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International trade and labour market integration of immigrants

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Abstract

We examine whether international trade improves labour market integration of immigrants in Sweden. Immigrants participate substantially less than natives in the labour market. However, trading with a foreign country is expected to increase the demand for immigrants from that country. By hiring immigrants, a firm may access foreign knowledge and networks needed to overcome information frictions in trade. Using granular longitudinal matched employer–employee data and an instrumental variable approach, we estimate the causal effects of a firm's bilateral trade on employment and wages of immigrants from that country. We find a positive, yet heterogeneous, effect of trade on immigrant employment but no effect on immigrant wages.

KEYWORDS

employment, export, immigrants, import, wages

1 | INTRODUCTION

This paper examines how international trade affects labour market integration of immigrants in Sweden. Migrants possess qualifications that can make them relatively attractive for some employers. In particular, information about their native country could be valuable for firms wanting to trade with that country. Participation in international trade typically requires substantial knowledge of foreign countries. Differences in languages, legal systems, distribution networks, preferences and other market characteristics add up to information frictions that firms have to

overcome in order to export or import (Allen, 2014; Bernard et al., 2018; Melitz, 2003). There are different ways to acquire the necessary knowledge of foreign markets, and hiring people with a background from the country in question is presumably one.

Labour market effects of immigration have been a key issue in recent political discussions. One debated aspect is the ability of immigrants to gain employment rather than to be dependent on government support. Immigrants with relatively less knowledge about the host country's institutions, culture and networks often have difficulties finding employment, or they are restricted to jobs that are below their formal qualifications. This is particularly the case in countries with relatively strict labour market regulations, such as high minimum wages, and with generous social insurance schemes (Bratsberg et al., 2010, 2014). As a result, immigrants tend to have considerably lower labour market participation rates and wages than natives (OECD, 2017). Moreover, the labour market participation rate differs substantially between different groups of immigrants and tends to be particularly low for people from developing countries and for refugees. As an example, the employment rate of refugees in the European Union is about nine percentage points lower than for the native population (European Commission, Directorate-General for Employment, Social Affairs and Inclusion, Organisation for Economic Co-operation and Development, 2016).

Sweden is a suitable country when studying the effects of trade on labour market integration. It is not only the paragon of a small open economy—with a trade to GDP ratio of 91%—but also an important host country of immigration and a country with relatively poor labour market integration and relatively strict labour market regulations. Immigrants constitute approximately a fifth of the Swedish population. Their share has almost tripled since 1970. In recent years, Sweden—accounting for 2% of the EU population—has received the second-largest numbers of asylum seekers in the EU. Meanwhile, it takes 8–10 years until half of a cohort of immigrants from a low-income country gain a foothold in the Swedish labour market (Gustafsson et al., 2017). Moreover, and as will be shown below, the employment rate for native Swedes is around 15 percentage points higher than the rate for immigrants.

In this paper, we exploit data on firms and individuals to examine how increased exports and imports at the firm level affect employment and wages of immigrants. Our analysis relies on linked longitudinal employer–employee register data for Sweden across almost two decades. More specifically, we examine information on Swedish firms and their employees in the private sector between 1997 and 2013. These data include detailed information on the characteristics of firms and individuals, such as bilateral foreign trade, gender and education. Importantly, we have register data on the country of birth of individuals and of their parents.

We will examine the causal effect of international trade on immigrants' labour market integration by employing a Bartik-style instrumental variable approach. In the first stage, foreign countries' demand and supply of different products are related to Swedish firms' export and import portfolios, and, in a second stage, firms' exports and imports are related to labour market outcomes of immigrants.

We start by examining whether the employment of immigrants from a particular country is affected by trade with this country, and continue by examining the trade effect on wages for employed immigrants. Moreover, we will examine both the extensive margin of trade (trade with a new country) and the intensive margin (expansion of existing trade relationships). Finally, we will examine possible heterogeneous effects by dividing our sample of immigrants by region of origin, gender and level of education, as well as by dividing our sample of firms by skill intensities, size and ownership. We will also look at the effect of international trade on wages and employment of second-generation immigrants. Finally, we will examine whether

employment of immigrants is more important when formal trade costs and cultural distances are large.

Our results demonstrate a relatively large and robust effect of international trade on employment of immigrants. The effect on the extensive margin is particularly large. More precisely, firms starting to export to or import from a new country exhibit an increase in employment of workers born in that country by close to 200%. Since most firms have very few workers from a specific foreign country, this figure corresponds to hiring 'half' to 'three quarters' of an immigrant, on average, when the firm starts to trade with a new country. Expanding existing trade relationships, the intensive margin, also has a positive, albeit relatively small, effect on employment of immigrants: a 10% increase in exports or imports with a foreign country increases employment of immigrants from this country with between 0.1 and 0.6%. However, we find no effect of increased trade on immigrants' wages. We cautiously interpret the lack of a wage effect as caused by a large pool of immigrants outside the labour force that employers can draw upon.

The effects are heterogeneous across both immigrants and firms. International trade increases employment more for men than for women, and more for European immigrants than for immigrants from more distant regions. Labour demand increases for first-generation immigrants as well as for second-generation immigrants. Interacting trade with trade barriers, we find that trade increases labour demand relatively more when trade is with countries that have high trade barriers. Finally, the employment effect is large in firms employing relatively low-skilled workers, perhaps because such firms lack the necessary competence themselves.

Our study relates and contributes to several different areas in the literature on economic effects of international trade. Most importantly, we contribute to the literature on labour market effects of international trade. It is arguably an important area against the background of recent backlashes against globalisation (Collier, 2018). This expanding literature has examined how firms' import and export affect aspect such as wages (Amiti & Davis, 2012; Borrs & Knauth, 2021; Hummels et al., 2014), matching of firms and workers (e.g. Bombardini et al., 2019; Davidson et al., 2012) and demand for different occupations and skills (e.g. Brencic & Pahor, 2019; Davidson et al., 2017). We add to the literature by examining how firms' import and export affect employment and wages of immigrants. This issue has not received much attention despite its policy relevance and despite indications that trade could have an impact on labour market integration of immigrants. More specifically, a large literature has shown a positive effect of immigrants on international trade to their home countries (e.g. Andrews et al., 2017; Bastos & Silva, 2012; Hatzigeorgiou & Lodefalk, 2016; Hiller, 2013; Olney & Pozzoli, 2021; Parsons & Vezina, 2018).[1] Hence, these studies show a positive effect of migration on international trade, presumably because knowledge of foreign conditions lowers the costs of international trade. The demand for immigrants from a specific country can therefore be expected to increase when the potential for trade with that country is increasing.

One study more related to our take on this issue is Surovtseva (2021) who finds that increased trade positively affects wages and careers of immigrants. The paper uses NAFTA as a positive trade shock between United States and Mexico and China's entry in to the WTO as a positive trade shock between United States and China. In both cases are there an improvement in the labour market for high-skilled immigrants, in particular for immigrants in management positions. Moreover, the effect is larger for immigrant descendants than for first-generation immigrants, arguably because the former group combine origin- and destination-specific knowledge.

[1]For a recent survey of this burgeoning literature, see Hatzigeorgiou and Lodefalk (2021).

Finally, many previous studies have examined the conditions and policies that can increase the labour market participation rate of immigrants. For instance, the initial placement of refugees is important: the local availability of jobs and of jobs requiring the right qualifications has a large impact on labour market outcomes of immigrants (Åslund et al., 2010, 2011; Åslund & Fredrikson, 2009; Åslund & Rooth, 2007; Trapp et al., 2018). Moreover, integration is positively affected by existing local immigrant networks (Damm, 2009) and by well-designed active labour market programmes (Sarvimäki & Hämäläinen, 2016). Again, our contribution here is to look at the effect of international trade.

The rest of the paper is organised as follows. Section 2 describes our data and displays descriptive statistics on immigration and labour market integration in Sweden. Section 3 presents our empirical model and Section 4 our results. Section 5 concludes.

2 | DATA AND DESCRIPTIVE STATISTICS

2.1 | Data and descriptive statistics

We use granular longitudinal employer–employee data for Sweden between 1997 and 2013. The firm-level data set covers Swedish firms in the manufacturing sector with at least 20 employees and includes information on such firm characteristics as size, capital stock, value added and ownership.[2] Moreover, we have firm-level information on exports and imports by country at the eight-digit Combined Nomenclature-level product group. These data cover all trade with countries outside the EU, as well as all trade with EU for firms with annual imports or exports above a certain threshold.[3] Our instrumental variable approach requires firms to be engaged in export and import. Hence, we will follow Hummels et al. (2014) and include only firms with exports and imports under a year. These firms account for roughly 99% of the number of firms engaged in trade (export and/or import) and for 97% of employment in trading firms.[4]

The firms included are rather trade intensive as seen in Table A1 in the appendix. More specifically, the average number of exported goods is 18 and the number of imported goods 26. Moreover, the firms are on average importing from six different countries and exporting to 16. Our final sample constitutes an unbalanced panel data set that includes more than 191,003 firm-year observations and 126,910 employee-year observations. Table A1 in the appendix describes the included variables in our sample of firms and individuals.

We also have data on all Swedish individuals, aged 15 years and older, which we can link to the firm-level data, using unique individual and firm identifiers. The data on individuals include information on gender, education, employment and other characteristics. Most importantly for our study, we have unique and crucial information on which country both the individual and the

[2]Our restriction to manufacturing firms is due to the lack of the global bilateral services trade data necessary for constructing the instruments.

[3]For intra-EU trade, we capture approximately 96% of trade. A firm's annual exports/imports with the rest of the union has to amount to SEK X million to be recorded, with X being 4.5 in the years 2009–2013; 2.2 and 4.5 for imports exports, respectively, in the years 2005–2008; and 1.5 in the years 1997–2004.

[4]Our estimation results are robust to relaxing the restrictions to also include firms that only export or import and to firms that infrequently trade does not affect (Tables S1-S4 of the Online Appendix).

TABLE 1 The largest immigrant countries in Sweden in 2013

	Share of immigrant population (%)
Finland	10.5
Iraq	8.4
Poland	5.1
Former Yugoslavia	4.5
Iran	4.4
Bosnia and Hercegovina	3.7
Somalia	3.5
Germany	3.2
Turkey	3.0
Denmark	2.8
Norway	2.8
Syria	2.7
Thailand	2.4
Chile	1.8
China	1.8
Lebanon	1.6
Afghanistan	1.6
Great Britain	1.5
Romania	1.5
India	1.3
USA	1.2
Russia	1.2
Eritrea	1.1
Vietnam	1.0
Hungary	1.0
Ethiopia	1.0

Source: Statistics Sweden

individual's parents are born in, which enables us to examine the effect of international trade on both first- and second-generation immigrants.

In our last year of analysis, 2013, immigrants accounted for 16% of the Swedish population.[5] There were immigrants from 203 different countries. The 26 countries with at least 1% of the immigrants are listed in Table 1. Immigrants from Finland are the largest group, followed by Iraq and Poland. There is a relatively large heterogeneity of the major immigrant countries, with large shares for many neighbouring countries but also countries in the Middle East and Africa.

[5]The share of immigrants has increased to 19.6% in 2019. This figure can be compared to a mean of around 12.5% in the 28 European Union countries, 17% in the United States (including illegal immigrants), 21% in Canada and 29% in Australia (Connor and Budiman, 2019; Eurostat, 2019; Tabellini, 2020).

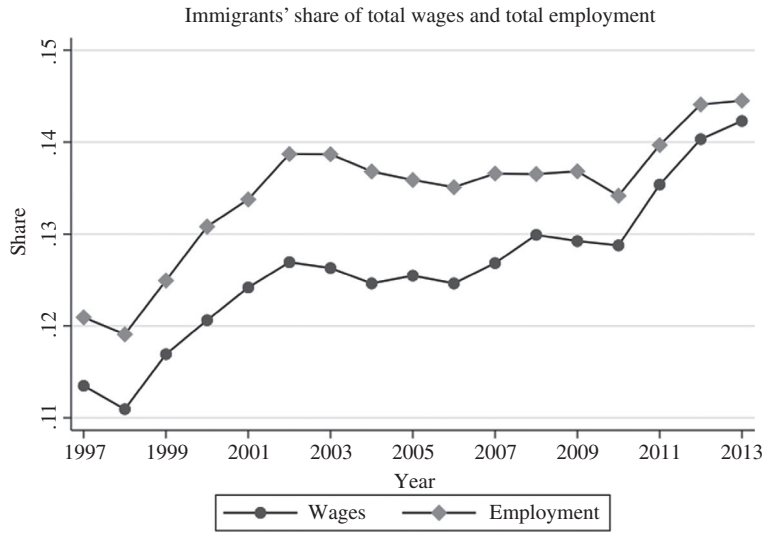

FIGURE 1 The figure displays immigrants' share of total wages (lower line) and total employment (upper line), respectively, in the 1997–2013 period

Figure 1 shows the shares of employment and wages of immigrants in our firm-level sample. The employment share has increased over time: from around 12% in 1997, stabilising at around 13.5% between 2002 and 2010, and has since increased again to about 14.5% in 2013. The wage share of immigrants has developed similarly but is lower than the employment share, consistent with immigrants disproportionately being employed in low-wage jobs.

The labour market participation rate differs between natives and immigrants, as mentioned in the introduction. There is an employment gap of around 15 percentage points as seen in Figure 2, which shows the employment rate for people from 15 years of age. The employment rate for natives is relatively constant at close to 70% throughout the period. The employment rate for immigrants increased in the first years but later stabilising at around 55%.

The employment rates also differ between individuals with different skills. We have, in Figure 2, divided our population by education, where high skill is defined as completed post-secondary education. The employment rate of high-skilled immigrants is close to 70%, or at about the same level as the average employment rate for native-born people. The employment rate for high-skilled natives is around 81%. Hence, the employment gap between natives and immigrants is lower for high-skilled people than for the population in general, but it is also clear that differences in education cannot alone explain the differences in employment rates.

The employment figures and wages differ also between different immigrant groups, as seen in Table 2. Immigrants from Europe account for more than 50% of the total, immigrants from Asia for around 31%, and Africa around 9%. Employment and wages for different groups of immigrants are shown as ratios with employment and wages for native Swedes. The employment rate is highest among immigrants from South America and lowest among immigrants from Africa. There is also a large difference in wages for employed individuals. The highest wages are for immigrants from North America, whose wages are 4% higher than wages for natives. Immigrants from Africa have the lowest wages: 70% of the average wage for natives.

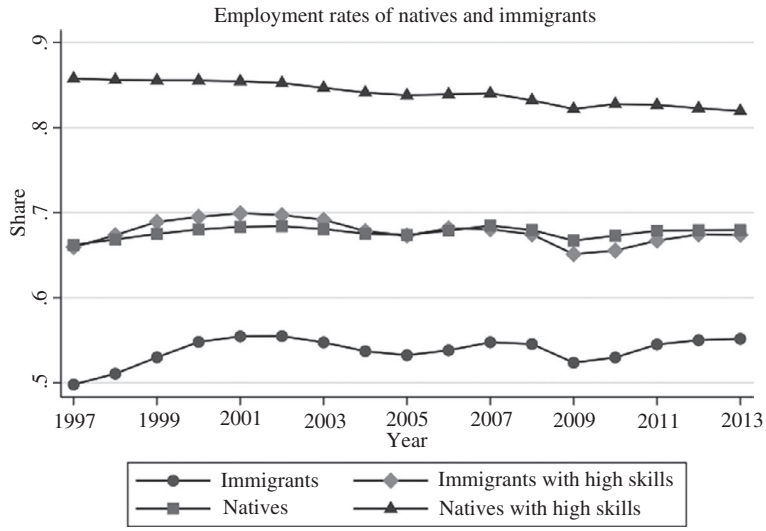

FIGURE 2 The figure displays employment rates of immigrants and natives, both overall, and for immigrants and natives with high skills (having post-secondary education) in the 1997–2013 period

TABLE 2 Labour market characteristics of immigrants from different regions, 2013

Region of origin	Share of total immigrants	Employment rate	Wage rate
Europe	0.530	0.545	0.963
Asia	0.308	0.545	0.769
Africa	0.091	0.517	0.699
South America	0.045	0.699	0.847
North America	0.022	0.622	1.044

Notes: Population of foreign-born who are ≥15 years of age. Wage rate is calculated as the average wage for employed persons from a region divided by the average wage for native-born employed persons.

3 | EMPIRICAL SPECIFICATION

3.1 | Estimating equation

We want to examine how international trade affects employment and wages of immigrants. To assess this issue, we estimate an equation were employment and wages of immigrants are related to firms' export and import. For employment, the log of firm *j*'s employment of immigrants from country *k* at time *t*, L_{jkt}, is related to the log of firm's export to, and import from, country *k* at time *t*, X_{jkt} and M_{jkt}, respectively, and a set of controls and fixed effects,

$$L_{jkt} = \beta_X X_{jkt} + \beta_M M_{jkt} + \mathbf{Z}_{jt}\boldsymbol{\beta}_{\mathbf{Z}} + \mathbf{D}_{ht}\boldsymbol{\beta}_{\mathbf{ht}} + \mathbf{D}_{jk}\boldsymbol{\beta}_{\mathbf{j}}\mathbf{k} + \varepsilon_{jkt}. \quad (1)$$

Our main interest is the coefficients for export, β_X, and import, β_M. It is likely that unobserved time-invariant firm-country factors will have an impact on export and import. We control for this by including firm-country fixed effects, $\mathbf{D}_{jk}$. Moreover, it is also possible that differences between industries affect employment. It could for instance be industry differences in technology or how

industries are affected by macroeconomic shocks that affect employment of immigrants. We therefore include industry-year fixed effects, $\mathbf{D}_{ht}$, to control for such time- and industry-variant differences.

Finally, we include firm characteristics that may affect employment: $\mathbf{Z}_{jt}$ is a vector of variables, including size (total sales), capital intensity (capital–labour ratio), skill intensity (share of employees with post-secondary education), firm age and a dummy variable for being a multinational firm.[6] ε_{jkt} is a firm-country-period i.i.d. error term.

Our estimations for wages will follow the same approach as above. We relate the log wage of an individual i from country k employed at firm j at time t, W_{jkt}, to the employer's log export to and import from country k, X_{jkt} and $M_{jkt,}$ respectively, and a set of controls and fixed effects,

$$W_{ijkt} = \beta_X X_{jkt} + \beta_M M_{jkt} + \mathbf{Y}_{it}\boldsymbol{\beta}_{\mathbf{Y}} + \mathbf{Z}_{jt}\boldsymbol{\beta}_{\mathbf{Z}} + \mathbf{D}_{ht}\boldsymbol{\beta}_{\mathbf{ht}} + \mathbf{D}_{ij}\boldsymbol{\beta}_{\mathbf{ij}} + \varepsilon_{ijkt}. \quad (2)$$

As in Equation 1, we will focus our attention on the coefficients for export, β_X, and import, β_M. The main difference between the wage and employment equations is that the wage equation will be estimated at the worker and not the firm level. Thus, we include the same firm characteristics and industry-year fixed effects as in Equation 1. In addition, we control for worker characteristics likely to affect wages: $\mathbf{Y}_{it}$ is a vector of variables, including marital status, work experience and its square term.[7] Moreover, when analysing wages, we pay attention to the possibility that unobserved worker-firm characteristics, such as a worker's job-specific human capital, can affect the wages, this by including a job-spell fixed effect, $\mathbf{D}_{ij}$, (e.g. Abowd et al., 1999).[8] Finally, ε_{ijkt} is a worker-firm-country-period i.i.d. error term.

The effect on demand for immigrants might be larger for firms starting to trade with a new country compared to firms that expand existing trade with a country. We will therefore examine both the extensive and intensive margins of trade, where the former captures the effect of new trade and the latter captures changes in existing trade flows. New trade is defined as trade with a new country.

3.2 | Instruments

One methodological challenge is that export and import might be endogenous. There might, for instance, be reverse causality from the presence of immigrants to international trade: immigrant employees might affect the trade shares to different countries. Moreover, although we control for various firm and individual characteristics, it is still possible that some unobserved factors may affect both the employment of immigrants and exports to these countries. One such factor could, for instance, be the acquisition of Swedish firms by foreign owners. Hence, our estimates might be biased by a possible endogeneity problem arising from reverse causality or omitted variables.

[6]All continuous variables are in log.

[7]See the previous footnote.

[8]The approach also controls for time-invariant characteristics at the level of the firm and the individual, for example gender.

We will approach the possible endogeneity problem by using an instrumental variable strategy with a Bartik-style instrument that is correlated with bilateral exports (imports) of Swedish firms but uncorrelated with the employment of immigrants and their wages. We follow the approach of Hummels et al. (2014) and construct our instrument for export demand as the level of foreign countries' imports of different products combined with the share of these products in the Swedish firm's export portfolio. In other words, we will construct an instrument that captures the time varying demand of different goods in different countries that specific firms encounter.

More specifically,

$$XD_{jkt} = \sum_{g=1}^{n} c_{jgkt} M_{gkt}, \tag{3}$$

where XD_{jkt} is the level of export demand that firm j encounters from country k at time t, c_{jgkt} is the share of product g in firm j's exports to country k at time t,[9] and M_{gkt} is country k's log of total import from the world (excluding import from Sweden) of product g at time t.[10] Hence, the variable XD_{jkt} captures country k's demand for products that are in the firm's bilateral export portfolio. The resulting variation across firms in export demand, XD_{jkt}, is caused by differences in firms' export portfolios, c_{jgkt}, which means that firms are differently exposed to world demand of different goods.

The construction of our instrument for imports follows the approach above and can be expressed as:

$$MS_{jkt} = \sum_{g=1}^{n} d_{jgkt} X_{gkt}, \tag{4}$$

where MS_{jkt} is the level of import supply that firm j encounters from country k at time t, d_{jgkt} is the share of product g in firm j's imports from country k at time t, and X_{gkt} is country k's log of total export to the world (excluding export to Sweden) of product g at time t.[11]

Again, the two instruments are time varying and firm-country specific. Variation over time and between firms is caused by different export (import) portfolios of firms and by different levels in export demand (import supply) of different products in different countries. At the same time, the levels of export (import) demand (supply) are external to Swedish firms and unlikely to be correlated with unobserved firm characteristics that may affect the firm-level labour mix.

The weights in Equations 3 and 4 are endogenous to changes in firms' engagement in international trade. We approach this problem by using fixed weights from the pre-sample period, specifically, year 1997.[12] A drawback, however, is that such an approach means that the introduction of new products will decrease the power of the instruments, since this change in the export

[9]Formally, $c_{jgkt} = \frac{EXP_{jgkt}}{\sum_{g=1}^{n} EXP_{jgkt}}$, with EXP being the export value.

[10]Formally, $M_{gkt} = \sum_{p=1}^{n-1} IM_{gktp} - IM_{gktp_{p=SE}}$, where IM is import value, p trade partner country of country k, and SE the country code for Sweden.

[11]Our definitions of d_{jgkt} and X_{gkt} are identical to their corresponding terms in Equation 3, but now concerning firm import shares and country exports, respectively.

[12]Throughout, regressions are run on the 1998–2013 sample.

(import) portfolio will not be captured by the weights from the pre-sample period (Davidson et al., 2017). We will, therefore, use weights lagged 1 year, $t-1$, as an alternative specification. As will be shown below, our results are robust regarding the choice of weights.

To analyse how employment and wages are impacted by expansion of firms' bilateral trade at the extensive margin, we apply an almost identical strategy as in Equations 3 and 4. The main difference is that at the extensive margin, the response variables are instead the Swedish firm j's status as an exporter, (1,0), or importer, (1,0), visavi country k at time t, this rather than the firm's export and import values, respectively. In addition, to study trade expansion at the extensive margin, we need to rectangularise the data set. We thereby allow firms to enter into new firm-product-country trade relationships. As expected, the resulting data set is consequently markedly larger than the one used when studying expansion along the intensive margin of trade.

Data on bilateral imports and exports at the product level are available from the UN Comtrade database. The products are at an six-digit HS level.[13] Note, again, that trade with Sweden is not included when we construct our measures on imports and exports of different products in different countries.

4 | RESULTS

4.1 | Main results

In Table 3, we present our main results for the extensive margin of trade, estimating Equation 1: the effect of trade with new countries on employment of immigrants. The first three columns show that OLS gives statistically significant coefficient estimates for both imports and exports. Our preferred estimations in Columns (4–6) control for a possible endogeneity between immigrant employees and trade by using the instruments described above. They are also controlling for unobservable characteristics by including industry-year and firm-country fixed effects. The instruments are highly significant and have the expected signs: an increase in a country's demand increases Swedish exports to this country, and an increase in a country's supply increases Swedish imports from this country. Finally, the instruments are found to be valid, with the F-statistics allowing us to reject the null hypotheses of weak partial correlations between the instruments and the trade variables.[14]

Moreover, we note that our IV estimates are in line with the OLS estimates, with both showing a large effect of international trade on employment of immigrants. The export variable, in particular, is, however, relatively unstable and changes dramatically when we also include the import variable. The reason is a high correlation between imports and exports at the extensive margin. Judging from the coefficients in Column (6), export to a new country increases employment of immigrants from that country by 189%. The effect of import from a new country is slightly larger at 199%. The average number of immigrant workers from a specific country j is approximately 0.23 and 0.37 in year $t-1$ for firms starting to export and import in year t. Hence, the estimated coefficients approximately correspond to hiring

[13]Firms' eight-digit CN-level trade portfolios have therefore been aggregated to the six-digit HS level.

[14]The full set of IV-statistics, and a test of the exogeneity of the instruments (combining the Bartik-approach and tariffs as instruments), are available in Tables S5-S10 of the Online Appendix.

TABLE 3 The effect of international trade on the employment of immigrants—Extensive margin

Panel A: OLS second stage	**OLS**			**FE-IV**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Export status (Dummy)	1.592***		0.552***	6.169***		1.888***
	(0.016)		(0.007)	(0.092)		(0.248)
Import status (Dummy)		2.858***	2.474***		2.936***	1.988***
		(0.028)	(0.025)		(0.044)	(0.121)
log(sale)	0.0616***	0.0573***	0.0513***	−0.00175	0.0117***	0.00772***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
log(physical capital stock)	0.0143***	0.0177***	0.0165***	−0.00284***	0.00336***	0.00148**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Share post-sec. edu.	0.174***	0.201***	0.129***	−0.0600***	−0.0385*	−0.0453**
	(0.015)	(0.014)	(0.014)	(0.020)	(0.020)	(0.020)
log(firm age)	−0.00245***	−0.00231***	−0.00179***	0.00255	−0.00469	−0.00251
	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.003)
Multinational status	−0.0319***	−0.0130***	−0.0281***	−0.0143***	−0.00105	−0.00500**
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
log(labour productivity)	−0.0180***	−0.0141***	−0.0143***	0.000264	−0.0000512	0.0000500
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Observations	4,495,327	4,495,327	4,495,327	4,301,307	4,301,307	4,301,307
Adjusted R^2	.108	.195	.203	.729	.728	.729

Panel B: first stage	**Export status (Dummy)**		**Import status (Dummy)**	
	(1)	**(2)**	**(3)**	**(4)**
log (world import demand)	0.015***	0.031***		0.002***
	(0.0001)	(0.0003)		(0.0003)

(Continues)

TABLE 3 (Continued)

Panel B: first stage	Export status (Dummy)		Import status (Dummy)	
	(1)	(2)	(3)	(4)
log (world export supply)		−0.0002***	0.032***	0.014***
		(0.001)	(0.0001)	(0.0003)
F-statistic for instruments	2602.67	2512.68	2464.49	2124.30
Observations	4,301,307	4,301,307	4,301,307	4,301,307
Adjusted R^2	.753	.874	.842	.754

Notes: Dependent variable: Log of no. of workers born in country *j*. Standard errors are in parentheses and clustered at firm-country level. All specifications besides OLS include industry-year and firm-country fixed effects. For the first-stage IV regressions in panel B, the dependent variable is firm-country trade status and only excluded instruments are reported.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 4 The effect of international trade on the employment of immigrants—Intensive margin

Panel A: OLS second stage	**OLS**			**FE-IV**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
log(export value)	0.385***		0.294***	0.105***		0.0654*
	(0.011)		(0.010)	(0.032)		(0.034)
log(import value)		0.417***	0.354***		0.136***	0.129***
		(0.010)	(0.010)		(0.027)	(0.028)
log(sale)	0.828***	0.854***	0.735***	0.252***	0.279***	0.268***
	(0.039)	(0.039)	(0.036)	(0.049)	(0.053)	(0.056)
log(physical capital stock)	0.140***	0.152***	0.126***	0.0608***	0.0604***	0.0572***
	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
Share post-sec. edu.	0.0394	0.833***	0.723***	0.292	0.440	0.443
	(0.232)	(0.233)	(0.226)	(0.542)	(0.544)	(0.549)
log(firm age)	−0.0236***	−0.0254***	−0.0255***	−0.0155	−0.0174	−0.0148
	(0.002)	(0.002)	(0.002)	(0.030)	(0.030)	(0.030)
Multinational status	−0.293***	−0.121*	−0.235***	0.0653	0.0793	0.0657
	(0.063)	(0.063)	(0.062)	(0.057)	(0.057)	(0.057)
log(labour productivity)	−0.129***	−0.116***	−0.120***	−0.00904	−0.00837	−0.00894
	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)
Observations	191,003	191,003	191,003	126,315	125,337	124,312
Adjusted R^2	.134	.144	.158	.807	.808	.808

(Continues)

TABLE 4 (Continued)

Panel B: first stage	**log(export value)**		**log(import value)**	
	(1)	**(2)**	**(3)**	**(4)**
log (world import demand)	0.340***	0.335***		0.049***
	(0.007)	(0.007)		(0.006)
log (world export supply)		0.030***	0.292***	0.288***
		(0.003)	(0.005)	0.005
F-statistic for instruments	429.75	375.87	429.81	484.81
Observations	126,315	124,312	125,337	124,312
Adjusted R^2	.802	.842	.757	.758

Notes: Dependent variable: Log of no. of workers born in country *j*. Standard errors are in parentheses and clustered at firm-country level. All specifications besides OLS include industry-year and firm-country fixed effects. For the first-stage IV regressions in panel B, the dependent variable is firm-country log of trade values and only excluded instruments are reported.

*$p < .10$, **$p < .05$, ***$p < .01$.

between 0.5 and 0.75 immigrant workers. Looking at the other explanatory variables, we can see that large and capital-intensive firms employ more migrants, whereas low-skilled and multinational firms employ fewer.

In Table 4, we display the main results for the intensive margin of trade, estimating Equation 2: whether the expansion of existing trade relationships has an effect on employment of migrants. We do find such an effect. A 10% increase in exports to a specific country increases employment of immigrants from that country by somewhere between 0.6% and 1% according to the IV estimates. Moreover, a 10% increase in imports from a specific country increases employment by around 1.3%. Hence, the effect of import is larger than the effect of export.

It is of interest from a policy perspective to understand whether the increased employment of immigrants comes from an expansion of the total labour force or from replacing native workers with immigrant workers. We therefore performed a number of additional estimations to further understand the mechanism at work. The results are shown in Table A3 in the appendix. We started by using employment of native workers as dependent variable (Columns 1 and 3). We would expect a negative effect on native workers if they are replaced by immigrant workers. This is not the case: trade has a positive effect also on native workers, which is perhaps not surprising if export increases production. We then continued and examined whether the employment growth of immigrant workers is higher than that of native workers by using the share of immigrant workers as a dependent variable (Columns 2 and 4). Trade at the extensive margin has a positive effect on the share of immigrants, suggesting that trade with a new country raises employment of immigrant workers more than it raises employment of native workers. Trade at the intensive margin does not seem to have more of an effect on immigrants than on native workers.

We continue our analysis by examining the effects of increased trade on wages. Results from individual-level estimations are seen in Table 5 for the extensive margin of trade and in Table 6 for the intensive margin of trade. The first three columns display the OLS estimates and Columns (4–6) the IV estimates. The instruments are, again, shown to be relevant and statistically significant as well as to have the expected signs.

There are no clear signs of an effect of international trade on immigrant workers' wages. Some of the estimated coefficients are statistically significant, but the sign sometimes differs between specifications. Moreover, all of the coefficients are relatively small. For instance, the (insignificant) point estimates suggest that a 10% increase in exports at the extensive margin increases wages by around 0.03%, according to the IV estimates, and the effect of a 10% increase in imports is around 0.1%. The corresponding (insignificant) estimates for the intensive margin of trade are 0.06% for export and a negative effect for import.[15]

The results above suggest that international trade has a relatively large positive effect on demand for immigrants but no effect on immigrant wages. However, the estimates would only capture wage increases for migrant workers already employed by the firm, not for the new hires made as labour demand increases because of trade. These new workers might, of course, increase their wages, when moving to the new positions firms, this compared to their old wages.

[15]We find even less effect on natives' wages from an expansion of trade. At the intensive margin, coefficients are virtually zero and statistically insignificant (results available upon request).

TABLE 5 The effect of international trade on wages of immigrants—Extensive margin

Panel A: second stage	OLS			FE-IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Export status (Dummy)	0.0193**		0.0096**	0.0046		0.0026
	(0.008)		(0.005)	(0.003)		(0.002)
Import status (Dummy)		0.0190**	0.0081		0.0101	0.0098
		(0.008)	(0.008)		(0.007)	(0.020)
Experience	0.115***	0.115***	0.115***	0.0105	0.0275*	0.0261*
	(0.002)	(0.002)	(0.002)	(0.038)	(0.014)	(0.014)
Experience square	−0.00167***	−0.00167***	−0.00167***	−0.00134	−0.00204***	−0.00194***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
Married (D)	0.0554***	0.0554***	0.0554***	−0.0782*	−0.0596***	−0.0622***
	(0.007)	(0.007)	(0.007)	(0.045)	(0.020)	(0.020)
log(employment)	0.0253***	0.0253***	0.0253***	−0.186	0.223	0.146
	(0.004)	(0.004)	(0.004)	(0.880)	(0.145)	(0.119)
log(physical capital stock)	0.00609**	0.00609**	0.00609**	0.0318	0.0135	0.0140
	(0.002)	(0.002)	(0.002)	(0.049)	(0.011)	(0.012)
Share post-sec. educ.	0.442***	0.442***	0.442***	0.216	0.106	0.162
	(0.027)	(0.027)	(0.027)	(0.443)	(0.338)	(0.325)
log(firm age)	0.0132***	0.0132***	0.0132***	−0.0895	0.0453	−0.00198
	(0.000)	(0.000)	(0.000)	(0.224)	(0.082)	(0.065)
Multinational status(D)	−0.00233	−0.00233	−0.00233	0.0154	−0.000946	−0.00374
	(0.010)	(0.010)	(0.010)	(0.057)	(0.034)	(0.034)
log(labour productivity)	0.00414***	0.00414***	0.00414***	0.00203	0.00836**	0.00612**
	(0.001)	(0.001)	(0.001)	(0.011)	(0.003)	(0.003)

TABLE 5 (Continued)

Panel A: second stage	**OLS**			**FE-IV**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Observations	171,838	171,838	171,838	70,617	69,863	69,698
Adjusted R^2	.090	.090	.090	.570	.571	.572

Panel B: first stage	**Export status (Dummy)**		**Import status (Dummy)**	
	(1)	**(2)**	**(3)**	**(4)**
log (world import demand)	0.615***	0.560***		0.068***
	(0.012)	(0.012)		(0.011)
log (world export supply)		0.020***	0.431***	0.533***
		(0.006)	(0.013)	(0.013)
F-statistic for instruments	10.21	10.54	12.1	10.80
Observations	70,617	69,698	70,617	69,698
Adjusted R^2	.585	.595	.570	.595

Notes: Dependent variable: Log of labour income. Standard errors are in parentheses and clustered at individual-country level. All specifications besides OLS include job-spell and industry-year fixed effects. For the first-stage IV regressions in panel B, the dependent variable is firm-country trade status and only excluded instruments are reported.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 6 The effect of international trade on wages of immigrants—Intensive margin

Panel A: OLS second stage	**OLS**			**FE-IV**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
log(export value)	0.0238***		0.0142***	0.0074		0.0055
	(0.002)		(0.002)	(0.012)		(0.013)
log(import value)		0.0204***	0.0160***		−0.00341	−0.00286
		(0.001)	(0.001)		(0.007)	(0.008)
Experience	0.128***	0.128***	0.128***	0.0708***	0.0736***	0.0730***
	(0.002)	(0.002)	(0.002)	(0.013)	(0.013)	(0.013)
Experience square	−0.00192***	−0.00192***	−0.00192***	−0.00201***	−0.00202***	−0.00201***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married(D)	0.0847***	0.0891***	0.0884***	−0.0658***	−0.0695***	−0.0671***
	(0.010)	(0.010)	(0.010)	(0.017)	(0.018)	(0.018)
log(employment)	−0.0103*	−0.00193	−0.0119**	0.0617	0.0819**	0.0686
	(0.006)	(0.005)	(0.006)	(0.048)	(0.041)	(0.048)
log(physical capital stock)	0.00687**	0.00737**	0.00588*	−0.00392	−0.00244	−0.00310
	(0.003)	(0.003)	(0.003)	(0.008)	(0.008)	(0.008)
Share post-sec. educ.	0.466***	0.507***	0.498***	0.200	0.187	0.188
	(0.037)	(0.037)	(0.037)	(0.259)	(0.267)	(0.265)
log(firm age)	0.0106***	0.0108***	0.0107***	−0.00867	−0.00979	−0.00926
	(0.001)	(0.001)	(0.001)	(0.008)	(0.008)	(0.008)
Multinational status(D)	0.0265*	0.0372**	0.0322**	−0.0159	−0.0205	−0.0171
	(0.015)	(0.015)	(0.015)	(0.024)	(0.023)	(0.024)

TABLE 6 (Continued)

Panel A: OLS second stage	**OLS**			**FE-IV**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
log(labour productivity)	0.00279**	0.00285**	0.00253**	0.00335*	0.00325	0.00316
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Observations	126,910	126,910	126,910	82,478	81,669	81,476
Adjusted R^2	.077	.078	.078	.573	.573	.573

Panel B: first stage	**log (export value)**		**log (import value)**	
	(1)	**(2)**	**(3)**	**(4)**
log (world import demand)	0.475***	0.462***		0.054***
	(0.012)	(0.012)		(0.011)
log (world export supply)		0.018***	0.431***	0.433***
		(0.006)	(0.013)	(0.013)
F-statistic for instruments	184.42	161.59	134.56	129.71
Observations	82,478	81,476	81,669	81,476
Adjusted R^2	.900	.904	.868	.867

Notes: Dependent variable: Log of labour income. Standard errors are in parentheses and clustered at individual-country level. All specifications besides OLS include job-spell and industry-year fixed effects. For the first-stage IV regressions in panel B, the dependent variable is firm-country log of trade values and only excluded instruments are reported.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 7 Worker heterogeneity (occupation, generation and gender)—Extensive margin

	Occupation			Second-generation immigrants	Gender	
	(1)	(2)	(3)	(4)	(5)	(6)
	Managers	Professionals	Other		Males	Females
Export status (Dummy)	0.406***	0.374***	0.127***	1.780***	0.460	0.396*
	(0.109)	(0.111)	(0.032)	(0.108)	(0.238)	(0.184)
Import status (Dummy)	0.230**	0.271***	0.100***	1.941***	0.311*	0.203
	(0.082)	(0.077)	(0.019)	(0.103)	(0.153)	(0.122)
Control variables	Included	Included	Included	Included	Included	Included
Observations	4,301,307	4,301,307	4,301,307	4,301,307	4,301,307	4,301,307
Adjusted R^2	.647	.648	.976	.973	.805	.789

Notes: FE-IV estimations. Dependent variable: No. of workers born in country *j*. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 8 Worker heterogeneity (occupation, generation and gender)—Intensive margin

	Occupation			Second-generation immigrants	Gender	
	(1)	(2)	(3)	(4)	(5)	(6)
	Managers	Professionals	Other		Males	Females
log(export value)	0.081***	0.111***	0.025***	0.0411***	0.035	0.050
	(0.014)	(0.013)	(0.003)	(0.008)	(0.032)	(0.026)
log(import value)	0.050***	0.062***	0.017***	0.019***	0.114***	0.071***
	(0.012)	(0.010)	(0.003)	(0.007)	(0.026)	(0.022)
Control variables	Included	Included	Included	Included	Included	Included
Observations	124,311	124,311	124,311	124,311	124,311	124,311
Adjusted R^2	.973	.983	.968	.830	.808	.790

Notes: FE-IV estimations. Dependent variable: No. of workers born in country *j*. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 9 Worker heterogeneity (regions)—Extensive margin

	Africa	Asia	Europe	North America	South America
Export status (Dummy)	0.119	0.246***	0.359***	0.296***	0.436
	(0.244)	(0.087)	(0.054)	(0.086)	(0.249)
Import status (Dummy)	0.235	0.186***	0.178***	0.103	0.273*
	(0.181)	(0.063)	(0.028)	(0.054)	(0.132)
Control variables	Included	Included	Included	Included	Included
Observations	1,033,065	976,716	920,367	488,358	225,396
Adjusted R^2	.967	.982	.971	.986	.985

Notes: FE-IV estimations. Dependent variable: Log of No. of workers born in region *m*. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

Another reason for a lack of a wage effect could be that although international trade make immigrant workers more important for firms, the supply of immigrants is large enough to keep wages at bay. For example, a pool of immigrants outside of the labour force can put a downward pressure on immigrant worker wages. We think this is a plausible explanation for the lack of a wage effect. As discussed previously, the employment rate in Sweden is substantially lower for immigrants than for native-born citizens, which supports the possibility that a pool of underutilised immigrants have a tendency to put a downward pressure on immigrant wages.

4.2 | Heterogeneous effects

We continue our analysis by examining if the effect on employment differs between different types of immigrants (Tables 7 and 8), countries (Tables 9–12) and firms (Tables 13 and 14).

TABLE 10 Worker heterogeneity (regions)—Intensive margin

	Africa	Asia	Europe	North America	South America
log(export value)	0.007*	0.033***	0.058***	0.040**	0.046
	(0.032)	(0.010)	(0.006)	(0.011)	(0.025)
log(import value)	0.004	0.033**	0.038***	0.033*	0.059
	(0.052)	(0.010)	(0.004)	(0.012)	(0.024)
Control variables	Included	Included	Included	Included	Included
Observations	1427	16,584	89,636	10,977	1978
Adjusted R^2	.978	.972	.970	.964	.978

Notes: FE-IV estimations. Dependent variable: Log of No. of workers born in region *m*. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

The results are relatively stable between OLS and IV, and therefore, we only display the IV results below.

4.2.1 | Workers

One might assume that increased trade would have a particularly positive effect on skilled immigrants, who are well suited to engage in cross-country business ventures. We therefore started by dividing immigrants according to skills, measured by level of education. There was, perhaps surprisingly, no difference between different skill groups.[16] One potential source of bias is that foreign education is self-reported by immigrants rather than reported by foreign authorities to one of the Swedish data registers.[17] We therefore instead turn to an alternative measure of qualifications, namely the type of occupations of the immigrant employees. The results are presented in the first three columns of Tables 7 and 8. Here, we do find a positive effect on all three groups of occupations, both from trade at the extensive and intensive margin, and both from import and export. As expected, the effect is larger for professionals and managers than for less-qualified occupations.

We continue by examining the effect of international trade on employment of second-generation immigrants. One would expect that knowledge of foreign countries will be passed on to children of immigrants. On the one hand, therefore, it seems reasonable to expect the second-generation immigrants to have more knowledge than natives on the foreign countries but less knowledge than first-generation immigrants. On the other hand, second-generation immigrants are expected to be better integrated into the host country than their parents and this is arguably likely to promote both their employment and their ability to convey knowledge about foreign countries to their employers. Ultimately, it is therefore an empirical question whether or not their combination of foreign and domestic knowledge will show up in employment patterns.

[16]The results are available upon request.

[17]More exactly, immigrants self-report the highest level of education they have achieved before immigrating to Sweden. If the immigrant later is educated in Sweden, this will be registered as the immigrant's highest level of education.

TABLE 11 Country heterogeneity (trade barriers)—Extensive margin

	Freedom to trade	Non-tariff barriers	Trade costs	Cultural distance	Communication ease
	(1)	(2)	(3)	(4)	(5)
ey/dx w.r.t Export status (Dummy)	−0.203***	−0.216***	0.132	0.308***	0.462***
	(0.068)	(0.010)	(0.084)	(0.008)	(0.101)
ey/dx w.r.t Import status (Dummy)	−0.249***	−0.483***	−0.369	−0.612***	−0.312
	(0.014)	(0.100)	(0.310)	(0.112)	(0.302)
Export status (D)*	−0.290***				
log(trade freedom)	(0.082)				
log(import value)*	0.106				
log(trade freedom)	(0.201)				
Export status (D)*		−0.132***			
log(non-tariff barriers)		(0.024)			
log(import value)*		0.102			
log(non-tariff barriers)		(0.312)			
Export status (D)*			0.119		
log(trade costs)			(0.244)		
log(import value)*			0.185***		
log(trade costs)			(0.052)		
Export status (D)*				−0.213	
log(cultural distance)				(0.282)	
log(import value)*				0.162	
log(cultural distance)				(0.266)	
Export status (D)*					0.023
log(communication ease)					(0.030)
log(import value)*					−0.034
log(communication ease)					(0.030)
Control variables	Included	Included	Included	Included	Included
Observations	3,106,310	2,765,312	3,004,342	2,910,876	3,100,206
Adjusted R^2	.678	.712	.879	.856	.779

Notes: FE-IV estimations. Dependent variable: Log of no. of workers born in country *j*. The export and import variables interact with the different variables stated in the column headline. Trade freedom: index (0–100), where higher values correspond to freer trade. Non-tariff barriers: index (0–10), where higher values correspond to lower barriers. See the definitions of other trade-obstacle variables in Table A2. All specifications in Columns (1–3) include industry-year and firm-country fixed effects. Industry-year and firm fixed effects are included in the specifications of Column (4) and Column (5). Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

Column (4) in Tables 9 and 10 suggests that also second-generation immigrants have knowledge relevant for firm trade. Increased trade, both at the extensive and intensive margin, increases employment of second-generation immigrants. Moreover, the estimates suggest that the employment effect of international trade is roughly as large on second- as on first-generation immigrants. We cautiously interpret these results as indicating that international trade promotes the hiring of immigrants, irrespective of their foreign-Sweden experience mix (either having first-hand knowledge of the foreign country or having second-hand knowledge of the foreign country and grown up in Sweden).

The next two columns examine the effect by gender. Some of the coefficients are not statistically significant, but the overall results suggest that employment of both immigrant men and women increases with trade, and, with one exception, the effect is slightly larger for men than for women. One possible explanation for the larger impact on immigrant men is that they are likely to have more foreign work experience. The reason is that in many countries, men tend to participate more in the labour market than do women. More foreign work experience could make immigrant men more attractive than immigrant women to firms wanting to hire immigrants to access those foreign markets. Another possible explanation, suggested in the literature, is that firms engaged in trade prefer to hire men since women are seen as being less flexible when it comes to working hours, and such flexibility is particularly important in firms engaged in cross-border trade (Bøler et al., 2018).

4.2.2 | Countries

The various hurdles for trade might be expected to differ between countries (Arkolakis, 2010). For instance, it is possible that countries at a large physical or cultural distance from Sweden or countries with a relatively regulated trade regime might require greater effort and more investment for firms wanting to trade with this country. It is then possible that the employment effects are larger for trade with such countries.

Our first take on this issue is by looking at international trade with different regions in Tables 9 and 10. There is no sign that trade with more distant regions has a large effect. For instance, the largest employment effect is seen for trade with physically and culturally close Europe (and not-so-culturally close South America). Moreover, trade with distant Africa and Asia has a relatively low effect on employment. It might be interesting to note that the effect is low for employment of immigrants from Africa, the region whose immigrants have the lowest degree of labour market integration, as seen in Table 2. That trade increases employment the most for European immigrants might seem somewhat surprising. However, we consider it consistent with Swedish manufacturing firms being both overrepresented in high-technological production, whose products are relatively exposed to informational frictions to trade due to their heterogeneous and contract-intensive nature, and trading the most with other EU countries. When these firms export to other EU countries, they can therefore be expected to be exposed to relatively high trade frictions, and benefit especially much from having immigrants employed.

Whereas the estimations in Tables 9 and 10 capture a variety of time-variant cultural and socio-economic factors, our first three estimations in Tables 11 and 12 focus more on differences in actual trade costs. Each column reports results reflecting export and import variables with country-specific variables on the ease and costs of international trade.

More specifically, our interaction variables in Columns (1–3) include formal trade barriers such as tariffs, non-tariff barriers and a top-down measure of trade costs. The first two variables

TABLE 12 Country heterogeneity (trade barriers)—Intensive margin

	Freedom to trade	Non-tariff barriers	Trade costs	Cultural distance	Communication ease
	(1)	(2)	(3)	(4)	(5)
ey/dx w.r.t log(export value)	−0.086**	−0.168**	0.033	0.034***	0.031***
	(0.032)	(0.080)	(0.084)	(0.008)	(0.010)
ey/dx w.r.t log(import value)	−0.049	−0.176	−0.269	−0.012**	−0.024***
	(0.044)	(0.154)	(0.315)	(0.006)	(0.008)
log(export value)*	−0.028**				
log(trade freedom)	(0.010)				
log(import value)*	0.004				
log(trade freedom)	(0.011)				
log(export value)*		−0.053***			
log(non-tariff barriers)		(0.008)			
log(import value)*		0.036			
log(non-tariff barriers)		(0.046)			
log(export value)*			−0.013		
log(trade costs)			(0.030)		
log(import value)*			0.016*		
log(trade costs)			(0.005)		
log(export value)*				−0.002	
log(cultural distance)				(0.005)	
log(import value)*				0.006	
log(cultural distance)				(0.006)	
log(export value)*					0.002
log(communication ease)					(0.001)
log(import value)*					−0.002
log(communication ease)					(0.002)
Control variables	Included	Included	Included	Included	Included
Observations	80,676	79,892	80,430	111,453	89,885
Adjusted R^2	.822	.690	.822	.883	.897

Notes: FE-IV estimations. Dependent variable: Log of no. of workers born in country *j*. The export and import variable are interacted with the different variables stated in the column headline. Trade freedom: index (0–100), where higher values correspond to freer trade. Non-tariff barriers: index (0–10), where higher values correspond to lower barriers. See the definitions of other trade-obstacle variables in Table A2 and A3. FE-IV estimations. All specifications in Columns (1–3) include industry-year and firm-country fixed effects. Industry-year and firm fixed effects are included in the specifications of Column (4) and Column (5). Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 13 Firm heterogeneity—Extensive margin

	Firm skill level		Firm size			Firm ownership		Multinational status	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	High skilled	Low skilled	Small	Medium	Large	Foreign	Domestic	Multinational	Local
Export status (Dummy)	1.034	2.125***	0.671	2.689***	4.162***	0.416	0.299	1.720**	2.442**
	(0.718)	(0.263)	(0.432)	(0.317)	(0.534)	(0.466)	(0.299)	(0.293)	(0.463)
Import status (Dummy)	3.357***	1.766***	1.079***	0.954*	3.261***	1.015***	0.049	2.232***	1.238***
	(0.367)	(0.128)	(0.213)	(0.152)	(0.253)	(0.340)	(0.172)	(0.143)	(0.225)
Control variables	Included	Included	Included	Included	Included	Included	Included	Included	Included
Observations	147,476	4,141,923	1,589,718	2,102,223	642,345	1,144,771	3,118,064	2,315,648	1,923,371
Adjusted R^2	.761	.731	.578	.685	.804	.758	.720	.751	.685

Notes: FE-IV estimations. Dependent variable: Log of no. of workers born in country *j*. High-skill firms: at least 50% employees with post-secondary education. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

TABLE 14 Firm heterogeneity—Intensive margin

	Firm skill level		Firm size			Firm ownership		Multinational status	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	High skilled	Low skilled	Small	Medium	Large	Foreign	Domestic	Multinational	Local
log(export value)	−0.072	0.055	0.040	−0.004	0.041	0.035	0.053***	0.067	−0.049
	(0.122)	(0.035)	(0.044)	(0.034)	(0.046)	(0.057)	(0.040)	(0.040)	(0.068)
log(import value)	0.019	0.111***	0.030	0.079*	0.080***	0.183***	0.090***	0.096**	0.112*
	(0.139)	(0.028)	(0.035)	(0.032)	(0.037)	(0.049)	(0.034)	(0.032)	(0.058)
Control variables	Included	Included	Included	Included	Included	Included	Included	Included	Included
Observations	7566	115,923	23,356	55,391	42,913	44,903	76,818	90,357	30,603
Adjusted R^2	.847	.808	.657		.811	.854	.815	.814	.820

Notes: FE-IV estimations. Dependent variable: Log of no. of workers born in country *j*. High-skill firms: at least 50% employees with post-secondary education. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

are measured as an index where high figures reflect low barriers.[18] Hence, a negative coefficient on the interaction variable with 'freedom to trade' and 'non-tariff barriers' means that the effect of trade with countries having high barriers on employment is positive. The variable 'trade costs' is constructed such that high values mean high costs of trade. Hence, a positive coefficient on the interaction variable with 'trade costs' means that the effect on employment is positive.

The included variables are not all statistically significant, but the overall result is in line with our expectations: trade with countries with high trade barriers has a comparable large effect on employment of immigrants, as seen from the negative and statistically significant coefficient between export and 'freedom to trade' and export and 'non-tariff barriers', as well as from the positive coefficient on the interaction variable with import and 'trade costs'.

We continue in Columns (4) and (5) by examining two aspects of informal trade costs. The first estimation examines the cultural distance between Sweden and other countries. It might be the case that the larger the cultural distance, the more important are employees with a background from the country in question. However, we do not find any support for this hypothesis as seen from the statistically insignificant coefficients on the interaction variables. The next estimation examines the role of languages. It has been shown that the ability for people from two countries to communicate by mastering or at the least understanding each other language is associated with bilateral foreign trade (Hutchinson, 2002; Melitz, 2008). The need for foreign employees might be relatively large when firms in Sweden trade with countries where the two countries' populations do neither share a first, nor a second language of communication. To examine this informal trade barrier, we use the measure of Melitz and Toubal (2014) on communication ease, which captures the likelihood that two persons from two countries are able to talk in some language. Again, however, we do not find support for such an effect.

4.2.3 | Firms

We continue in Tables 13 and 14 by examining the effect on different types of firms. Table 13 examines the effect of the extensive margin of trade and Table 14 of the intensive margin. The first two columns examine the effect on high-skilled and low-skilled firms, measured using their share of employees with post-secondary education. It might be the case that high-skilled firms already have the necessary competence to export to foreign markets and are, therefore, in less need of recruiting immigrants when foreign demand increases. The difference between the two firm types is not consistent for the intensive and extensive margin of trade and for import and export, but the overall findings suggest that the effect is positive for both groups of firms but is larger for low-skilled firms than for high-skilled ones.

The next three columns continue by examining whether the effect differs between firms of different sizes. The positive correlation between firm size and exports has been well established, both theoretically and empirically (Bernard et al., 2018; Melitz, 2003). Small firms might lack the necessary resources to export and are thus less able to respond to an increase in foreign demand. We find in most specifications a positive effect of both imports and exports on employment of immigrants in all three groups of firms, but, contrary to our expectation, the effect tends to be larger in large firms than in small firms. One explanation for this result could be the fact that larger firms already are more internationally oriented, and this is likely

[18]Data sources and definition of these variables are seen in Table A2 in the appendix.

to influence their recruiting patterns, paying relatively more attention to foreign knowledge and experience. Another explanation could simply be that larger (and more internationalised) firms are better managed, including a superiority in identifying and attracting key personnel, and in line with evidence of exports contributing to assortative matching between employers and employees (Bloom & Van Reenen, 2010; Davidson et al., 2012).

We continue in Columns (6–9) to examine whether there is a difference between domestic- and foreign-owned firms, or between local firms and multinational firms.[19] One might perhaps expect that foreign firms and multinational firms already have the necessary competence for international trade, and are thus less likely to increase recruitment of immigrants when they increase exports and imports. This hypothesis does not receive empirical support. The effect is positive in most specifications for all firm types, and there is no consistent pattern of differences between firm types.

We also sorted our sample of firms by export intensities as an additional look at heterogeneous effects. In other words, the effect of international trade on employment of immigrants might differ between firms depending on how important trade is for them. However, we found no strong evidence for such a pattern: international trade affected employment in all firms, irrespective of their export intensity. The estimated coefficients for exports and imports were slightly larger for firms with high intensities, but there were no statistically significant differences between these coefficients (not shown).

We have also run all the specifications in Tables 6–10 with wages for individuals as the dependent variable. The results are not shown but available on request. All results are fragile, with the coefficients on exports and imports changing signs in different specifications and with low levels of statistical significance. Moreover, the estimates are very small in all specifications, meaning that there are no significant economic effects of international trade on immigrants' wages.

4.3 | Robustness checks

4.3.1 | Weights

As previously discussed, we have used weights from the pre-sample year 1997 when we constructed our instruments. The reason is to avoid a possible endogeneity problem, but the approach comes with a cost of running the risk of missing changes in firms' trade portfolios. We therefore examine how large of a problem this might be by allowing weights to change over time in Column (1) of Tables 15 and 16, using weights with a lag, $t-1$. The estimated coefficients differ from the ones using fixed weights in our base results in Tables 3 and 4. More specifically, the effect at the extensive margin of trade becomes larger, over 200%, and the effect at the intensive margin of trade becomes smaller. The main conclusion remains, however, that trade increases employment of immigrants.

[19]Firms with above 50% foreign ownership are defined as foreign. Firms with foreign affiliates are defined as multinational.

TABLE 15 Robustness estimations—Extensive margin

Panel A: second stage	**Weights lagged 1 year**	**Using Tariffs as instruments**	**FE-PPML**
	(1)	**(2)**	**(3)**
Export status (Dummy)	2.435**	1.416***	2.202***
	(0.936)	(0.110)	(0.103)
Import status (Dummy)	2.063***	0.159***	0.868***
	(0.774)	(0.068)	(0.111)
Control variables	Included	Included	
Observations	3,509,425	1,412,568	3,018,320
Adjusted R^2	.717	.790	
Pseudo R^2			.902
Panel B-1: first stage	**Weights lagged 1 year**		
	Export status (D)	**Import status (D)**	
	(1)	**(2)**	
log (world import demand)	0.002***	0.00002	
	(0.002)	(0.0003)	
log (world export supply)	0.002	0.005***	
	(0.0003)	(0.0003)	
F-statistic for instruments	262.84	248.02	
Observations	3,509,425	3,509,425	
Adjusted R^2	.749	.702	
Panel B-2: first stage	**Using Tariffs as instruments**		
	Export status (D)	**Import status (D)**	
	(1)	**(2)**	
log (weighted import tariff)	−0.0004***	0.0002***	
	(0.0001)	(0.000)	
log (weighted export tariff)	0.004***	−0.0008***	
	(0.000)	(0.000)	
F-statistic for instruments	16.22	28.10	
Observations	1,412,568	1,412,568	
Adjusted R^2	.700	.721	
Panel B-3: first stage	**Control function**		
	Export status (D)	**Import status (D)**	
	(1)	**(2)**	
log (world import demand)	0.003***	0.006***	
	(0.000)	(0.001)	

TABLE 15 (Continued)

Panel B-3: first stage	**Control function**	
	Export status (D)	**Import status (D)**
	(1)	**(2)**
log (world export supply)	0.002***	0.001***
	(0.000)	(0.000)
Observations	3,018,320	3,018,320
Adjusted R^2	.812	.723

Notes: Dependent variable: Log of no. of workers born in country *j*. All specifications include industry-year and firm-country fixed effects. The results of the first-stage IV regression and control function (only excluded instruments) are reported in panel B. Standard errors are clustered at firm-country level for FE-IV and bootstrapped for FE-PPML combined with control function (rep. 50).

*$p < .10$, **$p < .05$, ***$p < .01$.

4.3.2 | An alternative instrument

We continue our robustness estimations by employing an alternative instrument that uses tariffs, drawing on Davidson et al. (2014) and Feng et al. (2016). The instrument relates two-digit HS-product-level import tariffs, instead of six-digit HS-product-level foreign export demand and import supply, to Swedish firms' trade portfolios, exploiting firm-product-country-time-specific information.

More specifically, we employ Equations 3 and 4 but with two modifications. Firstly, in Equation 3, we substitute M_{gkt} with the foreign tariff of country k at time t for product g visavi the world, τ^*_{gkt}, to construct the instrument for Swedish firms' bilateral exports. Secondly, in Equation 4, we substitute X_{gkt} with the EU tariff visavi the world, including country k, at time t for product g, τ_{gkt}, to construct the instrument for Swedish firms' bilateral imports.[20]

The advantage with tariffs is that they are arguably exogenous. Foreign countries will decide on their tariff levels without considering Sweden. Moreover, Swedish import tariffs are set and common at the European Union (EU) level. Again, since Sweden is a relatively small country, it seems reasonable to assume that Swedish conditions are not important when EU import tariffs are set. One disadvantage with using tariffs as instruments is that there is less time variation in tariffs compared to the previously used exports and imports figures. One main reason is that a very large part of Swedish trade is with other EU countries, and tariffs are zero on intra-EU trade.

Panel B-2 of Tables 15 and 16 shows that tariffs work as expected as an instrument for Swedish trade. The first stage reveals statistically significant coefficients for our instruments, showing that Swedish exports increase when foreign import tariffs decrease, and that Swedish imports increase when Swedish (EU) import tariffs decrease. Column (2) in panels A of Tables 15 and 16 shows the results from the second stage when we use tariffs as instruments for Swedish exports and imports. As in the previous estimations, both exports and imports have a positive and statistically significant effect on the employment of immigrants. One difference with the previous results is the size of the estimated coefficients. Using tariffs as instruments

[20]In both equations, we use the most-favoured nation *ad valorem* tariffs. For the firm-product-country weights, we use their lagged values at *t*–1.

TABLE 16 Robustness estimations—Intensive margin

Panel A: second stage	**Weights lagged 1 year**	**Using Tariffs as instruments**	**FE-PPML**
log(export value)	0.022*	0.310*	0.032*
	(0.011)	(0.109)	(0.015)
log(import value)	0.105***	0.712***	0.068***
	(0.004)	(0.003)	(0.011)
Control variables	Included	Included	
Observations	83,501	45,128	46,283
Adjusted R^2	.824	.766	
Pseudo R^2			.883

Panel B-1: first stage	**Weights lagged 1 year**	
	log(export value)	**log(import value)**
	(1)	**(2)**
log (world import demand)	0.184***	0.035***
	(0.007)	(0.005)
log (world export supply)	0.002	0.145***
	(0.003)	(0.005)
F-statistic for instruments	108.39	102.12
Observations	83,501	83,501
Adjusted R^2	.825	.775

Panel B-2: first stage	**Using Tariffs as instruments**	
	log(export value)	**log(import value)**
	(1)	**(2)**
log (weighted import tariff)	−0.020***	0.031***
	(0.004)	(0.000)
log (weighted export tariff)	0.021***	−0.025***
	(0.002)	(0.004)
F-statistic for instruments	15.82	15.15
Observations	45,128	45,128
Adjusted R^2	.760	.682

Panel B-3: first stage	**Control function**	
	log(export value)	**log(import value)**
	(1)	**(2)**
log (world import demand)	0.332***	0.285***
	(0.007)	(0.005)
log (world export supply)	0.010***	0.015***
	(0.003)	(0.006)
Observations	124,312	124,312

TABLE 16 (Continued)

Panel B-3: first stage	Control function	
	log(export value)	log(import value)
	(1)	(2)
Adjusted R^2	.805	.760

Notes: Dependent variable: Log of no. of workers born in country *j*. All specifications include industry-year and firm-country fixed effects. The results of the first-stage IV regression and control function (only excluded instruments) are reported in panel B. Standard errors are clustered at firm-country level for FE-IV and bootstrapped for FE-PPML combined with control function (rep. 50).

*$p < .10$, **$p < .05$, ***$p < .01$.

result in a much smaller estimated effect from the extensive margin of trade and a much larger effect from the intensive margin of trade. Again, the tariff instrument is only working on non-EU trade and we, therefore, believe that our previously estimated effects are more accurate.

4.3.3 | Dealing with zeros

There are firms with no immigrant workers from some of the countries that they trade with. This results in observations with zeros. Our main approach to this has been to add a small value before taking the log of labour demand for computational reasons and as is common in the literature (e.g. Bratti et al., 2014; Eichengreen & Irwin, 1995; Peri & Requena-Silvente, 2010). In essence, this approach mimics a semi-log Tobit estimator. As a robustness check, we employ a Poisson pseudomaximum-likelihood estimator that deals with the zeros while controlling for multiple fixed effects (FE-PPML) (Correia et al., 2020). The estimates are presented in Column (3) of panel A of Tables 15 and 16. Comfortingly, we note that the FE-PPML results are qualitatively identical to our base results in Tables 3 and 4 in the sense that there is a positive and statistically significant association between trade and employment of immigrants, although the magnitudes differ. Overall, the effect is around half as large as the previous estimates, while being slightly larger than the base results for the extensive margin of exports.

5 | CONCLUDING REMARKS

We find international trade to facilitate labour market integration of immigrants. Hence, one policy implication of our study is that trade promotion will have a beneficial effect by improving the labour market participation of immigrants, a group that, in many countries, is vulnerable and shows lower employment rates than the native-born population. Sweden is one of these countries: the employment rate is 15 percentage points lower for immigrants than for natives and the employment rate for immigrants from developing countries is lower still.

Our results suggest that employment of immigrants is particularly large in firms starting to trade with a new country. More precisely, when firms start to trade with a new country, employment of immigrants from this country increases by close to 200%. Expansion of existing trade also

has a positive but small effect on the employment of immigrants. We do not, however, find any effect on wages for already employed migrants.

It is worth noting that the positive effect is found for both imports and exports, for most groups of immigrant and firms, and for trade with most regions and countries. However, the magnitude of the effect differs, and we find particularly large effects for immigrant managers and professionals, for male immigrants, for firms with a relatively unskilled labour force and in trade with countries with high formal trade barriers.

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DATA AVAILABILITY STATEMENT

The provider of these micro-level data—Statistics Sweden—does not allow any dissemination due to confidentiality constraints. The administrative micro-level data are from several registers of Statistics Sweden (SCB) and are contained in a database (a matched longitudinal employer–employee database) of Örebro University, Sweden. The database was obtained after the Swedish Ethical Vetting Board gave its approval. Physically, these and similar micro-level data of Sweden are located on the servers of SCB. Researchers and their assistants may access these data, subject to approval by SCB. Access is commonly provided through the secure internet-based Micro-data Online Access (MONA) system. However, if a foreign-based researcher wishes to use these data or the data from the Swedish ECA, the researcher may either visit a Swedish institution with access to the data or cooperate with researchers in Sweden. If researchers wish to access our specific data for replication purposes, then we will of course provide guidance regarding the process for project approval from the Swedish Ethical Vetting Board and SCB.

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APPENDIX

TABLE A1 Descriptive statistics

	Observations	Mean	SD	Min	Max
(A) Firm level data					
Sale*	26,891	66.1	391.3	0	16,593.3
Employment	26,891	182.8	710.6	20	23,321
Physical capital stock*	26,891	13.6	86.4	0	3037.8
Share of high-skill workers	26,891	0.178	0.141	0.008	1
Firm age	26,891	16.9	6.8	1	28
Multinational status	26,891	0.532	0.499	0	1
Labour productivity*	26,891	0.079	0.074	−1.318	5.625
Exp. intensity	26,891	0.290	1.489	0	1
Imp. intensity	26,891	0.142	1.183	0	1
No. of exp. products	26,891	18.1	33.7	1	696
No. of exp. destinations	26,891	16.1	18.7	1	176
No. of imp. products	26,891	25.9	39.8	1	641
No. of imp. destinations	26,891	5.6	8.6	1	128
No. of trade destinations	26,891	8.2	12.0	1	176
(B) Firm-country level data					
Export value*	191,003	2.42e+08	8.66e+08	1	2.41e+10
Import value*	191,003	9.51e+07	5.46e+08	1	2.72e+10
(C) Individual level data					
Years of schooling	126,910	11.283	3.012	5	19
Age	126,910	44.717	11.491	15	89
Experience	126,910	33.434	12.626	4	84
High-skill (D)	126,910	0.374	0.484	0	1
Married(D)	126,910	0.558	0.497	0	1

Notes: All statistics are based on the data sets of the estimations. The set in panel A has firm-year observations. The set in panel B has firm-country-year observations. The set in panel C has individual-firm-country-year observations. The variables marked with an asterisk are presented in millions of US$.

TABLE A2 Data descriptions and sources

Variables	Definitions	Sources
Firm variables		
log (sale)	Log of sales in millions of US$	SBS
log (value added)	Log of value added in millions of US$	SBS
log (employment)	Log of number of (full-time equivalent) employees	SBS
log (productivity)	Log of value added per worker	SBS and own calculation
Share post-sec. educ.	Share of employees with any post-secondary education	LISA
log (physical capital stock)	Log of physical capital stock in millions of US$	SBS
Firm age	The number of years since the firm entered officially	FAD
Multinational status (D)	Part of an enterprise with affiliates abroad, zero otherwise	EGR
Foreign ownership (D)	Larger than 50% foreign ownership, zero otherwise	EGR
Individual variables		
log (years of schooling)	Log of the years of schooling	LISA and own calculation
Marital status (D)	Married or not, zero otherwise	LISA
Male (D)	Gender of male, zero otherwise	LISA
Work experience	A person's age minus years of schooling	LISA and own calculation
Wage	Log of annual salary in US$	LISA
Firm-country variables		
log (export value)	Log value of exports in millions of US$	FTS
log (import value)	Log value of imports in millions of US$	FTS
Export status (D)	Exports to a specific destination, zero otherwise	FTS
Import status (D)	Imports to a specific destination, zero otherwise	FTS
Foreign tariffs	Tariffs on Swedish export by country of destination, weighted by Swedish export share	UNCTAD TRAINS
Swedish tariffs	Swedish (EU) tariffs on products by country of origin, weighted by Swedish import share	UNCTAD TRAINS
Trade freedom	Index based on destination's trade-weighted average tariff, plus the incidence of non-tariff barriers to trade (0–100, where higher values correspond to freer trade)	Miller et al. (2015)

TABLE A2 (Continued)

Variables	Definitions	Sources
Non-tariff barriers	Index of trade barriers that restrict imports or exports of goods or services through mechanisms other than the simple imposition of tariffs (0–10, where higher values correspond to lower barriers)	Gwartney et al. (2018)
Trade costs	Estimated overall bilateral costs for trade in manufactures	Arvis et al. (2013)
Cultural distance	Index of bilateral distance in terms of average differences in views along the traditional/secular-rational authority, and the survival/self-expression dimensions (0–4, where higher values correspond to culturally more distant countries) (cross-section data)	Tadesse and White (2010)
Communication ease	The probability that two random persons from two countries can have a conversation in at least some language (0–1) (cross-section data)	Melitz and Toubal (2014)

Notes:: Sources from Statistics Sweden are Structural Business Statistics (Företagens ekonomi), SBS; Longitudinal Integration Database for Health Insurance and Labour Market Studies, LISA; Enterprise Group Register (Koncernregistret), EGR; Foreign Trade Statistics (Utrikeshandel med varor, Utrikeshandel med tjänster), FTS; Business Register (Företagsdatabasen), FDB; and Register of Firms and Plants' dynamics (Företagens och arbetsställenas Dynamik), FAD.

TABLE A3 The effect of international trade on employment of natives and on the share of immigrants

	Extensive margin		Intensive margin	
	Log (no. of native workers)	Share of immigrant workers	Log (no. of native workers)	Share of immigrant workers
Dependent variables	**(1)**	**(2)**	**(3)**	**(4)**
log(export value)	0.044***	0.001***	0.023***	−4.56e-05
	(0.007)	(0.0002)	(0.002)	(5.38e-05)
log(import value)	0.015	0.004***	0.014***	1.28e-04**
	(0.014)	(0.0005)	(0.002)	(4.58e-05)
Control variables	Included	Included	Included	Included
Observations	4,301,307	4,191,053	124,312	124,312
Adjusted R^2	.970	.789	.986	.921

Notes: FE-IV estimations. All specifications include industry-year and firm-country fixed effects. Standard errors clustered at firm-country level.

*$p < .10$, **$p < .05$, ***$p < .01$.

A4 | A NOTE ON COUNTRIES

Sweden is the reporter in our data set. Data on merchandise trade are available for 220 partner countries. Matching current trade data and migration data was complicated by the appearance of new countries, as a result of the break-ups of the Soviet Union, Yugoslavia and Czechoslovakia.

To address these issues, the former Yugoslavia was treated as one entity, and the former Czechoslovakia was treated as another entity. One advantage of this approach is that it facilitated panel data analysis because partner countries are consistent over the years covered in the study. Furthermore, this approach simplifies the aggregation of trade flows.

Migrants from the former Soviet Union (USSR), which disintegrated before the period covered in our data set, were re-classified as having been born in Russia and consequently matched with Sweden's trade with Russia, since we lacked information about which parts of the USSR the immigrants came from.