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Immigrants and Export Demand: Exploring a Reverse Causality Bias

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Exploring a Reverse Causality Bias

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Preliminary draft

The literature focusing on the export-enhancing effect of immigrants acknowledges the presence of a reverse causality bias. However, virtually no study investigates such a possibility. We fill this gap by analysing how the export shocks that French firms face determine their decisions of hiring immigrant workers. To allow for causal inference, we use an export demand proxy that reacts to macro-economic fluctuations in the firm's export destinations, but that is exogenous to its employment decisions. Using firm-level data on the French manufacturing sector from 2005 to 2009, we find that exporters facing an increase in foreign demand hire more immigrant workers. This effect is robust to the inclusion of various labour flexibility proxies. We thus infer that firms hire immigrant workers for a number of unobserved characteristics that are valuable to export.

Keywords: Employment strategies, Export demand, Immigrants, Occupations
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1 Introduction

This paper analyses how French manufacturing firms react to export shocks by adapting their employment strategies and particularly their decisions of hiring immigrant workers. Our paper answers back a vast literature which studies the opposite relationship: the impact of immigrant workers on firms' export performances. A number of firm-level studies find that immigrant workers enhance the export performance of their employers. Especially when they are qualified, immigrant workers decrease variable and fixed export costs faced by exporters thanks to their language ability, their export know-how, their knowledge of foreign markets and business networks (Hiller, 2013; Hatzigeorgiou and Lodefalk, 2016; Andrews et al., 2017). In addition, immigrants seem to complement natives in production. They impact the organisation of the production, upgrade the technology and increase the productivity of their firm (Gandal et al., 2004; Lewis, 2011; Mitaritonna et al., 2017). Consequently, immigrant workers enhance exports at both margins (Marchal and Nedoncelle, 2017; Mitaritonna et al., 2017).

These studies acknowledge the presence of a reverse causality which may bias standard estimations of the pro-trade effect of immigrant workers. Among several reasons, firms may hire immigrants *because* these workers possess and gainfully apply information that is relevant for exporting and *because* they complement natives in tasks. It is indeed likely that firms' decisions to hire immigrant workers are well informed. Firms would thus adapt the composition of their workforce according to the export demand. While export anticipations and realisations eventually determine firms' employment strategies, only some articles document this reverse causality mechanism. Some articles show that firms actively prepare to export by increasing their workforce expertise, for instance by hiring workers from other exporters (Labanca et al., 2014; Minondo, 2011). To the best of our knowledge, no paper investigates firms' hiring of immigrant workers in light of their export opportunities.

To explore this research question, we use an exhaustive firm-level dataset of French manufacturing exporters from 2005 to 2009. It contains information on the composition of their workforce in terms of occupations, type of contract (permanent *vs.* temporary, full- *vs.* part-time) and nativity (native *vs.* foreign-born). To allow for causal inference, we use an export demand proxy proposed by Mayer et al. (2016) that reacts to macro-economic fluctuations in the firm's export destinations, but that is exogenous to its employment decisions. This proxy consists in a firm-specific and time-invariant part that builds on the export product and destination portfolio of the firm at the beginning of the period. It is then interacted with the product-destination demand in a given year. This foreign demand is constructed using the BACI dataset from the CEPII (Gaulier and Zignago, 2010). It is correlated with conditions in the firm's export markets, but exogenous to its decisions such as its export participation as well as hiring decisions, and in particular hiring decisions of immigrant workers.

We start by documenting the overall shifts in the employment of immigrant workers induced by fluctuations in the export demand of the firm. Our results show that firms facing an 10% exogenous

increase in their export demand, increase their immigrant employment by 0.4%. This results is robust across different specifications and controlling for various firm financial characteristics and employment set-ups. Then, we find that the employment of immigrants in both high- and low-skilled jobs increases with export opportunities. In addition, we find that only the number of immigrants holding permanent positions react to export demand shocks, while the number of immigrant holding temporary positions does not. These results are validated by a number of placebo tests using the native employment as a dependent variable. Our empirical analysis also excludes the fact that firms could favour immigrant employment because they self-select into particular positions such as high-skilled occupations, temporary contracts and part-time jobs. We thus infer that firms facing an increase in export opportunities deliberately hire immigrant workers for a set of unobserved characteristics that are valuable to export (such as their export know-how or their complementarity to natives).

The contribution of this paper is two-fold. First, our work echos the existing literature on the export-enhancing effect of immigrants by showing that the reverse causality bias is present and that firms do hire immigrant workers when they face higher export opportunities. Second, we contribute to a recent strand of literature on how trade determines employment strategies. See for instance evidence for Germany (Schank et al., 2007) and the US (Autor et al., 2014, 2016). Yet, to the best of our knowledge, we are the first to focus on immigrant employment in this research context.

The remainder of the paper is organised as follows. In the next section, we survey the literature related to this paper. We present available firm-level evidence on how immigrant workers foster exports. We then review articles that explore the reverse causality. In Section 3, we present the French firm-level dataset and a number of stylised facts. In Section 4, we detail our estimation strategy and how we deal with endogeneity concerns. We report our results on immigrant employment and export demand in Section 5. We conclude in Section 6.

2   Literature review

Our paper builds on two strands of literature: First, the literature looking at foreign employment and firms' export performance; second, research that looks at firms' organisational arrangements when facing an export demand shock and subsequent decisions to start exporting or increase their exports.

2.1   How immigrant workers increase exports

Immigrant workers foster exports at both margins through two main channels. First, they promote exports by decreasing variable and fixed costs faced by exporters thanks to their superior knowledge of foreign markets or because they are well connected to business networks. Several firm-level studies provide evidence for this empirical regularity, using data on Denmark (Hiller, 2013; Parrotta et al.,

2016), France (Mitaritonna et al., 2017; Marchal and Nedoncelle, 2017), Germany (Andrews et al., 2017), Portugal (Bastos and Silva, 2012), Spain (Peri and Requena-Silvente, 2010) and Sweden (Hatzigeorgiou and Lodefalk, 2016). This pro-trade effect is magnified for differentiated goods for which the price fails to transmit relevant information. The literature also suggests a larger pro-trade effect of educated, recently arrived and unforced migrants, and those of whose origin and host countries have weak legal institutions (Parsons and Winters, 2014).

Second, immigrant workers increase the productivity of their firms. Using French data, Marchal and Nedoncelle (2017) show that the export-enhancing effect of immigrant workers goes beyond this informational channel and that productivity or technological effects may be at play at the firm level. An emerging strand of the literature suggests that, indeed, industries absorb immigrants by adapting their technologies instead of reducing relative wages. This absorption emerges from production complementarities between natives and immigrant workers. Mitaritonna et al. (2017) explicitly analyse the link between immigration and productivity gains. Using French data, the authors show that the productivity-enhancing effect of immigrants comes along with larger exports. Other studies show that immigration-driven labour supply shocks induce firms to adapt their technology (Lewis, 2011; Gandal et al., 2004).

Aforementioned studies implement various identification strategies to tackle the presence of endogeneity due to reverse causality issues. These endogeneity concerns have been listed by Mitaritonna et al. (2017) and Hatzigeorgiou and Lodefalk (2014). At the regional level, immigration may be driven by trade exposure and performance of the labour market. At the firm level, firms may decide to hire immigrant workers in order to increase their export volume or to serve a new destination.

In addition, endogeneity may be induced by the presence of a selection bias. Exporting firms may have higher capabilities to attract and absorb immigrant workers than other firms. To incorporate immigrant labour supply, they may undertake a number of organisational and technological changes. In addition, foreign employment may systematically correlate with exporting firms' characteristics such as their employment strategies. For instance, firms may need higher labour flexibility around the time of the export realisation due to the risk induced by this operation, while immigrant work are over-represented in precarious jobs.

2.2 Do firms adjust their workforce to their export opportunities?

A rather small literature shows that firms adjust their workforce based on their expected export participation. Fabling and Sanderson (2013) investigate how firm characteristics react to export market entry and subsequent expansion into new markets using a sample of New Zealand manufacturing firms. The authors show that entry and expansion are both associated with employment growth and capital deepening.

Then, Labanca et al. (2014) show that firms prepare to export by hiring workers from other exporters. Using employer-employee data on Brazil, the authors first estimate the probability to export at time $t+1$ depending on the characteristics of the firm at time t and on a set of instruments capturing the export-market conditions at time t. They find that the expected export status of the firm impacts significantly and positively the firm's decision to hire workers from other exporters. Their results suggest that firms actively prepare to export by increasing their workforce expertise. In the same line of thoughts, Minondo (2011) use Spanish data to provides empirical evidence that firms have a higher probability to start exporting when they employ managers with previous export experience.

3   Data, descriptive statistics and stylised facts

3.1   The data

3.1.1   Firm-level data

We use a database made of three administrative sources of information on French manufacturing firms. Data sources are merged using the SIREN number, a unique firm administrative identifier.

French employer-employee data   First, we use the *Déclarations Annuelles des Données Sociales* (DADS) from 2005 to 2009. This employer-employee dataset consists of payroll declarations from individuals and legal entities established on the mainland territory. These declarations are compulsory for all firms except for public entities, and therefore all employees but civil servants are accounted for in this dataset. The dataset contains information on personal and professional characteristics of the employees including her age, gender, nativity (native *vs.* foreign-born), experience, occupation (socio-professional categories), type of contract (permanent *vs.* temporary, full- *vs.* part-time), earnings, hours worked, sector of the employer, etc. Note that information on permanent and temporary contracts is only available from 2005. This is the reason for which our analysis only starts in 2005.

We construct our variable of interest using information on employees' nativity. The DADS dataset allows to identify whether a worker was born in France or abroad (the exact country of birth of foreign-born individuals is, however, unknown).[1] As we exploit information on nativity, we thus classify naturalised individuals as immigrant employees. Finally, using information on occupations and following the classification of occupations provided by Bombardini et al. (2015), we are able to identify high- and low-skilled occupations. For each firm we compute the number of hours worked by native and immigrant employees for high- and low-skilled occupations and for each type of contract. We then aggregate the DADS data at the firm-year level. Once aggregated, the dataset contains 11,786,598 firm-year observations.

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[1] The variable *département de naissance* (region of birth) takes the value of 99 when the employee was born abroad.

French customs data Second, we use the French customs data from 2000 to 2009. This dataset reports export flows from firms located on the French mainland territory. It contains exports in value (in Euros) and in volume (in tons) by CN8 product (European Union Combined Nomenclature at 8 digits) and by export destination. A number of thresholds apply for reporting shipments to the customs. Within the European Union, firms should report to the customs only if their annual trade value exceeds 150,000 Euros. Outside the European Union, firms should only report to the customs if their shipment exceeds 1,000 Euros or one ton. The dataset contains 13,866,290 firm-product-destination-year observations, that we aggregate at the firm-year level to merge it with the DADS data.

Tax records Third, we use the *Bénéfices Réels Normaux* (BRN) from 2000 to 2009. The BRN dataset contains balance-sheet information reported by French firms to the tax administration such as domestic sales, export sales, profit, assets, value added, etc. It contains firms in the private sector excluding the agricultural and financial sectors. It contains 3,186,931 firm-year observations. Depending on the year, these firms represent between 90% and 95% of French exports contained in the customs data.

3.1.2 Product-destination import data

Finally, we use the BACI dataset from 2000 to 2009 from the CEPII (Gaulier and Zignago, 2010) that records bilateral import flows at the HS6 product level by origin and destination. For each year and for each country, we aggregate imports at the product level across origin countries (excluding imports from France) as to build an import aggregate. We obtain a dataset made of 4,246,695 product-destination-year observations that we match with the French customs dataset at the product-destination-year level as to build our export demand proxy. Note that the latter proxy is computed based on the export product and destination portfolio of the firm. We thus obtain a proxy at the firm-year level.

3.2 Descriptive statistics and stylised facts

Descriptive statistics

After matching, we obtain a sample covering the period 2000-2009. Note that our period of interest is 2005-2009, but we use information on firms' export performance from 2000 to 2009. From this sample, we only keep firms that export at least two years over the period 2000-2009, with at least one of these two years being included in the period of interest (2005-2009). We obtain a sample of 32,834 firms (158,027 firm-year observations) over 2005-2009. These firms export 80% of the time and 60% of them export continuously.

Table 1 provides a number of descriptive statistics for the period of interest. Variations in export participation translate into firms' size in terms of profit, assets and value added. Firms

serve on average 10 destinations and their export value amounts to 7,8 million euros. On average, 10.9% of the hours worked in a firm are supplied by immigrant workers, 94.3% by employees with permanent contracts, 93.0% by employees in full-time positions and 33.8% by employees in high-skilled occupations. Looking only at immigrants, we see that these employees hold more precarious positions – only 91.7% of them hold temporary contracts and 93% of them hold full-time positions. In addition, they are over-represented in low-skilled occupations as 29.3% of them hold high-skilled jobs. These figures support the idea that immigrant workers have different characteristics and eventually different job preferences as compared to native workers.

	All firms		
	Obs.	**Mean**	**Std. dev.**
Taxe records			
Profit (thousand of euros)	158,027	720	23,824
Assets (thousand of euros)	158,027	30,543	299,928
Added value (thousand of euros)	148,391	7,287	79,690
Capital productivity (added value/assets)	148,391	0.417	0.245
SME	158,027	0.935	0.246
Sh. of exports in total sales	143,227	0.607	0.438
Trade data			
Export value	158,027	7,864,770	9.65e+07
Export quantity	158,027	3,015,847	6.79e+07
Aggregate demand (value)	158,027	1.19e+10	3.39e+10
Aggregate demand (quantity)	158,027	1,824,165	7,303,873
Employer-employee data			
Hourly employment	127,088	170,307	683,035
Sh. of permanent positions (hrs)	124,287	0.943	0.096
Sh. of high-skilled jobs (hrs)	125,332	0.338	0.241
Sh. of full-time positions (hrs)	126,991	0.939	0.111
Sh. of immigrant employees (hrs)	127,088	0.109	0.154
Among immigrants employee (hrs)			
Sh. of permanent positions	93,133	0.917	0.212
Sh. of high-skilled jobs	93,864	0.293	0.346
Sh. of full-time positions	94,417	0.930	0.194

The aggregate demand is given by the sum of imports (France excl.) for each product-destination (pj) pair served by the firm $(\sum_{pj} imp_{pj})$.

Table 1: Descriptive statistics, all firms 2005-2009

In Table 2, we compare firms when they do not export with firms that show a positive export value. As expected, exporting firms are significantly larger in terms of profit, assets and value added. They offer a larger share of permanent contracts and full-time positions and they use a larger share of high-skilled jobs. In line with previous empirical evidence on the trade-migration nexus, we see that exporting firms employ a significantly larger share of immigrant workers. This

correlation between immigrant employment and export value is shown in Figure 1. The left-side figure shows the correlation for immigrants in low-skilled occupations and the right-side figure shows the correlation for immigrants in high-skilled occupations.

	No export			Positive exports			
	Obs.	**Mean**	**Std. dev.**	**Obs.**	**Mean**	**Std. dev.**	**Diff.**
Taxe records							
Profit (thousand of euros)	22,974	101	1,115	135,053	826	25,765	***
Assets (thousand of euros)	22,974	4,024	17,969	135,053	35,054	324,137	***
Added value (thousand of euros)	20,808	1,345	3,413	127,588	8,257	85,893	***
Capital productivity (added value/assets)	20,808	0.490	0.299	127,588	0.405	0.232	***
SME	22,974	0.992	0.085	135,053	0.926	0.262	***
Sh. of exports in total sales	22,974	0	0	120,253	0.722	0.380	***
Trade data							
Export value	22,974	0	0	135,053	9,202,653	1.04e+08	***
Export quantity	22,974	0	0	135,053	3,528,876	7.35e+07	***
Aggregate demand (value)	22,974	1.29e+09	5.54e+09	135,053	1.37e+10	3.62e+10	***
Aggregate demand (quantity)	22,974	228,946	1,089,254	135,053	2,095,529	7,855,769	***
Employer-employee data							
Hourly employment	17,823	46,427	91,237	109,265	190,515	733,736	***
Sh. of permanent positions (hrs)	17,374	0.941	0.107	106,913	0.943	0.095	**
Sh. of high-skilled jobs (hrs)	17,426	0.298	0.259	107,906	0.345	0.238	***
Sh. of full-time positions (hrs)	17,786	0.931	0.141	109,205	0.941	0.105	***
Sh. of immigrant employees (hrs)	17,823	0.104	0.165	109,265	0.110	0.152	***
Among immigrants employee (hrs)							
Sh. of permanent positions	10,584	0.904	0.245	82,549	0.918	0.207	***
Sh. of high-skilled jobs	10,664	0.236	0.357	83,200	0.301	0.344	***
Sh. of full-time positions	10,751	0.919	0.233	83,666	0.932	0.189	***

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

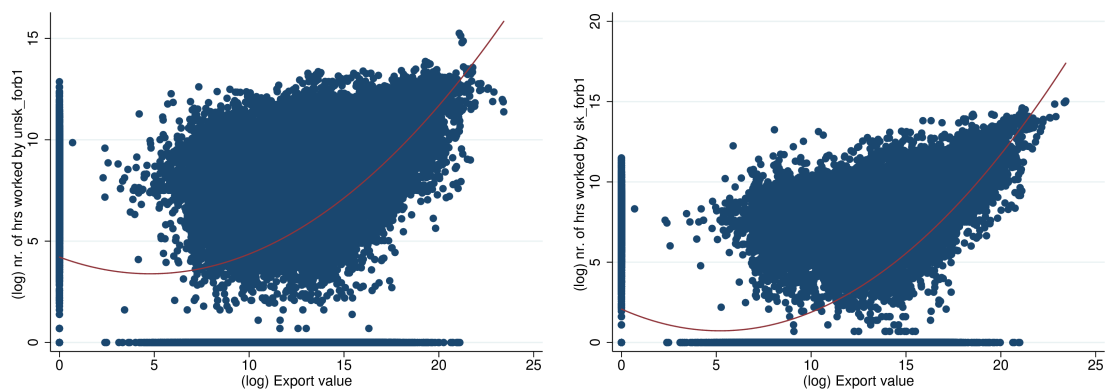Table 2: Descriptive statistics by firms' export status, 2005-2009

Figure 1: Export value and foreign employment in low- and high-skilled occupations.

4   Empirical strategy

Prior literature as well as descriptive evidence provided here-before document that the employment of immigrant workers correlates with firms' export performance. In this paper, we investigate whether firms deliberately hire immigrants in response to an increase in export opportunities. To do so, one needs to identify changes in the firm's exports that are not caused by its internal choices such as its employment decisions or its export strategy. To this end, we build an exogenous proxy of the export demand faced by the firm. We then estimate firms' hiring decisions as a function of their export demand.

4.1   Identification strategy: the export demand proxy

The exogenous export demand proxy provides a source of variation in the firm's exports that is not correlated with its decisions, especially its hiring decisions. We rely on the work of Mayer et al. (2016) to construct a proxy that varies over time for each firm.

Let d_{it} denote the export demand faced by a firm i at time t. This proxy is computed as shown by Equation (1):

$$d_{it} = \sum_{pj} \frac{x^*_{it_0}}{s^*_{it_0}} \frac{x_{ipjt_0}}{x_{it_0}} \text{imp}_{pjt} \; ; \forall t > t_0 \tag{1}$$

The first part of this proxy is based on firm i's export value at time t_0 *i.e.* the first year that firm i exports over the period 2000-2009. More precisely, x_{ipjt_0}/x_{it_0} denotes the share of firm i's export of product p to destination j over its total exports at time t_0. This share is further weighted by firm i's share of exports in its total sales at time t_0, denoted $x^*_{it_0}/s^*_{it_0}$, where the star indicates that the variable is extracted from the tax records. This weight accounts for the fact that exports constitute only a share of firm i's total sales, and may therefore only partially impact its employment strategy. The second part relates to variations in the firm's export demand. Any shift in demand of product p from destination j faced by firm i can be approximated by country j's world imports of product p (imports from France excluded). Let imp_{pjt} denote the world import of product p by destination j at time t. In our baseline specification, we define t_0 as the first export year between 2000 and 2009. We then perform a robustness test where we define t_0 as the first export year between 2004 and 2009.

This proxy can be computed for each firm-year observation such that $t > t_0$. We thus compute the export demand for each year form 2005 to 2009. Doing so, we obtain a firm-specific export demand proxy for each year of the sample, irrespective of the firm's export status. Variations in the export demand only comes from yearly changes in demand form destination j. Therefore, firm i's decision to export or to employ immigrant workers are completely exogenous to this proxy. Nonetheless, our baseline proxy is highly correlated with the firms' export value as shown by Figure 2.
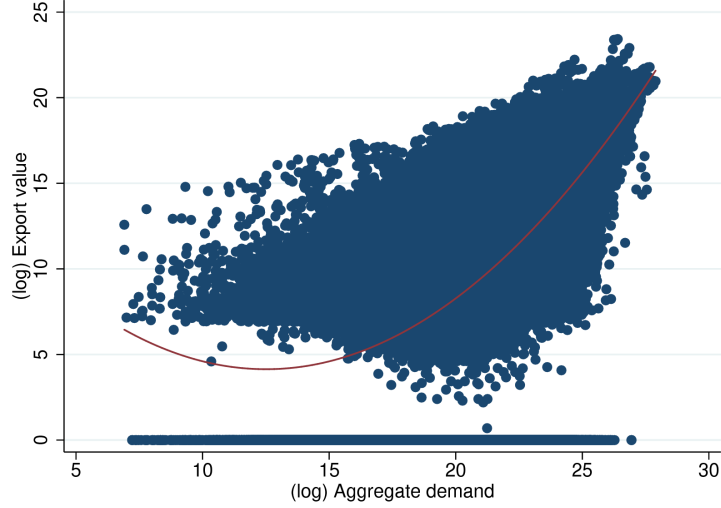
Figure 2: Aggregated export demand and firm's export value

4.2 Empirical model

We perform a number of multivariate regressions using an OLS fixed effects model to capture how firms adjust their immigrant employment in reaction to export demand shocks. Following a positive demand shock, we expect firms to increase their employment of immigrant workers.

We estimate the impact of a positive demand shock as follows:

$$l_{it} = \beta_0 + \beta_1 d_{it} + B'F_{it} + \gamma_i + \gamma_{st} + \gamma_r + \epsilon_{it} \tag{2}$$

where l_{it} represents the log number of hours worked by immigrant employees in firm i at time t plus unity (in order to include firms employing no immigrant worker in the sample). F_{it} denotes a set of time-varying firm-level controls and γ_i, γ_{st} and γ_r respectively denote firm, sector-year and region fixed effects. Estimates therefore report within-firm effects that account for all characteristics of the firm that are time-invariant. Sector-year fixed effects allows us to control for yearly effects common to all firms within the same sector. Lastly, we include region fixed effects to account for variations in the immigrant labour supply at the regional level.

The vector F_{it} includes the capital productivity of the firm in logarithm measured by the value added over the total assets of the firm, the log number of hours worked by the remaining categories of workers, the share of permanent contracts, the share of high-skilled jobs and the share of full-time positions used by firm i. Note that the number of hours worked by the remaining employees (*i.e.*

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the native workers) allows us to study how the export demand impacts the use of immigrant workers *ceteris paribus* that is for a fixed number of hours worked by native workers.

5   Empirical results

At first, our strategy consists in evaluating the impact of the demand shock, d_{it}, on the volume of hours worked by immigrants workers. We progressively include additional control variables to show that this immigrant employment adjustment is robust. We finally include the interaction of the capital productivity and the export demand proxy as to check if the export demand has a different impact on employment of immigrant workers depending on how productive the firm is.

We then present a number of additional results. We explore how the results vary across low- and high-skilled occupations and across types of contract. We also control whether our results hold for firms that do not employ any immigrant worker in the previous period, and for firms employing at least one immigrant worker in the previous period.

To finish, we run a number of robustness checks, including sample restrictions based on firms' and workers' characteristics.

5.1   Immigrant employment adjustment

We start by exploring how firms adjust their immigrant employment to export demand fluctuations. We report our baseline estimates in Table 3, columns (1) to (6). We find that the export demand consistently and significantly increases the contemporaneous number of hours worked by immigrants. A 10% increase in export demand induces a 0.42% increase in hours worked by immigrants (column 1). This result holds when we control for the capital productivity of the firm (column 2) and when we add the volume of hours worked by the native workforce (column 3). We furthermore control for the composition of the workforce in the firm by adding the share of permanent contracts (column 4), high-skilled jobs (column 5) and full-time positions (column 6) as to ensure that the demand for immigrant employees is not caused by a demand for a more flexible workforce or specific observable skills. The fact that firms facing higher export demand increase their use of immigrant workers remains robust from column (3) to column (6).

We pursue our analysis by interacting the export demand with the capital productivity of the firm as to investigate if firms with different productivity levels respond differently to export demand shocks. The results are reported in Table 3, column (7). While the interaction term is positive and significant, the weighted demand falls in size and significance. It implies that for the least productive firms, the export demand is not associated with any shift in immigrant employment. On the contrary, the higher the productivity of the firm, the higher the effect of the export demand on the use of immigrant workers. We display the results of this interaction for the full spectrum of firms in Figure 3. This figure shows how the effect of the export demand on immigrant employment

changes along the productivity of the firm. The shaded area displays the distribution of firms by productivity level. For the vast majority of firms, we see that a positive export demand shock induces an increase in immigrant employment. The effect is however not significant for the least productive firms. A possible explanations for such a firm behaviour could be that the least productive firms employ a small number of employees and export only occasionally. Thereby, they may not have the need nor the organisational capacity to hire immigrant workers.

Sample	All firms						
Dependent variable	(log) Hours worked by immigrants						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(log) Export demand (d_{it})	0.042***	0.043***	0.039***	0.039***	0.039***	0.039***	0.003
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.015)
(log) Capital productivity		1.116***	0.861***	0.834***	0.797***	0.791***	-1.077**
		(0.138)	(0.131)	(0.122)	(0.123)	(0.124)	(0.544)
(log) Hours worked by natives			0.317***	0.327***	0.318***	0.320***	0.319***
			(0.045)	(0.047)	(0.048)	(0.050)	(0.050)
Sh. of permanent contracts (in hours)				-0.815***	-0.806***	-0.814***	-0.815***
				(0.130)	(0.135)	(0.133)	(0.133)
Sh. of high-skilled jobs (in hours)					-0.224***	-0.223***	-0.221***
					(0.068)	(0.068)	(0.068)
Sh. of full-time positions (in hours)						-0.067	-0.067
						(0.131)	(0.130)
(log) Export demand (d_{it}) * (log) Capital productivity							0.099***
							(0.027)
Firm FE	yes	yes	yes	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes	yes
Observations	102,123	94,672	94,672	92,622	92,079	92,044	92,044
R-squared	0.903	0.905	0.906	0.913	0.913	0.913	0.913

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

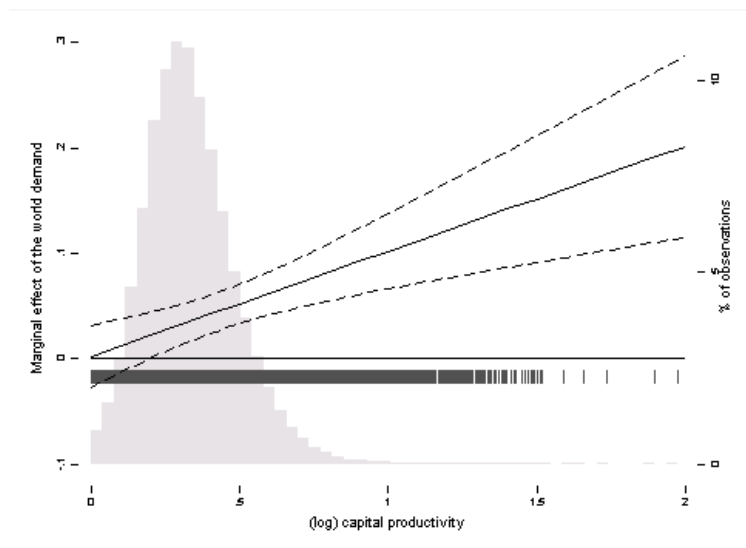Table 3: Baseline results: Immigrant employment adjustment

Figure 3: Marginal effect of the export demand on immigrant employment by capital productivity levels

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5.2 Immigrant employment across occupations

The baseline results show that firms facing export opportunities adjust their labour force by hiring more immigrant workers. To deepen our comprehension of the studied causality, we explore the within-firm adjustment of the workforce for high- and low-skilled occupations. In other words, we estimate Equation 2 separately for immigrants in high-skilled jobs and immigrants in low-skilled jobs. We also perform two placebo tests in which we use the native workforce in high- and low-skilled occupations as our dependent variables.

Sample	All firms			
Dependent variable	(log) Hours worked by immigrants		(log) Hours worked by natives	
	High-skilled jobs	Low-skilled jobs	High-skilled jobs	Low-skilled jobs
	(1)	(2)	(3)	(4)
(log) Export demand (d_{it})	0.033***	0.039***	0.017*	0.009
	(0.011)	(0.011)	(0.009)	(0.007)
(log) Capital productivity	0.503***	0.809***	0.732***	0.755***
	(0.141)	(0.135)	(0.134)	(0.101)
(log) Hours worked by immigrants in high-skilled jobs		-0.074***	0.067***	0.028***
		(0.007)	(0.007)	(0.004)
(log) Hours worked by immigrants in low-skilled jobs	-0.101***		0.040***	0.116***
	(0.009)		(0.005)	(0.014)
(log) Hours worked by natives in high-skilled jobs	0.135***	0.060***		0.125***
	(0.012)	(0.008)		(0.026)
(log) Hours worked by natives in low-skilled jobs	0.104***	0.319***	0.230***	
	(0.011)	(0.024)	(0.041)	
Sh. of permanent contracts (in hours)	-0.321**	-0.862***	0.433***	-0.653***
	(0.141)	(0.149)	(0.135)	(0.097)
Sh. of full-time positions (in hours)	0.049	-0.097	0.336**	0.383***
	(0.116)	(0.122)	(0.143)	(0.108)
Firm FE	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes
Region FE	yes	yes	yes	yes
Observations	92,580	92,580	92,580	92,580
R-squared	0.859	0.886	0.838	0.865

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Employment adjustment by occupation and nativity

Results are presented in Table 4. Controlling for the size of the remaining workforce by occupation and nativity status, we find that an export shock of 10% yields a significant increase in the use of immigrant employees in high-skilled jobs by 0.33% (column 1). We find a similar results for immigrants in low-skilled occupations: a 10% increase in export demand induces an increase in immigrant employment by 0.39% (column 2). Looking at columns (3) and (4), we find a significant effect, yet only at the 10% level, for natives in high-skilled occupations and no significant effect for natives in low-skilled jobs. These placebo tests show that the native workforce of the firm is rather insensitive to export demand fluctuations. We infer it is unlikely that immigrant employment adjustment would be induced by a change in the size of the firm.

In addition, we find a negative relationship between the volume of hours worked by immigrants in low-skilled jobs and those in high-skilled jobs (columns 1 and 2). It suggests that the two types of workers are, to some extent, substitutes in production. In addition, we find a positive

relationship between the volume of hours worked by immigrants and natives, unconditional on their occupational category (columns 1 and 2). This result implies that the two groups of workers might be complements so that firms increasing their immigrant employment also increase their native workforce.

5.3   Immigrant employment and contract security

We now explore how the impact of the export demand on the employment of immigrant workers depends on the type of contract they hold. The French legislation does not allow to employ workers under temporary contract for regular activities of the firm. A person can only be hired with such a contract if his/her work task is identified as temporary *i.e.* for a maximum duration of 18 months. Temporary contracts are primarily used for replacing employees on leave such as maternity leave, for temporary growth of the firm's activities or for seasonal work arrangements.

Expanding export activities can be risky and uncertain, it could therefore induce a need for a higher employment flexibility *i.e.* for a larger share of temporary contracts in which immigrant workers are over-represented. On the other end, exporting can be assimilated to a long-term strategy as most exporting firms export continuously over time. As immigrant workers posses valuable information to export, firms may want to secure it over time by offering them permanent contracts.

Sample	All firms			
Dependent variable	(log) Hours worked by immigrants		(log) Hours worked by natives	
	Temporary contracts	Permanent contracts	Temporary contracts	Permanent contracts
	(1)	(2)	(3)	(4)
(log) Export demand (d_{it})	0.019	0.029***	0.001	-0.003
	(0.013)	(0.010)	(0.015)	(0.008)
(log) Capital productivity	0.812***	0.560***	1.920***	0.113
	(0.146)	(0.119)	(0.262)	(0.103)
(log) Immigrants with a temporary contract (in hours)		-0.009***	0.153***	0.029***
		(0.003)	(0.006)	(0.003)
(log) Immigrants with a permanent contract (in hours)	-0.023***		0.042***	0.400***
	(0.008)		(0.007)	(0.029)
(log) Natives with a temporary contract (in hours)	0.139***	0.016***		0.108***
	(0.006)	(0.003)		(0.011)
(log) Natives with a permanent contract (in hours)	0.105***	0.590***	0.421***	
	(0.008)	(0.010)	(0.016)	
Sh. of high-skilled jobs (in hours)	-0.196***	-0.211***	-0.725***	0.123*
	(0.075)	(0.070)	(0.093)	(0.064)
Sh. of full-time positions (in hours)	-0.056	0.054	-0.321**	1.036***
	(0.108)	(0.113)	(0.141)	(0.117)
Firm FE	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes
Region FE	yes	yes	yes	yes
Observations	94,033	94,033	94,033	94,033
R-squared	0.681	0.913	0.753	0.813

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Employment adjustment by type of contract and nativity

The results are reported in Table 5. In columns (1) and (2), we look at the volume of hours worked by immigrants under temporary and permanent contracts. We perform a placebo test using the volume of hours worked by natives under temporary and permanent contracts in columns (3) and (4). Looking at column (1), we find no significant impact of the export demand on the use of immigrants under temporary contracts. On the contrary, in column (2), we find a significant impact of the export demand on the use of immigrants under permanent contracts. As expected, columns (3) and (4) show no significant shift in temporary and permanent native employment due to an increase in export opportunities. To sum-up, the results indicate that firms tend to hire more immigrant workers in permanent positions when they face higher export opportunities.

5.4 Controlling for previous immigrant employment

The baseline results explore the percentage change in the number of hours worked by immigrants. To include firms that have no immigrant employee, we estimate the immigrant employment using the logarithm of the variable plus unity. We now investigate the impact of the export demand on the firm's immigrant employment conditional on its previous immigrant employment.

We first analyse the impact of the export demand on a sub-sample of firms that do not employ any immigrant worker at time $t-1$. This sub-sample represents about 16% of the baseline estimation sample. Results are presented in Table 6. We find that firms employing no immigrant workers in the previous period increase their use of immigrant workers in response to an export demand shock. The estimates of interest from columns (1) to (6) are all positive and significant. The magnitude of the effect is about three times larger as compared to the baseline estimates.

We then look at a sub-sample of firms that employ at least one immigrant worker at time $t - 1$. This sub-sample includes the remaining 84% of the baseline estimation sample. Results are presented in Table 7. The results are in line with our baseline estimates. The effect of the export demand is positive and significant. Its magnitude is however slightly smaller as compared to the baseline estimates.

These results underline the strength of the causality when firms face a higher export demand. We find that an increase in export demand not only yields firms to start hiring immigrant workers, but also to increase the volume of their immigrant workforce when they already employ some immigrant workers. This indicates that unobserved characteristics of immigrants may gainfully add-up (for instance, they may posses information about different foreign markets).

Sample	Firms with no immigrant worker in $t-1$					
Dependent variable	(log) Hours worked by immigrants					
	(1)	(2)	(3)	(4)	(5)	(6)
(log) Export demand (d_{it})	0.047*	0.072**	0.070**	0.076***	0.079***	0.078***
	(0.025)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
(log) Capital productivity		0.061	-0.118	-0.104	-0.082	-0.153
		(0.316)	(0.369)	(0.385)	(0.388)	(0.384)
(log) Hours worked by natives			0.225	0.209	0.223	0.318
			(0.158)	(0.183)	(0.190)	(0.200)
Sh. of permanent contracts (in hours)				-1.599***	-1.630***	-1.706***
				(0.239)	(0.242)	(0.239)
Sh. of high-skilled jobs (in hours)					-0.083	-0.044
					(0.104)	(0.105)
Sh. of full-time positions (in hours)						-0.728***
						(0.191)
Firm FE	yes	yes	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Observations	15,721	13,017	13,017	12,826	12,645	12,634
R-squared	0.425	0.449	0.450	0.453	0.454	0.455

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Foreign employment adjustment in firms with no immigrant worker at time $t-1$

Sample	Firms with at least one immigrant worker in $t-1$					
Dependent variable	(log) Hours worked by immigrants					
	(1)	(2)	(3)	(4)	(5)	(6)
(log) Export demand (d_{it})	0.035***	0.030***	0.026**	0.024**	0.024**	0.024**
	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
(log) Capital productivity		1.276***	1.031***	1.023***	0.988***	0.978***
		(0.125)	(0.116)	(0.105)	(0.107)	(0.107)
(log) Hours worked by natives			0.314***	0.320***	0.308***	0.304***
			(0.050)	(0.052)	(0.052)	(0.053)
Sh. of permanent contracts (in hours)				-0.559***	-0.522***	-0.525***
				(0.123)	(0.126)	(0.124)
Sh. of high-skilled jobs (in hours)					-0.384***	-0.389***
					(0.098)	(0.098)
Sh. of full-time positions (in hours)						0.198
						(0.143)
Firm FE	yes	yes	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Observations	81,391	76,564	76,564	74,910	74,529	74,516
R-squared	0.786	0.794	0.796	0.810	0.811	0.811

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Foreign employment adjustment in firms with at least one immigrant worker at time $t-1$

5.5 Robustness tests

We perform a number of robustness tests as to ensure that our results are not driven by our model specification nor by the characteristics of our sample. The results of these robustness checks are presented in Appendix.

5.5.1 Lagged export demand and immigrant employment adjustment

We first explore how the firm reacts to lagged export shocks. We estimate Equation 2 with one time-lag for the export demand, d_{it-1}. Doing so, we investigate whether the effect of the export demand lasts after the current period. The intuition behind this robustness test is that firms may take their employment decisions at time t based on export opportunities observed earlier.

The results are presented in Appendix in Table 8. We find that a positive export demand shock in the previous year ($t-1$) has a positive and significant impact on the firm's use of immigrant workers (column 1). Yet, the magnitude of the estimate is smaller as compared to our baseline specification (reported in column 2). We then include both the contemporaneous and the lagged export demand (d_{it} and d_{it-1}) in the same regression (column 3). The aforementioned results are confirmed. We thus infer that the decision of hiring immigrant workers is not only determined by contemporaneous export demand shocks, but also by earlier shocks.

5.5.2 Alternative definition of export demand shock

We then change the way we construct the export demand (d_{it}). We now define the initial export year (time t_0) as the first export year over the period 2004-2009. Doing so, we reduce our sample by only keeping firms that export at least two years over 2004-2009. The closer the initial export year to the period of interest, the more representative the export share of the firm should be $\left(\sum_{pj} \frac{x^*_{it_0}}{s^*_{it_0}} \frac{x_{ipjt_0}}{x_{it_0}}\right)$. Therefore, this change in d_{it} might increase either the significance level or the magnitude of the estimates.

Results are reported in Appendix in Table 9. In line with our baseline results, we obtain positive and highly significant estimates for the export demand proxy. The magnitude of the effect is slightly lower than our baseline results. We thus infer that the way we construct the export demand in our baseline strategy does not bias downward our estimates. Our baseline export demand proxy may indeed be more exogenous to the firm's export decisions than the proxy used in this robustness test (Table 9).

5.5.3 Immigrant hours *vs.* number of employees

We now investigate whether our results hold when looking at the head count of immigrants rather than the number of hours they worked in a year. It allows us to ensure that the results are not

driven by an increase in overtime work. To investigate this possibility, we measure the immigrant and native employment in number of physical persons.

Results are reported in Appendix in Table 10. We find that a 10% increase in the export demand yields an increase in the number of immigrant employees by 0.07%. This result is in line with our baseline estimates. We can therefore exclude the hypothesis that our results would only be driven by variations in overtime work.

5.5.4   Alternative definition of immigrant employee

In this paper, we identify foreign-born workers based on a variable recording the administrative region of birth of the employees. We find this to be a suitable choice because this variable is well-defined as it is based on the social security number of the employee. The coverage of this variable is almost complete and there is an insubstantial number of missing values. The down-side of this definition is that it also includes French citizens that were born abroad. It is, however, not a crucial issue for our analysis as one may consider that French foreign-born workers might possess intrinsic characteristics that distinguish them from native French individuals, and that could be valuable for exporting.

The alternative definition offered by the DADS data is the variable *foreign*. We use this alternative variable in a robustness check. The main caveat with this variable lies in the large number of missing entries. These missing values may be true missing values, but not only. The French statistical office (INSEE) indeed recommends to consider that these missing values are native workers. We therefore follow this approach.

Results are reported in Appendix in Table 11. The estimates corroborate our baseline results. We find that a 10% increase in the export demand yields a 0.46% increase in the volume of hours worked by immigrants. The magnitude of the impact is slightly larger as compared to our baseline estimates.

It is worth noting that, contrarily to our baseline estimates (Table 3, column 6), we find that the volume of hours worked by native workers is negatively correlated with the volume of hours worked by immigrants. This result would imply that natives and immigrants are substitutes, which goes against the idea developed in this paper according to which they would differ in their set of unobserved characteristics. Yet, the poor quality of this alternative variable requires us to be very cautious with the interpretation of this last result.

5.5.5   Controlling for total employment

We then proposed an alternative specification. In our baseline model, we control for the number of hours worked by native employees. The result presented here-before should thus be interpreted as changes in immigrant employment when native employment is held constant. We now investigate

the robustness of our results when we control for the total number of hours worked in the firm. By construction, this control includes the immigrant employees.

The results are presented in Appendix in Table 12. The estimates of the export demand should now be interpreted as a change in the immigrant employment when the size of the firm is kept constant. We find a positive and significant effect of the export demand on the employment of immigrant workers, although the magnitude of the effect is slightly smaller as compared to the baseline estimates.

6 Conclusion

This paper investigates how export opportunities determine firms' decisions to hire immigrant workers. This research question echoes the concerns of existing studies on the pro-trade effect of immigrants regarding the presence of a reverse causality bias. These studies acknowledge that firms may hire foreign workers because they already export and plan to expend their trade activities, or because they anticipate to start exporting in the future. We fill a gap in this literature by investigating this reverse causality.

Using firm-level data on the French manufacturing sector from 2005 to 2009, we find that export demand fluctuations have a significant impact on the use of immigrant workers. A 10% increase in the export demand yields a 0.42% increase in the use of immigrant workers. This results holds for immigrants in both high- and low-skilled occupations. We also find that this positive effect only holds for immigrants with permanent contracts. We interpret our results as suggestive evidence that firms hire immigrant workers for their unobserved characteristics that could ease export activities, such as their export know-how.

Our results are important for future research in multiple directions. First, we show that immigrant workers possess unobserved characteristics that are valued by exporters and future exporters. Future research could try to further identify these characteristics using data that could provide detailed information on individuals such as their language skills, job preferences, past experience, etc. Such a work would allow one to shed light on the mechanisms at play in the hiring decisions of immigrant workers and the export activities of the firms. Second, our paper is the first to explicitly study how export opportunities impact the employment of immigrant workers. Future research on the pro-trade effect of immigrants should therefore consider the problem of reverse causality with care and in a more systematic way.

Finally, our work has one major policy implication. We show that firms react to an increase in export demand by increasing their employment of immigrant workers, especially under permanent positions. In other words, while export opportunities favours immigrant employees, a negative demand shock does not necessarily hurts immigrant workers who are already employed under permanent contracts in the short term. Meanwhile, we find that export demand shocks have little impact on natives' employment. Therefore, policies aimed at further integrating immigrant workers

into the French labour market could aim at enhancing export opportunities for French firms. In addition to their positive impact on trading activities, such policies would participate to a better integration of the foreign population living in France by exploiting the complementarities between native and immigrant workers.

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Appendix

Sample	All firms		
Dependent variable	(log) Hours worked by immigrants		
	(1)	(2)	(3)
(log) Export demand (d_{it})		0.039***	0.027**
		(0.009)	(0.011)
(log) Export demand (d_{it-1})	0.030***		0.021**
	(0.010)		(0.010)
(log) Capital productivity	0.811***	0.791***	0.811***
	(0.136)	(0.124)	(0.136)
(log) Hours worked by natives	0.292***	0.320***	0.291***
	(0.052)	(0.050)	(0.052)
Sh. of permanent contracts (in hours)	-0.877***	-0.814***	-0.876***
	(0.136)	(0.133)	(0.136)
Sh. of high-skilled jobs (in hours)	-0.173**	-0.223***	-0.172**
	(0.074)	(0.068)	(0.074)
Sh. of full-time positions (in hours)	-0.036	-0.067	-0.035
	(0.133)	(0.131)	(0.133)
Firm FE	yes	yes	yes
Sector-year FE	yes	yes	yes
Region FE	yes	yes	yes
Observations	82,495	92,044	82,467
R-squared	0.916	0.913	0.916

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Robustness test: Lagged export demand and immigrant employment adjustment

Sample	All firms					
Dependent variable	(log) Hours worked by immigrants					
	(1)	(2)	(3)	(4)	(5)	(6)
(log) Export demand (d_{it})	0.033***	0.030***	0.029***	0.032***	0.033***	0.033***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
(log) Capital productivity		1.156***	0.907***	0.881***	0.861***	0.858***
		(0.130)	(0.124)	(0.118)	(0.121)	(0.121)
(log) Hours worked by natives			0.306***	0.313***	0.307***	0.308***
			(0.048)	(0.049)	(0.050)	(0.052)
Sh. of permanent contracts (in hours)				-0.823***	-0.807***	-0.815***
				(0.136)	(0.140)	(0.138)
Sh. of high-skilled jobs (in hours)					-0.263***	-0.262***
					(0.071)	(0.071)
Sh. of full-time positions (in hours)						-0.099
						(0.138)
Firm FE	yes	yes	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Observations	95,070	87,917	87,917	86,137	85,618	85,588
R-squared	0.906	0.908	0.908	0.915	0.915	0.915

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Robustness test: Alternative definition of the export demand - t_0 is the first export year over 2004-2009

Sample	All firms
Dependent variable	(log) Nr. of immigrant workers
	(1)
(log) Export demand (d_{it})	0.007***
	(0.002)
(log) Capital productivity	0.126***
	(0.023)
(log) Nr. of native workers	0.382***
	(0.021)
Sh. of permanent contracts (in hours)	-0.162***
	(0.029)
Sh. of high-skilled jobs (in hours)	-0.030***
	(0.012)
Sh. of full-time positions (in hours)	-0.032
	(0.022)
Firm FE	yes
Sector-year FE	yes
Region FE	yes
Observations	92,044
R-squared	0.967

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 10: Robustness test: Using the *number* of employees

Sample	All firms					
Dependent variable	(log) Hours worked by immigrants					
	(1)	(2)	(3)	(4)	(5)	(6)
(log) Export demand (d_{it})	0.047***	0.045***	0.045***	0.046***	0.046***	0.046***
	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
(log) Capital productivity		1.245***	1.601***	1.544***	1.526***	1.514***
		(0.133)	(0.141)	(0.139)	(0.142)	(0.142)
(log) Hours worked by natives			-0.474***	-0.471***	-0.473***	-0.474***
			(0.015)	(0.016)	(0.016)	(0.016)
Sh. of permanent contracts (in hours)				-1.535***	-1.519***	-1.527***
				(0.181)	(0.184)	(0.184)
Sh. of high-skilled jobs (in hours)					-0.205**	-0.210**
					(0.099)	(0.100)
Sh. of full-time positions (in hours)						0.356**
						(0.136)
Firm FE	yes	yes	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes	yes
Observations	102,123	94,672	94,672	92,622	92,079	92,044
R-squared	0.805	0.807	0.817	0.823	0.823	0.823

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Robustness test: Alternative variable to identify immigrant workers

Sample	All firms			
Dependent variable	(log) Hours worked by immigrants			
	(1)	(2)	(3)	(4)
(log) Export demand (d_{it})	0.025**	0.026***	0.026***	0.025***
	(0.010)	(0.009)	(0.009)	(0.009)
(log) Capital productivity	-0.053	-0.055	-0.069	-0.076
	(0.124)	(0.118)	(0.119)	(0.120)
(log) Total hours worked in the firm	1.541***	1.533***	1.532***	1.566***
	(0.042)	(0.040)	(0.040)	(0.040)
Sh. of permanent contracts (in hours)		-0.670***	-0.671***	-0.664***
		(0.107)	(0.110)	(0.111)
Sh. of high-skilled jobs (in hours)			-0.029	-0.019
			(0.063)	(0.062)
Sh. of full-time positions (in hours)				-0.663***
				(0.112)
Firm FE	yes	yes	yes	yes
Sector-year FE	yes	yes	yes	yes
Region FE	yes	yes	yes	yes
Observations	94,672	92,622	92,079	92,044
R-squared	0.911	0.917	0.918	0.918

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Robustness test: Controlling for the total nr. of hours