final goods, in our main analysis, we do not restrict our offshoring measures to only intermediate inputs. We test the robustness of our results to some variations in the offshoring definition. First, according to Hummels et al. (2018), offshoring is about intermediate inputs (or tasks) used for production, not final goods used for consumption. We, therefore, repeat our main specification where we define offshoring as the imports of only intermediate goods, as classified by the Broad Economic Categories (BEC), in the same HS4 digit category of firm exports. The results

barely change, as shown in columns (1) and (2) of appendix table A10.

Second, following Bernard et al. (2020) we use a narrow measure of offshoring based on imports of the same HS6 products that the firm produces at home. We repeat our results with this alternative measure of offshoring in columns (3) and (4) of appendix table A10. The results are similar to our main estimates in terms of both significance and magnitudes.

5.3 Subsample analysis on exports and total sales

One potential concern is that the rise in exports may come at the expense of domestic sales. In that case, the rise in exports will simply reflect the effect of increased connections with non- EU countries, not necessarily increased production capacity driven by access to inputs. To address this concern, in table A11 using firm-level sales tax return data, we study how total sales changed in high-skill firms relative to low-skill firms post 2012. We find that the total sales increased for all firms by 4.8% (column (1)), but this is driven entirely by small firms (column (2)).[23] Finally, we address two major concerns regarding sample selection. First, our results of exports and domestic sales might be affected by firms clustered in several big cities. Potentially, these cities are more active in the economy and possess more international networks via immigrant workers and multinational firms. To reduce the impact of these cities, we exclude the four biggest cities ("Big 4") in the Netherlands, i.e., Amsterdam, Rotterdam, Den Haag, and Utrecht. Second, firms with multiple plants are also likely to adjust export decisions more easily. In order to minimize the impact of these channels, we restrict our sample to firms that never changed their location or firms that have only one plant throughout the period 2009-2016. Both the extensive and the intensive results are robust across various choices of sub-samples, as shown in appendix table A12.

6 Conclusion

This paper studies how easing duration-based restrictions on high-skilled migration affects firms' sourcing decisions and participation in global markets. Exploiting a reform that lowered the cost of hiring short-stay, high-skilled non-EU workers in the Netherlands, we show that temporary migration operates as a flexible input-market liberalization: firms expand employment without displacing native or EU workers, reorganize production through increased offshoring and enter export markets, with effects concentrated among small, skill-intensive firms. Short-stay high-skilled migration programs lower the fixed costs that typically prevent small firms from hiring specialized workers. When these workers return home, they create networks that facilitate cross-border trade. In this

[23] Note that firm-level total sales data is not country-specific and therefore, our instrumental variable strategy using country-specific immigrant employees is not applicable in this estimation.

way, migration policy can reshape firms' global sourcing and exporting decisions.

Temporary and project-based migration schemes are widely used in sectors such as information technology, engineering, and business services in many high-income economies. As production becomes more fragmented and knowledge-intensive, firms' ability to access skills flexibly may play an increasingly important role in global value chain participation. While our analysis focuses on short- to medium-run firm responses, future work could examine longer-run implications for innovation, productivity growth, and the geographic allocation of high-skilled jobs, as well as potential effects on sending countries. Understanding these dynamics is important for evaluating how migration policies interact with broader forces of globalization.

References

Ariu, A. (2022). Foreign workers, product quality, and trade: Evidence from a natural experiment. *Journal of International Economics 139*, 103686.

Bahar, D. and H. Rapoport (2018). Migration, Knowledge Diffusion and the Comparative Advantage of Nations. *The Economic Journal 128*(612), F273–F305.

Bas, M. and V. Strauss-Kahn (2014). Does importing more inputs raise exports? firm-level evidence from france. *Review of World Economics 150*, 241–275.

Beerli, A., J. Ruffner, M. Siegenthaler, and G. Peri (2021). The abolition of immigration restrictions and the performance of firms and workers: evidence from switzerland. *American Economic Review 111*(3), 976–1012.

Berkhout, E., A. Heyma, M. Volkerink, S. van der Werff, et al. (2015). Attracting and retaining highly skilled migrants in the Netherlands. *SEO-report 88*.

Bernard, A. B., T. C. Fort, V. Smeets, and F. Warzynski (2020). Heterogeneous Globalization: Offshoring and Reorganization. Technical report, National Bureau of Economic Research.

Bossavie, L. and Ç. Özden (2023). Impacts of temporary migration on development in origin countries. *The World Bank Research Observer 38*(2), 249–294.

Boustan, L. P. (2010). Was Postwar Suburbanization "White Flight"? Evidence from the Black Migration. *The Quarterly Journal of Economics 125*(1), 417–443.

Brinatti, A., M. Chen, P. Mahajan, N. Morales, and K. Shih (2023). The impact of immigration on firms and workers: Insights from the h-1b lottery. *Available at SSRN 4431106*.

Brinatti, A. and N. Morales (2021). Firm Heterogeneity and the Impact of Immigration: Evidence from German Establishments.

Burchardi, K. B., T. Chaney, and T. A. Hassan (2019). Migrants, Ancestors, and Foreign Investments. *The Review of Economic Studies 86*(4), 1448–1486.

Burdett, K. and D. T. Mortensen (1998). Wage differentials, employer size, and unemployment. *International economic review*, 257–273.

Card, D. (2001). Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration. *Journal of Labor Economics 19*(1), 22–64.

Cardoso, M. and A. Ramanarayanan (2022). Immigrants and exports: Firm-level evidence from Canada. *Canadian Journal of Economics/Revue canadienne d'économique 55*(3), 1250–1293.

Cascio, E. U. and E. G. Lewis (2012). Cracks in the Melting Pot: Immigration, School Choice, and Segregation. *American Economic Journal: Economic Policy 4*(3), 91–117.

Cerveny, J. and J. C. Van Ours (2013). Unemployment of Non-Western Immigrants in the Great Recession. *De Economist 161*(4), 463–480.

Cohen, L., U. G. Gurun, and C. Malloy (2017). Resident Networks and Corporate Connections: Evidence from World War II Internment Camps. *The Journal of Finance 72*(1), 207–248.

De Nederlandsche Bank (2024). Labour market developments. https://www.dnb.nl/en/current-economic-issues/labour-market/. Accessed: September 20, 2025.

Dustmann, C. and J.-S. Görlach (2016). The economics of temporary migrations. *Journal of Economic Literature 54*(1), 98–136.

Dustmann, C. and U. Schönberg (2025). Linking empirical evidence to theory: A framework for understanding the labor market effects of immigration. In C. Dustmann and T. Lemieux (Eds.), *Handbook of Labor Economics*, Volume 6. Elsevier.

Egger, P. H., K. Erhardt, and A. Lassmann (2019). Immigration and firms' integration in international production networks. *European Economic Review 111*, 1–34.

Erbahar, A. and O. T. Gencosmanoglu (2021). Migrants and Global Value Chains: Evidence from Dutch Firms.

European Migration Network (2013). Attracting Highly Qualified and Qualified Third-Country Nationals. *European Commission*.

Fan, J., E. Lee, and V. Smeets (2022). High-Skill Immigration, Offshore R&D, and Firm Dynamics.

Felbermayr, G. J. and F. Toubal (2012). Revisiting the Trade-Migration Nexus: Evidence from New OECD Data. *World Development 40*(5), 928–937.

Feng, L., Z. Li, and D. L. Swenson (2016). The connection between imported intermediate inputs and exports: Evidence from chinese firms. *Journal of International Economics 101*, 86–101.

Glennon, B. (2020). How Do Restrictions on High-Skilled Immigration Affect Offshoring? Evidence from the H-1B Program. *SSRN Electronic Journal*, 1–47.

Görlach, J.-S. K. et al. (2022). Temporary migration entails benefits, but also costs, for sending and receiving countries. *IZA World of Labor*.

Gould, D. M. (1994). Immigrant Links to the Home Country: Empirical Implications for U.S. Bilateral Trade Flows. *The Review of Economics and Statistics*, 302–316.

Grossman, G. M., E. Rossi-Hansberg, et al. (2006). The Rise of Offshoring: It's Not Wine for Cloth Anymore. *The New Economic Geography: Effects and Policy Implications 2006*.

Haltiwanger, J., H. Hyatt, and E. McEntarfer (2015). Cyclical reallocation of workers across employers by firm size and firm wage. Technical report, National Bureau of Economic Research.

Head, K. and J. Ries (1998). Immigration and Trade Creation: Econometric Evidence from Canada. *Canadian Journal of Economics*, 47–62.

Hummels, D., R. Jogersen, J. Munch, and C. Xiang (2014). The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data. *American Economic Review 104*(6), 1597–1629.

Hummels, D., J. R. Munch, and C. Xiang (2018). Offshoring and Labor Markets. *Journal of Economic Literature 56*(3), 981–1028.

International Monetary Fund (2024). Netherlands: Staff report for the 2024 article iv consultation. Technical report, IMF.

Kahn, L. B. and E. McEntarfer (2014). Employment cyclicality and firm quality. Technical report, National Bureau of Economic Research.

Kasahara, H. and B. Lapham (2013). Productivity and the decision to import and export: Theory and evidence. *Journal of international Economics 89*(2), 297–316.

Kasahara, H. and J. Rodrigue (2008). Does the use of imported intermediates increase productivity? plant-level evidence. *Journal of development economics 87*(1), 106–118.

Lodefalk, M. (2016). Temporary expats for exports: micro-level evidence. *Review of World Economics 152*(4), 733–772.

Mobarak, A. M., I. Sharif, and M. Shrestha (2021). Returns to international migration: Evidence from a bangladesh-malaysia visa lottery.

Mobarak, A. M., I. Sharif, and M. Shrestha (2023, October). Returns to international migration: Evidence from a bangladesh-malaysia visa lottery. *American Economic Journal: Applied Economics 15*(4), 353–88.

Moriconi, S., G. Peri, and D. Pozzoli (2020). The role of institutions and immigrant networks in firms' offshoring decisions. *Canadian Journal of Economics/Revue canadienne d'économique 53*(4), 1745–1792.

Moscarini, G. and F. Postel-Vinay (2012). The contribution of large and small employers to job creation in times of high and low unemployment. *American Economic Review 102*(6), 2509–2539.

Muñoz, M. (2023, 06). Trading Nontradables: The Implications of Europe's Job-Posting Policy*. *The Quarterly Journal of Economics 139*(1), 235–304.

Naidu, S., Y. Nyarko, and S.-Y. Wang (2016). Monopsony power in migrant labor markets: Evidence from the united arab emirates. *Journal of Political Economy 124*(6), 1735–1792.

OECD (2008). International migration outlook 2008.

Olney, W. W. and D. Pozzoli (2019). The Impact of Immigration on Firm-Level Offshoring. *Review of Economics and Statistics 24*(3), 272–284.

Orrenius, P. M., M. Zavodny, and A. T. Abraham (2020). The Effect of Immigration on Business Dynamics and Employment.

Ottaviano, G. I. and G. Peri (2012). Rethinking the effect of immigration on wages. *Journal of the European Economic Association 10*(1), 152–197.

Ottaviano, G. I., G. Peri, and G. C. Wright (2018). Immigration, trade and productivity in services: Evidence from U.K. firms. *Journal of International Economics 112*, 88–108.

Parsons, C. and P.-L. Vézina (2018). Migrant Networks and Trade: The Vietnamese Boat People as a Natural Experiment. *The Economic Journal 128*(612), F210–F234.

Peri, G. and F. Requena-Silvente (2010). The Trade Creation Effect of Immigrants: Evidence from the Remarkable Case of Spain. *Canadian Journal of Economics/Revue canadienne d'économique 43*(4), 1433–1459.

Peri, G. and C. Sparber (2009). Task specialization, immigration, and wages. *American Economic Journal: Applied Economics 1*(3), 135–69.

Rauch, J. E. (1999). Networks versus markets in international trade. *Journal of international Economics 48*(1), 7–35.

Rauch, J. E. and V. Trindade (2002). Ethnic Chinese Networks in International Trade. *Review of Economics and Statistics 84*(1), 116–130.

Steingress, W. (2018). The causal impact of migration on US trade: Evidence from political refugees. *Canadian Journal of Economics/Revue canadienne d'économique 51*(4), 1312–1338.

ThinkEurope (2024). High demand netherlands jobs 2024 with approved employers list and dutch work visa. Accessed: September 20, 2025.

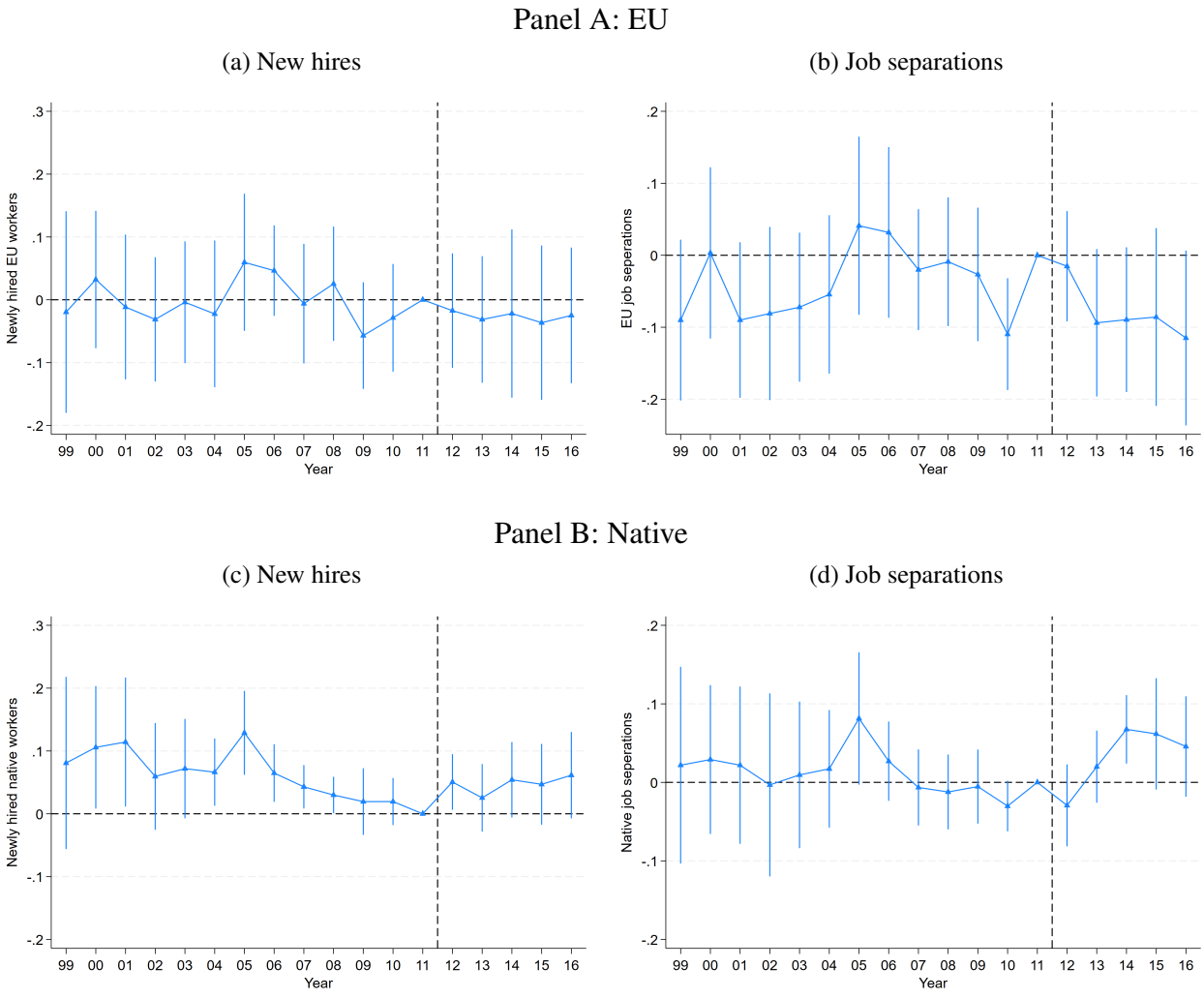
Timm, L. M., M. Giuliodori, and P. Muller (2025). Tax incentives for migrants with mid-level earnings: Evidence from the netherlands. *American Economic Journal: Applied Economics 17*(3), 42–79.

Vézina, P.-L. (2012). How Migrant Networks Facilitate Trade: Evidence from Swiss Exports. *Swiss Journal of Economics and Statistics 148*(3), 449–476.

A SUPPLEMENTAL ONLINE APPENDIX

A.1 Supplementary figures

Figure A1: Event study of EU and native workers' job dynamics over-time in small firms

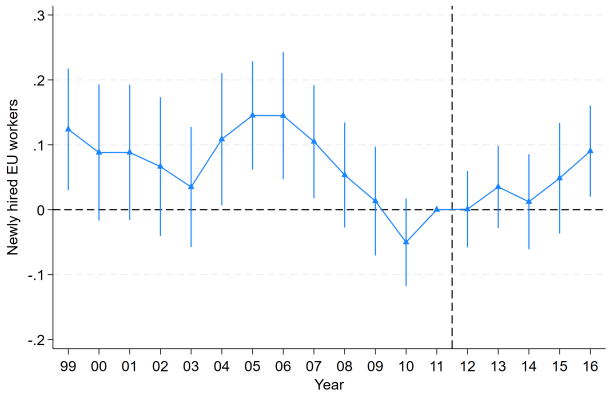


Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the new hires/job separations of EU/ native workers within small firms.

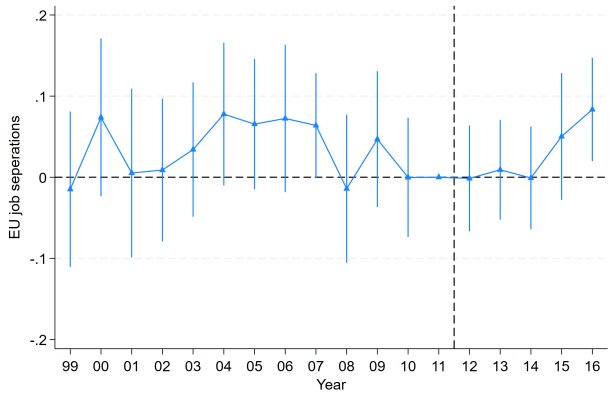
Figure A2: Event study of EU and native workers' job dynamics over-time in big firms

Panel A: EU

(a) New hires

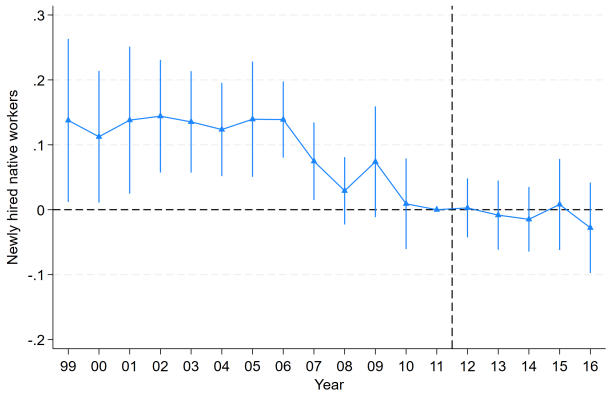


(b) Job separations

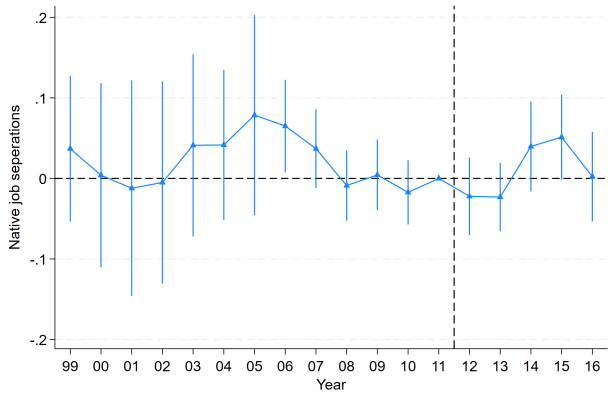


Panel B: Native

(c) New hires



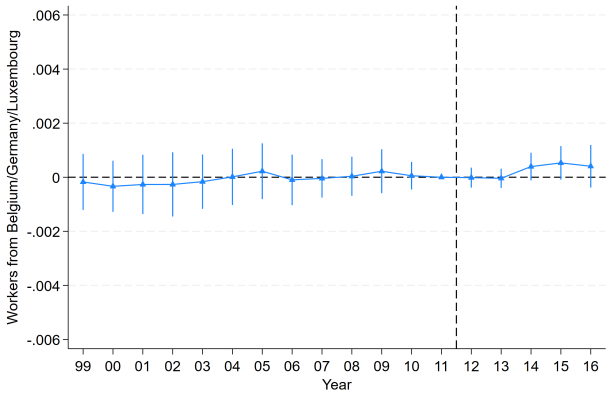
(d) Job separations



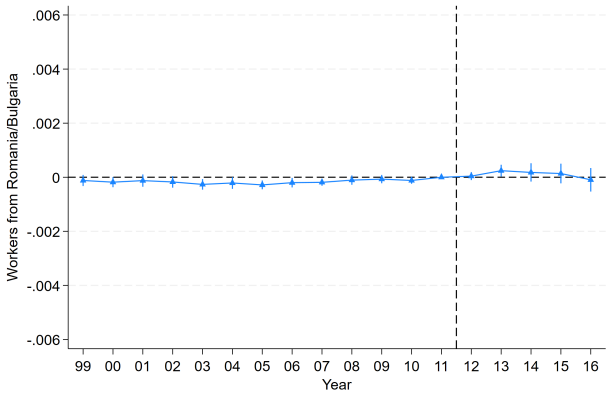
Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the new hires/job separations of EU/ native workers within big firms.

Figure A3: Event study of firm-level employment shares for specific groups over time in response to concurrent policies

(a) The Dutch border



(b) Romania and Bulgaria



Notes: These figures plot the event study coefficients with 95% confidence intervals from estimating equation 1 with the dependent variable being the share of employment of workers within a firm from home countries that experience concurrent policies.

A.2 Supplementary tables

Table A1: Full list of data sources in Statistics Netherlands

Units	Dataset names in Dutch	English translation
Firm	ABR	General business register
	INVESTERINGEN	Total investments in fixed assets
	IHG	International trade in goods
	BTW	Declared sales tax return
Employee	BAANKENMERKENBUS	Job characteristics
	BAANPRSJAARBEDRAGTAB	Annual wages
	GBAPERSOONTAB	Demographic characteristics
	HOOGSTEOPLTAB	Education in the Netherlands
	GBAADRESOBJECTBUS	Address characteristics
	VSLGWBTAB	Municipal, district and neighborhood codes
	GBAMIGRATIEGEBEURTENISBUS	Migration characteristics
	MIGMOTIEFBUS	Migration motives

Table A2: Descriptive statistics of firm-year dataset in all sectors

	(1) mean	(2) sd
Firm-level characteristics		
Male	0.640	0.282
Age	38.94	6.274
Share of bachelor degree among natives	0.235	0.264
Tenure	3.990	2.779
Work experience	6.368	4.069
Capital stock value per capita in euros	7,002	195,519
Multi-establishment	0.324	0.468
Big firms (above 50 employees in 2009)	0.324	0.468
High-skilled firms	0.210	0.407
Employment size	112.4	800.5
Average taxable yearly wage per worker	30,306	14,559
Labour market outcomes		
Number of non-EU workers	8.066	77.01
Number of EU workers	2.515	21.16
Number of native workers	101.8	724.5
Share of non-EU workers	0.0565	0.0971
Share of EU workers	0.0215	0.0516
Share of native workers	0.922	0.118
Average taxable yearly wage per non-EU worker	28,128	19,004
Average taxable yearly wage per EU worker	30,813	30,027
Average taxable yearly wage per native worker	30,490	14,687
No. of non-EU new hires	17.75	306.6
No. of EU new hires	7.986	87.75
No. of native new hires	54.82	1,023
No. of non-EU job separations	17.06	302.1
No. of EU job separations	7.460	82.06
No. of native job separations	52.23	986.5
No. of non-EU job switches to bigger firms	3.733	19.98
No. of EU job switches to bigger firms	2.181	7.499
No. of native job switches to bigger firms	8.499	52.78
No. of Non-EU emigrants within 3 years of employment	1.851	4.374
No. of EU emigrants within 3 years of employment	1.817	3.877
No. of Non-EU returnees within 3 years of employment	1.610	2.453
No. of EU returnees within 3 years of employment	1.718	3.435

Notes: There are 571,732 observations from 1999 to 2016. For variables of labour market outcomes decomposed by origin, the observations include sub-samples of firms only if they have at least one employee, one new hire, one job separation, one emigrant, or one returnee of a specific type of workers (non-EU /EU /natives).

Table A3: Descriptive statistics of offshoring, export, and domestic sales in the manufacturing sector

	(1) mean	(2) sd
Offshoring (firm-destination-year dataset)		
Whether firms offshored	0.0258	0.158
Offshored value (in 1000 euros)	2,020	25,867
Whether firms offshored differentiated goods	0.0226	0.149
Offshored value of differentiated goods (in 1000 euros)	1,049	11,798
Whether firms offshored homogeneous goods	0.00539	0.0732
Offshored value of homogeneous goods (in 1000 euros)	5,337	52,242
Export (firm-destination-year dataset)		
Whether firms exported	0.0653	0.247
Exported value (in 1000 euros)	1,190	15,776
Whether firms exported differentiated goods	0.0563	0.230
Exported value of differentiated goods (in 1000 euros)	919.6	15,554
Whether firms exported homogeneous goods	0.0197	0.139
Exported value of homogeneous goods (in 1000 euros)	1,291	10,759
Total sales (firm-year dataset)		
Sales tax return (in 1000 euros)	24,140	106,909

Notes: For offshoring and export, there are 1,450,390 observations in 43 non-EU countries from 2010 to 2016. Summary statistics of offshored value or export value are reported on the sub-samples of firms that offshored or exported at least once both before 2012 and after 2012. For domestic sales, there are 30,802 observations from 2007 to 2016.

Table A4: Wage by firm size

	(1) Non-EU	(2) Non-EU	(3) EU	(4) EU	(5) Native	(6) Native
HS*Post	0.0211**	0.0394***	0.0139	0.0460***	0.0205**	0.0329**
	(0.00974)	(0.0107)	(0.0136)	(0.0108)	(0.00897)	(0.0145)
Observations	138,802	123,285	86,103	102,096	297,121	144,546
R-squared	0.780	0.799	0.802	0.774	0.940	0.954
Firm Size	Small	Big	Small	Big	Small	Big
Industry/ Region/ Year Fixed Effects	yes	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes	yes	yes

Notes: The table reports the results of estimating equation 2 with the dependent variable being the log (wage). Variable *Average wage* is excluded from the list of control variables. The samples are firms that have non-missing wage information for a specific type of workers (non-EU/EU/natives) during period 1999-2016. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A5: Job separations from small to big firms

	(1) Non-EU	(2) EU	(3) Native
HS*Post	0.0669***	-0.00892	-0.00767***
	(0.0249)	(0.0439)	(0.00283)
Observations	88,040	37,222	434,805
R-squared	0.789	0.715	0.982
Industry/ Region/ Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes

Notes: The table reports the results of estimating equation 2 with the dependent variables being log (non-EU/ EU/ native workers separated from small firms who join big firms in the next year) respectively. We additionally control for the total job separations from small to big firms in a year in W_{ijmt} to reflect the overall firm-level job losses. The samples include firms that have at least 1 job separation of non-EU, EU, or natives workers in a year who switch to bigger firms in the next year. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A6: First stage results for offshoring

	(1) Extensive	(2) Intensive
Immigrant Share 2007*HS	0.762***	0.731***
	(0.0307)	(0.0438)
Immigrant Share 2007*Post	0.740***	0.705***
	(0.0169)	(0.0664)
HS*Post	0.00160***	0.00235***
	(0.000137)	(0.000374)
Immigrant Share 2007*HS*Post	-0.737***	-0.657***
	(0.0298)	(0.0824)
Observations	918,136	32,512
Industry/ Region/ Destination-Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
Firm and Workforce Characteristics	yes	yes
Mean of Immigrant Share 2007	0.00220	0.00300

Notes: The table reports the results of estimating equation 4. The sample in column (1) includes all manufacturing firms in the firm-destination-year dataset 2010-2016. The sample in column (2) includes manufacturing firms in the firm-destination-year dataset 2010-2016 that had at least one offshoring activity both before 2012 and after 2012. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A7: Offshoring to EU countries

	(1) Extensive	(2) Intensive
Lagged immigrant share within firm	-0.0168	-0.0799
	(0.0284)	(0.162)
Observations	918,136	310,546
Industry/ Region/ Destination-Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
Firm and Workforce Characteristics	yes	yes
Mean of Offshoring Dummy Variable	0.375	14.88
Mean of Lagged Immigrant Share	0.00200	0.00200
First stage: KP F-stat	845.1	1645

Notes: The table reports the results of estimating equation 5 for manufacturing firms. The dependent variables are a dummy variable indicating whether firms offshored to any EU country in a year in column (1) and log (offshored value) for offshoring firms to all EU countries in a year. The sample in column (1) includes all manufacturing firms in the firm-destination-year dataset 2010-2016. The sample in column (2) includes manufacturing firms in the firm-destination-year dataset 2010-2016 that had at least one offshoring activity both before 2012 and after 2012. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A9: Exports to EU countries

	(1) Extensive	(2) Intensive
Lagged immigrant share within firm	0.00672	0.152
	(0.0239)	(0.107)
Observations	918,136	430,989
Industry/ Region/ Destination-Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
Firm and Workforce Characteristics	yes	yes
Mean of Export Dummy Variable or Log (Export)	0.469	15.72
Mean of Lagged Immigrant Share	0.00200	0.00200
First stage: KP F-stat	845.1	1527

Notes: The table reports the results of estimating equation 5 for manufacturing firms. The dependent variables are a dummy variable indicating whether firms exported to any EU country in a year in column (1) and log (export value) for offshoring firms to all EU countries in a year. The sample in column (1) includes all manufacturing firms in the firm-destination-year dataset 2010-2016. The sample in column (2) includes manufacturing firms in the firm-destination-year dataset 2010-2016 that had at least one exporting activity both before 2012 and after 2012. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A8: First stage results for export

VARIABLES	(1) Extensive	(2) Intensive
Immigrant Share 2007*HS	0.762***	0.775***
	(0.0307)	(0.0541)
Immigrant Share 2007*Post	0.740***	0.791***
	(0.0169)	(0.0163)
HS*Post	0.00160***	0.00208***
	(0.000137)	(0.000231)
Immigrant Share 2007*HS*Post	-0.737***	-0.766***
	(0.0298)	(0.0477)
Observations	918,136	83,190
Industry/ Region/ Year Fixed Effects	yes	yes
Firm Fixed Effects	yes	yes
Firm and Workforce Characteristics	yes	yes
Mean of Immigrant Share 2007	0.00220	0.00280

Notes: The table reports the results of estimating equation 4. The sample in column (1) includes all manufacturing firms in the firm-destination-year dataset 2010-2016. The sample in column (2) includes manufacturing firms in the firm-destination-year dataset 2010-2016 that had at least one exporting activity both before 2012 and after 2012. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A10: Alternative definitions of offshoring using BEC classifications

	(1) Extensive	(2) Intensive	(3) Extensive	(4) Intensive
Lagged immigrant share within firm	0.331***	14.48***	0.259***	12.17**
	(0.0861)	(4.164)	(0.0691)	(5.592)
Observations	918,136	42,827	918,136	30,659
Industry/ Region/ Destination-Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes
Mean of Offshoring Dummy Variable or Log (Offshored Value)	0.0490	9.264	0.0340	9.781
Mean of Lagged Immigrant Share	0.00200	0.00300	0.00200	0.00300
First stage: KP F-stat	845.1	39.68	845.1	61.66

Notes: The table reports the results of estimating equation 5 for offshoring activities of manufacturing firms using different definitions. In columns (1) and (2), offshoring is defined as the imports of only intermediate goods defined by BEC. In columns (3) and (4), we adapt the definition of offshoring measure that firms import products from a non-EU country to which they also export at the HS6 level. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A11: Total sales

	(1) All firms	(2) Small firms	(3) Big firms
HS*Post	0.0484**	0.0677*	0.0206
	(0.0179)	(0.0331)	(0.0358)
Observations	30,257	19,541	10,716
R-squared	0.908	0.837	0.854
Industry/ Region/ Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes

Notes: The table reports the results of estimating equation 2 with the dependent variable being log (net sales VAT). The sample in column (1) include manufacturing firms that have reported non-zero VAT in the firm-year dataset 2007-2016. The samples in columns (2) and (3) are small and big firms separately. Standard errors are clustered at 2-digit SBI industry code. *** p<0.01, ** p<0.05, * p<0.1

Table A12: Sub-sample analysis for export

	(1) No Big4 Extensive	(2) 1 location/ 1 plant Extensive	(3) No Big4 Intensive	(4) 1 location/ 1 plant Intensive
Lagged immigrant share within firm	0.255***	0.254***	-0.521	-0.254
	(0.0744)	(0.0705)	(1.973)	(1.781)
Observations	887,262	894,271	80,893	80,377
Industry/ Region/ Destination-Year Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Firm and Workforce Characteristics	yes	yes	yes	yes
Mean of Export Dummy Variable or Log (Export Value)	0.0950	0.0940	11.01	10.98
Mean of Lagged Immigrant Share	0.00200	0.00200	0.00300	0.00300
First stage: KP F-stat	1101	869.3	779	794.3

Notes: The table reports the results of estimating equation 5 for exports of manufacturing firms with different sub-samples both for the extensive margin and the intensive margin. Columns (1) and (3) exclude firms located in 4 biggest cities (Amsterdam, Rotterdam, Den Haag, and Utrecht) of the Netherlands. Columns (2) and (4) exlude firms with multiple locations or plants. Standard errors are clustered at 2-digit SBI industry code. *** $p<0.01$, ** $p<0.05$, * $p<0.1$