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When Immigrants Meet Exporters: A Reassessment of the Migrant-Native Wage Gap*

Léa Marchal, Guzmán Ourens and Giulia Sabbadini

May 2025

Abstract

We show that high-skilled immigrants earn higher wages than comparable natives in exporting firms, while low-skilled immigrants do not. Using matched employer–employee and customs data from Portugal, we document a reversal of the migrant-native wage gap among high-skilled workers in exporting firms. We develop a model with heterogeneous firms and directed search, in which high-skilled immigrants lower export costs through destination-specific knowledge. The model yields an *information premium* that explains the wage gap reversal. We provide evidence consistent with this mechanism using information on the origin country of the workers and the destination country of the firm's exports. Our results identify a novel channel through which trade reduces wage inequality conditional on the skill level and origin country of the employees, and provide new micro-level evidence on the role of workers in shaping firm-level internationalisation.

Keywords: Export; Firm; Immigrant; Wage.

JEL Codes: F14, F22, F16, J15.

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1 Introduction

We show that high-skilled immigrants earn higher wages than comparable natives in exporting firms. This wage gap reversal is attributable to an *information premium* stemming from the complementarity between high-skilled immigrants' destination-specific knowledge and their employers' export activities. Using matched employer–employee and customs data from Portugal, we show that the migrant-native wage gap narrows or reverses for high-skilled workers. To explain this pattern, we develop a model in which heterogeneous firms engage in directed search and employ high-skilled immigrants who lower export costs. The model generates an information premium for high-skilled immigrants and highlights a novel channel through which trade can reduce wage inequality. We provide empirical evidence consistent with this mechanism using information on the origin country of the workers and the destination country of the firm's exports.

Immigrant workers typically earn less than natives. A recent report from the International Labour Organisation evaluates that migrant workers, in 33 high-income countries, earn approximately 12.6% less than natives (Amo-Agyei, 2020). In the case of Portugal, the report shows that the wage gap between immigrants and natives widened from 25.4% in 2015 to 28.9% in 2020. Our findings highlight heterogeneity in the wage gap, indicating that the gap narrows or reverses for high-skilled immigrants employed in exporting firms.

Trade economists have established that exporting firms pay higher wages than non-exporting firms (Bernard et al., 1995; Schank et al., 2007), but also that internationalisation contributes to wage inequality within firms (Bøler et al., 2018; Bonfiglioli and De Pace, 2021; Burstein and Vogel, 2017; Friedrich, 2020; Georgiev and Juul Henriksen, 2020; Klein et al., 2013). We document that firms' export activity and workers' skills interact to generate an information premium for high-skilled immigrants, revealing a previously overlooked mechanism by which trade can reduce wage inequality.

Using Portuguese employer-employee data from 2010 to 2021, we estimate a wage equation that includes worker characteristics (low-/high-skilled, native/immigrant) and the firm's export activity (export intensity and export status). We address potential endogeneity concerns regarding omitted variable bias affecting the firm's export activity and wage-setting decision, using firm-time fixed effects in the baseline specification. Moreover, to address issues related to the selection of better workers into exporting firms, we control for workers' quality with a large set of control variables at the individual level in the baseline, including the education level and the average deviation of the worker's wage from her coworkers in the same occupation, in a robustness.

We find that, on average, immigrant workers earn lower wages than natives. This wage gap persists for low-skilled immigrant workers, irrespective of the firm's export status. However, we find different results for high-skilled workers. Although there is an export premium for both high-skilled native and immigrant workers, the effect is larger for the latter. The baseline results show that a 10% increase in export value increases wages by 0.12% for high-skilled immigrant workers but only by 0.005% for high-skilled native workers. When a firm starts exporting, the export premium is around 14% for high-skilled immigrants, and their wage premium is around 12%. Low-skilled immigrant workers earn about 2% less than low-skilled native workers, irrespective of the export status of the employing firm.

Since firms' revenue increases when they enter foreign markets, hiring the right workers – those that allow firms to extract most of the potential surplus of the market – is particularly important (Bombardini et al., 2019). First, high-skilled immigrants enhance exports on both intensive and extensive margins by reducing transaction costs associated with cultural and institutional differences and by fostering trust in repeated buyer-seller interactions (Bahar and Rapoport, 2018; Hatzigeorgiou and Lodefalk, 2021; Hiller, 2013; Olney and Pozzoli, 2021; Rauch, 2001; Rauch and Trindade, 2002). Second, immigrant workers improve firm integration into the global value chain through their knowledge of specific input requirements (Ariu et al., 2019; Bastos and Silva, 2012; Egger et al., 2019; Hatzigeorgiou and Lodefalk, 2016; Sabbadini, 2024). Finally, the literature has shown that immigrant workers play a crucial role in helping firms acquire knowledge about the specificity of foreign demand (Araujo et al., 2016; Arkolakis, 2010; Artopoulos et al., 2013; Mion and Opromolla, 2014).

Our theoretical model integrates these insights from the literature. In our model, firms are heterogeneous in productivity and face export costs, following Melitz (2003). This heterogeneity results in the concentration of the export activity within a subset of firms. Following Moen (1997), we incorporate directed search in the labour market, allowing firms to offer different wages to specific types of labour. Workers are categorised by skill level (low- or high-skilled) and origin (immigrant or native). The model yields an export premium and an immigrant discount, reflecting less favourable labour market conditions for immigrants than natives. It also yields a skill premium, where higher skill levels translate into a higher marginal product. The employment of high-skilled immigrants reduces the cost of exporting, creating a premium for this specific factor of production. This premium can be interpreted as an *information premium* arising from immigrants' ability to provide valuable information to exporters serving – or seeking access to – foreign markets.[1] In equilibrium, high-skilled immigrants earn higher wages than natives within the same skill group, provided that the information premium for this particular group more than compensates for the immigrant discount. We obtain these results in perfectly competitive labour markets, differentiating our approach from those involving monopsony power by firms (Amior and Manning, 2020).

We provide empirical evidence in support of the information premium proposed by our theoretical model. Using detailed data on immigrants' country of origin, we examine whether the wages of immigrant workers from a specific origin are positively affected by their firm's export activity to that particular foreign market. We find a positive and significant relationship between the wage of a high-skilled immigrant worker from a specific origin country and the export activity of the employing firm in that particular country. No such effect is observed for exports

[1] Immigrant workers might also affect firm-level performance through productivity gains (Mitaritonna et al., 2017; Ottaviano et al., 2018; Peri and Sparber, 2009). However, such gains result from the presence of both native and immigrant workers within a firm, making it unlikely to generate a wage premium specific to immigrant workers. Therefore, our focus remains primarily on the information premium mechanism, disregarding productivity effects.

to other markets or the sample of low-skilled workers. This is a key finding, offering new evidence consistent with research showing how immigrants improve exports to their home countries. As immigrant workers strengthen trade ties, they also capture an information premium, translating into higher wages and lower wage gaps.[2]

Our work contributes to the literature on the migrant-native wage gap (Amo-Agyei, 2020; Christl et al., 2020; Dustmann and Glitz, 2011; Hofer et al., 2017; Ingwersen and Thomsen, 2021). To our knowledge, our study is the first to examine how the interaction between employers' export activity and workers' skill level and origin shapes the wage gap. Our study is closely related to the work of Dostie et al. (2021), which decomposes both the level and the change in the migrant-native wage gap in Canada using firm-level data. They find that native workers earn a higher average firm-specific pay premium, driven by the under-representation of immigrants in high-premium firms. Their analysis also shows that university-educated immigrants from developing countries experience the largest gains as they climb the job ladder. Our results complement these research efforts focused on firms by focusing on how trade affects wages for workers who differ in occupation and origin country, and by showing that trade can reduce rather than increase wage inequality.

Our article also contributes to the literature showing how trade affects wage inequality. Verhoogen (2008) establishes a connection between trade and wage inequality through quality upgrading, where higher-quality goods require higher-quality workers, who in turn receive higher wages. Bøler et al. (2018) show that exporting is associated with a larger gender wage gap, as women are either less flexible or perceived to be so, hindering communication with international partners across time zones and the ability to travel on short notice. In contrast, Bonfiglioli and De Pace (2021) show that exporting reduces the gender wage gap for high-skilled workers as serving foreign markets requires interpersonal skills, reinforcing females' comparative advantage. We depart from this literature not only by showing that trade can decrease wage inequalities, but also by identifying a new source of workers' heterogeneity affecting the wage distribution - their origin country.

Finally, the theoretical framework most closely related to ours is that of Felbermayr et al. (2018), which features a directed search setting with homogeneous labour. We extend this framework by incorporating multiple labour markets and allowing trade costs to be firm-specific and contingent on employing a particular type of labour. Other contributions that integrate trade models with heterogeneous firms into models with labour market frictions include Helpman et al. (2010), Felbermayr et al. (2011) and Amiti and Davis (2012). However, most of this literature treats labour as a homogeneous factor. A notable exception is Sampson (2014), who introduces labour heterogeneity in one dimension (skill) to analyse the impact of trade on inequality. Our model differs from this approach by introducing heterogeneity along two dimensions: skills and

[2] The working paper version of this manuscript (Marchal et al., 2023) presents similar results using French data. However, compared to the Portuguese one, a key limitation of this dataset is that it identifies only the region of origin (EU or non-EU) rather than the exact country of origin of immigrant workers. However, the worker's country of origin is key to providing supporting evidence of the information premium put forward in this paper. Despite this limitation, the findings of Marchal et al. (2023) remain closely aligned with the results presented here.

foreign status. Moreover, we focus on a framework in which a specific factor of production lowers trade costs and analyse the resulting wage implications.

The remainder of the paper is structured as follows. Section 2 describes the Portuguese employer-employee data and presents stylised facts on the relationship between workers' foreign status, wage inequality, and firms' export activity. Section 3 outlines our empirical strategy and discusses how we address endogeneity concerns. Section 4 reports the main empirical results. Section 5 introduces the theoretical framework rationalising the underlying mechanism driving our results. Section 6 provides empirical evidence supporting this mechanism. Section 7 concludes.

2 Data and Descriptive Evidence

2.1 Data Sources

We use administrative data on Portuguese manufacturing firms and their employees from 2010 to 2021. The first data source consists of annual employer-employee data: the *Quadros de Pessoal* from the *Gabinete de Estratégia e Planeamento*. All wage-paying and private legal entities established in Portugal must submit payroll declarations.[3] We focus only on workers employed in firms that are part of the manufacturing industry according to the Portuguese classification of activities (*Indústrias transformadoras; Classificação Portuguesa das Actividades Económicas, Revisão 3*).

This dataset allows us to follow employees over time. It contains workers' characteristics such as their age, gender, citizenship, and education. We define immigrant workers as those with foreign citizenship. Additionally, the dataset contains information on job characteristics such as years of experience in the firm, gross wages, number of hours worked, and occupation. The classification of occupations (*Classificação Portuguesa de Profissões, 2010*) allows us to identify low- and high-skilled workers. We define low-skilled workers as those belonging to occupation groups 4, 5, 7, 8, and 9.[4] We define high-skilled workers as those belonging to occupation groups 1 to 3.[5] Additional information about the classification of occupations is provided in Table A.1 (Appendix A). The dataset also contains information on firms' age, legal status, social capital, main sector of activity (CAE Rev.3 at the 2-digit level), total sales, total employment, and the percentage of foreign capital.

Information on the export activity of firms is provided by the *Serviço de Estatísticas do Comércio Internacional* of the *Departamento de Estatísticas Económicas*. The dataset includes

[3] Only central, regional and local administrations, public institutes, and employers of domestic service workers are exempted from filling such declarations.

[4] 4: Pessoal administrativo / Administrative staff; 5: Trabalhadores dos serviços pessoais, de protecção e segurança e vendedores / Personal service, security and safety workers and salespersons; 7: Trabalhadores qualificados da indústria, construção e artífices / Skilled industrial, construction and craft workers; 8: Operadores de instalações e máquinas e trabalhadores da montagem / Plant and machine operators and assembly workers; 9: Trabalhadores não qualificados / Unskilled labourers.

[5] 1: Representantes do poder legislativo e de órgãos executivos, dirigentes, directores e gestores executivos / Representatives of the legislature and executive bodies, leaders, directors and executive managers ; 2: Especialistas das actividades intelectuais e científicas / Specialists in intellectual and scientific activities; 3: Técnicos e profissões de nível intermédio / Technicians and mid-level professions.

information on imports and exports between firms in Portugal and the other Member States of the European Union and countries outside the European Union. It reports shipments in value and volume by firm, NC8 product, origin/destination country and year.[6]

Finally, to build the instrument approximating the world import demand faced by Portuguese firms for a robustness test on identification, we use the BACI dataset from the *Centre d'Études Prospectives et d'Informations Internationales*, which contains bilateral trade flows at the HS6 product level by origin and destination countries, measured in U.S. dollars.[7]

2.2 Descriptive Statistics

After merging all data sources, we obtain a sample of 5,744,470 worker-firm-year observations, 4,327,103 of which constitute the baseline sample of worker-firm-year observations employed by exporters, defined as firms that export at least once over the study period. The sample contains 51,621 manufacturing firms, 14,759 of which export at least once over the studied period. The sample thus confirms two key facts: Exporters are large employers, and exporting is rare (as first documented by Bernard et al., 2007). Approximately 74.11% of the workers are employed by an exporting firm, and 28.59% of the firms export at least once.

Table 1 provides an overview of firm characteristics. On average, firms in our baseline sample engage in positive exports for 60% of the time, 15% of their workforce is employed in high-skilled occupations, and immigrant workers constitute roughly 2% of their workforce. Table A.2 (Appendix A) reports firm characteristics by export status. Firms exporting at least once over the sample period have significantly larger revenues and a higher skill intensity than never-exporting firms. Switching perspective, Table A.3 (Appendix A) shows how firms' export activity varies with their employment of immigrant workers. The data show that exporters employing immigrants export more often, exhibit larger export values and serve more export destinations, product varieties, and product-destination markets than their counterparts employing no immigrant workers.

Table 1: Summary Statistics.

	Mean	Std. Dev.	N
Total sales	6.9e+06	9.0e+07	127,930
Domestic sales	6.5e+06	8.5e+07	127,930
Export sales	321,053	4.6e+06	127,930
Export status	0.604	0.489	127,930
Share of employees in high-skilled occupations	0.150	0.216	127,930
Share of immigrant employees	0.020	0.078	127,930
Share of immigrants in low-skilled occupations	0.018	0.134	124,308
Share of immigrants in high-skilled occupations	0.006	0.078	77,934

Notes: This table reports descriptive statistics for the baseline sample of firms exporting at least once over the study period.

The dataset includes 1,036,768 workers, among whom 768,322 are in the baseline sample. In this sample, immigrant workers constitute 3.87% of all workers and 2.52% (4.12%) of the total employment of high-skilled (low-skilled) workers. Finally, Table A.4 (Appendix A) presents

[6] To convert the trade data in euros, we use the exchange rates from the ECB.
[7] We harmonize the product classification using the HS07 classification.

descriptive statistics on the wage distribution for the workers included in the baseline sample. The data show that immigrant workers earn, on average, higher wages than native workers when they hold high-skilled occupations.

These wage differences correlate with several firm characteristics, particularly the export participation of the employing firm: Workers employed by firms that do not export in a given year earn approximately 1.15 euros less per hour than individuals employed by firms that export in a given year (equivalent to about 0.139 log points). Second, wage differences correlate with individual characteristics such as gender, age, and occupation. On average, an individual in a high-skilled position earns about 2.04 euros more per hour than a low-skilled worker (about 0.715 log points).

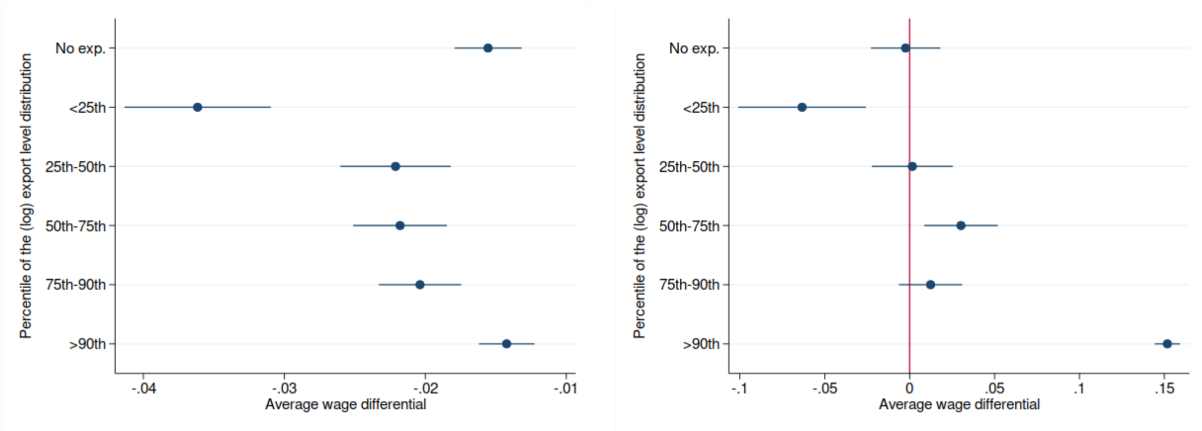
2.3 Stylised Facts

Our data suggests that different factors interact to shape wages. First, the firm's export intensity correlates differently with the wages of its workers, depending on their origin and occupation group. Figure 1 plots the average wage differential between native and immigrant workers in different percentiles of the distribution of firms' average export value.[8] The left side of the figure focuses on low-skilled workers, and the right side focuses on high-skilled workers. For the sample of low-skilled workers, we observe that immigrant workers earn consistently less than native workers across the entire distribution of firms' export activity. In contrast, for the sample of high-skilled workers, immigrants earn wages comparable to natives in never-exporting firms. However, they earn higher or equal wages in medium and large exporting firms.

[8] We take the average export value of the firm so that firms belong to the same bin of the export distribution over time. Results are unchanged when assigning firms to bins based on the distribution of export value at the firm-year level.

Figure 1: Wage Gap and Exports by Occupation Groups.

(a) Workers in Low-Skilled Occupations **(b)** Workers in High-Skilled Occupations



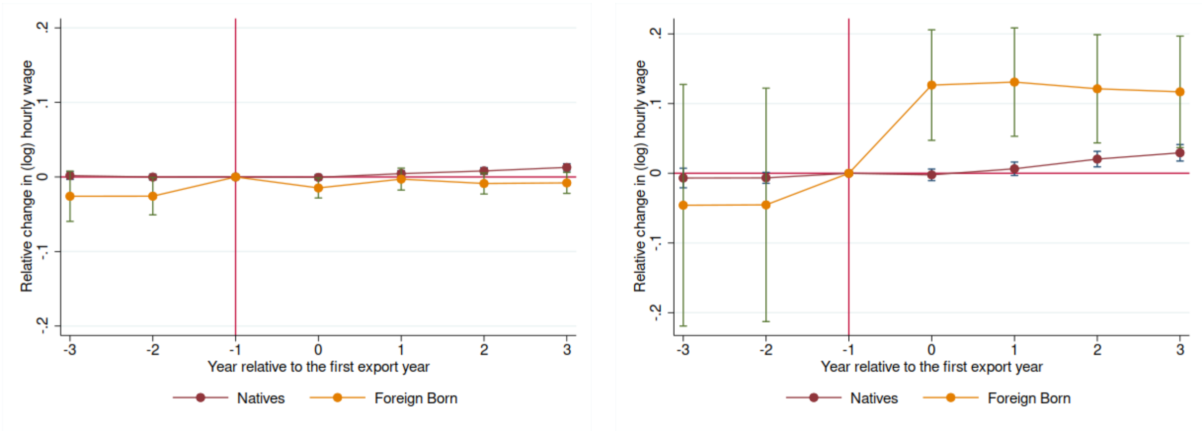
Notes: Each figure shows the average wage differential between native and immigrant workers in different percentiles of the export distribution (measured as the average (log) value over the firm period). Wage differentials, denoted β_g, are estimated from a wage equation that includes interaction terms between a dummy variable for immigrant workers ($\mathbb{D}_i$) and a dummy variable indicating the export percentile g of the employing firm: $\ln w_{i(j)t} = \mathbb{D}_i \times \sum_{g=1}^{G} \beta_g \mathbb{1}\left[Export_{jt} \in g\right] + X'_{it}\Gamma + X'_{jt}\Theta + \varphi_{fo} + \varphi_{st} + \varphi_{rt} + \varepsilon_{it}$. The regression includes individual characteristics, denoted by X'_{it} (gender, age, experience, experience squared, and education dummies), firm-level controls, denoted by X'_{jt} (firm domestic sales, MNE group dummy, and firm age), as well as firm-occupation, sector-time, and region-time fixed effects. Coefficients are reported with their corresponding 95% confidence intervals.

Second, we plot the wage dynamics of workers before and after their employer starts exporting for the first time. For this exercise, we focus on workers who do not change firms over the sample period (80% of the workers in the sample). Workers employed in firms that never export serve as a control group, providing the counterfactual basis for estimating the effect of exporting. The coefficients in Figure 2 represent the change in wages relative to the year a firm exports for the first time. Consistent with the well-known export premium, we find that both native and immigrant workers in high-skilled occupations experience a wage increase after their employer starts exporting. However, the increase is larger for the sample of immigrants in high-skilled occupations. This does not hold for the sample of workers in low-skilled occupations.[9]

[9] The sample is unbalanced: it includes workers present before and after t=0 and workers present only as of t=0. Since the data are truncated at the start of our sample period in 2010, only 9% of the observations are balanced, while 49% include workers present as of t=0. This means that the results in Figure 2 can be driven by either the workers already employed in the firm or those hired when the firm starts exporting. However, the mechanism proposed in this paper relies on the complementarity between the information that the worker might bring to the firm and the employer's export activity. This information can come from both new hires and existing employees. Section 6.3 discusses this in more detail.

Figure 2: Wage Dynamics in Firms Starting to Export.

(a) Workers in Low-Skilled Occupations **(b)** Workers in High-Skilled Occupations



Notes: The coefficients for the two groups of workers are estimated from the same regression, which includes individual controls (foreign dummy, gender, age, experience, experience squared, and education dummies), firm controls (firm domestic sales, MNE group dummy, and firm age), as well as firm-occupation, sector-time, and region-time fixed effects. Coefficients are reported with their corresponding 95% confidence intervals.

3 Empirical Strategy

3.1 Empirical Specification

This section studies how the migrant-native wage gap varies with the firm's export activity and the worker's occupation. Our empirical strategy is based on a wage equation in which we relate the wages of workers employed in Portuguese manufacturing firms to the observed characteristics of both workers and firms:

$$\begin{aligned}\ln \mathrm{w}_{i(j)t} =& \beta_0 + \beta_1 \mathrm{Foreign}_i + \beta_2 \mathrm{Export}_{jt} + \beta_3 (\mathrm{Foreign}_i \times \mathrm{Export}_{jt}) \\ &+ \beta_4 (\mathrm{Foreign}_i \times \mathrm{HS}_i) + \beta_5 (\mathrm{Export}_{jt} \times \mathrm{HS}_i) \\ &+ \beta_6 (\mathrm{Foreign}_i \times \mathrm{Export}_{jt} \times \mathrm{HS}_i) + \Gamma X'_{it} + \Theta X'_{jt} + \mathrm{FE} + \varepsilon_{i(j)t} \qquad (1)\end{aligned}$$

The dependent variable is the (log) hourly wage of an individual i working in firm j at time t. $\mathrm{Foreign}_i$ is a binary variable equal to one if worker i is a foreign citizen and zero otherwise. Export_{jt} is either the (log) export value of firm j at time t or a binary variable equal to one if firm j exports at time t. HS_i is a dummy variable indicating whether the worker is employed in a high-skilled occupation.[10] This specification includes the triple interaction between the immigrant dummy, the export variable, and the high-skilled occupation dummy, as well as the double interaction terms. A positive sign of β_6 in Equation (1) would indicate that the migrant-native wage gap is smaller in export-intensive (or exporting) firms for high-skilled occupations.

The specification includes time-invariant and time-varying individual characteristics (X'_{it}), specifically the gender of individual i, her tenure in the firm at time t and its squared term,

[10] We focus on workers who do not switch between high- and low-skilled occupations.

and her age at time t. We also include education dummies to approximate worker quality and partly control for the self-selection of better workers in exporting firms.[11] For example, exporters may be better at screening workers on the labour market, and thus may hire workers who prove valuable for exporting after gaining experience and having revealed their productivity while working for previous employers. These workers may earn higher wages (reflecting higher productivity) and eventually move to more export-intensive firms. The selection of better – and thus better-paid – workers into exporting firms would confound the effect of exporting on wages. We further discuss this selection issue in Section 4.2.

Time-varying firm characteristics (X'_{jt}) include the (log) value of domestic sales of firm j at time t to control for firm size, the age of the firm, as well as an MNE dummy set to one if firm j has a positive share of foreign capital at time t.

The first set of fixed effects (FE) includes firm-occupation, sector-time, and region-time fixed effects. Using firm-occupation fixed effects allows us to compare the wages of two individuals employed in the same firm and the same 2-digit occupation but differing in their immigrant status. Sector-time fixed effects capture systematic variations in wages across sectors and sector-specific inflation that might affect the level of wages, and other nominal variables. Exploiting within-sector variation allows us to control for the possibility that exporters may be concentrated in industries with a high density of native or immigrant workers. Region-time fixed effects control for unobserved factors at the region level, such as search costs, which are typically higher in less dense areas. They also account for the fact that some regions might exhibit, on average, higher wages.

The second set of fixed effects builds on the first set and includes firm-occupation, firm-time, and occupation-time fixed effects. Firm-time fixed effects control for unobserved firm-level demand and technological shocks that could simultaneously affect trade and wage decisions and selection into exporting (Bøler et al., 2018; Bonfiglioli and De Pace, 2021). Occupation-time fixed effects capture differential wage trends, which may be correlated with the inflow of immigrants to fill vacancies.

With both sets of fixed effects, we can compute the total wage gap between immigrant and native workers in different occupations. Yet, we can only compute the total export premium for each worker category with the first set of fixed effects.[12] Finally, errors are clustered at the firm level to account for correlations across workers employed in the same firm.

4 A Reassessment of the Migrant-Native Wage Gap

This section investigates how the migrant-native wage gap varies with firms' export activity across broad occupation groups. We then present a set of robustness tests using alternative variables and alternative samples.

[11] Information on education is as populated for immigrant workers as for native workers. For both types of workers, the information is missing for only 2% of the sample. Additionally, the average share of immigrant workers with only basic education is statistically significantly lower than for native workers, 46% *vs* 62%.

[12] As firms do not change sector and location over the sample period, firm-time fixed effects subsume the sector-time and region-time fixed effects.

4.1 Baseline Results

In Table 2, we present the results of the baseline specification (Equation 1) analysing the determinants of the migrant-native wage gap. We report the results for the export intensity in columns (1) and (2) and for the export status in columns (3) and (4).

In each specification, the triple interaction term (β_6) is positive and significant. This indicates a differentiated impact of exporting on the migrant-native wage gap for high-skilled workers relative to low-skilled workers. These results hold for both export intensity and status. To ease the interpretation of the results presented in Table 2, we compute the implied export thresholds, export premium, and migrant-native wage gap using the coefficients shown in Table 3.

Table 2: Baseline Results.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Estimation results				
(β_1) Foreign$_i$	-0.023***	-0.024***	-0.025***	-0.023***
	(0.008)	(0.008)	(0.008)	(0.008)
(β_2) Export$_{jt}$	0.000		0.001	
	(0.000)		(0.001)	
(β_3) Foreign$_i$ × Export$_{jt}$	0.000	0.000	0.007	0.003
	(0.001)	(0.001)	(0.008)	(0.008)
(β_4) Foreign$_i$ × HS$_i$	-0.025	-0.031	0.012	-0.002
	(0.027)	(0.027)	(0.024)	(0.024)
(β_5) Export$_{jt}$ × HS$_i$	0.000	0.000	0.003	0.002
	(0.000)	(0.000)	(0.003)	(0.003)
(β_6) Foreign$_i$ × Export$_{jt}$ × HS$_i$	0.011***	0.012***	0.125***	0.143***
	(0.002)	(0.002)	(0.027)	(0.028)
Observations	4,327,103	4,318,286	4,327,103	4,318,286
R-squared	0.160	0.168	0.160	0.168
Controls	yes	yes	yes	yes
FE	fo-st-rt	fo-ft-ot	fo-st-rt	fo-ft-ot

Notes: This table reports OLS coefficients. The dependent variable is the (log) hourly wage of an individual i working in a firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, and education dummies. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, st, rt and ot indicate firm-occupation, firm-time, sector-time, region-time, and occupation-time fixed effects.

Export thresholds. Based on the estimations in columns (1) and (2) of Table 2, we can determine, for each occupation group, an export threshold above (below) which immigrant workers earn higher (lower) wages than native workers. Results are reported in the first panel of Table 3.

Starting with the results for low-skilled workers, in columns (1) and (2), we find that the immigrant discount persists throughout the entire distribution of export intensity, as the export threshold to reach wage parity is above unity and insignificant. However, we find significant thresholds for high-skilled workers showing that immigrants employed by firms exporting less (more) than 58 to 83 euros earn lower (higher) wages than natives.

The migrant-native wage gap. Based on the estimations in columns (3) and (4) of Table 2, we can compute the magnitude of the wage gap between immigrant and native workers by exporting status by looking at linear combinations of coefficients from Equation (1). Results are reported in the second panel of Table 3.

Low-skilled immigrant workers earn 1.8 to 2.5% less than their native counterparts, independent of their employers' export status (columns 3 and 4). High-skilled immigrants earn as much as high-skilled natives when non-exporting firms employ them. However, they earn 12% more than natives when employed by exporters.[13]

The export premium. Finally, we can compute the export premium for both firms' export intensity and export status. Results are reported in the third panel of Table 3.

An increase in the export intensity of the firm (column 1) has no significant effect on the wages of low-skilled workers, whether immigrants or natives. However, a 10% increase in the export intensity of the firm is associated with a 0.005% increase in the wages of high-skilled natives (significant at the 11% level) and with a 0.12% increase in the wages of high-skilled immigrants. Similarly, when the firm becomes an exporter (column 3), the wages of high-skilled natives increase by 0.4% and those of high-skilled immigrants by 13.5%. Here again, the export premium on high-skilled natives is only weakly significant. Note that when the sample of high-skilled natives is extended to include the administrative staff (category 4 in Table A.1, Appendix C), the coefficients do not change in terms of magnitude, yet, the export premium for high-skilled native workers becomes positive and significant at the conventional level. Results are available upon request.

Therefore, for both measures of trade activity, high-skilled workers benefit from exporting – akin to the well-known export premium – yet immigrants benefit more than natives.

Our findings indicate that low-skilled immigrant workers face a wage discount relative to their native counterparts, regardless of the export activity of their employing firms. Exporting does not affect wage inequality between immigrants and natives in this occupation group. Conversely, for high-skilled workers, the wage gap between immigrants and natives depends on the export activity of the employing firm. Immigrants earn lower wages than natives at the lower end of the export intensity distribution. Therefore, exporting determines the wage gap between immigrant and native high-skilled workers.

[13] For the export intensity, the migrant-native wage gap would need to be evaluated at a given level of the export value. Instead, we provide the export threshold required to reach wage equality in the first panel of Table 3.

Table 3: Interpretation – Baseline Results.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Export thresholds				
Low-skilled workers ($-\beta_1/\beta_3$)	70.516	81.204	-	-
	(119.603)	(155.419)	-	-
High-skilled workers ($-[\beta_1+\beta_4]/[\beta_3+\beta_6]$)	4.054**	4.415***	-	-
	(1.606)	(1.503)	-	-
The migrant-native wage gap				
Low-skilled workers in non-exporter (β_1)	-	-	-0.025***	-0.023***
	-	-	(0.008)	(0.008)
Low-skilled workers in exporter ($\beta_1 + \beta_3$)	-	-	-0.018***	-0.020***
	-	-	(0.003)	(0.003)
High-skilled workers in non-exporter ($\beta_1 + \beta_4$)	-	-	-0.013	-0.025
	-	-	(0.022)	(0.023)
High-skilled workers in exporter ($\beta_1 + \beta_3 + \beta_4 + \beta_6$)	-	-	0.118***	0.121***
	-	-	(0.020)	(0.020)
The export premium				
Low-skilled natives (β_2)	0.000	-	0.001	-
	(0.000)	-	(0.001)	-
Low-skilled immigrants ($\beta_2 + \beta_3$)	0.000	-	0.008	-
	(0.001)	-	(0.008)	-
High-skilled natives ($\beta_2 + \beta_5$)	0.000	-	0.004	-
	(0.000)	-	(0.003)	-
High-skilled immigrants ($\beta_2 + \beta_3 + \beta_5 + \beta_6$)	0.012***	-	0.136***	-
	(0.002)	-	(0.026)	-

Notes: This table provides an interpretation for the results of each estimation presented in Table 2. Standard errors for non-linear and linear combinations of coefficients are obtained using the delta method.

4.2 Robustness Tests

In this section, we investigate the robustness of the estimation of Equation (1). First, we tackle potential remaining concerns on the identification strategy by i) augmenting the baseline specification with a measure of worker quality for the selection issue, and ii) using an instrumental variable strategy for the omitted variable issue. Second, we modify the baseline sample by i) adding the sample of never exporting firms and ii) exploring heterogeneity across genders and types of contracts. All results are presented in Appendix C and confirm the baseline findings.

Workers' selection. As mentioned in Section 3.1, the relationship between exporting and wages can be driven by the selection of better workers into exporting firms. For instance, firms might recruit from an international labour market as they expand their export activities, mainly because the high-productivity workers they require are scarce in the domestic market. Higher wages would, therefore, reflect higher worker quality rather than an export premium.

The most straightforward way to control for this would be to add worker fixed effects in the baseline specification. However, we possibly do not have enough power in the data, since the hourly wage of the workers might not vary a lot over time. Therefore, the wage effect is identified by one-time changes due to exporting. In fact, once they start exporting, 74% of the firms in our sample do so continuously. Figure 2 also supports this fact by showing one discrete jump only around the first time of exporting.

Under the assumption that higher wages reflect higher worker quality, to control for worker quality and selection of workers into firms, we augment the baseline specification with a measure of worker quality based on the average past deviation of a worker's wage from her co-workers in the same firm-occupation-foreign status cell (g).[14] We compute worker i's quality at time t as follows:

$$\text{Quality}_{it} = \frac{1}{t-1}\sum_{\tau=1}^{t-1}(w_{i\in g,\tau} - \bar{w}_{-i\in g,\tau}) \tag{2}$$

The results of this specification are reported in Tables A.5 and Table A.6 (Appendix C). The results are fully consistent with the baseline findings. The coefficient associated with the triple interaction term (β_6) is always positive and significant and of comparable magnitude. The results are also in line with the baseline linear combinations of coefficients. We find that immigrant workers earn lower wages than their native counterparts when they hold low-skilled positions, independently of the export status of their employers. On the contrary, we find a wage premium of about 10% for high-skilled immigrant workers in exporting firms, *versus* a wage discount of about 9% (or parity) for high-skilled immigrant workers in non-exporting firms. Finally, even when further controlling for worker selection, high-skilled immigrants experience a higher export premium than their native counterparts (18% *versus* 0.9%) when the employing firm becomes an exporter. The estimates controlling for worker quality are qualitatively consistent with the comparable baseline estimates, suggesting that even if some selection is at play, it does not fully drive our results.

Instrumentation strategy. In the baseline specification, we rely on firm-time fixed effects to address endogeneity concerns arising from potential omitted variable bias that could affect the wage-setting and exporting decisions of the firm. The results are comparable to those obtained without firm-time fixed effects, thus indicating that omitted variables should not be a major source of concern.

Nevertheless, in this section, we use an IV-2SLS strategy to instrument the export activity of the firm. We use the world import demand faced by firm j at time t, computed as follows:

$$\text{IV}_{jt} = \ln\left(\sum_{pc}\overline{\omega}_{jpc}M_{pct}\right) \ \forall c \neq \text{Portugal} \tag{3}$$

where M_{pct} denotes the total imports of product p by country c at time t, as recorded in the BACI database, excluding imports from Portugal. $\overline{\omega}_{jpc}$ is a time-invariant weight capturing the share that the product-destination pair pc represents in firm j's total exports on average. These weights consider the change in the product-destination mix in a firm export basket over time,

[14]This specification reduces the sample size as we drop the first observation per worker since it is not possible to compute past deviations for that year. Additionally, we drop the observation for which it is not possible to compute the wage deviation because, for example, there is only one worker in that cell.

thus increasing the instrument's power (Davidson et al., 2017).[15] Note that this shift-share instrument is also defined for the years when the firm is not exporting since the weights are computed as average during the years when the firm exports and then kept constant throughout its lifetime in the sample. However, the instrument is not defined for firms that never export, as it is unclear which weights should be applied for these firms (Bas et al., 2021).

Results obtained with this IV strategy are reported in columns (1) and (3) of Tables A.7 and A.8 (Appendix C). We report the results by occupation groups (high- *versus* low-skilled workers) because the full set of interactions decreases the instrument's power. The results align with the baseline findings regarding sign and magnitude.

Alternative samples. We replicate the baseline specification, including firms that never export and thus exhibit no variation in their export activity. Results are reported in Tables A.9 and A.10 (Appendix C) and fully align with the baseline results. Firms that never export do not contribute much to the overall identifying variation. Notably, the export premium for the high-skilled natives is now significant.

Finally, we replicate the baseline specification using a sample of male workers – who represent 60% of the workers in the baseline sample – and a sample of workers with permanent contracts – who represent 63% of the workers in the baseline sample. In doing so, we aim to test the robustness of our findings with a sample of workers with more stable employment patterns. The results of this test are available upon request and align fully with the baseline findings, both in terms of significance and magnitude.

5 Theoretical Framework

This section presents a model summarising the determinants of the wage differential between native and immigrant workers as documented in the previous sections. Our model embeds directed search as in Kaas and Kircher (2015) and in the tradition of Moen (1997), into a trade model with monopolistic competition and heterogeneous firms, similar to Melitz (2003). This allows for firms to be heterogeneous in their exporting status, for factors to be heterogeneous in their productivity, and for wages to be firm- and factor-specific. By merging these frameworks, our model closely aligns with Felbermayr et al. (2018). We build on their model by generalising the production side to include multiple factors of production and introducing the possibility that trade costs can be reduced by using one of the labour inputs.

The model features a standard *skill premium*, wherein higher skills translate into a higher marginal product of skilled workers. The existence of frictions in the labour market allows an *immigrant discount* to exist, as natives have better outside options in the labour market than immigrants. The setting with directed search allows wages to be firm-specific. Introducing heterogeneous firms enables the model to reproduce the fact that only the most efficient and larger firms export. Due to their larger size, exporters must pay higher wages to all types of labour to attract larger quantities of each type, resulting in an *export premium*. When one of

[15] In unreported results, available upon request, we use weights at (firm-specific) t_0 as an alternative. These weights are more exogenous but exhibit weak instrument statistics.

the factors of production (in our case, high-skilled immigrants) contributes relatively more to increasing exporting profits, that creates an additional premium (what we call an *information premium*) exclusive to that factor and exporting firms. Our model shows that high-skilled immigrants can offset the immigrant discount when the skill and export premia they enjoy are sufficiently high.

The model comprises an economy open to international trade and closed to financial capital movements and migration. The trade partner of this economy is not explicitly modelled and is assumed to be symmetric in every aspect for simplicity. Heterogeneous firms produce output $y(\omega)$ of variety ω, using labour of type ij, with $i = L, H$ denoting low-skilled and high-skilled workers respectively, and $j = I, N$ denoting immigrant and native workers respectively. Workers of different types differ in their productivity and the labour market conditions they face. Additionally, HI-type workers can contribute to reducing export costs. Output varieties are consumed both domestically and internationally, as there is free trade in final goods. Firms producing final goods operate under monopolistic competition and are heterogeneous in their productivity level ϕ. The model also allows for free entry into production.

5.1 Consumers

Consumers' preferences are homogeneous and exhibit constant elasticity of substitution across differentiated varieties ω of an aggregate good:

$$C = M^{-\frac{1}{\sigma-1}} \left[\int_{\omega\in\Omega} y(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}} \tag{4}$$

where $\sigma > 1$ and Ω represents the set of all varieties ω, with mass M. In this expression, $M^{-1/(\sigma-1)}$ eliminates scale effects stemming from the love of variety. The following aggregate price can be derived:

$$P = \left[\frac{1}{M} \int_{\omega\in\Omega} p(\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}} \tag{5}$$

where $p(\omega)$ denotes the price of variety ω. We use P as the *numeraire* and derive the usual inverse demand function, expenditure, and aggregate expenditure:

$$y(\omega) = \frac{Y}{M} p(\omega)^{-\sigma},\ r(\omega) = \frac{Y}{M} p(\omega)^{1-\sigma},\ \text{and } R = Y = \int r(\omega) d\omega \tag{6}$$

Consumers only receive income from inelastically selling their workforce in the labour market. Workers of type ij are compensated with a wage w_{ij}. We consider the mass of each type of worker to be exogenous and identical. By ruling out endogenous migration decisions, we provide a theory for wage formation, given the existing composition of the workforce.

5.2 Firms

Firms pay a fixed entry cost ($f_E > 0$) to discover their productivity level ϕ in producing one single variety ω. Since each firm has a unique ϕ and a unique ω, we can identify firms with either parameter. The ex-ante distribution of firms, $g(\phi)$, is exogenous and known to all producers, with the cumulative distribution denoted as $G(\phi)$. Once their productivity is revealed, firms may produce for the domestic market, incurring an additional fixed cost ($f_D > 0$).

A firm with productivity level ϕ operates the following Cobb-Douglas production function:

$$y(\phi) = \phi \prod_{ij} \ell_{ij}(\phi)^{\beta_{ij}} \tag{7}$$

where $\ell_{ij}(\phi)$ is the employment level for factor ij, $0 < \beta_{ij} < 1 \; \forall ij$, and $\sum \beta_{ij} = 1$. β_{ij} represents the marginal product of factor ij. To align with the empirical literature documenting the skill premium, we assume this is higher for high-skilled than low-skilled workers. This amounts to setting the following assumption:

Assumption 1 $\beta_{Hj} > \beta_{Lj}, \forall j = I, N$

5.3 Directed Search

Each labour type ij is recruited in a separate labour market through directed search, in the tradition of Moen (1997). This implies four different labour markets, each segmented over a continuum of sub-markets. In each sub-market, there is a number of unemployed workers $U(\theta_{ij})$ and a number of unfilled vacancies $V(\theta_{ij})$, with each sub-market being defined by its unique ratio $\theta_{ij} = V(\theta_{ij})/U(\theta_{ij})$, a measure of (inverse) market tightness. Unemployed workers and vacancies are matched through a stochastic matching technology $M(U_{ij}, V_{ij})$, and the flow rate of a match for a vacancy is defined as $M(U_{ij}, V_{ij})/V_{ij} = q(\theta_{ij})$. We follow Felbermayr et al. (2018) in modelling this rate as a Cobb-Douglas function:

$$q(\theta_{ij}) = A\theta_{ij}^{-\eta} \tag{8}$$

where $0 < \eta < 1$ and $A > 0$.[16] Note that $\eta = -q'(\theta_{ij})\theta_{ij}/q(\theta_{ij})$ and denotes the constant elasticity of the filling rate with respect to θ_{ij}. In each labour market ij, each firm ϕ posts a number of vacancies $v_{ij}(\phi)$ for their requirements of each factor ij, along with a respective wage $w_{ij}(\phi)$. A share $q(\theta_{ij})$ of these vacancies is filled, resulting in an employment level for factor ij of $\ell_{ij}(\phi, \theta_{ij}) = q(\theta_{ij})v_{ij}(\phi)$.

Finally, firms face convex costs when posting vacancies. We follow Felbermayr et al. (2018) for specifying the form of these search costs:

$$C(v_{ij}) = v_{ij}^{\alpha} \tag{9}$$

where $\alpha > 1$ determines the degree of convexity in search costs. The recruitment process for a firm involves choosing the segment θ_{ij} and the number of vacancies $v_{ij}(\phi)$ that allow the firm to maximise its profits. As shown below, convex search costs yield a negative relationship between these two variables, implying that firms aiming to fill more vacancies in market ij need to search in a tighter labour sub-market.

[16] The main purpose of this assumption is to provide tractability. This assumption is compatible with the standard assumptions of $M(.)$ being at least twice continuously differentiable, increasing in its arguments, satisfying the Inada conditions, and being homogeneous of degree 1.

The matching process occurs in a single period with no time discounting. The product $q(\theta_{ij})\theta_{ij}$ represents the share of employed workers in a specific sub-market. Consequently, $q(\theta_{ij})\theta_{ij}w(\theta_{ij})$ equals the expected wage for any worker of the ij type in any sub-market in the absence of job-destroying conditions. The indifference condition for all workers of that type is:

$$\chi_{ij}W_{ij} = q(\theta_{ij})\theta_{ij}w(\theta_{ij}) \tag{10}$$

Here, the outside option for all types of workers is the same and is normalised to zero for simplicity. W_{ij} denotes the expected wage of type-ij workers. To introduce exogenous and heterogeneous labour market conditions across labour types, we allow for potential differences in the labour market outcomes, for example, due to varying probabilities of workers being fired. In a single-period context, we rationalise this by introducing the parameter $0 < \chi_{ij} < 1$, which can be interpreted as the portion of potential income not lost due to the position being vacated for any reason before the period expires. To reflect that workers, conditional on skill level, have better prospects in a given labour market when they are natives as opposed to immigrants, we assume this parameter is higher for them. This implies setting:

Assumption 2 $\chi_{iN} > \chi_{iI}, \forall i = L, H$

Equation (10) implicitly sets a negative relationship between θ_{ij} and w_{ij}. This is a standard feature of directed search models: wages increase with market tightness. In our model with convex search costs, this also means that firms wanting to fill more vacancies in market ij offer higher wages.

5.4 Exporting

Shipping goods internationally entails costs. First, selling abroad entails a constant fixed cost higher than the cost of supplying the domestic market ($f_X > f_D > 0$). Additionally, exporting entails a variable cost that we model as an iceberg cost $\tau > 1$, meaning that τ units must be shipped for one unit to arrive at destination. We allow iceberg export costs to be firm-specific, as they can be reduced by hiring high-skilled immigrants. In particular, these workers can reduce variable costs by facilitating operations through effective communication with final customers or intermediate buyers.

In practice, both fixed and variable export costs are influenced by firm characteristics and may be lower for firms using certain inputs more intensively. For instance, employing high-skilled immigrant workers can decrease fixed costs by identifying profitable markets in their country of origin or by leveraging their expertise in establishing initial trade flows. Our discussion focuses on reducing iceberg costs for analytical simplicity, although the results would be analogous in scenarios where fixed costs are also reduced.

We set the reduction in iceberg costs as proportional to the semi-elasticity of output with respect to the use of factor HI. This allows the effect to be continuous and to decrease as the quantity of the factor employed by the firm increases. We impose this notion through the following assumption:

Assumption 3
$$\frac{\partial \tau(\phi)}{\partial \ell_{HI}(\phi)} = \frac{-\kappa \beta_{HI}}{\ell_{HI}(\phi)},$$

with $\kappa > 0$ being a constant.

The profits of firm ϕ are given by:

$$\pi(\phi) = R(\phi) - \sum_{ij} [\ell_{ij}(\phi) w_{ij}(\phi) + C(v_{ij})] - f_D - \mathbb{I}_X f_X \tag{11}$$

where $\mathbb{I}_X = 1$ if the firm is an exporter and $\mathbb{I}_X = 0$ if it is not. As is common in heterogeneous firm models, the exporting status of a firm is determined by whether the firm's productivity is above the export threshold that we define later on. Under Dixit-Stiglitz competition in the final goods market, revenues can be expressed as:

$$R(\phi) = \left[\frac{Y}{M} (1 + \mathbb{I}_X \tau(\phi)^{1-\sigma}) \right]^{\frac{1}{\sigma}} y(\phi)^{\frac{\sigma-1}{\sigma}} \tag{12}$$

Consider the profit maximisation of the firm concerning factor ij. The first-order conditions of the problem are:

$$\frac{\partial R}{\partial \ell_{ij}} \frac{A}{\theta_{ij}^{\eta}} = \frac{W_{ij}}{\chi_{ij} \theta_{ij}} + \alpha v_{ij}^{\alpha - 1} \tag{13}$$

$$\frac{\partial R}{\partial \ell_{ij}} \frac{A\eta}{\theta_{ij}^{1+\eta}} = \frac{W_{ij}}{\chi_{ij} \theta_{ij}^2} \tag{14}$$

Using these equations, we derive an expression for the optimal number of vacancies that firm ϕ posts when recruiting factor ij:

$$v_{ij}(\phi) = \left[\frac{1-\eta}{\eta} \frac{W_{ij}}{\chi_{ij} \alpha} \frac{1}{\theta_{ij}} \right]^{\frac{1}{\alpha - 1}} \tag{15}$$

Expression (15) explicitly shows that when search costs are convex ($\alpha > 1$), our model yields a positive relationship between the number of vacancies posted in market ij and the tightness level of that market.

Given our production function (7), we can express that:

$$\frac{\partial R(\phi)}{\partial \ell_{ij}} = \frac{\sigma - 1}{\sigma} R(\phi) \frac{\beta_{ij}}{\ell_{ij}} \left[1 + \mathbb{I}_{HI} \lambda(\phi) \right], \quad \text{where} \quad \lambda(\phi) = \frac{\kappa \mathbb{I}_X \tau^{-\sigma}}{1 + \mathbb{I}_X \tau^{1-\sigma}} > 0 \tag{16}$$

where $\mathbb{I}_{HI}$ is an indicator that takes the value one when $ij = HI$. Here, the value of the marginal product of factor $ij \neq HI$ equals the contribution that one additional unit of that factor makes to the production of final good quantities. For $ij = HI$, its marginal product may be enhanced above this level because it reduces iceberg costs when the firm exports. This is captured by the term $\lambda(\phi)$. It is important to note that this term is only positive for exporting firms. For non-exporting firms, $\mathbb{I}_X = 0$ and $\lambda(\phi) = 0$, meaning the marginal product of factor HI is limited to its contribution to the production of final good quantities, like all other factors.

The model is closed with standard zero-profit cut-off conditions, which pin down the productivity thresholds for producing domestically and exporting (ϕ_D and ϕ_X, respectively), and a free-entry condition. These are detailed in Appendix B as they are not central to our analysis.

5.5 Equilibrium Wages

Let us denote with a tilde variable levels that pertain to the average firm, i.e., the one with productivity $\tilde{\phi}$. By construction, $p(\tilde{\phi}) = 1$, allowing us to write the market tightness of the average firm as follows:

$$\tilde{\theta}_{ij} = \left[\frac{\sigma}{\sigma - 1} \frac{W_{ij}}{A\eta\beta_{ij}\chi_{ij}} \frac{\ell_{ij}(\tilde{\phi})}{\tilde{y}(\phi)} \frac{1}{[1 + \mathbb{I}_{HI}\lambda(\phi)]} \right]^{\frac{1}{1-\eta}} \tag{17}$$

When comparing the first-order conditions (equation 13) for two different firms, namely one that exports and the average firm that does not export, we find:

$$[1 + \mathbb{I}_X \tau(\phi)^{1-\sigma}]^{\frac{1}{\sigma}} \left[\frac{y(\phi)}{y(\tilde{\phi})} \right]^{\frac{\sigma-1}{\sigma}} \frac{\ell_{ij}(\tilde{\phi})}{\ell_{ij}(\phi)} [1 + \mathbb{I}_{HI}\lambda(\phi)] = \left[\frac{\tilde{\theta}_{ij}}{\theta_{ij}} \right]^{1-\eta} \tag{18}$$

This expression can be rewritten (18) as:

$$[1 + \mathbb{I}_X \tau(\phi)^{1-\sigma}]^{\frac{1}{\sigma}} [1 + \mathbb{I}_{HI}\lambda(\phi)] \left[\frac{\phi}{\tilde{\phi}} \right]^{\frac{\sigma-1}{\sigma}} \prod_{k/ij} \left[\frac{\tilde{\theta}_k}{\theta_k} \right]^{\Psi\beta_k} = \left[\frac{\tilde{\theta}_{ij}}{\theta_{ij}} \right]^{\frac{\alpha}{\alpha-1} - \beta_{ij}\Psi} \tag{19}$$

where $\Psi = \left(\frac{1}{\alpha-1} + \eta \right) \frac{\sigma-1}{\sigma} > 0$. This expression defines a system of equations where the number of equations equals the number of labour types in the economy, from which we can derive expressions for $\tilde{\theta}_{ij}$ and θ_{ij} based only on parameters $\tilde{\phi}$ and ϕ. For simplicity, we group all $ij \neq HI$ into a single group, denoted as B, so we effectively work with a system of two equations. We find expressions for $\tilde{\theta}_{HI}$, $\tilde{\theta}_B$, θ_{HI}, and θ_B, which are presented in Appendix B.

Taking these expressions back to (10), we finally obtain an expression for the wage paid by firm ϕ to each factor. The wage paid to factor HI is:

$$\begin{aligned} w_{HI}(\phi) \;=\; & \underbrace{\left[\frac{\phi}{\tilde{\phi}} \right]^{(\sigma-1)\zeta\delta}}_{\text{Productivity effect}} \underbrace{\overbrace{[1 + \mathbb{I}_X \tau(\phi)^{1-\sigma}]^{\zeta\delta}}^{\text{Pure export premium}} \overbrace{[1 + \lambda(\phi)]^{\delta + \frac{1}{1+\rho}}}^{\text{Information premium}}}_{\text{Export premium}} \underbrace{\beta_{HI}^{\frac{1}{1+\rho}} \beta_B^{\frac{\rho}{1+\rho}}}_{\text{Skill premium}} \\ & \underbrace{[W_{HI}\chi_{HI}]^{\frac{\mu}{1+\rho}+1} [W_B\chi_B]^{-\frac{\epsilon}{1+\rho}}}_{\text{Immigrant discount}} \underbrace{\tilde{\phi}\eta \frac{(\sigma-1)}{\sigma}}_{\text{Macro conditions}} \end{aligned} \tag{20}$$

where ζ, ϵ, δ, ρ, and μ are bundles of parameters defined in Appendix B. There, we show that all these bundles have positive values. Comparable expressions for the other factors are also obtained and presented in Appendix B.

Expression (20) shows the determinants of wages in our model. First, high-productivity firms offer higher wages since $(\sigma - 1)\zeta\delta > 0$. Additionally, when the firm is an exporter ($\mathbb{I}_X = 1$ and

$\lambda(\phi) > 0$), the wage it pays is even higher, representing the *export premium* documented in the literature. This premium comprises two distinct components. The first one is directly related to the firm's export activity. The fact that $\zeta\delta > 0$ indicates that this component of the export premium is a negative function of the iceberg costs (τ). The more challenging exporting is, the lower the revenues from exporting for a given firm, thus reducing the premium paid by exporters. This premium is not exclusive to factor HI but affects all other factors (see Appendix B). The second component of the export premium arises due to the reduction in exporting costs brought about by the employment of factor HI and is always positive, as $\delta + 1/(1+\rho) > 0$. This premium is also exclusive to exporters, as it is only for them that $\lambda(\phi) > 0$. We refer to this effect as the *information premium*. Due to complementarity across factors in the production function, we find a positive impact of λ on the wage of other factors. However, as shown in Appendix B, this effect is more pronounced for factor HI under reasonable parametrization.

Then, a *skill premium* comes into play, as the wage is positively affected by the marginal product of labour. The higher the marginal product of factor HI (β_{HI}), the higher the wage of that factor. A higher marginal product of the other factors also contributes to higher wages of factor HI, w_{HI}, due to the complementarity of factors in the production function. This indirect effect is smaller than the direct effect stemming from the higher productivity of the factor in question when $\rho < 1$. While this inequality does not hold for all possible parameter values, it does hold for most reasonable parametrization (see discussion in Appendix B). In scenarios where higher skills translate into a higher marginal product, high-skilled workers obtain a wage premium due to their higher productivity than low-skilled workers, all else being equal.

Conditions specific to an ij market also shape wages. These conditions include, for example, the probability of job termination, which we assumed to be different for native and immigrant workers. An improvement in these conditions for factor HI would increase the wage rate for that factor, as $\mu/(1+\rho) + 1 > 0$. When these conditions are more favourable for native workers, our model reflects an *immigrant discount*. Notably, better conditions for other factors unambiguously reduce the wage of factor HI, as $-\epsilon/(1+\rho) < 0$. This occurs because improvements in conditions for other worker types lead to higher wages for them, reducing the surplus left to be allocated as wages to type-HI workers.

Finally, economy-wide conditions also impact wages. These conditions reflect the overall competitiveness level in the economy. In our model, such conditions are represented by the average productivity of firms ($\tilde{\phi}$), firms' market power (driven by σ), and the technology of the matching function (η). As Expression (20) suggests, when firms are, on average, more productive, the wages paid by a particular firm (with a given productivity gap $\phi/\tilde{\phi}$) are higher. As indicated by higher mark-ups $\sigma/(\sigma-1)$, firms with stronger power in the final product market tend to pay lower wages. A more efficient matching technology also increases wages for a given firm and a given factor of production.

6 Evidence on the Information Premium

On the one hand, the literature has established that immigrant workers promote firms' export activities, especially to their countries of origin (see Hatzigeorgiou and Lodefalk, 2021, for a recent survey). On the other hand, the literature has also highlighted how workers – in particular managers – convey the knowledge necessary to serve foreign markets, and how this translates into higher wages. (see Mion and Opromolla, 2014; Mion et al., 2022, for specific evidence on Portugal).

However, no study has provided evidence on whether this pro-trade effect of immigrants impacts wages. In this section, we provide evidence supporting the existence of an *information premium*, as our theory proposes. Our working hypothesis is that high-skilled immigrant workers in exporting firms experience a smaller wage discount or even a wage premium because they provide valuable information about foreign markets the exporting firm serves. As a result, they capture an information premium, which translates into higher wages.

6.1 Trade-Related Occupations

To test the validity of our hypothesis, we first use an alternative categorisation of occupation groups. We identify the occupations more likely to entail decisions affecting trade activities instead of the standard categorisation of high- *versus* low-skilled occupations used in our baseline analysis. More specifically, trade-related occupations include company directors (occupations 11 and 12), high-skilled occupations related to commercial relations and transport (occupations 14, 24, and 25), and intermediate-level occupations involved in the sale and transport of merchandise (occupations 33, 35, and 52). Accordingly, we classify workers into trade-related and non-trade-related occupation groups (as detailed in column 2 of Table A.1, Appendix A). Importantly, this classification does not fully overlap with the baseline classification by occupation groups, as only 38% of workers in high-skilled occupations also hold a trade-related occupation.

The results are reported in Tables 4 and 5. We find that immigrants earn less than their native counterparts when employed in a non-trade-related occupation, independently of the exporting status of the firm. However, the wage gap becomes positive – to the benefit of immigrants – for workers holding a trade-related occupation and employed by an exporting firm. The export premium associated with an increase in export intensity and a change in export status is the highest for immigrant workers in trade-related occupations. These findings suggest that the mechanism underlying the relationship between the migrant-native wage gap and the firm's export intensity is linked to the trade content of immigrant workers' occupations.

Table 4: Trade-Related Occupations.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Estimation results				
(β_1) Foreign_i	-0.032***	-0.033***	-0.026***	-0.026***
	(0.008)	(0.009)	(0.008)	(0.008)
(β_2) Export_{jt}	0.000		0.002	
	(0.000)		(0.001)	
(β_3) $\text{Foreign}_i \times \text{Export}_{jt}$	0.002**	0.002**	0.017**	0.014*
	(0.001)	(0.001)	(0.008)	(0.008)
(β_4) $\text{Foreign}_i \times \text{Info}_i$	-0.017	-0.014	0.010	0.006
	(0.037)	(0.038)	(0.036)	(0.037)
(β_5) $\text{Export}_{jt} \times \text{Info}_i$	-0.000	0.000	-0.001	0.002
	(0.000)	(0.000)	(0.003)	(0.003)
(β_6) $\text{Foreign}_i \times \text{Export}_{jt} \times \text{Info}_i$	0.009***	0.009***	0.093**	0.103**
	(0.003)	(0.003)	(0.039)	(0.040)
Observations	4,550,383	4,542,151	4,550,383	4,542,151
R-squared	0.164	0.172	0.164	0.172
Controls	yes	yes	yes	yes
FE	fo-st-rt	fo-ft-ot	fo-st-rt	fo-ft-ot

Notes: This table reports OLS coefficients. The dependent variable is the (log) hourly wage of an individual i working in a firm j at time t. Info_i is a dummy equal to one if the individual holds a trade-related job and zero otherwise. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, and education dummies. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, st, rt and ot indicate firm-occupation, firm-time, sector-time, region-time, and occupation-time fixed effects.

Table 5: Interpretation - Trade-Related Occupations.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Export thresholds				
Non-trade related workers ($-\beta_1/\beta_3$)	18.441***	18.910***	-	-
	(4.199)	(3.935)	-	-
Trade related workers ($-[\beta_1+\beta_4]/[\beta_3+\beta_6]$)	4.679*	4.504*	-	-
	(2.463)	(2.500)	-	-
The migrant-native wage gap				
Non-trade related workers in non-exporter (β_1)	-	-	-0.026***	-0.026***
	-	-	(0.008)	(0.008)
Non-trade related workers in exporter ($\beta_1 + \beta_3$)	-	-	-0.010**	-0.011***
	-	-	(0.004)	(0.004)
Trade related workers in non-exporter ($\beta_1 + \beta_4$)	-	-	-0.017	-0.020
	-	-	(0.036)	(0.037)
Trade related workers in exporter ($\beta_1 + \beta_3 + \beta_4 + \beta_6$)	-	-	0.093***	0.098***
	-	-	(0.024)	(0.024)
The export premium				
Natives in non-trade-related occupations (β_2)	0.000	-	0.002	-
	(0.000)	-	(0.001)	-
Immigrants in non-trade-related occupations ($\beta_2 + \beta_3$)	0.002***	-	0.018**	-
	(0.001)	-	(0.008)	-
Natives in trade-related occupations ($\beta_2 + \beta_5$)	0.000	-	0.000	-
	(0.000)	-	(0.003)	-
Immigrants in trade-related occupations ($\beta_2 + \beta_3 + \beta_5 + \beta_6$)	0.010***	-	0.111***	-
	(0.003)	-	(0.038)	-

Notes: This table provides an interpretation for the results of each estimation presented in Table 4. Standard errors for non-linear and linear combinations of coefficients are obtained using the delta method.

6.2 Destination-Specific Information

We now test whether immigrant workers possess valuable knowledge about export markets, particularly those responsible for more sophisticated tasks. This expertise might impact the marginal revenues (or costs) and the fixed cost of the employing firm serving a foreign market, thereby enhancing its export performance (Mion and Opromolla, 2014).

To this end, we study how the wages of immigrant workers from different origin countries vary with the export activity of their employing firms in those countries. More precisely, we analyse how the wage of an immigrant worker from an origin country c changes with the export activity of the employing firm to destination c, controlling for the general effect of exporting. Here, we exclude Portuguese citizens from the sample as it is impossible to distinguish the export towards the worker's origin country for the sample of national citizens. Therefore, we are now analysing wage responses to export activity, rather than wage *gap* responses. Suppose immigrant workers can capture an information premium thanks to better knowledge of specific foreign markets, such as their countries of origin. In that case, we should observe that these workers' wages increase, or increase more, with the firm's export activity to these destination markets.

To test this hypothesis, we use information on the workers' citizenship from the annual employer-employee data – the *Quadros de Pessoal*, which we combine with data on firms' export destinations from the custom data. We estimate the following specification:

$$\begin{aligned}\ln \text{hw}^c_{i(j)t} =& \beta_0 + \beta_1 \text{Export}^c_{jt} + \beta_2 \text{Export}_{jt} \\ &+ \beta_3 \text{Export}^c_{jt} \times \text{HS}_i + \beta_4 \text{Export}_{jt} \times \text{HS}_i \\ &+ \Gamma X'_{it} + \Theta X'_{jt} + \text{FE} + \varepsilon_{i(j)t} \end{aligned} \tag{21}$$

where $\text{hw}^c_{i(j)t}$ represents the hourly wage of workers i from origin country c employed by firm j at time t. The terms Export^c_{jt} and Export_{jt} denote the firm j's export activity to country c and total export activity, respectively. The controls and fixed effects remain the same as in the baseline specification. The coefficients β_1 and $\beta_1 + \beta_3$ represent the effect that exporting to country c has, respectively, on the wage of a low-skilled and a high-skilled worker from origin country c, once the average effect of exporting is controlled for. Robust standard errors are clustered at the firm level.

We include three different sets of fixed effects, mainly following the identification strategy adopted in the baseline specification in Equation (1). The first set includes firm-occupation, country-time, sector-time, and region-time fixed effects. In doing so, we compare the wages of two immigrant workers, employed in the same firm and the same occupation, but differing in their origin countries. The country-time fixed effects control for unobservable time-varying trends in country c, which might command systematically higher wages for workers from country c.

The second set of fixed effects includes firm-occupation, firm-time, occupation-time, and country-time fixed effects. With firm-time fixed effects, we attenuate concerns related to omitted variable bias by controlling for unobservable factors that might affect the wage-setting and the export decisions of the firm, to the extent that these positive or negative shocks are also firm-time specific. Occupation-time fixed effects capture differential wage trends that may correlate with the inflow of immigrants to fill vacancies.

However, if additional omitted variable concerns persist, that are related to unobservable time-varying trends driving both the wage and the export decisions associated with a particular country c, then the third set of fixed effects should attenuate them as it includes firm-country-time fixed effects (which also subsume firm-time fixed effects), together with occupation-time fixed effects.

Results are presented in Tables 6 and 7. Using the first set of fixed effects in columns (1) and (4), we find that wages of high-skilled immigrant workers increase with the export activity of their employing firms toward their origin countries. These results hold for both export intensity and status and do not respond to exporting in general. Additionally, we find no significant results for low-skilled immigrant workers, who are less likely to provide valuable information on export markets than high-skilled immigrant workers, and are therefore less able to capture an information premium.

Using the second set of fixed effects, in columns (2) and (5), we cannot compute the total premium of exporting in general for high-skilled workers, as the firm-time fixed effects absorb β_2. However, comparing β_3 with β_4 shows that only exporting to country c commands a *differential* wage effect for high-skilled workers compared to low-skilled workers, while exporting *per se* is not associated with such a differential effect.

With the third set of fixed effects, in columns (3) and (6), we find a differential general effect of exporting for high-skilled workers compared to low-skilled workers. However, there is also an additional country-specific effect on wages for high-skilled immigrant workers, which is higher than the general effect, at least according to the point estimates.

These results support the existence of a country-specific information premium and should attenuate remaining concerns on alternative explanations, such as our results being driven by worker selection. While we cannot rule out that the selection of better workers into exporting firms is not at play, if that fully drove our results, we would (only) find a comparable effect of exporting for all workers irrespective of their origin country.

Table 6: Exporting by Origin Countries.

	$\ln \text{hw}^c_{i(j)t}$					
	Export Intensity			Export Status		
	(1)	(2)	(3)	(4)	(5)	(6)
Estimation results						
Export^c_{jt} (β_1)	-0.001	-0.001		-0.008	-0.007	
	(0.001)	(0.001)		(0.005)	(0.006)	
Total export_{jt} (β_2)	0.000			0.006		
	(0.000)			(0.004)		
$\text{Export}^c_{jt} \times \text{HS}_i$ (β_3)	0.008***	0.010***	0.026***	0.082***	0.099**	0.316***
	(0.003)	(0.003)	(0.007)	(0.030)	(0.037)	(0.089)
$\text{Export}_{jt} \times \text{HS}_i$ (β_4)	-0.000	-0.003	0.014***	-0.013	-0.018	0.163**
	(0.002)	(0.004)	(0.005)	(0.021)	(0.034)	(0.066)
Observations	81,585	70,152	55,088	81,585	70,152	55,088
R-squared	0.075	0.085	0.122	0.074	0.084	0.118
Controls	yes	yes	yes	yes	yes	yes
FE	fo-rt-st-ct	fo-ft-ot-ct	fct-ot	fo-rt-st-ct	fo-ft-ot-ct	fct-ot

Notes: This table reports OLS coefficients. The dependent variable is the (log) hourly wage of an individual i from country c working in a firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, and education dummies. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, fct, ct, st, rt and ot indicate firm-occupation, firm-time, firm-destination-time, destination-time, sector-time, region-time, and occupation-time fixed effects.

Table 7: Interpretation - Exporting by Origin Countries.

	$\ln \text{hw}^{c}_{i(j)t}$					
	Export Intensity			Export Status		
	(1)	(2)	(3)	(4)	(5)	(6)
Export premium by origins						
Low-skilled workers/ same origin country (β_1)	-0.001	-0.001	-	-0.007	-0.006	-
	(0.001)	(0.001)	-	(0.005)	(0.006)	-
Low-skilled workers/ average effect (β_2)	0.000	-	-	0.005	-	-
	(0.000)	-	-	(0.004)	-	-
High-skilled workers/ same origin country ($\beta_1 + \beta_3$)	0.008***	0.009**	-	0.075**	0.092**	-
	(0.003)	(0.003)	-	(0.029)	(0.036)	-
High-skilled workers/ average effect ($\beta_2 + \beta_4$)	-0.000	-	-	-0.007	-	-
	(0.002)	-	-	(0.020)	-	-

Notes: This table provides an interpretation for the results of each estimation presented in Table 6. Standard errors for linear combinations of coefficients are obtained via delta method.

To reduce concerns about the mechanical correlation between the two export variables, Equation (21) excludes the observations where the firm is exporting only to one country, and that one country is also the origin of the foreign workers it employs. Additionally, in unreported results available upon request, we restrict the analysis to observations where the number of destinations is above the mean to ensure that Export^{c}_{jt} constitutes only a smaller fraction of the total exports. Finally, in Tables A.11 and A.12, we report the results where we replace Export_{jt} with $\text{Export}^{other}_{jt}$. However, in this case, we can only control for unobservable factors that might affect the wage and the export decisions to the extent to which those are assumed to be firm-time specific and not firm-country-time specific. This is because there is no relevant set of fixed effects for the exports to *other* destinations. However, all the results presented so far suggest that omitted variable bias is not a major concern. The results in Tables A.11 and A.12 (Appendix C) confirm the results in Tables 6 and 7, and notably the coefficients β_1 and β_3 do not change between Table 6 and Table A.11.

6.3 Information Premium and New Hires

Our main finding – that high-skilled immigrants earn an export wage premium, such that the wage gap for high-skilled workers is reduced or reversed– relies on the complementarity between the information workers possess, particularly about their origin countries, and the firm's export activity.

On the one hand, the effect may be driven by foreign workers already employed by the firm. On the other hand, the effect may stem from new foreign workers hired as the firm expands its export activity. Prior research finds that firms adjust their occupational structure in response to trade, which improves matching efficiency (Bombardini et al., 2019; Caliendo and Rossi-Hansberg, 2012; Davidson et al., 2017; Mion and Opromolla, 2014).

To provide suggestive evidence that information brought by newly hired workers might be driving our results, we study whether exporting to a specific country is associated with increased hiring of new foreign workers from that country, beyond those already employed by the firm. A positive correlation would support the view that firms actively seek suitable workers to support their export activity.

We exploit the firm-occupation-country-year dimension of the data that records, for each firm, the number of foreign workers employed from its export destinations in either high- or low-skilled occupations as well as whether the firm exports any quantity to the countries of origin of its foreign workers.[17] We estimate the following specification using a count model:

$$\begin{aligned} \mathrm{L}^c_{jot} = & \beta_0 + \beta_1 \mathrm{HS}_o + \beta_2 \mathrm{Export}^c_{jt} + \beta_3 \mathrm{Export}^c_{jt} \times \mathrm{HS}_o \\ & + \beta_4 \mathrm{Export}_{jt} + \beta_5 \mathrm{Export}_{jt} \times \mathrm{HS}_o \\ & + \Theta X'_{jt} + \mathrm{FE} + \varepsilon^c_{jot} \end{aligned} \quad (22)$$

where L^c_{jot} denotes the number of new foreign workers from origin country c in occupation group o (high- *versus* low-skilled) hired by firm j at time t. Export^c_{jt} and Export_{jt} denote the firm j's export activity to country c and its total export activity, respectively. The firm controls remain the same as in the baseline specification. Robust standard errors are clustered at the firm level.

To tackle omitted variable concerns, we exploit different sets of fixed effects consistent with those used in Equation (21).[18] Specifically, columns (1) and (4) include firm, region-time, sector-time, and country-time fixed effects. The country-time fixed effects account for unobservable time-varying trends in destination c that may systematically influence the employment of workers from that country. We use firm-time and country-time fixed effects in columns (2) and (5), to control for unobservable factors that may simultaneously affect a firm's employment and export decisions, to the extent that these unobserved shocks are firm-time specific. Columns (3) and (6) include firm-country, region-time, sector-time, and country-time fixed effects. This specification intends to mitigate concerns about unobserved firm-country-specific factors that could jointly influence employment and export decisions related to country c, and that are time-invariant. The sets of fixed effects in this specification are less stringent than in Equation (21), and therefore our results are meant to present some suggestive evidence related to the main mechanism put forward in this paper.

The results, reported in Table 8, show that exporting to a specific destination country is associated with increased employment of new high-skilled foreign workers from that country, pointing to a reorganisation of the firm toward foreign workers of particular origin countries. These findings suggest that firms actively seek country-specific information and better worker-firm matches as they expand their export activity. By contrast, we find no significant correlation between the overall export intensity and the employment of new high-skilled foreign workers from a particular origin country, and the average export participation is negatively correlated with such employment. Finally, we find no significant results when we replicate this specification, looking at the employment of new foreign workers from countries *other than* the export destina-

[17] This means that there are observations that display zeros in terms of workers' employment if the firm exports to c but does not hire any worker from country c, and in terms of the firm's exports if the firm employs workers from country c but does not serve that destination.

[18] We drop the occupation dimension in θ_{fo} and the θ_{ot} because the analysis is not anymore at the individual-level. Therefore we cannot include combinations of fixed effects that rely on the 2-digit occupation of the worker.

tion. Results are available upon request. The absence of a correlation thus suggests that firms seek country-specific information, and that foreign workers are not perfectly substitutable across origins.

Table 8: Employment of New Immigrant Workers.

	L^c_{jot}					
	Export Intensity			Export Status		
	(1)	(2)	(3)	(4)	(5)	(6)
Estimation results						
HS_o	-2.557***	-2.554***	-2.495***	-2.322***	-2.322***	-2.322***
	(0.160)	(0.160)	(0.155)	(0.140)	(0.140)	(0.140)
Export^c_{jt}	-0.020*	-0.021*	-0.003	-0.341***	-0.366***	-0.067
	(0.011)	(0.012)	(0.007)	(0.104)	(0.109)	(0.067)
$\text{Export}^c_{jt} \times HS_o$	0.161***	0.161***	0.150***	1.641***	1.641***	1.641***
	(0.012)	(0.012)	(0.011)	(0.114)	(0.114)	(0.114)
Export_{jt}	-0.011		-0.015*	-0.064		-0.120
	(0.007)		(0.008)	(0.067)		(0.076)
$\text{Export}_{jt} \times HS_o$	-0.011	-0.012	-0.014	-0.383**	-0.383**	-0.383**
	(0.015)	(0.015)	(0.015)	(0.150)	(0.150)	(0.150)
Observations	1,113,162	323,266	184,986	1,113,162	323,266	184,986
Controls	yes	yes	yes	yes	yes	yes
FE	f-rt-st-ct	ft-ct	fc-rt-st-ct	f-rt-st-ct	ft-ct	fc-rt-st-ct

Notes: This table reports PPML coefficients. The dependent variable is the count of new immigrant workers in occupation group o (high- and low-skilled) from country c employed by firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. f, ft, fc, st, rt, and ct indicate firm, firm-time, firm-country, sector-time, region-time, and country-time fixed effects.

7 Conclusions

Using employer-employee data from the Portuguese manufacturing sector from 2010 to 2021, we show that the magnitude and direction of the migrant-native wage gap depend on both firm and worker characteristics. The wage gap for high-skilled workers varies with the export intensity of their firms: Immigrants earn higher wages than natives when a firm starts exporting or increases its export intensity. In contrast, for low-skilled workers, immigrant wages consistently fall below those of natives across the entire distribution of export intensity.

We propose a model embedding directed search into a trade model with monopolistic competition and heterogeneous firms. In this framework, the interplay between firms' export activity, the skills of their workers, and their foreign status generates an information premium specific to skilled immigrant workers employed by exporting firms. This premium compensates for the wage discount typically experienced by immigrant workers in the labour market. In some cases, the gap can close and even reverse.

Finally, we provide evidence supporting this mechanism. First, we show that the relationship between the migrant-native wage gap and a firm's export activity is driven by the trade content of immigrant workers' occupations. Second, we find that the wages of high-skilled workers from a specific origin country respond positively to the export activity of firms in that foreign market, but are not associated with the firms' exports to markets unrelated to the workers' origin. Third, we show that exporting to a specific destination country is associated with increased employment of new high-skilled foreign workers from that country, pointing to a reorganisation of firms toward foreign workers of specific origin countries. Together, these findings suggest that immigrant workers capture an information premium when employed in positions closely tied to export decision-making within exporting firms.

From a policy perspective, our findings show the importance of both individuals' occupations and their employers' export activity in assessing the scale of the migrant-native wage in the Portuguese manufacturing sector. Our study also highlights the value of expertise in a specific foreign market for both workers and their employers. Additionally, our results suggest that trade, to some extent, helps reduce wage inequality among workers. This is an important result, given that trade is often criticised as a driver of inequality.

References

M. Amior and A. Manning. Monopsony and the wage effects of migration. Technical report, CEP Discussion Paper No. 1690., 2020.

M. Amiti and D. R. Davis. Trade, Firms, and Wages: Theory and Evidence. *Review of Economic Studies*, 79(1):1–36, 2012.

S. Amo-Agyei. *The migrant pay gap: Understanding wage differences between migrants and nationals*. International Labour Organization, 2020.

L. Araujo, G. Mion, and E. Ornelas. Institutions and export dynamics. *Journal of International Economics*, 98:2–20, 2016.

A. Ariu, K. N. Hakkala, J. B. Jensen, and S. Tamminen. Service imports, workforce composition, and firm performance: Evidence from finnish microdata. Working paper 26355, NBER, 2019.

C. Arkolakis. Market penetration costs and the new consumers margin in international trade. *Journal of Political Economy*, 118(6):1151–1199, 2010.

A. Artopoulos, D. Friel, and J. C. Hallak. Export emergence of differentiated goods from developing countries: Export pioneers and business practices in argentina. *Journal of Development Economics*, 105:19–35, 2013.

D. Bahar and H. Rapoport. Migration, knowledge diffusion and the comparative advantage of nations. *The Economic Journal*, 128(612):F273–F305, 2018.

M. Bas, P. Bombarda, S. Jean, and G. Orefice. Firms' exports, volatility and skills: Evidence from france. *European Economic Review*, 140:103941, 2021.

P. Bastos and J. Silva. Networks, firms, and trade. *Journal of International Economics*, 87(2): 352–364, 2012.

A. B. Bernard, J. B. Jensen, and R. Z. Lawrence. Exporters, jobs, and wages in U.S. manufacturing: 1976-1987. *Brookings Papers on Economic Activity. Microeconomics*, 1995:67–119, 1995.

A. B. Bernard, J. B. Jensen, S. J. Redding, and P. K. Schott. Firms in international trade. *Journal of Economic Perspectives*, 21(3):105–130, September 2007. doi: 10.1257/jep.21.3.105.

E. A. Bøler, B. Javorcik, and K. H. Ulltveit-Moe. Working across time zones: Exporters and the gender wage gap. *Journal of International Economics*, 111:122–133, 2018.

M. Bombardini, G. Orefice, and M. D. Tito. Does exporting improve matching? evidence from french employer-employee data. *Journal of International Economics*, 117:229–241, 2019.

A. Bonfiglioli and F. De Pace. Export, female comparative advantage and the gender wage gap. Discussion Paper DP15801, CEPR, 2021.

A. Burstein and J. Vogel. International trade, technology, and the skill premium. *Journal of Political Economy*, 125(5):1356–1412, 2017.

L. Caliendo and E. Rossi-Hansberg. The impact of trade on organization and productivity. *The Quarterly Journal of Economics*, 127(3):1393–1467, 2012.

M. Christl, M. Köppl-Turyna, and P. Gnan. Wage differences between immigrants and natives: the role of literacy skills. *Journal of Ethnic and Migration Studies*, 46(19):4010–4042, 2020.

C. Davidson, F. Heyman, S. Matusz, F. Sjöholm, and S. C. Zhu. Global engagement and the occupational structure of firms. *European Economic Review*, 100:273–292, 2017.

B. Dostie, J. Li, D. Card, and D. Parent. Employer policies and the immigrant–native earnings gap. *Journal of Econometrics*, 2021.

C. Dustmann and A. Glitz. Migration and education. In *Handbook of the Economics of Education*, volume 4, pages 327–439. Elsevier, 2011.

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

G. Felbermayr, G. Impullitti, and J. Prat. Firm dynamics and residual inequality in open economies. *Journal of the European Economic Association*, 5(16):1476–1539, 2018.

G. J. Felbermayr, J. Prat, and H. J. Schmerer. Globalization and labor market outcomes: Wage bargaining, search frictions, and firm heterogeneity. *Journal of Economic Theory*, 146(1): 39–73, 2011.

B. Friedrich. Trade shocks, firm hierarchies and wage inequality. Mimeo, Northwestern University, 2020.

B. Georgiev and J. Juul Henriksen. Within-firm wage inequality and firm-level exports. *Review of International Economics*, 28(1):1–34, 2020.

A. Hatzigeorgiou and M. Lodefalk. Migrants' influence on firm-level exports. *Journal of Industry, Competition and Trade*, 16(4):477–497, 2016.

A. Hatzigeorgiou and M. Lodefalk. A literature review of the nexus between migration and internationalization. *The Journal of International Trade & Economic Development*, 30(3): 319–340, 2021.

E. Helpman, O. Itskhoki, and S. Redding. Inequality and unemployment in a global economy. *Econometrica*, 78(4):1239–1283, 2010.

S. Hiller. Does immigrant employment matter for export sales? Evidence from Denmark. *Review of World Economics*, 149(2):369–394, 2013.

H. Hofer, G. Titelbach, R. Winter-Ebmer, and A. Ahammer. Wage discrimination against immigrants in Austria? *Labour*, 31(2):105–126, 2017.

K. Ingwersen and S. Thomsen. The immigrant-native wage gap in Germany revisited. *The Journal of Economic Inequality*, 19:825–854, 2021.

L. Kaas and P. Kircher. Efficient firm dynamics in a frictional labor market. *American Economic Review*, 10(105):3030–3060, 2015.

M. W. Klein, C. Moser, and D. M. Urban. Exporting, skills and wage inequality. *Labour Economics*, 25:76 – 85, 2013.

L. Marchal, G. Ourens, and G. Sabbadini. When immigrants meet exporters: A reassessment of the immigrant wage gap. Technical report, CES Working Paper Series, 2023-10, 2023.

M. J. Melitz. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725, 2003.

G. Mion and L. D. Opromolla. Managers' mobility, trade performance, and wages. *Journal of International Economics*, 94(1):85–101, 2014.

G. Mion, L. D. Opromolla, and A. Sforza. The Value of Managers' Export Experience: Lessons from the Angolan Civil War. *The Review of Economics and Statistics*, pages 1–26, 2022.

C. Mitaritonna, G. Orefice, and G. Peri. Immigrants and firms' outcomes: Evidence from France. *European Economic Review*, 96:62–82, 2017.

E. R. Moen. Competitive search equilibrium. *Journal of Political Economy*, 105(2):385–411, 1997.

W. W. Olney and D. Pozzoli. The impact of immigration on firm-level offshoring. *Review of Economics and Statistics*, 103(1):177–195, 2021.

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

G. Peri and C. Sparber. Task specialization, immigration, and wages. *American Economic Journal: Applied Economics*, 1(3):135–169, 2009.

J. E. Rauch. Business and social networks in international trade. *Journal of Economic Literature*, XXXIX:1177–1203, December 2001.

J. E. Rauch and V. Trindade. Ethnic chinese networks in international trade. *Review of Economics and Statistics*, 84(1):116–130, 2002.

G. Sabbadini. Firm-level prices, quality, and markups: The role of immigrant workers. *Review of International Economics*, 32(5):2259–2295, 2024.

T. Sampson. Selection into trade and wage inequality. *American Economic Journal: Microeconomics*, 6(3):157—202, 2014.

T. Schank, C. Schnabel, and J. Wagner. Do exporters really pay higher wages? first evidence from german linked employer-employee data. *Journal of International Economics*, 72(1):52–74, 2007.

E. A. Verhoogen. Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector. *The Quarterly Journal of Economics*, 123(2):489–530, 05 2008.

Appendix

A Additional Information on the Data

Table A.1: Classification of Occupations.

CPP2010 code	Occupation (Portuguese)	Occupation (English)	(1)	(2)
0	**PROFISSÕES DAS FORÇAS ARMADAS**	**ARMED FORCES PROFESSIONS**	-	-
1	**REPRESENTANTES DO PODER LEGISLATIVO E DE ÓRGÃOS EXECUTIVOS, DIRIGENTES, DIRECTORES E GESTORES EXECUTIVOS**	**REPRESENTATIVES OF THE LEGISLATURE AND EXECUTIVE BODIES, LEADERS, DIRECTORS AND EXECUTIVE MANAGERS**		
11	Representantes do poder legislativo e de órgãos executivos, dirigentes superiores da Administração Pública, de organizações especializadas, directores e gestores de empresas	Representatives of the legislature and executive bodies, senior public administration officials, specialized organizations, company directors and managers	W	T
12	Directores de serviços administrativos e comerciais	Directors of administrative and commercial services	W	T
13	Directores de produção e de serviços especializados	Directors of production and specialized services	W	-
14	Directores de hotelaria, restauração, comércio e de outros serviços	Hotel, restaurant, retail and other service managers	W	T
2	**ESPECIALISTAS DAS ACTIVIDADES INTELECTUAIS E CIENTÍFICAS**	**SPECIALISTS IN INTELLECTUAL AND SCIENTIFIC ACTIVITIES**		
21	Especialistas das ciências físicas, matemáticas, engenharias e técnicas afins	Specialists in the physical sciences, mathematics, engineering and related techniques	W	-
22	Profissionais de saúde	Health professionals	W	-
23	Professores	Professores	W	-
24	Especialistas em finanças, contabilidade, organização administrativa, relações públicas e comerciais	Specialists in finance, accounting, administrative organization, public and commercial relations	W	T
25	Especialistas em tecnologias de informação e comunicação (TIC)	Information and communication technology (ICT) specialists	W	T
26	Especialistas em assuntos jurídicos, sociais, artísticos e culturais	Experts in legal, social, artistic and cultural matters	W	-
3	**TÉCNICOS E PROFISSÕES DE NÍVEL INTERMÉDIO**	**TECHNICIANS AND INTERMEDIATE-LEVEL PROFESSIONS**		
31	Técnicos e profissões das ciências e engenharia, de nível intermédio	Science and engineering technicians and professions, intermediate level	W	-
32	Técnicos e profissionais, de nível intermédio da saúde	PTechnicians and mid-level health professionals	W	-
33	Técnicos de nível intermédio, das áreas financeira, administrativa e dos negócios	Mid-level financial, administrative and business technicians	W	T
34	Técnicos de nível intermédio dos serviços jurídicos, sociais, desportivos, culturais e similares	Mid-level legal, social, sports, cultural and similar service technicians	W	-
35	Técnicos das tecnologias de informação e comunicação	Information and communication technology technicians	W	T
4	**PESSOAL ADMINISTRATIVO**	**ADMINISTRATIVE STAFF**		
41	Empregados de escritório, secretários em geral e operadores de processamento de dados	Office workers, secretaries in general and data processing operators	B	-
42	Pessoal de apoio directo a clientes	Direct customer support staff	B	-
43	Operadores de dados, de contabilidade, estatística, de serviços financeiros e relacionados com o registo	Data, accounting, statistics, financial services and registration operators	B	-
44	Outro pessoal de apoio de tipo administrativo	Other administrative support staff	B	-
5	**TRABALHADORES DOS SERVIÇOS PESSOAIS, DE PROTECÇÃO E SEGURANÇA E VENDEDORES**	**PERSONAL SERVICE, SECURITY AND SAFETY WORKERS AND SALESPEOPLE**		
51	Trabalhadores dos serviços pessoais	Personal service workers	B	-
52	Vendedores	Sellers	B	T
53	Trabalhadores dos cuidados pessoais e similares	Personal care and similar workers	B	-
54	Pessoal dos serviços de protecção e segurança	Safety and security personnel	B	-
6	**AGRICULTORES E TRABALHADORES QUALIFICADOS DA AGRICULTURA, DA PESCA E DA FLORESTA**	**FARMERS AND SKILLED WORKERS IN AGRICULTURE, FISHERIES AND FORESTRY**		
61	Agricultores e trabalhadores qualificados da agricultura e produção animal, orientados para o mercado	Market-oriented farmers and skilled agricultural and animal production workers market	B	-
62	Trabalhadores qualificados da floresta, pesca e caça, orientados para o mercado	Market-oriented skilled forestry, fishing and hunting workers	B	-
63	Agricultores, criadores de animais, pescadores, caçadores e colectores, de subsistência	Subsistence farmers, livestock farmers, fishermen, hunters and gatherers	B	-
7	**TRABALHADORES QUALIFICADOS DA INDÚSTRIA, CONSTRUÇÃO E ARTÍFICES**	**SKILLED INDUSTRIAL, CONSTRUCTION AND CRAFT WORKERSs**		
71	Trabalhadores qualificados da construção e similares, excepto electricista	Skilled construction and related workers, except electricians	B	-
72	Trabalhadores qualificados da metalurgia, metalomecânica e similares	Skilled metalworkers, metal mechanics and the like	W	-
73	Trabalhadores qualificados da impressão, do fabrico de instrumentos de precisão, joalheiros, artesãos e similares	Skilled printers, precision instrument makers, jewelers, craftsmen and the like	B	-
74	Trabalhadores qualificados em electricidade e em electrónica	Skilled electrical and electronics workers	B	-
75	Trabalhadores da transformação de alimentos, da madeira, do vestuário e outras indústrias e artesanato	Workers in food processing, woodworking, clothing and other industries and handicrafts	B	-
8	**OPERADORES DE INSTALAÇÕES E MÁQUINAS E TRABALHADORES DA MONTAGEM**	**PLANT AND MACHINE OPERATORS AND ASSEMBLY WORKERS**		
81	Operadores de instalações fixas e máquinas	Fixed plant and machine operators	B	-
82	Trabalhadores da montagem	Assembly workers	B	-
83	Condutores de veículos e operadores de equipamentos móveis	Vehicle drivers and mobile equipment operators	B	-
9	**TRABALHADORES NÃO QUALIFICADOS**	**UNQUALIFIED WORKERS**		
91	Trabalhadores de limpeza	Cleaning workers	B	-
92	Trabalhadores não qualificados da agricultura, produção animal, pesca e floresta	Unskilled agricultural, animal production, fishing and forestry workers	B	-
93	Trabalhadores não qualificados da indústria extractiva, construção, indústria transformadora e transportes	Unskilled workers in mining, construction, manufacturing and transport	B	-
94	Assistentes na preparação de refeições	Meal preparation assistants	B	-
95	Vendedores ambulantes (excepto de alimentos) e prestadores de serviços na rua	Street vendors (except food) and street service providers	B	-
96	Trabalhadores dos resíduos e de outros serviços elementares	Waste and other elementary service workers	B	-

Column (1) classifies occupations into low- and high-skilled occupations (respectively denoted B and W). Column (2) denotes occupations possibly related to trade activities (T).

Table A.2: Summary Statistics By Firm Export Status.

	Non-Exporters			Exporters			
	Mean	**Std. Dev.**	**N.**	**Mean**	**Std. Dev.**	**N.**	Signif.
Total sales	387,068	2.7e+06	216,655	6.9e+06	8.96e+07	127,930	***
Domestic sales	387,068	2,651,435	216,655	6,545,540	8.53e+07	127,930	***
Export sales	0	0	216,655	321,053	4.6e+06	127,930	***
Export status	0	0	216,655	0.604	0.489	127,930	***
Share of employees in high-skilled occupations	0.096	0.236	216,655	0.150	0.216	127,930	***
Share of immigrant employees	0.021	0.109	216,655	0.020	0.078	127,930	**
Share of immigrants in low-skilled occupations	0.020	0.140	206,748	0.019	0.136	124,301	**
Share of immigrants in high-skilled occupations	0.008	0.091	52,856	0.006	0.077	77,919	***

Notes: This table reports descriptive statistics for two groups of firm-year observations: Never exporting firms *vs* firms exporting at least once over the study period.

Table A.3: Firm Export Activity by Employment of Immigrant Workers.

	No immigrant worker			At least 1 immigrant worker			
	Mean	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**	Signif.
Export value in euros	143,856	635,753	104,151	1,097,166	1.05e+07	23,779	***
Export participation	0.566	0.496	104,151	0.771	0.420	23,779	***
Nr. of destinations	2.990	6.185	104,151	8.210	12.144	23,779	***
Nr. of products	5.595	16.797	104,151	12.865	27.042	23,779	***
Nr. of markets	12.054	43.730	104,151	34.118	80.504	23,779	***

Notes: This table reports descriptive statistics for two subsamples. For each year, we identify firms employing no immigrant workers and firms employing at least one immigrant worker.

Table A.4: Worker Characteristics by Nativity Status.

	Native workers			Immigrant workers			
	Mean	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**	Signif.
Age	41.099	10.995	4,242,298	38.663	10.287	84,805	***
Experience	11.113	10.416	4,242,298	4.583	6.047	84,805	***
Separation rate	0.186	0.187	4,242,298	0.358	0.317	84,805	***
Sh. of high-skilled workers	0.163	0.370	4,242,298	0.120	0.325	84,805	***
Sh. of female workers	0.408	0.492	4,242,298	0.330	0.470	84,805	***
(log) Hourly wage of low-skilled workers	1.563	0.344	3,549,805	1.563	0.297	74,641	
(log) Hourly wage of high-skilled workers	2.275	0.565	692,493	2.538	0.770	10,164	***

Notes: This table reports descriptive statistics for native-year and immigrant-year observations.

B Theory Proofs

B.1 Firm Optimisation and Key Equations

A firm ϕ chooses ℓ_{ij} and θ_{ij} to maximize (11) which we can re-write as:

$$\pi(\phi) = R(\phi) - \sum_{ij}\left[\frac{v_{ij}(\phi)\hat{W}_{ij}}{\theta_{ij}} + v_{ij}^{\alpha}\right] - f_D - \mathbb{I}_x f_X$$

where $\hat{W}_{ij} = W_{ij}\chi_{ij}$ The first order conditions (FOC) to this concave problem are:

$$\frac{\partial \pi(\phi)}{\partial v_{ij}} = \frac{\partial R}{\partial \ell_{ij}}\frac{\partial \ell_{ij}}{\partial v_{ij}} - \frac{\hat{W}_{ij}}{\theta_{ij}} - \alpha v_{ij}(\phi)^{\alpha-1} = 0 \Rightarrow \frac{\partial R}{\partial \ell_{ij}}\frac{A}{\theta_{ij}^{\eta}} = \frac{\hat{W}_{ij}}{\theta_{ij}} + \alpha v_{ij}^{\alpha-1}$$

and

$$\frac{\partial \pi(\phi)}{\partial \theta_{ij}} = \frac{\partial R}{\partial \ell_{ij}}\frac{\partial \ell_{ij}}{\partial q(\theta_{ij})}\frac{\partial q(\theta_{ij})}{\partial \theta_{ij}} + \frac{v_{ij}\hat{W}_{ij}}{\theta_{ij}^2} = 0 \Rightarrow \frac{\partial R}{\partial \ell_{ij}}\frac{A\eta}{\theta_{ij}^{1+\eta}} = \frac{\hat{W}_{ij}}{\theta_{ij}^2}$$

which constitute (13). Combining the two FOC we obtain (15).

Consider first all factors $ij \neq HI$. By (7) and (12):

$$\frac{\partial R(\phi)}{\partial \ell_{ij}} = \left[\frac{Y}{M}(1+\mathbb{I}\tau^{1-\sigma})\right]^{\frac{1}{\sigma}}\frac{\sigma-1}{\sigma}y^{1-\frac{1}{\sigma}}\frac{\beta_{ij}}{\ell_{ij}} \overset{(3)}{=} \frac{\sigma-1}{\sigma}\beta_{ij}\ell_{ij}(\phi)^{-1}p(\phi)y(\phi) \quad \forall ij \neq HI$$

Now consider $ij = HI$, for which we have

$$\begin{aligned}\frac{\partial R(\phi)}{\partial \ell_{HI}} &= \frac{\sigma-1}{\sigma}R(\phi)\frac{Y}{M}\kappa\frac{\beta_{HI}}{\ell_{HI}}\mathbb{I}_X\left[\frac{Y}{M}(1+\mathbb{I}_X\tau^{1-\sigma})\right]^{-1}\tau^{-\sigma} + \frac{\sigma-1}{\sigma}R(\phi)\frac{\beta_{HI}}{\ell_{HI}} \\ &= \frac{\sigma-1}{\sigma}p(\phi)y(\phi)[1+\lambda(\phi)]\frac{\beta_{HI}}{\ell_{HI}(\phi)}\end{aligned}$$

We combine both previous results in (16).

For the average firm $\tilde{\phi}$, we have that $p(\tilde{\phi}) = 1$, then:

$$\frac{\partial R(\tilde{\phi})}{\partial \ell_{ij}} = \frac{\sigma-1}{\sigma}\beta_{ij}\frac{y(\tilde{\phi})}{\ell_{ij}(\tilde{\phi})}[1+\mathbb{I}_{HI}\lambda(\phi)] \overset{(10)}{\Rightarrow} \frac{\sigma-1}{\sigma}\beta_{ij}\frac{y(\tilde{\phi})}{\ell_{ij}(\tilde{\phi})}\frac{A\eta}{\hat{W}_{ij}}[1+\mathbb{I}_{HI}\lambda(\phi)] = \tilde{\theta}_{ij}^{\eta-1}$$

And solving for $\tilde{\theta_{ij}}$ gives (17).

Consider now two types of firms: one that exports with productivity ϕ and one that does not export with productivity $\tilde{\phi}$. For the former, we have that

$$\frac{\partial R(\ell_{ij}, \mathbb{I}_X, \phi)}{\partial \ell_{ij}} = \left[\frac{Y}{M}(1+\mathbb{I}_X\tau^{1-\sigma})\right]^{\frac{1}{\sigma}}\frac{\sigma-1}{\sigma}y(\phi)^{1-\frac{1}{\sigma}}\frac{\beta_{ij}}{\ell_{ij}}[1+\mathbb{I}_{HI}\lambda(\phi)]$$

While for the latter:

$$\frac{\partial R(\tilde{\ell}_{ij}, 0, \tilde{\phi})}{\partial \ell_{ij}} = \left[\frac{Y}{M}\right]^{\frac{1}{\sigma}}\frac{\sigma-1}{\sigma}y(\tilde{\phi})^{1-\frac{1}{\sigma}}\frac{\beta_{ij}}{\ell_{ij}}$$

Dividing (13) for these two firms gives (18).

B.2 Solving the Main System of Equations

We can find the relationship between employment levels and tightness by:

$$\ell_{ij}(\phi,\theta_{ij}) \overset{(6)}{=} q(\theta_{ij})v_{ij} \overset{(11)}{=} A\theta_{ij}^{-\eta}\left[\frac{1-\eta}{\eta}\frac{\hat{W}_{ij}}{\alpha}\frac{1}{\theta_{ij}}\right]^{\frac{1}{\alpha-1}} = A\left[\frac{\hat{W}_{ij}(1-\eta)}{\alpha\eta}\right]^{\frac{1}{\alpha-1}}\frac{1}{\theta_{ij}^{\frac{1}{\alpha-1}+\eta}} \tag{A.1}$$

For exposition purposes let us now group all $ij \neq HI$ into one single labor type that we call B. Then, plugging (7) and (A.1) into (18), we obtain:

$$(1+\mathbb{I}_X\tau^{1-\sigma})^{\frac{1}{\sigma}}\left[\frac{\phi}{\tilde{\phi}}\right]^{\frac{\sigma-1}{\sigma}}\left[\frac{\tilde{\theta}_{HI}}{\theta_{HI}}\right]^{\Psi\beta_{HI}} = \left[\frac{\tilde{\theta}_B}{\theta_B}\right]^{J_B} \tag{A.2}$$

and

$$(1+\mathbb{I}_X\tau^{1-\sigma})^{\frac{1}{\sigma}}\left[\frac{\phi}{\tilde{\phi}}\right]^{\frac{\sigma-1}{\sigma}}\left[\frac{\tilde{\theta}_B}{\theta_B}\right]^{\Psi\beta_B}(1+\lambda) = \left[\frac{\tilde{\theta}_{HI}}{\theta_{HI}}\right]^{J_{HI}} \tag{A.3}$$

where $\Psi = \left(\frac{1}{\alpha-1}+\eta\right)\frac{\sigma-1}{\sigma} > 0$ and $J_{ij} = \frac{\alpha}{\alpha-1} - \beta_{ij}\Psi > 0$. Proof that parameter bundles are positive can be found in the next section of this Appendix.

Merging (A.2) with (A.3) delivers:

$$(1+\mathbb{I}_X\tau^{1-\sigma})^{\frac{1}{\sigma}(1+D)}\left[\frac{\phi}{\tilde{\phi}}\right]^{\frac{\sigma-1}{\sigma}(1+D)}(1+\lambda) = \left[\frac{\tilde{\theta}_{HI}}{\theta_{HI}}\right]^{J_{HI}-\Psi\beta_{HI}D} \tag{A.4}$$

where $D = \frac{\Psi\beta_B}{J_B} > 0$. Taking this back to (A.2):

$$(1+\mathbb{I}_X\tau^{1-\sigma})^{\frac{1}{\sigma}(1+(1+D)H)}\left[\frac{\phi}{\tilde{\phi}}\right]^{\frac{\sigma-1}{\sigma}(1+(1+D)H)}(1+\lambda)^H = \left[\frac{\tilde{\theta}_B}{\theta_B}\right]^{J_B} \tag{A.5}$$

where $H = \frac{\Psi\beta_{HI}}{J_{HI}-\Psi\beta_{HI}D} > 0$.

We now proceed to obtain parametric expressions for $\tilde{\theta}_{HI}$ and $\tilde{\theta}_B$ that we will introduce in the expressions above. For this purpose we use (A.1) for the particular case of firm $\tilde{\phi}$, and merge that with (17) to obtain:

$$\tilde{\theta}_{HI} = \left[\frac{\sigma}{\sigma-1}\frac{\hat{W}_{HI}^{\frac{\alpha-\beta_{HI}}{\alpha-1}}}{\hat{W}_B^{\frac{\beta_B}{\alpha-1}}}\frac{\tilde{\theta}_B^{\beta_B\left(\frac{1}{\alpha-1}+\eta\right)}}{A\eta\beta_{HI}\tilde{\phi}}\frac{1}{1+\lambda}\right]^{N_{HI}}, \text{ and } \tilde{\theta}_B = \left[\frac{\sigma}{\sigma-1}\frac{\hat{W}_B^{\frac{\alpha-\beta_B}{\alpha-1}}}{\hat{W}_{HI}^{\frac{\beta_{HI}}{\alpha-1}}}\frac{\tilde{\theta}_{HI}^{\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)}}{A\eta\beta_B\tilde{\phi}}\right]^{N_B} \tag{A.6}$$

with $N_{ij} = [1-\eta+(1-\beta_{ij})\left(\frac{1}{\alpha-1}+\eta\right)]^{-1} > 0$.

Using both expressions in (A.6) we obtain the desired parametric expressions:

$$\tilde{\theta}_{HI} = \left[\left(\frac{\sigma}{\sigma-1} \right)^{1+\rho} \frac{\hat{W}_{HI}^{\frac{\alpha-\beta_{HI}(1+\rho)}{\alpha-1}} \hat{W}_B^{\frac{\alpha\rho-\beta_B(1+\rho)}{\alpha-1}}}{(1+\lambda)(A\eta\tilde{\phi})^{1+\rho}\beta_{HI}\beta_B^{\rho}} \right]^{\Omega} \tag{A.7}$$

and

$$\tilde{\theta}_B = \left[\left(\frac{\sigma}{\sigma-1} \right)^{1+\Phi(1+\rho)} \frac{\hat{W}_B^{\gamma_1} \hat{W}_{HI}^{-\gamma_2}}{(\tilde{\phi}A\eta)^{1+\Phi(1+\rho)}(1+\lambda)^{\Phi}\beta_{HI}^{\Phi}\beta_B^{1+\Phi\rho}} \right]^{N_B} \tag{A.8}$$

where $\rho = \beta_B N_B \left(\frac{1}{\alpha-1} + \eta \right)$, $\Phi = \frac{\beta_{HI}N_{HI}\left(\frac{1}{\alpha-1}+\eta\right)}{1-N_{HI}\rho\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)}$, $\gamma_1 = \frac{\alpha-\beta_B}{\alpha-1} - \Phi \left[\frac{\beta_B(1+\rho)-\alpha\rho}{\alpha-1} \right]$, $\gamma_2 = \frac{\beta_{HI}}{\alpha-1} - \Phi \left[\frac{\alpha-\beta_{HI}(1+\rho)}{\alpha-1} \right]$, and $\Omega = \frac{N_{HI}}{1-N_{HI}\rho\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)}$.

Inserting (A.7) and (A.8) into (A.4) and (A.5) respectively, gives:

$$\begin{aligned} \theta_{HI} = & (1+\mathbb{I}_X\tau^{1-\sigma})^{-\frac{1}{\sigma}\frac{1+D}{Z}} \phi^{-\frac{\sigma-1}{\sigma}\frac{1+D}{Z}} \tilde{\phi}^{\frac{\sigma-1}{\sigma}\frac{1+D}{Z}-\Omega(1+\rho)} (1+\lambda)^{-\frac{1}{Z}-\Omega} \\ & \cdot \left[\left(\frac{\sigma}{\sigma-1} \right)^{1+\rho} \frac{\hat{W}_{HI}^{\frac{\alpha-\beta_{HI}(1+\rho)}{\alpha-1}} \hat{W}_B^{\frac{\alpha\rho-\beta_B(1+\rho)}{\alpha-1}}}{(A\eta)^{1+\rho}\beta_{HI}\beta_B^{\rho}} \right]^{\Omega} \end{aligned} \tag{A.9}$$

and

$$\begin{aligned} \theta_B = & (1+\mathbb{I}_X\tau^{1-\sigma})^{-\frac{1}{\sigma}\frac{1}{J_B}[1+(1+D)H]} \phi^{-\frac{\sigma-1}{\sigma J_B}[1+(1+D)H]} \tilde{\phi}^{\frac{\sigma-1}{\sigma J_B}[1+(1+D)H]-V} \\ & \cdot (1+\lambda)^{-\left[\frac{H}{J_B}+\Phi N_B\right]} \left(\frac{\sigma}{\sigma-1} \right)^{V} (A\eta)^{-V} \left[\frac{\hat{W}_B^{\gamma_1}\hat{W}_{HI}^{-\gamma_2}}{\beta_{HI}^{\Phi}\beta_B^{1+\Phi\rho}} \right]^{N_B} \end{aligned} \tag{A.10}$$

with $Z = \frac{H}{\Psi\beta_{HI}}$, and $V = N_B(1+\Phi(1+\rho))$.

Then inserting these back into (10) gives:

$$\begin{aligned} w_{HI}(\phi) = & \left[\frac{\phi}{\tilde{\phi}} \right]^{\frac{\sigma-1}{\sigma}\frac{1+D}{Z}(1-\eta)} [1+\mathbb{I}_X\tau(\phi)^{1-\sigma}]^{\frac{1-\eta}{\sigma}\frac{1+D}{Z}} [1+\lambda(\phi)]^{\left(\frac{1}{Z}+\Omega\right)(1-\eta)} \beta_{HI}^{\Omega(1-\eta)} \beta_B^{\Omega(1-\eta)\rho} \\ & \times \hat{W}_{HI}^{\mu\Omega(1-\eta)+1} \hat{W}_B^{-\epsilon\Omega(1-\eta)} \left[\frac{(\sigma-1)\eta\tilde{\phi}}{\sigma} \right]^{\Omega(1-\eta)(\rho+1)} A^{\Omega(1-\eta)(\rho+1)-1} \end{aligned} \tag{A.11}$$

and

$$\begin{aligned} w_B(\phi) = & \left[\frac{\phi}{\tilde{\phi}} \right]^{(\sigma-1)T} [1+\mathbb{I}_X\tau(\phi)^{1-\sigma}]^{T} [1+\lambda(\phi)]^{\left[\frac{H}{J_B}+\Phi N_B\right](1-\eta)} \beta_{HI}^{\Phi N_B(1-\eta)} \beta_B^{V(1-\eta)} \\ & \times \hat{W}_{HI}^{\gamma_2 N_B(1-\eta)} \hat{W}_B^{1-\gamma_1 N_B(1-\eta)} \left[\frac{(\sigma-1)\eta\tilde{\phi}}{\sigma} \right]^{V(1-\eta)} A^{V(1-\eta)-1} \end{aligned} \tag{A.12}$$

with $T = \frac{1-\eta}{\sigma J_B}[1+(1+D)H]$.

To re-write (A.11) as (20), it suffices to show that $[\Omega(1-\eta)]^{-1} = 1+\rho$. For this, we can re-write:

$$
\begin{aligned}
[\Omega(1-\eta)]^{-1} &= \frac{1}{1-\eta}\frac{1-N_{HI}\rho\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)}{N_{HI}} = \frac{1}{1-\eta}\left[\frac{1}{N_{HI}} - \rho\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)\right] \\
&= \frac{1}{1-\eta}\left[1-\eta+\left(\frac{1}{\alpha-1}+\eta\right)(1-\beta_{HI}-\rho\beta_{HI})\right] \\
&= \frac{1}{1-\eta}\left[1-\eta+\left(\frac{1}{\alpha-1}+\eta\right)\rho\left(\frac{\beta_B}{\rho}-\beta_{HI}\right)\right]
\end{aligned}
$$

Notice that we can write $\rho = \left[\frac{1-\eta}{\beta_B\left(\frac{1}{\alpha-1}+\eta\right)} + \frac{1}{\beta_B} - 1\right]^{-1}$. Then $\frac{\beta_B}{\rho} = \frac{1-\eta}{\left(\frac{1}{\alpha-1}+\eta\right)} + 1 - \beta_B$. Taking this to our previous equation, we see that:

$$
[\Omega(1-\eta)]^{-1} = \frac{1}{1-\eta}\left[1-\eta+\left(\frac{1}{\alpha-1}+\eta\right)\rho\left(\frac{1-\eta}{\left(\frac{1}{\alpha-1}+\eta\right)} + \underbrace{1-\beta_B-\beta_{HI}}_{=0}\right)\right] = 1+\rho
$$

B.3 Sign of Parameter Bundles

This section provides proof that the parameter bundles used in the previous section are defined to be strictly positive. For this task, it is useful to keep in mind the range of our baseline parameters in the model: $0<\eta<1$, $\alpha>1$, $0<\beta_{ij}<1$, and $\sum_{ij}\beta_{ij}=1$, $\sigma>1$.

Given this, it is clear that $\Psi = \frac{\sigma-1}{\sigma}\left(\frac{1}{\alpha-1}+\eta\right) > 0$. Also, $\Psi < 1 \Leftrightarrow \frac{1}{\alpha-1}+\eta < \frac{\sigma}{\sigma-1}$.

We can write $J_{ij} = \underbrace{1-\eta}_{0<\ \ <1} + \underbrace{\left(\frac{1}{\alpha-1}+\eta\right)}_{0<}\left(1-\beta_A\underbrace{\frac{\sigma-1}{\sigma}}_{0<\ \ <1}\right) = \frac{\alpha}{\alpha-1} - \beta_A\Psi > 0$.

Then, it is clear that $D = \Psi\frac{\beta_B}{J_B} > 0$ since all its components are positive.

Let us now show that $H>0$. Notice that $H = \frac{\beta_{HI}\Psi}{J_{HI}-\beta_{HI}\Psi D}$ so

$$
\begin{aligned}
H &> 0 \iff J_{HI} > \beta_{HI}\Psi D \Leftrightarrow J_{HI} > \beta_{HI}\Psi^2\beta_B J_B^{-1} \Leftrightarrow \frac{J_{HI}}{\beta_{HI}}\frac{J_B}{\beta_B} > \Psi^2 \\
&\iff \left(\frac{\alpha}{\alpha-1}\frac{1}{\beta_{HI}} - \Psi\right)\left(\frac{\alpha}{\alpha-1}\frac{1}{\beta_B} - \Psi\right) > \Psi^2 \\
&\iff \underbrace{\frac{\alpha}{\alpha-1}\frac{1}{\beta_{HI}}}_{>0}\left[\frac{\alpha}{\alpha-1}\frac{1}{\beta_B} - \Psi\left(1+\frac{\beta_{HI}}{\beta_B}\right)\right] + \Psi^2 > \Psi^2 \\
&\iff \frac{\alpha}{\alpha-1}\frac{1}{\beta_B} > \Psi\left(1+\frac{\beta_{HI}}{\beta_B}\right) \iff \frac{\alpha}{\alpha-1} > \Psi\left(\underbrace{\beta_B+\beta_{HI}}_{=1}\right) \\
&\iff 1 > \underbrace{\frac{\sigma-1}{\sigma}}_{0<\ \ <1}\left[\frac{1}{\alpha}+\eta\frac{(\alpha-1)}{\alpha}\right]
\end{aligned}
$$

This proof is completed by reckoning that the term in brackets belongs to the range $(\eta, 1)$ for any value of α, and therefore the right-hand side of the inequality is always lower than unity. So $H > 0$ always holds.

It is straightforward to see that $N_{ij} = [1-\eta+(1-\beta_{ij})\left(\frac{1}{\alpha-1}+\eta\right)]^{-1} > 0$, since $0 < 1-\eta < 1$, and $\frac{1}{\alpha-1}+\eta > 0$. Similarly, it is straightforward that $T = \frac{1-\eta}{\sigma J_B}[1+(1+D)H] > 0$.

Note that $\Phi > 0$ since all its components are positive. Also, $\Phi < 1 \Leftrightarrow 1+\beta_B N_B > \beta_{HI} N_{HI} \Leftrightarrow (\beta_B - \beta_{HI})\left(\frac{1}{\alpha-1}+\eta\right) < 1$.

We can also show that $\Omega > 0$. For this notice that, since $N_{HI} > 0$, then

$$
\begin{aligned}
\Omega > 0 \quad &\Longleftrightarrow \quad 1 > N_{HI}\rho\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right) \\
&\Longleftrightarrow \quad 1 > \frac{\beta_B\left(\frac{1}{\alpha-1}+\eta\right)}{1-\eta+(1-\beta_B)\left(\frac{1}{\alpha-1}+\eta\right)} \times \frac{\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)}{1-\eta+(1-\beta_{HI})\left(\frac{1}{\alpha-1}+\eta\right)} \\
&\Longleftrightarrow \quad 1 > \frac{\beta_B(1+\eta(\alpha-1))}{\alpha-\beta_B(1+\eta(\alpha-1))} \times \frac{\beta_{HI}(1+\eta(\alpha-1))}{\alpha-\beta_{HI}(1+\eta(\alpha-1))} \\
&\Longleftrightarrow \quad 1 > \frac{\beta_B}{\frac{\alpha}{1+\eta(\alpha-1)}-\beta_B} \times \frac{1-\beta_B}{\frac{\alpha}{1+\eta(\alpha-1)}-(1-\beta_B)} \\
&\Longleftrightarrow \quad 1 > \frac{\beta_B(1-\beta_B)}{\left[\frac{\alpha}{1+\eta(\alpha-1)}\right]^2-\frac{\alpha}{1+\eta(\alpha-1)}+\beta_B(1-\beta_B)} = \left[\frac{\left[\frac{\alpha}{1+\eta(\alpha-1)}\right]^2-\frac{\alpha}{1+\eta(\alpha-1)}}{\beta_B(1-\beta_B)}+1\right]^{-1}
\end{aligned}
$$

The inequality above holds because the term in brackets on the right-hand side is larger than one. To see this notice that

$$
\left[\frac{\alpha}{1+\eta(\alpha-1)}\right]^2-\frac{\alpha}{1+\eta(\alpha-1)} = \frac{\alpha}{1+\eta(\alpha-1)}\left[\frac{\alpha}{1+\eta(\alpha-1)}-1\right] > 0 \Longleftrightarrow
$$
$$
\frac{\alpha}{1+\eta(\alpha-1)} > 1 \Longleftrightarrow \alpha > 1+\eta(\alpha-1) \Longleftrightarrow \alpha-1 > \eta(\alpha-1)
$$

where the last inequality always holds since $0 < \eta < 1$.

Given the above results, it is easy to see that all the parameter bundles used in (20) have a clear sign. Indeed:

$$
\begin{aligned}
\zeta &= \frac{1+D}{\sigma} > 0 \\
\delta &= \frac{1-\eta}{Z} > 0 \\
\rho &= \beta_B N_B\left(\frac{1}{\alpha-1}+\eta\right) > 0
\end{aligned}
$$

Let us now explore the signs of $\mu = \frac{\alpha - \beta_{HI}(1+\rho)}{\alpha-1}$ and $\epsilon = \frac{\alpha\rho - \beta_B(1+\rho)}{\alpha-1}$. First, we can show that $\mu > 0$:

$$\mu > 0 \iff \alpha > \beta_{HI}(1+\rho) \iff \alpha > \beta_{HI}\left(1 + \frac{\left(\frac{1}{\alpha-1}+\eta\right)\beta_B}{1-\eta+(1-\beta_B)\left(\frac{1}{\alpha-1}+\eta\right)}\right)$$
$$\iff \alpha > \beta_{HI}\left(1 + \frac{\left(\frac{1}{\alpha-1}+\eta\right)\beta_B(\alpha-1)}{\alpha - \left(\frac{1}{\alpha-1}+\eta\right)\beta_B(\alpha-1)}\right)$$
$$\iff \alpha > \frac{\beta_{HI}\alpha}{\alpha-\beta_B\left(1+\eta(\alpha-1)\right)} \iff 1 > \frac{1-\beta_B}{\alpha-\beta_B\left(1+\eta(\alpha-1)\right)}$$

In the last step, we used $\beta_{HI} = 1-\beta_B$. Now we proceed by showing that $\alpha - \beta_B\left(1+\eta(\alpha-1)\right) > 0$. This is the case whenever $\frac{\alpha}{1+\eta(\alpha-1)} > \beta_B$. It is easy to see that this condition holds when $0 < \eta < 1$ and $0 < \beta_B < 1$ since then $\frac{\alpha}{1+\eta(\alpha-1)} > \frac{\alpha}{1+(\alpha-1)} = 1 > \beta_B$. Then we can write that:

$$\mu > 0 \iff \alpha - \beta_B\left(1+\eta(\alpha-1)\right) > 1-\beta_B \iff \alpha - 1 > \beta_B\eta(\alpha-1) \iff 1 > \beta_B\eta$$

As can be seen, this condition always holds when $0 < \eta < 1$ and $0 < \beta_B < 1$.

Finally, we can show that:

$$\epsilon > 0 \iff \beta_B(1+\rho) < \alpha\rho \iff \frac{1}{\rho} \iff \frac{1-\eta+(1-\beta_B)\left(\frac{1}{\alpha-1}+\eta\right)}{\left(\frac{1}{\alpha-1}+\eta\right)\beta_B} < \frac{\alpha}{\beta_B} - 1$$
$$\iff \frac{\alpha}{(\alpha-1)\left(\frac{1}{\alpha-1}+\eta\right)\beta_B} - 1 < \frac{\alpha}{\beta_B} - 1 \iff (1-\alpha)\left(\frac{1}{\alpha-1}+\eta\right) > 1$$
$$\iff 1+\eta(\alpha-1) > 1 \iff \eta(\alpha-1) > 0$$

We know the last inequality always holds, meaning that $\epsilon > 0$.

B.4 Discussion of the Effects in Equation (20)

Equation (20) shows that the wage of factor HI increases when the employer is an exporter by factor $[1+\mathbb{I}_X\tau(\phi)^{1-\sigma}]^{\zeta\delta}[1+\lambda(\phi)]^{\delta+\Omega(1-\eta)}$. The first term in brackets signals the pure export premium that firms pay workers when they serve a foreign market. The second term in brackets appears because of the reduction in trade costs that hiring HI workers has, increasing the appeal of hiring this type of labour for exporting firms. The first effect is present also in the wage of other factors (see equation A.12) because the export premium is not exclusive to any production factor. The second effect also appears in other wages because of the complementarity of different labour types in the production function. Inspection of (A.12) shows that this second effect will be higher in HI than in other factors whenever $\delta + \Omega(1-\eta) > \left[\frac{H}{J_B} + \Phi N_B\right](1-\eta)$. While this condition does not need to hold for all values of parameters, it does hold for a wide range of parametrizations including the set of parameter values considered most reasonable.[19]

[19] Numerical exercises show that the condition can be violated when $\sigma \to +\infty$ and $\alpha \to 1$.

Equation (20) features a direct productivity effect, stemming from the fact that higher productivity of factor HI yields a higher wage rate for that factor, other things equal. The same equation also features an indirect productivity effect: when other types of labour are more productive, other things equal, factor HI has a higher wage rate. While the second effect is unequivocally positive, its relative intensity with respect to the direct effect depends on the magnitude of ρ: if $\rho < 1$ the indirect effect is smaller than the direct effect and when $\rho > 1$ the opposite is true. Notice that:

$$\begin{aligned}
\rho < 1 \quad &\Longleftrightarrow \quad \left(\frac{1}{\alpha-1} + \eta\right)\beta_B < 1 - \eta + (1-\beta_B)\left(\frac{1}{\alpha-1} + \eta\right) \\
&\Longleftrightarrow \quad \left(\frac{1}{\alpha-1} + \eta\right)\beta_B < \frac{\alpha}{\alpha-1} - \beta_B\left(\frac{1}{\alpha-1} + \eta\right) \\
&\Longleftrightarrow \quad 2\left(\frac{1}{\alpha-1} + \eta\right)\beta_B < \frac{\alpha}{\alpha-1} \quad \Longleftrightarrow \quad (1+\eta(\alpha-1))\frac{\beta_B}{\alpha} < \frac{1}{2}
\end{aligned}$$

The last inequality holds for high values of α and for low values of η and β_B. Moreover, we find that under the most reasonable values for these parameters, the condition holds. For example, for $\alpha = 3$ and $\eta = 0.4$, the condition only does not hold for values of $\beta_B > 5/6$, which we deem extremely high in a two-factor setting.

B.5 Conditions Closing the Model

In our model, firms will produce and sell domestically if their productivity level is above a cutoff value ϕ_D. Firms decide to export if their productivity level is above the threshold ϕ_X. A sufficient condition for the existence and uniqueness of each threshold is the profit function being monotonically increasing in ϕ.

We can obtain a function of profits depending on ϕ and parameters following a sequence of steps. First, we go back to the FOC in (16) of the firm to find an expression for the price charged in the domestic market:

$$\frac{\partial R(\phi)}{\partial \ell_{ij}} = \frac{\sigma-1}{\sigma}\frac{\beta_{ij} p_D(\phi) y_D(\phi)}{\ell_{ij}}$$

We derive this expression for two firms ϕ and $\tilde{\phi}$ to obtain:

$$p_D(\phi)\frac{y_D}{\ell_{ij}}\frac{\tilde{\ell_{ij}}}{\tilde{y_D}} = \left[\frac{\tilde{\theta}_{ij}}{\theta_{ij}}\right]^{1-\eta} \Rightarrow p_D(\phi) = \frac{\ell_{ij}}{\tilde{\ell_{ij}}}\frac{\tilde{y_D}}{y_D}\left[\frac{\tilde{\theta}_{ij}}{\theta_{ij}}\right]^{1-\eta}$$

where the first equality uses (18).

Notice that (7) establishes that :

$$\frac{\ell_{ij}}{\tilde{\ell_{ij}}}\frac{\tilde{y_D}}{y_D} = \frac{\tilde{\phi}}{\phi}\left[\prod_{h\neq ij}\left(\frac{\tilde{\ell_h}}{\ell_h}\right)^{\beta_h}\right]\left(\frac{\tilde{\ell_{ij}}}{\ell_{ij}}\right)^{\beta_{ij}-1}$$

By (A.1) we have that $\frac{\ell_{ij}}{\tilde{\ell}_{ij}} = \left[\frac{\tilde{\theta}_{ij}}{\theta_{ij}}\right]^{\frac{1}{\alpha-1}+\eta}$, so we can now write:

$$p_D(\phi) = \frac{\tilde{\phi}}{\phi}\left[\frac{\tilde{\theta}_{ij}}{\theta_{ij}}\right]^{N_{ij}^{-1}}\left[\prod_{h\neq ij}\left(\frac{\theta_{ij}}{\tilde{\theta}_{ij}}\right)^{\beta_h\left(\frac{1}{\alpha-1}+\eta\right)}\right]$$

In the case of two factors of production, we can write:

$$p_D(\phi) = \frac{\tilde{\phi}}{\phi}\left[\frac{\tilde{\theta}_{HI}}{\theta_{HI}}\right]^{N_{HI}^{-1}}\left[\frac{\theta_B}{\tilde{\theta}_B}\right]^{\beta_B\left(\frac{1}{\alpha-1}+\eta\right)}, \text{ and } p_D(\phi) = \frac{\tilde{\phi}}{\phi}\left[\frac{\tilde{\theta}_B}{\theta_B}\right]^{N_B^{-1}}\left[\frac{\theta_{HI}}{\tilde{\theta}_{HI}}\right]^{\beta_B\left(\frac{1}{\alpha-1}+\eta\right)}$$

which constitute a system of two equations we can solve to obtain:

$$p_D(\phi) = \left[\frac{\tilde{\phi}}{\phi}\right]^{1+\beta_B\left(\frac{1}{\alpha-1}+\eta\right)N_B^{-1}}\left[\frac{\tilde{\theta}_{HI}}{\theta_{HI}}\right]^{\Gamma}$$

with $\Gamma = N_H^{-1} + N_B^{-1}\beta_B\beta_{HI}\left(\frac{1}{\alpha-1}+\eta\right)^2 > 0$

Using (A.4), we can re-write the previous expression as:

$$p_D(\phi) = \left[\frac{\tilde{\phi}}{\phi}\right]^{\Delta}(1+\mathbb{I}_X\tau^{1-\sigma})^{\Gamma Z\frac{(1+D)}{\sigma}}(1+\lambda)^{\Gamma Z} \tag{A.13}$$

with $\Delta = 1 + \beta_B\left(\frac{1}{\alpha-1}+\eta\right)N_B^{-1} - \Gamma Z(1+D)\frac{\sigma-1}{\sigma}$. Then, we use (5) to write:

$$1 = P = \left[\frac{1}{M}\int_{\omega\in\Omega}p(\omega)^{1-\sigma}d\omega\right]^{\frac{1}{1-\sigma}} = \left[\frac{M_D}{M}\int_{\phi_D}^{\infty}p_D(\omega)^{1-\sigma}[1+\mathbb{I}_X\tau^{1-\sigma}]\mu(\phi)d\phi\right]^{\frac{1}{1-\sigma}}$$

Where, for the second equality, we re-scale the integral so it includes only producing firms (i.e., firms for which $\phi > \phi_D$), M_D is defined as the mass of firms that produce for the domestic market, and we define $\mu(\phi) = g(\phi)/[1-G(\phi_D)]$. We can call ϱ the share of domestic firms that export. By symmetry, this is also the share of foreign firms that import. Then, we have that $M = M_D + \varrho M_D$, and can re-write the above equation as:

$$1+\varrho = \int_{\phi_D}^{\infty}p_D(\omega)^{1-\sigma}[1+\mathbb{I}_X\tau^{1-\sigma}]\mu(\phi)d\phi$$

Merging this with (A.13) yields:

$$\tilde{\phi}(\phi_D) = \left[\frac{1}{1+\varrho}\int_{\phi_D}^{\infty}\phi^{\Delta(\sigma-1)}[1+\mathbb{I}_X\tau^{1-\sigma}]^{1-\Gamma Z(1+D)\frac{\sigma-1}{\sigma}}(1+\lambda)^{\Gamma Z(1-\sigma)}\mu(\phi)d\phi\right]^{\frac{1}{(\sigma-1)\Delta}}$$

A further step requires that we find an expression for $R_D(\phi)$, i.e., the revenues obtained by firm ϕ from selling in the domestic market. For this notice that we can write: $R(\phi) = [1+\mathbb{I}_X\tau^{1-\sigma}]R_D(\phi)$. Then using (12) we obtain: $R_D(\phi) = [\frac{Y}{M}(1+\mathbb{I}_X\tau^{1-\sigma})]^{\frac{1-\sigma}{\sigma}}y^{\frac{\sigma-1}{\sigma}}$. Dividing two versions of the previous equality (one for ϕ and another for $\tilde{\phi}$), we get:

$$\frac{R_D(\phi)}{R_D(\tilde{\phi})} = \left[\frac{y}{\tilde{y}}\right]^{\frac{\sigma-1}{\sigma}} \Rightarrow R_D(\phi) = \left[\frac{\phi}{\tilde{\phi}} \prod_{ij} \left(\frac{\tilde{\theta_{ij}}}{\theta_{ij}}\right)^{\beta_{ij}\left(\frac{1}{\alpha-1}+\eta\right)}\right]^{\frac{\sigma-1}{\sigma}} \tilde{y}$$

where the last equality uses (7) and $p(\tilde{\phi}) = 1$.

The final step is going back to (11) to write an expression for profits that depend on parameters and the productivity level ϕ:

$$\pi(\phi) = [1 + \mathbb{I}_X \tau^{1-\sigma}] \left[\frac{\phi}{\tilde{\phi}} \prod_{ij} \left(\frac{\tilde{\theta_{ij}}}{\theta_{ij}}\right)^{\beta_{ij}\left(\frac{1}{\alpha-1}+\eta\right)}\right]^{\frac{\sigma-1}{\sigma}} \tilde{y} - \sum_{ij} \left[\frac{\hat{W}_{ij} v_{ij}}{\theta_{ij}} + C(v_{ij})\right] - f_D - \mathbb{I}_X f_X$$

We can split the expression above into different components to ease exposition. Using (A.4) and (A.5) we can see that:

$$\begin{aligned} \prod\nolimits_{ij} \quad \left(\frac{\tilde{\theta_{ij}}}{\theta_{ij}}\right)^{\beta_{ij}\left(\frac{1}{\alpha-1}+\eta\right)} &= \\ = \quad [1 + \mathbb{I}_X \tau^{1-\sigma}]^{\Psi\left[\beta_{HI} Z \frac{1+D}{\sigma} + \beta_B \frac{T}{1-\eta}\right]} &\left[\frac{\phi}{\tilde{\phi}}\right]^{\Psi\left[\beta_{HI} \frac{1+D}{Z} \frac{\sigma-1}{\sigma} + \beta_B T \frac{\sigma-1}{1-\eta}\right]} (1+\lambda)^{\Psi\left[\beta_{HI} Z + \beta_B \frac{H}{J_B}\right]} \end{aligned}$$

Using (7) and (A.1) we can write:

$$\begin{aligned} \tilde{y} &= A \left[\frac{1-\eta}{\alpha\eta}\right]^{\frac{1}{1-\alpha}} \tilde{\phi} \prod_{ij} \left(\frac{\hat{W}_{ij}}{\theta_{ij}^{\frac{1}{\alpha-1}+\eta}}\right)^{\beta_{ij}} \\ &= K \hat{W}_{HI}^{\beta_{HI} - \iota\alpha_1 + \varsigma\gamma_2} \hat{W}_B^{\iota\alpha_2 + \beta_B - \varsigma\gamma_1} \tilde{\phi}^{\iota(1+\rho)+\varsigma(1+\Phi(1+\rho))} (1+\lambda)^{\iota+\varsigma\Phi} \end{aligned}$$

where the second equality uses (A.9) and (A.10), and where $\iota = \Omega\beta_{HI}\left(\frac{1}{\alpha-1} + \eta\right)$, $\varsigma = N_B \beta_B \left(\frac{1}{\alpha-1} + \eta\right)$, $\alpha_1 = \frac{\beta_B(1+\rho)-\alpha\rho}{\alpha-1}$, $\alpha_2 = \frac{\alpha-\beta_{HI}(1+\rho)}{\alpha-1}$ and

$$\begin{aligned} K &= A^{\iota(1+\rho)+\varsigma(1+\Phi(1+\rho))} \left[\frac{1-\eta}{\alpha}\right]^{\frac{1}{\alpha-1}} \eta^{\frac{-1}{\alpha-1}+\iota(1+\rho)+\varsigma(1+\Phi(1+\rho))} \times \\ &\times \left[\frac{\sigma-1}{\sigma}\right]^{\iota(1+\rho)+\varsigma(1+\Phi(1+\rho))} \beta_{HI}^{\iota+\varsigma\Phi} \beta_B^{\iota\rho+\varsigma(1+\Phi\rho)}. \end{aligned}$$

This allows us to reach a final expression for revenues as a function of productivity levels:

$$\begin{aligned} R(\phi) &= K \hat{W}_{HI}^{\beta_{HI} - \iota\alpha_1 + \varsigma\gamma_2} \hat{W}_B^{\iota\alpha_2 + \beta_B - \varsigma\gamma_1} [1 + \mathbb{I}_X \tau^{1-\sigma}]^{1+\Psi\left[\beta_{HI} Z \frac{1+D}{\sigma} + \beta_B \frac{T}{1-\eta}\right]} \times \\ &\times \phi^{\Psi\left[\beta_{HI} \frac{1+D}{Z} \frac{\sigma-1}{\sigma} + \beta_B T \frac{\sigma-1}{1-\eta}\right]} \tilde{\phi}^{\frac{1}{\sigma} - \Psi\left[\beta_{HI} \frac{1+D}{Z} \frac{\sigma-1}{\sigma} + \beta_B T \frac{\sigma-1}{1-\eta}\right] + \iota(1+\rho) - \varsigma(1+\Phi(1+\rho))} \times \\ &\times (1+\lambda)^{\Psi(\beta_{HI} Z + \beta_B \frac{H}{J_B})\iota+\varsigma\Phi} \end{aligned}$$

Revenues are a monotonically increasing function of productivity levels since, following our previous proofs: $\Psi\left[\beta_{HI}\frac{1+D}{Z}\frac{\sigma-1}{\sigma}+\beta_B T\frac{\sigma-1}{1-\eta}\right]>0$.

Now, we turn to the cost side of the profit function. Using (9) and (15) we can write:

$$\sum_{ij}\left[\frac{\hat{W}_{ij}v_{ij}}{\theta_{ij}}+C(v_{ij})\right]=\sum_{ij}\left[X_{ij}^{\frac{1}{\alpha-1}}\theta_{ij}^{\frac{-\alpha}{\alpha-1}}\hat{W}_{ij}+X_{ij}^{\frac{\alpha}{\alpha-1}}\theta_{ij}^{\frac{-\alpha}{\alpha-1}}\right]=\sum_{ij}\theta_{ij}^{\frac{-\alpha}{\alpha-1}}[X_{ij}^{\frac{1}{\alpha-1}}(1+X_{ij}^{\alpha})]$$

with $X_{ij}=\left[\frac{1-\eta}{\eta}\frac{\hat{W}_{ij}}{\alpha}\right]$. Notice that costs are a negative function of θ_{ij}. Then, inspection of (A.9) and (A.10) suffices to see that the cost function is a positive function of ϕ. The shape of the profit function for different productivity levels depends on the parametrization chosen. We find that it is a monotonically increasing function of productivity levels ϕ, for a broad range of parametrizations that include the set of values found reasonable elsewhere in this Appendix.

When the profit function is monotonically increasing in ϕ, then a threshold ϕ_D for producing for the domestic market exists, is unique, and is determined by setting $\pi(\phi_D)=0$, which constitutes the zero-profit condition. The threshold for exporting, ϕ_X, also exists and is unique. This is obtained by setting the following equality: $\pi(\phi_X,\mathbb{I}_X=0)=\pi(\phi_X,\mathbb{I}_X=1)$.

Finally, the free-entry condition establishes that expected profits need to equal entry costs so it can be written as:

$$\int_{\phi_D}^{\infty}\pi(\phi)dG(\phi)=f_E$$

Again, a unique solution exists for this equation when profits are a monotonically increasing function of ϕ.

C Additional Results

Table A.5: Worker Quality.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Estimation results				
(β_1) Foreign_i	-0.026**	-0.027**	-0.027**	-0.025**
	(0.012)	(0.013)	(0.011)	(0.012)
(β_2) Export_{jt}	0.000		0.000	
	(0.000)		(0.001)	
(β_3) $\text{Foreign}_i \times \text{Export}_{jt}$	-0.000	-0.000	-0.001	-0.004
	(0.001)	(0.001)	(0.011)	(0.012)
(β_4) $\text{Foreign}_i \times \text{HS}_i$	-0.022	-0.039	-0.039	-0.064
	(0.068)	(0.068)	(0.043)	(0.041)
(β_5) $\text{Export}_{jt} \times \text{HS}_i$	0.001**	0.000	0.009**	0.003
	(0.000)	(0.000)	(0.004)	(0.003)
(β_6) $\text{Foreign}_i \times \text{Export}_{jt} \times \text{HS}_i$	0.010**	0.011***	0.170***	0.195***
	(0.004)	(0.004)	(0.052)	(0.052)
Observations	3,284,065	3,281,397	3,284,065	3,281,397
R-squared	0.495	0.534	0.495	0.534
Controls	yes	yes	yes	yes
FE	fo-st-rt	fo-ft-ot	fo-st-rt	fo-ft-ot

Notes: This table reports OLS coefficients. The dependent variable is the (log) hourly wage of an individual i working in a firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, education dummies, and worker quality. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, st, rt and ot indicate firm-occupation, firm-time, sector-time, region-time, and occupation-time fixed effects.

Table A.6: Interpretation - Worker Quality.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Export thresholds				
Low-skilled workers ($-\beta_1/\beta_3$)	-182.050	-239.339	-	-
	(1,378.664)	(3.935)	-	-
High-skilled workers ($-[\beta_1+\beta_4]/[\beta_3+\beta_6]$)	4.873	5.940	-	-
	(5.162)	(4.321)	-	-
The migrant-native wage gap				
Low-skilled workers in non-exporter (β_1)	-	-	-0.027**	-0.025**
	-	-	(0.011)	(0.012)
Low-skilled workers in exporter ($\beta_1 + \beta_3$)	-	-	-0.028***	-0.029***
	-	-	(0.005)	(0.004)
High-skilled workers in non-exporter ($\beta_1 + \beta_4$)	-	-	-0.066	-0.089**
	-	-	(0.042)	(0.040)
High-skilled workers in exporter ($\beta_1 + \beta_3 + \beta_4 + \beta_6$)	-	-	0.102**	0.102***
	-	-	(0.040)	(0.039)
The export premium				
Low-skilled natives (β_2)	0.000	-	0.000	-
	(0.000)	-	(0.001)	-
Low-skilled immigrants ($\beta_2 + \beta_3$)	-0.000	-	-0.001	-
	(0.001)	-	(0.008)	-
High-skilled natives ($\beta_2 + \beta_5$)	0.001**	-	0.009***	-
	(0.000)	-	(0.003)	-
High-skilled immigrants ($\beta_2 + \beta_3 + \beta_5 + \beta_6$)	0.011**	-	0.178***	-
	(0.004)	-	(0.052)	-

Notes: This table provides an interpretation for the results of each estimation presented in Table A.5. Standard errors for non-linear and linear combinations of coefficients are obtained using the delta method.

Table A.7: Instrumentation Strategy.

	$\ln hw_{i(j)t}$							
	Export Intensity				Export Status			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation results								
(β_1) Foreign$_i$	-0.042*	-0.505***	-0.025***	-0.017	-0.002	-0.826***	-0.027***	-0.016
	(0.026)	(0.177)	(0.008)	(0.028)	(0.023)	(0.265)	(0.007)	(0.045)
(β_2) Export$_{jt}$	0.000*	0.009	0.000	0.010***	0.004	0.112	0.001	0.102***
	(0.000)	(0.008)	(0.000)	(0.003)	(0.002)	(0.095)	(0.001)	(0.033)
(β_3) Foreign$_i$ × Export$_{jt}$	0.011***	0.045***	0.001	-0.000	0.119***	0.987***	0.010	-0.001
	(0.002)	(0.013)	(0.001)	(0.002)	(0.027)	(0.309)	(0.007)	(0.052)
First-stage results								
WID$_{jt}$		0.593***		0.675***		0.047***		0.067***
		(0.115)		(0.062)		(0.008)		(0.005)
Foreign$_i$ × WID$_{jt}$		0.826***		0.968***		0.038***		0.044***
		(0.106)		(0.081)		(0.006)		(0.005)
Observations	702,657	671,525	3,624,446	3,423,321	702,657	671,525	3,624,446	3,423,321
Group	HS	HS	LS	LS	HS	HS	LS	LS
Method	OLS	IV	OLS	IV	OLS	IV	OLS	IV
R-squared	0.274	-	0.144	-	0.274	-	0.144	-
K-Paap Stat.	-	13.239	-	59.973	-	16.281	-	44.474
Controls	yes	yes	yes	yes	yes	yes	yes	yes
FE	fo-st-dt	fo-st-dt	fo-st-dt	fo-st-dt	fo-st-dt	fo-st-dt	fo-st-dt	fo-st-dt

Notes: This table reports OLS and IV-2SLS coefficients. The dependent variable is the (log) hourly wage of an individual i working in a firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, and education dummies. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, st, rt and ot indicate firm-occupation, firm-time, sector-time, region-time, and occupation-time fixed effects.

Table A.8: Interpretation - Instrumentation Strategy.

	$\ln hw_{i(j)t}$							
	Export Intensity				Export Status			
Group	HS (1)	HS (2)	LS (3)	LS (4)	HS (5)	HS (6)	LS (7)	LS (8)
Export thresholds ($-\beta_1/\beta_3$)	3.734**	11.139***	42.369	-395.124	-	-	-	-
	(1.724)	(0.755)	(33.06)	(23035.68)	-	-	-	-
The migrant-native wage gap								
Workers in non-exporter (β_1)	-	-	-	-	-0.002	-0.852***	-0.027***	-0.037
	-	-	-	-	(0.023)	(0.265)	(0.007)	(0.045)
Workers in exporter ($\beta_1 + \beta_3$)	-	-	-	-	0.117***	0.167***	-0.017***	-0.017***
	-	-	-	-	(0.019)	(0.027)	(0.003)	(0.006)
The export premium								
Natives (β_2)	0.000*	0.009	0.000	0.010***	0.004	0.112	0.001	0.035
	(0.000)	(0.008)	(0.000)	(0.003)	(0.002)	(0.094)	(0.001)	(0.069)
Immigrants ($\beta_2 + \beta_3$)	0.012***	0.054***	0.001	0.010***	0.123***	1.099***	0.011	0.101*
	(0.002)	(0.153)	(0.001)	(0.004)	(0.027)	(0.323)	(0.007)	(0.083)

Notes: This table provides an interpretation for the results of each estimation presented in Table A.7. Standard errors for non-linear and linear combinations of coefficients are obtained via delta method.

Table A.9: Including never exporting firms.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Estimation results				
(β_1) Foreign$_i$	-0.017***	-0.018***	-0.017***	-0.017***
	(0.004)	(0.004)	(0.004)	(0.004)
(β_2) Export$_{jt}$	0.000		0.002	
	(0.000)		(0.001)	
(β_3) Foreign$_i$ × Export$_{jt}$	-0.000	-0.000	-0.001	-0.003
	(0.000)	(0.000)	(0.005)	(0.005)
(β_4) Foreign$_i$ × HS$_i$	-0.021	-0.026	-0.003	-0.011
	(0.017)	(0.018)	(0.016)	(0.016)
(β_5) Export$_{jt}$ × HS$_i$	0.000	0.000	0.003	0.002
	(0.000)	(0.000)	(0.003)	(0.003)
(β_6) Foreign$_i$ × Export$_{jt}$ × HS$_i$	0.011***	0.012***	0.139***	0.151***
	(0.002)	(0.002)	(0.023)	(0.024)
Observations	5,744,470	5,682,110	5,744,470	5,682,110
R-squared	0.142	0.153	0.142	0.153
Controls	yes	yes	yes	yes
FE	fo-st-rt	fo-ft-ot	fo-st-rt	fo-ft-ot

Notes: This table reports OLS coefficients. The dependent variable is the (log) hourly wage of an individual i working in a firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, and education dummies. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, st, rt and ot indicate firm-occupation, firm-time, sector-time, region-time, and occupation-time fixed effects.

Table A.10: Interpretation - Including never exporting firms.

	$\ln \text{hw}_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Export thresholds				
Low-skilled workers ($-\beta_1/\beta_3$)	-122.056	-119.862	-	-
	(366.938)	(326.578)	-	-
High-skilled workers ($-[\beta_1+\beta_4]/[\beta_3+\beta_6]$)	3.426***	3.730***	-	-
	(1.271)	(1.208)	-	-
The migrant-native wage gap				
Low-skilled workers in non-exporter (β_1)	-	-	-0.017***	-0.017***
	-	-	(0.004)	(0.004)
Low-skilled workers in exporter ($\beta_1 + \beta_3$)	-	-	-0.018***	-0.020***
	-	-	(0.003)	(0.003)
High-skilled workers in non-exporter ($\beta_1 + \beta_4$)	-	-	-0.020	-0.028*
	-	-	(0.016)	(0.017)
High-skilled workers in exporter ($\beta_1 + \beta_3 + \beta_4 + \beta_6$)	-	-	0.118***	0.121***
	-	-	(0.020)	(0.020)
The export premium				
Low-skilled natives (β_2)	0.000	-	0.002	-
	(0.000)	-	(0.001)	-
Low-skilled immigrants ($\beta_2 + \beta_3$)	0.000	-	0.000	-
	(0.000)	-	(0.005)	-
High-skilled natives ($\beta_2 + \beta_5$)	0.001*	-	0.004*	-
	(0.000)	-	(0.003)	-
High-skilled immigrants ($\beta_2 + \beta_3 + \beta_5 + \beta_6$)	0.012***	-	0.142***	-
	(0.002)	-	(0.024)	-

Notes: This table provides an interpretation for the results of each estimation presented in Table A.9. Standard errors for non-linear and linear combinations of coefficients are obtained using the delta method.

Table A.11: Exporting by Origin Countries.

	$\ln \text{hw}^c_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Estimation results				
Export^c_{jt} (β_1)	-0.000	-0.001	-0.006	-0.007
	(0.001)	(0.001)	(0.005)	(0.006)
$\text{Export}^{other}_{jt}$ (β_2)	0.000	-0.002	0.003	-0.031
	(0.000)	(0.003)	(0.004)	(0.033)
$\text{Export}^c_{jt} \times \text{HS}_i$ (β_3)	0.008***	0.009***	0.076***	0.090**
	(0.003)	(0.003)	(0.029)	(0.036)
$\text{Export}^{other}_{jt} \times \text{HS}_i$ (β_4)	0.001	0.003	-0.006	0.025
	(0.002)	(0.004)	(0.019)	(0.033)
Observations	82,176	70,657	82,176	70,657
R-squared	0.074	0.085	0.074	0.084
Controls	yes	yes	yes	yes
FE	fo-rt-st-ct	fo-ft-ot-ct	fo-rt-st-ct	fo-ft-ot-ct

Notes: This table reports OLS coefficients. The dependent variable is the (log) hourly wage of an individual i from country c working in a firm j at time t. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. Individual controls include gender, age, experience, experience squared, and education dummies. Firm controls include the (log) domestic sales, a dummy set to one if the firm is part of an MNE group, and the firm's age. fo, ft, ct, st, rt and ot indicate firm-occupation, firm-time, destination-time, sector-time, region-time, and occupation-time fixed effects.

Table A.12: Interpretation - Exporting by Origin Countries.

	$\ln \text{hw}^c_{i(j)t}$			
	Export Intensity		Export Status	
	(1)	(2)	(3)	(4)
Export premium by origins				
Low-skilled workers/ same origin country (β_1)	-0.000	-0.001	-0.006	-0.007
	(0.001)	(0.001)	(0.005)	(0.006)
Low-skilled workers/ other origins (β_2)	0.000	-0.002	0.003	-0.030
	(0.000)	(0.003)	(0.004)	(0.033)
High-skilled workers/ same origin country ($\beta_1 + \beta_3$)	0.007***	0.008**	0.070**	0.083**
	(0.003)	(0.003)	(0.029)	(0.036)
High-skilled workers/ other origins ($\beta_2 + \beta_4$)	0.001	0.000	-0.003	-0.005
	(0.002)	(0.006)	(0.018)	(0.048)

Notes: This table provides an interpretation for the results of each estimation presented in Table A.11. Standard errors for linear combinations of coefficients are obtained via delta method.

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