

Sabbadini, Giulia

**Article — Published Version**

## Firm-level prices, quality, and markups: The role of immigrant workers

Review of International Economics

**Provided in Cooperation with:**

John Wiley & Sons

*Suggested Citation:* Sabbadini, Giulia (2024) : Firm-level prices, quality, and markups: The role of immigrant workers, Review of International Economics, ISSN 1467-9396, Wiley, Hoboken, NJ, Vol. 32, Iss. 5, pp. 2259-2295,  
<https://doi.org/10.1111/roie.12772>

This Version is available at:

<https://hdl.handle.net/10419/306112>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<http://creativecommons.org/licenses/by-nc-nd/4.0/>

## ORIGINAL ARTICLE

# Firm-level prices, quality, and markups: The role of immigrant workers

Giulia Sabbadini 

Heinrich-Heine University, Düsseldorf  
Institute for Competition Economics  
(DICE), Düsseldorf, Germany

## Correspondence

Giulia Sabbadini, Heinrich-Heine  
University, Düsseldorf Institute for  
Competition Economics (DICE),  
Düsseldorf, Germany.  
Email: [sabbadini@dice.hhu.de](mailto:sabbadini@dice.hhu.de)

## Abstract

In this article, I study export quality as a channel through which immigrant workers affect the export prices and markups of French manufacturing firms. I find that the share of immigrant workers in a local labor market is positively associated with firm-level export prices and quality and that this quality advantage translates to higher markups. I present evidence for the mechanism accounting for these relationships and find that the presence of immigrant workers is positively associated with firms importing higher-price (higher-quality) intermediate inputs, which are key to producing higher-price (higher-quality) exports. The hypothesized economic mechanism is that immigrant workers help firms overcome informational barriers to sourcing higher-price (higher-quality) inputs from abroad. I provide evidence consistent with immigrant workers having specialized knowledge of the upstream market.

## KEYWORDS

exports, immigrant workers, intermediate inputs, markups, prices, quality

## JEL CLASSIFICATION

F14, F16, F22, D22, D24

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2024 The Author(s). *Review of International Economics* published by John Wiley & Sons Ltd.

## 1 | INTRODUCTION

The connection between immigration and domestic firms' outcomes is an avenue of research that is both important and longstanding. The salience of this connection, however, has recently risen as immigration has become a more central theme in public debates in many countries. Recent research, for example, finds that immigration is an important driver of populism (Eichengreen, 2018). In labor economics, there is a lively research effort investigating the impact of migrants on local labor market outcomes (Peri, 2016). In the trade literature, one focus has been on the impact of immigrants on trade patterns (see Hatzi-georgiou & Lodefalk, 2021 for a recent survey, as well as the literature review below for a discussion).

My paper contributes a novel perspective to the debate on the impact that immigrant workers have in their host economies: I study quality upgrading as a channel through which immigrant workers affect firm-level export prices and markups. The novelty of my approach is twofold. First, to my knowledge, this is the first paper studying the relationship between immigrant workers and quality-related changes in firms' prices. Second, the paper maps those quality changes to firm-level markups.

To structure the empirical investigation and account for the findings, I posit an economic mechanism based on information frictions. Specifically, immigrant workers are hypothesized to lower upstream information frictions and thus the cost of acquiring information on foreign intermediate inputs. This facilitates firms' access to high-price (high-quality) imported intermediate inputs, which help them produce high-price (high-quality) exports, for which they can charge higher markups.

For this study, I combine customs records, firms' balance sheets, and employer–employee data from France to characterize the labor composition and export outcomes of manufacturing firms for the 2004–2015 period. I leverage a shift-share design to identify the sign and magnitude of the relationship between the employment of immigrant workers and firm performance.<sup>1</sup>

Before turning to the identification strategy and main results of the paper, I establish several stylized facts consistent with consumers valuing quality and firms finding it optimal to charge higher prices and markups for higher-quality goods. At the same time, these facts suggest that immigrant workers may be at the root of a quality advantage.

I then formalize the analysis and I first show that the *département*-level share of immigrant workers is positively associated with firm-level export prices of narrowly defined varieties.<sup>2</sup> Following the specification of Verhoogen (2008), in the baseline analysis I exploit the within-variety dimension of the data to argue that the effect of immigrants on prices is due to an increase in export quality. I support this claim by showing that immigrant workers are positively associated with a firm-level measure of the quality of each exported variety. Then, I show that the department-level share of immigrant workers is positively associated with an increase in firm-level markups and that the effect is likely attributable to quality differences.

The main explanatory variable, the share of immigrant workers in each French *département*, may be subject to several endogeneity concerns, including time-varying *département*-level factors that affect both the employment of immigrant workers and the different firm-level outcomes. To counter these identification issues, I rely on a shift-share instrumental variable strategy.

Given the main results on the relationship between immigrant workers, prices, and markups, I turn to explain the mechanism that may account for these linkages. I find that the

department-level share of immigrant workers is positively associated with the import prices of narrowly defined varieties, reflecting an increase in the quality of inputs. A key pillar of the hypothesized mechanism is that immigrant workers have better knowledge of foreign suppliers of intermediate inputs.

Short of observing firms' access to information, I offer two pieces of evidence supporting the interpretation that immigrants reduce upstream information frictions. The first approach exploits immigrant worker occupation data that allow one to distinguish between white-collar and blue-collar workers. Consistent with the information frictions mechanism, I find that the relationship between immigrants and input prices is driven by white-collar workers. That is, workers who are more likely to provide information to the employing firms. The second approach builds upon the intuition that immigrant workers should be better informed about intermediate inputs sourced from their own country of origin, especially if the information frictions from that sourcing country are larger. To pursue this idea, I use information on the country of origin of immigrants in the department where the firm is located. The findings show that the effect of immigrant workers on intermediate input prices (quality) is larger for intermediate inputs sourced from the workers' countries of origin and that the source country of the intermediate inputs is informative of the different nature of the information barriers that immigrants help lower.

All the results are robust to studying the within-firm changes of the different outcomes, as well as using firm-level immigrant employment.

This paper contributes to different strands of literature. First, the paper contributes to the empirical work on the determinants of output quality and, in particular, the strand that has identified input quality as its main driver (Bas, 2012; Bas & Strauss-Kahn, 2014; Bastos et al., 2018; Kugler & Verhoogen, 2009, 2012; Manova & Zhang, 2012). These studies have presented only limited evidence regarding the role played by the workforce in this respect. The few papers that have related quality to labor force characteristics have focused on workers' skills (Bas & Strauss-Kahn, 2015; Fieler et al., 2018; Verhoogen, 2008). In this strand of the literature, quality upgrading is modeled as a skill-biased technological change, and skilled labor and high-quality inputs are complementary in producing high-quality goods. My paper departs from these studies by focusing on a different channel through which workers, and in particular immigrant workers, affect quality, i.e., an informational channel.

This paper also contributes to the new and growing literature on the role of immigrant workers in helping firms integrate into the global value chain. The bulk of the literature concentrates on how immigrants foster trade on both the intensive and extensive margin by providing information on the destination country or by establishing buyer-supplier networks (Andrews et al., 2016; Bahar & Rapoport, 2018; Hiller, 2013; Olney & Pozzoli, 2021; Rauch, 2001; Rauch & Trindade, 2002).<sup>3</sup> However, little is known about the role of immigrants in the international organization of production. A relevant study is Egger et al. (2019), which shows that immigrant workers increase the number of buyer-supplier relationships, as well as their stability. Finally, the work by Ariu (2022) finds that thanks to better intermediate inputs sourced from the origin countries of cross-border workers, Swiss postal codes experiencing an increase in the number of these workers increase their export volume and quality. My paper builds on this study in several ways. First, it studies the relationship between immigrant workers, export price (quality), and input price (quality) at the firm level. Second, it examines how this relationship translates to higher markups by exploiting state-of-the-art techniques of production function estimation, thus liaising the strand of literature on the trade-migration nexus and the industrial organization one. Finally, it brings a different context that arguably improves the external validity of the results, as

well as a different methodology that allows to estimate the elasticity of the different measures of firm-level performance to the presence of immigrant workers.

The third literature where my results are relevant is the empirical work on the determinants of firm-level markups. In a framework where markups are variable and endogenous, the literature has devoted increasing attention to how trade policy affects them through factors related to marginal costs (and physical productivity) or through stronger competition and prices (Hornok & Muraközy, 2019; Liu et al., 2019). While output tariff liberalization decreases markups because of a pro-competitive effect, a more relevant strand of literature for this study finds that input tariff liberalization (or importing status) increases markups because of access to cheaper or higher-quality inputs. My paper contributes to this literature by proposing a channel other than trade policy that can affect markups via quality upgrading, namely, employment of immigrant workers.

The remainder of the article is structured as follows: Section 2 provides a conceptual framework, Section 3 and Section 4 describe the data and the key stylized facts. Sections 5 and 6 present the main empirical approach and results. Section 7 provides some additional results, and Section 8 concludes.

## 2 | CONCEPTUAL FRAMEWORK

This paper advances the idea that firms learn about high-quality (high-price) input suppliers, upgrade the quality of their exported products, and optimally charge higher export prices, and markups. This section aims to provide a framework to conceptualize this idea, relying on existing theoretical contributions. A growing literature has been showing both theoretically and empirically that firms vary their output quality by sourcing intermediate inputs of different quality (Bas & Strauss-Kahn, 2024; Kugler & Verhoogen, 2012; Manova & Yu, 2017).

The introduction of quality –intended as any product characteristic that consumers are willing to pay for– has several implications on the pricing strategy of firms and their competitiveness. Building on the early work by Melitz and Ottaviano (2008), allowing for variable markups, Antoniadis (2015) shows how the scope for quality differentiation and endogenous quality choices rotate the demand curve of the firm and scale-up prices, markups, and profits.<sup>4</sup> In this model, both prices and markups are expressed as linear functions of the optimal quality level chosen by the firm. The latter in turn depends on the scope for quality differentiation, including consumers' taste for quality and the degree of substitutability between the different varieties. The intuition is that consumers are willing to pay higher prices because their demand becomes steeper, i.e. it displays a lower elasticity of substitution and/or a higher taste for quality. I follow prior literature and refer to the scenario where firms sell higher quality goods at higher prices as *quality sorting*, as opposed to *efficiency sorting*.<sup>5</sup> In models with quality sorting, quality upgrading raises the marginal cost of production because, for example, firms access higher-quality inputs.<sup>6</sup> Bas and Strauss-Kahn (2024) studies how input trade liberalization is likely to entail quality sorting for a sample of Chinese firms that take advantage of lower input tariffs to upgrade the quality of their input, thus increasing marginal costs, product quality, and export prices. In this sense, the effect of immigrant employment on quality described in this paper is similar to an input liberalization episode (Ariu, 2022), as it lowers the cost of acquiring information on higher-quality input suppliers triggering the effect on prices and markups described above.

Starting from the definition of markups as the ratio between price and marginal cost, a higher output price is consistent with a higher markup and/or a higher marginal cost. Alternatively, the

increase in markup is consistent with a higher price and/or a lower marginal cost, the latter being unlikely given the mechanism put forward in this paper, hinging on high-price (high-quality) inputs. Short of observing firms' marginal cost, in the empirical analysis, I follow De Loecker and Warzynski (2012) and partly control for it by including the firm's productivity, so that both higher output prices and markups are likely to stem from demand side differences, i.e. shifts in demand due to higher quality, rather than differences in the supply side.

### 3 | DATA AND CONSTRUCTION OF VARIABLES

I use three sources of confidential data for French manufacturing firms for the 2004–2015 period. The unique firm identifier, the *SIREN* (*Système d'Identification du Répertoire des Entreprises*) code, allows me to combine the different data sources. First, I use annual employee declarations by wage-paying establishments located in the French metropolitan territory (*Déclarations Annuelles des Données Sociales* or DADS postes). This dataset is at the individual contract-establishment-year level and includes information on worker characteristics such as the *département* of residence and work, wage, type of contract, occupation, place of birth (France or foreign country), and citizenship (French or foreign). Throughout the paper, an immigrant is defined as a foreign citizen. However, the origin countries of immigrant workers are not available in the data. To deal with workers who have more than one contract in the same year, I keep the contract of the main activity for each worker.<sup>7</sup> I aggregate the data at both the *département*-year and the firm-year level to obtain the share of immigrant workers as follows:<sup>8,9</sup>

$$\text{Sh.Immig}_{dt} = \frac{\text{Immig}_{dt}}{\text{Immig}_{dt} + \text{Native}_{dt}} \text{ and } \text{Sh.Immig}_{ft} = \frac{\text{Immig}_{ft}}{\text{Immig}_{ft} + \text{Native}_{ft}}. \quad (1)$$

Second, I use balance-sheet data consisting of tax reports (*Fichier de comptabilité unifié dans SUSE* or FICUS and *Fichier approché des résultats d'Esane* or FARE). This dataset is at the firm-year level and provides, among others, information on firm domestic sales, value-added, capital stock, number of full-time equivalent workers, total assets, and main industry.<sup>10</sup> I keep only firms whose main activity is in the manufacturing sector for the whole period in which they appear in the dataset.<sup>11</sup> I use balance-sheet data to compute firm-level markups following the standard method in the literature (De Loecker & Warzynski, 2012) as follows:

$$\mu_{ft} = \theta_{ft}^L \times (\alpha_{ft}^L)^{-1}, \quad (2)$$

where  $\theta_{ft}^L$  is the gross output elasticity of labor and  $\alpha_{ft}^L$  is the wage bill as a fraction of total revenues. The elasticity of labor is estimated separately for all firms in each sector from a (revenue) gross output production function that is Cobb-Douglas in labor, material inputs, and capital. Following recent advancements in the literature on production function estimation, I use alternative estimation methods to compute firm-level markups. First, I tackle the concern regarding the use of revenues rather than quantities to estimate productivity by building a price index at the firm-year level based on the prices that the firms charge for their exports (Caselli et al., 2021). Second, I tackle the concern regarding the use of labor, more precisely the number of full-time equivalent workers, as flexible input by estimating markup using the number of hours worked (Caselli et al., 2021). Third, I address Gandhi et al. (2020)'s non-identification

critique by using a value-added specification, and by including the (log) average wage, and its interaction with the other inputs, in the control function when computing the output elasticities to the different inputs (De Loecker & Scott, 2022; Stiebale & Szücs, 2022). Finally, I compute markups using the accounting profits approach as in Baqaee and Farhi (2020), where markups are computed as sales over costs (sales-profits). The advantage of this approach compared to more sophisticated ones is that it does not require any manipulation of the data as all the required information comes from the balance sheet. All the details on markup estimation are in Appendix A.1.

Third, I use French customs data on monthly shipments (imports and exports) in value and volume by firm-NC8 product-origin/destination country. During the period of the analysis, several changes in the product classification occurred. To harmonize the product classification, I use the procedure developed by Bergounhon et al. (2018).<sup>12</sup> The customs data are used to compute different outcome variables, such as prices and quality. Prices and quality are computed by exploiting the information provided by the customs data on both quantity (kg) and value (euros) at the firm ( $f$ )-NC8 product ( $p$ )-destination ( $c$ )/origin ( $o$ )-year ( $t$ ) level. Prices are calculated as follows:

$$P_{fpct} = \frac{\text{Export Value}_{fpct}}{\text{kgs}_{fpct}} \text{ and } P_{fpot} = \frac{\text{Import Value}_{fpot}}{\text{kgs}_{fpot}}. \quad (3)$$

Moreover, export quality is computed as in Khandelwal et al. (2013) as follows:

$$\hat{\lambda}_{fpct} = \frac{\eta_{fpct}}{(\sigma_p - 1)}, \quad (4)$$

where  $\eta_{fpct}$  is the residual from an OLS regression relating demand for a variety (physical quantity) to its price, scaled by the elasticity of substitution  $\sigma_p$ , and including product and country-year fixed effects. The intuition is that conditional on price and market conditions, a higher demanded quantity reflects higher quality. Given that it is possible to compute the measures of firm-level prices and quality only for firms included in the customs data, the empirical analysis focuses on the sample of two-way traders, i.e., firms that both import and export in the same year. In addition to firm-level data, I use the population census (*Recensement de la Population* or RP). The census is an annual data collection covering 20% of municipalities with fewer than 10,000 inhabitants and 8% of households in municipalities with more than 10,000 inhabitants. Thus, over five years, the census covers all municipalities with fewer than 10,000 inhabitants and 40% of the population in larger municipalities. Thanks to the population census, I obtain an imputed share of immigrant workers by country of origin  $o$  at the *département*-level  $d$  and at the national level (FR) in each year  $t$  as follows:

$$M_{dot}^{RP} = \frac{\text{Immig}_{dot}^{RP}}{\text{Immig}_{dt}^{RP}} \text{ and } M_{FR,ot}^{RP} = \frac{\text{Immig}_{FR,ot}^{RP}}{\text{Immig}_{FR,t}^{RP}}. \quad (5)$$

Finally, I use several publicly available sources of information. I use the Rauch (1999) classification to identify homogeneous and differentiated goods and data on the elasticities of substitution from Fontagné et al. (2022). Then, I exploit the UNCTAD BEC classification for product categories to identify intermediate inputs.<sup>13</sup> The final sample includes 19,784 firms and accounts for ~ 56% of total manufacturing revenues, and 65% (50%) of French manufacturing exports



(imports of intermediate inputs). ~ 50% of the firm-year observations export both differentiated and homogeneous goods (with 74% of the export value being in differentiated goods), 45% of the firm-year observations export only differentiated products, and 5% only homogeneous products. ~ 70% of the firm-year observations import differentiated and homogeneous inputs (with 83% of the import value being in differentiated inputs), 25% of the firm-year observations import only differentiated inputs, and 5% only homogeneous inputs. On average, firms export (import) 53 (27) varieties, that is product-country combinations, and 13 (18) products, to (from) 14 (7) countries. In Figure A2, I provide the detailed distribution of immigrant workers across regions and industries. I report a number of additional summary statistics in Table A2 in Appendix A.2.

## 4 | STYLIZED FACTS

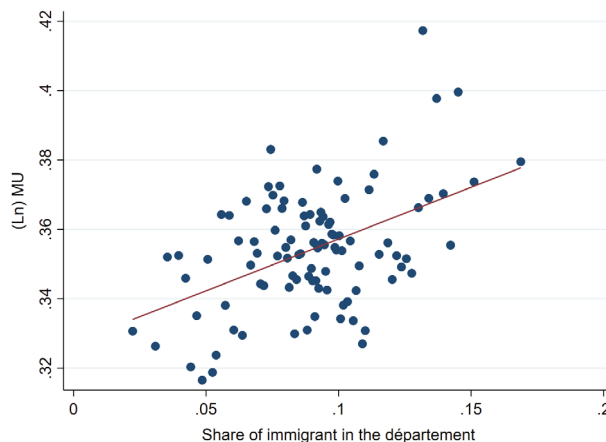
To guide and motivate the empirical analysis, I present two stylized facts on the relationship between immigrant workers and different firm-level outcomes. In Appendix B I confirm, for the sample of French manufacturing firms, the positive correlations between output prices and revenues and between output quality and input prices, as in Manova and Zhang (2012).

### Fact 1

Figure 1 shows that there is a positive correlation between the firm-level (log) markup and the *département*-level share of immigrant employment.

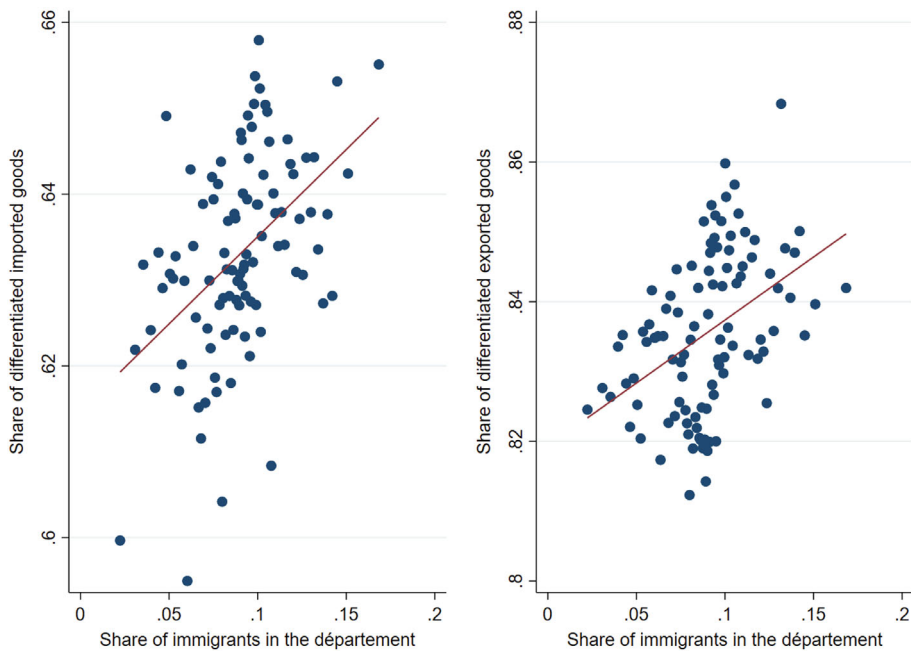
### Fact 2

The left-hand side of Figure 2 shows that the firm-level export share of differentiated goods is positively correlated with the *département*-level share of immigrant workers. As these are



**FIGURE 1** Relationship between firm-level (log) markup and the *département*-level share of immigrant workers. (Controls include region-by-period and sector-by-period fixed effects.) [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]





**FIGURE 2** Export and import share of differentiated products and *département*-level share of immigrant workers. (Controls include region-by-period and sector-by-period fixed effects.) [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

the goods for which there is scope for quality differentiation, this piece of evidence suggests that immigrant workers may foster product quality. The right-hand side of Figure 2 shows that the firm-level import share of differentiated goods is also positively correlated with the *département*-level share of immigrant workers. This last correlation suggests that immigrant workers may help firms produce higher-quality exports through imports of higher-quality inputs.

## 5 | IMMIGRANT WORKERS, EXPORT PERFORMANCE, AND MARKUPS

The stylized facts in Section 4 suggest that both the firm-level export share of differentiated goods and markups are positively correlated with the share of immigrant workers. This suggests that immigrant workers may be at the root of a quality advantage for firms that translates to higher prices and markups. In this section, I advance this narrative by formalizing these correlations. First, I show that firm-level export prices and quality are positively associated with the *département*-level share of immigrant workers. Second, I demonstrate that the share of immigrant workers is positively associated with firm-level markups. These results are consistent with the idea that consumers are willing to pay for final goods of higher quality (and higher price). Following the theoretical discussion in Section 2, this is rationalized by quality scaling up both prices and markups, since the demand for a variety becomes steeper.

## 5.1 | Econometric approach

The econometric approach involves examining the response of different measures of firm export performance to changes in the share of immigrant workers in each French *département*. The baseline model is the following:

$$y_{fpct} = \beta_0 + \beta_1 \text{Sh.Immig}_{dt} + X'_{ft} \Gamma + X'_{dt} \Delta + \theta_{pct} + \theta_{rT} + \varepsilon_{fpct}. \quad (6)$$

For the first part of the analysis, the left-hand side variable is  $\ln \text{Price}_{fpct}$ , the price that firm  $f$  charges for product  $p$  (defined at the 8-digit level) in destination  $c$  at time  $t$ . The fixed effects  $\theta_{pct}$  allow comparing two firms selling the same narrowly defined product in the same destination in the same year.<sup>14</sup> Arguably, exploiting this type of variation allows me to capture differences in export prices due to quality differences. To lend support to this interpretation, I present a second set of results where the left-hand side of Equation (6) is the firm-level quality for each variety,  $\hat{\lambda}_{fpct}$ . In the baseline specification, I use the share of immigrant workers in each French *département* ( $\text{Sh.Immig}_{dt}$ ). Immigrant workers affect the different measures of firm-level performance by providing information on the upstream market. Therefore, the main economic rationale behind the choice of using immigrant workers at the *département*-level is that information is local labor market specific and not necessarily firm-level specific.<sup>15,16</sup> The term  $\theta_{rT}$  is region-by-period fixed effects that allow comparison of the pricing strategies of two firms located in the same region and capture time-varying factors that are region specific.<sup>17</sup> The vector of firm-level controls  $X'_{ft}$  includes the capital intensity of the firm, its skill intensity, the log difference between the wage bill of the firm and the average wage bill paid in the sector-department cell where the firm operates, and its (log) productivity.<sup>18,19</sup> I use this set of controls to attenuate concerns regarding firm-level confounding factors affecting price and quality. As explained in Section 2, the inclusion of (log) productivity is meant to partially control for differences in marginal cost. The skill intensity of the firm aims at attenuating concerns regarding alternative explanations, where the share of immigrant workers is picking up a more general skill effect. Under the assumption that better workers are paid higher wages, the wage bill deviation aims at capturing the overall quality of the firm workforce, including its management. The vector of *département*-level controls  $X'_{dt}$  includes the (log) average number of employees.

### 5.1.1 | Identification strategy

Despite the rich set of fixed effects that should already reduce concerns over omitted variable bias, there might still be time-varying *département*-level factors that affect both firms' pricing strategy (quality) and local labor market employment decisions. The overall direction of the bias of the OLS estimates then depends on the correlation between the price/quality-decreasing (increasing) omitted variables and the share of immigrant workers. An intuitive source of endogeneity would be a common technological shock that is *département*-year specific and thus affects all firms located there, such that both firms' quality and price and the local employment of immigrant workers would increase. This would cause the OLS estimates to be upward biased. Then, even though Equation (6) includes the share of immigrant workers at the *département*-level and the left-hand side variable is at the firm level, there might still be problems related to reverse causality. Since the sample includes the largest firms, different measures of firm-level performance might

affect the local demand for immigrant workers. To deal with these endogeneity concerns, I use a shift-share instrument based on the past distribution of immigrants by country of origin across departments. Shift-share instruments have a long tradition in the migration literature, starting with the seminal work by Card (2001).<sup>20</sup> The instrument is constructed as follows:

$$IV_{dt} = \frac{\hat{M}_{dt}}{\hat{M}_{dt} + N_{d1999}}. \quad (7)$$

$\hat{M}_{dt}$  is the imputed share of immigrant workers in *département*  $d$  at time  $t$ . It is computed by allocating immigrant workers from origin country  $o$  and present in France at time  $t$  ( $\overline{\text{Immig}}_{o,t}$ ) across *départements*  $d$  according to the national group distribution in 1999, which is obtained from the *Recensement de la Population*  $\left( \frac{\text{Immig}_{d,o,1999}^{RP}}{\text{Immig}_{FR,o,1999}^{RP}} \right)$ . By summing across origin countries  $o$ , the following expression is obtained:

$$\hat{M}_{dt} = \sum_o \frac{\text{Immig}_{d,o,1999}^{RP}}{\text{Immig}_{FR,o,1999}^{RP}} \overline{\text{Immig}}_{o,t}. \quad (8)$$

Following Mitaritonna et al. (2017), I compute the number of immigrant workers present in France by country of origin  $\overline{\text{Immig}}_{o,t}$  as follows:

$$\overline{\text{Immig}}_{o,t} = \frac{\text{Immig}_{FR,o,t}^{RP}}{\text{Immig}_{FR,t}^{RP}} \times \text{Immig}_{FR,t}^{DADS}. \quad (9)$$

The first term in Equation (9) is the share of immigrant workers in France from origin country  $o$  from the *Recensement de la Population*, and the second term is the total number of immigrants working in France at time  $t$  in all sectors but agriculture from the DADS. As explained by Mitaritonna et al. (2017), the rationale behind Equation (9) is to use the DADS to obtain a very precise measure of total immigrants employed in year  $t$ , combined with the RP, to safely approximate only the *share* of immigrant workers by country of origin. Finally, I follow the existing literature and in Equation (7) use the number of native workers in 1999, the base year. I do so to avoid endogeneity concerns related to the internal mobility of the nonimmigrant population due to local demand shocks (Mitaritonna et al., 2017). The underlying assumption for the instrument presented in Equation (7) is that new immigrant workers tend to locate where previous immigrant workers were located due to network effects rather than local economic conditions, which could be endogenous. A commonly highlighted threat to the validity of this instrument is the persistence of local economic conditions that are correlated with both the distribution of immigrant workers across *départements* in 1999 and subsequent changes in the outcome variables of interest, as well as the employment of immigrant workers. To mitigate concerns regarding this type of violation of the exclusion restriction, Table 1 shows that changes in the instrument over the sample period (2004–2015) are uncorrelated with the pre-sample (2002–2004) trends in the outcome variables of interest. Finally, the instrument in Equation (7) depends on the share of immigrants across departments in 1999, by country of origin. The distribution of immigrants across departments for each country is assumed to be exogenous (Goldsmith-Pinkham et al., 2020). Following Moriconi et al. (2020), one way to test whether the initial shares are likely to be exogenous is to check whether they are correlated with potential confounders in the initial year. I do so in

TABLE 1 Correlation between the IV and pretrends in the main outcomes.

	$\Delta \ln MU_d$	$\Delta \ln Price_d^{II}$	$\Delta \ln Price_d^{EX}$
	(1)	(2)	(3)
$IV_{d,2015} - IV_{d,2004}$	-0.007 (0.015)	0.002 (0.003)	0.001 (0.002)
$R^2$	0.002	0.003	0.004
Observations	95	95	95

Note:  $\Delta \ln MU_d$  is the difference in the average (log) markup between 2002 and 2004.  $\Delta \ln Price_d^{II}$  ( $\Delta \ln Price_d^{EX}$ ) is the difference in the average (log) price of intermediate inputs (exports) between 2002 and 2004. Averages are computed across firms (in Column 1) and firm-product-country triplets (in Columns 2 and 3) in the same French *département*.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

TABLE 2 Base-year shares and department characteristics.

	Share <sub>od,1999</sub>					
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln FTE_{d,1999}$	0.065 (0.047)	0.090 (0.063)	0.095 (0.061)	0.183 (0.336)	0.052 (0.038)	0.073 (0.051)
$\ln \text{labor productivity}_{d,1999}$	0.270 (0.166)	0.356 (0.217)	0.370* (0.220)	1.191 (1.124)	0.214 (0.136)	0.300 (0.182)
$\ln \text{capital intensity}_{d,1999}$	0.010 (0.025)	0.007 (0.034)	0.003 (0.036)	0.295 (0.183)	0.014 (0.022)	0.006 (0.027)
$\ln \text{sales}_{d,1999}$	-0.040 (0.037)	-0.057 (0.050)	-0.061 (0.049)	-0.276 (0.340)	-0.032 (0.030)	-0.044 (0.041)
Sample	All	Median	75th	Std.Dev.	Developed	Developing
Observations	8,657	4,352	2,194	20	3,038	5,619
$R^2$	0.449	0.495	0.566	0.424	0.420	0.466

Note: Column 1 includes all the origins in the sample with a non-zero share, and Column 2 (3) includes the origin countries with a bilateral share larger than the sample median (75th percentile) in the department. Column 4 includes the 20 origin countries with the highest standard deviation. Column 5 (6) includes the sample of developed (developing) countries only. Explanatory variables are computed as simple mean across firms in the same department  $d$ . All specifications include origin country fixed-effects. Errors are clustered at the department level. Columns 1, 2, and 3 include 174 countries. Column 4 includes 20 countries. Column 5 (6) includes 55 (119) countries.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

Table 2. In Column 1, I report all the origin countries in the sample, while in Column 2 (3) I include the origin countries that have a bilateral share larger than the sample median (75th percentile) of the distribution in 1999. In column 4, I include the 20 origins with the highest standard deviation across departments. Columns (2)–(4) then include the shares that contribute the most to the identifying variation. In Column 5 (6) I include only developed (developing) countries. This is to tackle concerns related to the co-agglomeration of firms and workers. Because there is self-selection of immigrant workers, it could be possible that the share of immigrant workers from developed countries, in particular, is correlated with department characteristics that accommodate their preferences and the needs of potential employers (e.g., skilled workers to produce high-quality products). Table 2 shows that the initial bilateral share of immigrant workers has no significant correlation with several department-level characteristics in 1999.

## 5.2 | Results

### 5.2.1 | Export prices and export quality

Table 3 presents the estimated effect of an increase in the local labor market share of immigrant workers on the firm-level price and quality of each variety. The preferred specification in Column (2) shows that there is a positive and significant relationship between the export price and the share of immigrant workers within each variety: a 1 p.p. increase in the share of immigrant workers in the *département* where the firm is located is associated with a 1.3% price increase. The first-stage coefficients and the Kleibergen–Paap  $F$ -statistics suggest that the instrument is, respectively, relevant and not weak. A comparison between Columns (2) and (4) confirms the presence of an upward bias of the OLS estimates. Columns (5)–(8) of Table 3 show the results of Equation (6) when the left-hand side is  $\hat{\lambda}_{fpc}$ , the firm-level quality of each exported variety, rather than the price. The IV estimates in the preferred specification in column (6) show that there is a positive and significant relationship between the share of immigrant workers and the quality of the exported products within narrowly defined varieties. Firms, therefore, produce higher-quality goods when exposed to a larger supply of immigrant workers. These results lend support to the idea that the effect of the immigrant workers' share on export prices reflects mainly quality differences.

### 5.2.2 | Firm-level markups

This section studies whether the effect that immigrant workers have on firm-level quality translates into higher firm-level markups.<sup>21</sup> The idea is that high-quality products command both higher prices and higher markups (Antoniades, 2015; Hornok & Muraközy, 2019; Liu et al., 2019). Following De Loecker and Warzynski (2012), the baseline model is modified as below:

$$\ln \text{MU}_{ft} = \beta_0 + \beta_1 \text{Sh. Immig}_{dt} + \beta_2 \ln \text{TFP}_{ft} + X'_{ft} \Gamma + X'_{dt} \Delta + \theta_{rT} + \theta_{sT} + \varepsilon_{ft}. \quad (10)$$

In Equation (10), the left-hand side is the firm-level markup, computed as described in Section 3. I include the firm's productivity to partially control for changes in markups due to differences in marginal cost and therefore be able to better isolate the effect on markups due to quality changes. As explained in De Loecker and Warzynski (2012), once firm (log) productivity is included, the coefficient  $\beta_1$  should reflect differences in average prices between firms exposed to a different supply of immigrant workers. These price differences, in turn, are consistent with differences in input and output quality which ultimately are reflected in markups.<sup>22</sup> Finally, Equation (10) controls for firm-level and *département*-level characteristics, such as the firm capital intensity, skill intensity, wage bill deviation from the average, and (log) average number of employees. Sector-by-period ( $\theta_{sT}$ ) and region-by-period ( $\theta_{rT}$ ) fixed effects account for the fact that firms located in different regions or operating in different industries may consistently charge different markups. The endogeneity problems that the OLS estimates of Equation (10) may suffer from are akin to those affecting Equation (6), and therefore, I instrument the immigrant share with the shift-share instrument.

The results from estimating Equation (10) are presented in Table 4. The preferred specification in Column (2) shows that there is a positive and significant relationship between the (log) markup

TABLE 3 Export prices and export quality and share of immigrant workers.

	ln Price <sub>f<sub>pct</sub></sub>			$\hat{\lambda}_{fpc}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sh.Immig <sub>dt</sub>	1.061*** (0.400)	1.325*** (0.365)	2.309*** (0.283)	2.086*** (0.281)	1.344*** (0.362)	1.756*** (0.371)	2.097*** (0.273)	1.938*** (0.285)
ln TFP <sub>it</sub>		−0.129*** (0.025)		−0.125*** (0.025)		−0.055** (0.025)		−0.054** (0.025)
Sh.Skill <sub>it</sub>		0.870*** (0.030)		0.867*** (0.030)		0.804*** (0.032)		0.803*** (0.032)
Sh.K <sub>it</sub>		−0.013 (0.010)		−0.011 (0.010)		−0.125*** (0.011)		−0.125*** (0.011)
WB. Dev <sub>it</sub>		−0.004 (0.004)		−0.005 (0.004)		−0.034*** (0.004)		−0.034*** (0.004)
ln $\overline{\text{Empl}}_{dt}$		0.031*** (0.011)		0.037*** (0.011)		0.028** (0.012)		0.030** (0.012)
Observations	5,919,912	5,919,912	5,919,912	5,919,912	4,352,026	4,352,026	4,352,026	4,352,026
Method	2SLS	2SLS	OLS	OLS	2SLS	2SLS	OLS	OLS
K-Paap Stat.	235.92	214.10			240.23	219.41		
1st-stage coeff. Sh.Immig <sub>dt</sub>	0.670*** (0.044)	0.660*** (0.045)			0.673*** (0.043)	0.664*** (0.045)		

Note: Fixed effects are at the product-destination-year level and region-by-period level. The sample includes only the firm-year observations in which the firm both imports and exports at time *t*. Firm-level controls include the firm's capital intensity, skill intensity, wage bill deviation from the *dst*-average, and (log) productivity. *Département*-level controls include the (log) average number of employees. First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the *département*-year level.

\*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.10.

TABLE 4 Firm-level markups and immigrant employment.

	$\ln(\text{MU})_{ft}$			
	(1)	(2)	(3)	(4)
Sh.Immig <sub>dt</sub>	0.377*** (0.093)	0.407*** (0.076)	0.305*** (0.069)	0.311*** (0.057)
$\ln \text{TFP}_{ft}$	3.856*** (0.043)	8.910*** (0.109)	3.856*** (0.044)	8.909*** (0.109)
Sh.Skill <sub>ft</sub>		−0.264*** (0.006)		−0.264*** (0.006)
Sh.K <sub>ft</sub>		−0.081*** (0.004)		−0.081*** (0.004)
WB. Dev. <sub>ft</sub>		−0.188*** (0.003)		−0.188*** (0.003)
$\ln \overline{\text{Empl.}}_{dt}$		−0.100*** (0.006)		−0.100*** (0.006)
Observations	134,062	134,062	134,062	134,062
Method	2SLS	2SLS	OLS	OLS
K-Paap Stat.	647.64	641.14		
1st-stage coeff. Sh.Immig <sub>dt</sub>	1.071*** (0.042)	1.073*** (0.042)		

Note: Markup estimates based on a Cobb–Douglas production function. Fixed effects are at region-by-period and sector-by-period level. The sample includes only the firms that both export and import in year  $t$ . Firm-level controls include the firm's capital intensity, skill intensity, wage bill deviation from the  $dst$ -average, and (log) productivity. *Département*-level controls include the (log) average number of employees. First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the *département*-year level.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

and the local supply of immigrant workers, conditional on the inclusion of the set of controls and fixed effects: a 1 p.p. increase in the share of immigrant workers increases firm-level markups by 0.41%. The IV estimates are both relevant, as suggested by the first-stage coefficient, and not weak, as suggested by the Kleibergen–Paap  $F$ -statistics. The OLS estimates are biased downward, thus pointing to a negative correlation between the markup-decreasing (markup-increasing) omitted variables and the share of immigrant workers. In Table C1 in Appendix C, I report the results of Equation (10) where alternative methods are used to estimate markups. The markup estimates are computed, in turn, using a firm-level price index as a deflator and in the control function to address the potential input price bias, using the number of hours as flexible input as it might be more flexible than the number of full-time equivalents, using a value-added production function, and adding the average wage in the control function to address the critique by Gandhi et al. (2020). Finally, in Table C1, I report the results of Equation (10) where the markup estimates are computed using the accounting profits approach as in Baqaee and Farhi (2020).



## 6 | MECHANISM

In Section 1, I advance the hypothesis that thanks to immigrant workers, firms can produce higher-quality goods (and charge higher export prices) by using higher-quality inputs (and paying higher input prices). The results presented so far indicate that the share of immigrant workers is positively associated with both export prices and quality. In this section, I provide direct evidence of the immigrant–upstream market nexus. I do so by studying two related questions. First, I examine whether immigrant workers facilitate access to high-price (high-quality) imported intermediate inputs. Second, I explore whether the improved access to better inputs is due to better knowledge of the upstream market.

### 6.1 | Immigrant workers and imported input prices

To study whether immigrant workers help firms access better imported intermediate inputs, I exploit the following econometric model:

$$\ln \text{Price}_{fpot} = \beta_0 + \beta_1 \text{Sh. Immig}_{dt} + X'_{ft} \Gamma + X'_{dt} \Delta + \theta_{pot} + \theta_{rT} + \varepsilon_{fpot}. \quad (11)$$

The left-hand side of Equation (11) is the price that firm  $f$  pays for intermediate input  $p$  from source country  $o$  at time  $t$ . The fixed effects  $\theta_{pot}$  allow a comparison of two firms buying the same narrowly defined product from the same source country in the same year. Exploiting this type of variation allows for capturing differences in import prices due to quality differences.<sup>23</sup> Equation (11) is analogous to Equation (6) for the remaining terms. The results of Equation (11) are presented in Table 5. The preferred specification in Column (2) shows that there is a positive and significant relationship between the import price and the share of immigrant workers within each variety: a 1 p.p. increase in the share of immigrant workers in the *département* where the firm is located increases the price paid for the variety by 0.70%.

### 6.2 | Immigrant workers as information channel

A key pillar of the mechanism presented in Section 6 is that immigrant workers reduce the cost of acquiring information on the quality of intermediate inputs (Ariu, 2022). I provide evidence for this in different ways. First, I exploit the different occupations of immigrant workers, distinguishing the shares of white- and blue-collar workers. Second, I capitalize on the information on the source country of the intermediate inputs and the origin country of the immigrant workers to provide evidence that (i) the information is origin country-specific, and (ii) the information barriers that immigrant workers help lower are of different nature, depending on the source country of the intermediate inputs.

#### 6.2.1 | White- versus blue-collar immigrant workers

In this section, I study whether the effect of immigrant workers on imported intermediate input prices is driven by a specific occupational group: namely, white-collar workers.<sup>24</sup> The idea is that only workers in white-collar occupations can provide relevant information on the supply chain of

TABLE 5 Import prices and share of immigrant workers.

	<b>ln Price<sub>fpot</sub></b>			
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
Sh.Immig <sub>dt</sub>	1.175*** (0.352)	0.701** (0.306)	1.584*** (0.196)	1.029*** (0.179)
ln TFP <sub>ft</sub>		0.053*** (0.012)		0.053*** (0.012)
Sh.Skill <sub>ft</sub>		0.513*** (0.017)		0.511*** (0.017)
Sh.K <sub>ft</sub>		0.044*** (0.005)		0.045*** (0.005)
WB. Dev. <sub>ft</sub>		0.030*** (0.002)		0.030*** (0.002)
ln Empl. <sub>dt</sub>		0.004 (0.008)		0.005 (0.008)
Observations	3,310,608	3,310,608	3,310,608	3,310,608
Method	2SLS	2SLS	OLS	OLS
K-Paap Stat.	303.05	290.56		
1st-stage coeff. Sh.Immig <sub>dt</sub>	0.642*** (0.037)	0.640*** (0.038)		

Note: Fixed effects are at the product-source country-year level and region-by-period level. The sample includes only the firm-year observations in which the firm both imports and exports at time  $t$ . Firm-level controls include the firm's capital intensity, skill intensity, wage bill deviation from the  $dst$ -average, and (log) productivity. *Département*-level controls include the (log) average number of employees. First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the *département*-year level.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

the source country. Accordingly, I modify the baseline specification in Equation (11) by replacing the share of immigrant workers with the shares of immigrant workers in the two different occupational groups. I instrument the share of white- and blue-collar immigrant workers by building a shift-share instrument analogous to the one described in Equation (7):

$$IV_{dt}^g = \frac{\overline{M}_{dt}^g}{\overline{M}_{dt} + N_{d1999}}, \quad (12)$$

where  $g \in \{\text{white}, \text{blue}\}$ . Since the census data in the base year do not allow computing the distribution of workers across a *département* by country of origin separately for the two skill groups, I circumvent this problem by computing  $\overline{M}_{dt}^g$  as follows<sup>25</sup>:

$$\overline{M}_{dt}^g = \frac{\text{Immig}_{d,1999}^g}{\text{Immig}_{FR,1999}^g} \text{Immig}_{FR,t}^g. \quad (13)$$

TABLE 6 Import prices and share of immigrant workers: White- versus blue collar.

	$\ln \text{Price}_{fpt}$			
	(1)	(2)	(3)	(4)
Sh.Immig. White <sub>dt</sub>	2.298*** (0.525)	2.203*** (0.522)	3.086*** (0.432)	3.104*** (0.426)
Sh.Immig. Blue <sub>dt</sub>		0.210 (0.258)		0.156 (0.231)
Sh.Skill <sub>ft</sub>	0.561*** (0.018)	0.508*** (0.017)	0.557*** (0.017)	0.505*** (0.017)
Observations	3,310,608	3,310,608	3,310,608	3,310,608
Method	2SLS	2SLS	OLS	OLS
K-Paap Stat.	516.08	294.43		
1st stage coeff. Sh.Immig. White <sub>dt</sub>	1.070*** (0.047)	1.106*** (0.050)		
1st stage coeff. Sh.Immig. Blue <sub>dt</sub>		0.764*** (0.027)		

Note: Fixed effects are at the product-source country-year level and region-by-period level. The sample includes only the firm-year observations in which the firm both imports and exports at time  $t$ . Firm-level controls include the firm's skill intensity, wage bill deviation from the *dst*-average, (log) productivity, and capital intensity. *Département*-level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in Table 5. First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the *département*-year level. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

The results in Table 6 show that only immigrant workers in white-collar positions positively and significantly affect input prices, and the point estimate associated with the share of white-collar workers is virtually unchanged when including the share of blue-collar workers.<sup>26</sup> These results support the hypothesis that the employment of immigrants influences quality in situations where the immigrant workers have both information about the supplier network and can influence the importing decision. In Appendix D.2, I replicate the analysis distinguishing between the share of workers employed in information- and purchase-related occupations, and the share of other workers. The results show that only the former group of workers matters for the price of inputs.

### 6.2.2 | Immigrant workers' country of origin: Population census

The employer–employee data do not allow identification of immigrant workers' exact country of origin. To partly circumvent this problem, I exploit the population census (RP) to compute an imputed share of immigrant workers by country of origin in each *département* as follows:<sup>27</sup>

$$\text{Sh.Immig}_{dt}^o = \frac{\widetilde{\text{Immig}}_{dt}^o}{\text{Immig}_{dt} + \text{Natives}_{dt}}, \quad (14)$$

$$\text{where } \widetilde{\text{Immig}}_{dt}^o = \frac{\text{Immig}_{o,d,t}^{RP}}{\text{Immig}_{d,t}^{RP}} \times \text{Immig}_{dt}^{DADS}. \quad (15)$$

The shift-share instrument presented in Equation (7) is then slightly modified as follows:<sup>28</sup>

$$\text{IV}_{dt}^o = \frac{\hat{M}_{dt}^o}{\hat{M}_{dt}^o + \hat{M}_{dt}^{\text{other}} + N_{d1999}}, \quad (16)$$

where:

$$\hat{M}_{dt}^o = \frac{\text{Immig}_{d,o,1999}^{RP}}{\text{Immig}_{FR,o,1999}^{RP}} \times \overline{\text{Immig}}_{o,t}, \quad (17)$$

$$\hat{M}_{dt}^{\text{other}} = \left( \sum_o \frac{\text{Immig}_{d,o,1999}^{RP}}{\text{Immig}_{FR,o,1999}^{RP}} \times \overline{\text{Immig}}_{o,t} \right) - \hat{M}_{dt}^o. \quad (18)$$

Endowed with the imputed share of immigrant workers by country of origin in each *département*, I modify the specification in Equation (11), by distinguishing between the share of immigrant workers in  $dt$  from the same country of origin  $o$ , as the intermediate input, and the share of all the other immigrant workers:

$$\ln \text{Price}_{fpot} = \beta_0 + \beta_1 \text{Sh. Immig}_{dt}^o + \beta_2 \text{Sh. Immig}_{dt}^{\text{other}} + X'_{ft} \Gamma + X'_{dt} \Delta + \theta_{pot} + \theta_{rT} + \varepsilon_{fpot}. \quad (19)$$

The results of Equation (19) are presented in Columns (1)–(8) of Table 7, and show rich dynamics consistent with the information friction mechanism put forward in this paper. In Column (1), the share of immigrants from the same origin country as the intermediate input has a larger point estimate than the share of immigrants from other origins, even though the difference is not statistically significant. To investigate this result further, I study whether the effect of  $\text{Sh. Immig}_{dt}^o$  is heterogeneous across the different source countries. Column (2) of Table 7 shows that when the inputs are sourced from a country in the European Union, the immigrants from the same origin country have a not significantly different, or even smaller, effect than the share of immigrants from all other origins. Since the information frictions are low for this group of sourcing countries, it could be the case that also immigrant workers from origin  $o' \in \text{other}$ , that shares the same cultural/institutional/language background as origin  $o$  can provide useful information to the employing firm. On the contrary, Column (3) shows that when the intermediate inputs are sourced from developed countries outside the European Union, i.e. from countries with higher information frictions as well as with the scope for producing higher quality inputs (Bas & Strauss-Kahn, 2024), only the immigrant workers from the same origin country as the inputs have a positive and significant effect on input prices. Noting that the average bilateral share of immigrants from this second group of countries across departments is equal to 0.0007, a 10% increase in  $\text{Sh. Immig}_{dt}^o$  is associated with a 0.38% increase in the price of inputs from the same origin. Finally, Column (4) provides evidence of the role of immigrant workers in lowering a different type of information frictions. Column (4) shows that the share of immigrant workers from the same origin country as an intermediate input sourced from a developing country, where the

TABLE 7 Input prices and country of origin.

	ln Price <sub>pot</sub>				ln Price <sup>oεg</sup> <sub>pot</sub>					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sh.Immig <sup>o</sup> <sub>dt</sub>	0.898** (0.392)	0.331 (0.433)	54.700*** (7.366)	−9.272*** (1.889)	1.175*** (0.355)	−0.115 (0.381)	39.015*** (5.354)	−6.750*** (1.637)	5.508*** (0.767)	3.285*** (0.625)
Sh.Immig <sup>other</sup> <sub>dt</sub>	0.699** (0.310)	0.787*** (0.264)	−0.006 (0.719)	1.158** (0.536)	1.029*** (0.182)	0.920*** (0.151)	1.474*** (0.453)	1.342*** (0.342)	0.624* (0.350)	1.020*** (0.208)
Observations	3,301,556	2,557,598	437,428	306,530	3,301,556	2,557,598	437,428	306,530	2,934,354	2,934,354
Sample	All	Develop. & EU	Develop. & Non-EU	Developing	All	Develop. & EU	Develop. & Non-EU	Developing	All	All
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Method	2SLS	2SLS	2SLS	2SLS	OLS	OLS	OLS	OLS	2SLS	OLS
K-Paap Stat.	146.84	141.35	156.34	178.10					146.04	
1st-stage coeff.	1.103*** (0.023)	1.118*** (0.025)	1.472*** (0.097)	0.905*** (0.020)					1.047*** (0.018)	
Sh.Immig <sup>o</sup> <sub>dt</sub>										
1st-stage coeff.	0.648*** (0.037)	0.649*** (0.037)	0.610*** (0.034)	0.692*** (0.036)					1.058*** (0.019)	
Sh.Immig <sup>other</sup> <sub>dt</sub>										

Note: Fixed effects are at the product-source country-year level and region-by-period level. The sample includes only the firm-year observations in which the firm both imports and exports at time *t*. Firm-level controls include the firm's capital intensity, skill intensity, wage bill deviation from the *dstr*-average, and (log) productivity. *Département*-level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in Table 5. First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the *département*-year level.

\*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.10.

scope for producing high quality might be lower (Bas & Strauss-Kahn, 2024), is likely to inform the firm about cheaper suppliers, rather than higher quality ones.

In a second exercise in Columns (9)–(10), I relate the price of an intermediate sourced from origin country  $o$  belonging to the origin group  $g$ ,  $\ln \text{Price}_{fpt}^{o \in g}$ , to the share of immigrant workers from origin group  $g$  ( $\text{Sh. Immig}_{dt}^g$ ) and to the share of immigrant workers from all other country groups. There are 80 origin groups, defined as the combination of countries speaking the same language and belonging to the same income group.<sup>29,30</sup> Column (9) shows that the share of immigrant workers from the same origin group as the intermediate inputs has a larger effect: a 1 p.p increase in  $\text{Sh. Immig}_{dt}^g$  is associated with a 5.5% price increase, compared to the 0.62% price increase associated with the  $\text{Sh. Immig}_{dt}^{\text{other}}$ .<sup>31</sup> This latter positive, even though smaller, effect suggests that the information frictions that immigrant workers lower are not solely related to language and institutional barriers.<sup>32</sup>

## 7 | ADDITIONAL RESULTS

In this section, I present several results validating the mechanism put forward in Section 6, as well as leveraging a different specification and identification strategy.<sup>33,34</sup>

### 7.1 | Mechanism: Universe of the exporter

I replicate the analysis of the effect of immigrant workers on the export price and quality for the universe of manufacturing exporters, independently from their import status. If the effect on export outcomes is channeled through better intermediate inputs, then the effect of immigrant workers should be larger for the sample of exporters who are also importers (two-way traders). In Table 8, I present the results of Equation (6) augmented with an interaction term for the status of a two-way trader at time  $t$ . The positive effect is driven by the sample of two-way traders, as shown by the positive interaction terms (and the not significant level effects of immigrant workers).

### 7.2 | Specification: Within-firm variation

I add to the baseline results by exploiting the within-firm dimension of the data and replicating the main results of the baseline tables, namely Column (2) and Column (6) of Table 3, Column (2) of Tables 4 and 5, as well as Column (1) of Table 7. In doing so, concerns related to omitted variable bias and unobserved firm heterogeneity biasing the results should be attenuated. I modify Equations (6) and (11) by replacing the set of fixed effects  $\theta_{pct} (\theta_{pot})$  with fixed effects at the firm  $f$ -firm  $p$ -product  $c$ -destination ( $o$ -origin) level,  $\theta_{fpc} (\theta_{fpo})$  and augmenting the specification with an interaction term between the share of immigrant workers and a dummy that takes values one if the product is differentiated according to Rauch (1999)'s classification.<sup>35</sup> In doing so, I identify how changes in a firm's price (quality) depend on the local immigrant supply, and whether the effect is different across product categories (homogeneous vs. differentiated goods), i.e. across goods with a different scope for quality differentiation. I distinguish between these two product

TABLE 8 Export prices and export quality and share of immigrant workers: All exporters.

	<u>ln Price<sub>fpct</sub></u>		<u><math>\hat{\lambda}_{fpct}</math></u>	
	(1)	(2)	(3)	(4)
Sh.Immig <sub>dt</sub>	−0.314 (0.352)	0.142 (0.283)	−0.291 (0.389)	−0.138 (0.301)
Sh.Immig <sub>dt</sub> × $\mathbb{D}[\mathbb{I} =$ Two-way] <sub>ft</sub>	2.110*** (0.219)	2.064*** (0.208)	2.361*** (0.186)	2.323*** (0.178)
$\mathbb{D}[\mathbb{I} = \text{Two-way}]_{ft}$	−0.327***	−0.321***	−0.394***	−0.390***
Observations	6,269,848	6,269,848	4,708,975	4,708,975
Controls	YES	YES	YES	YES
Method	2SLS	OLS	2SLS	OLS
K-Paap Stat.	97.68		101.23	
1st-stage coeff. Sh.Immig <sub>dt</sub>	0.650*** (0.046)		0.654*** (0.045)	
1st-stage coeff. Sh.Immig <sub>dt</sub> × Two-way <sub>ft</sub>	1.013*** (0.032)		1.014*** (0.031)	

Note: Fixed effects are at the product-destination-year level and region-by-period level. The sample includes the firm-year observations in which the firm exports at time  $t$ . Firm-level controls include the firm's capital intensity, skill intensity,  $\mathbb{D}[\mathbb{I} = \text{Two-way}]_{ft}$  a dummy equal one if the firm imports and exports at time  $t$ , wage bill deviation from the  $dst$ -average, and (log) productivity. *Département*-level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in Table 3. First-stage coefficients refer to the endogenous variable (immigrant share and its interaction with the two-way trader status). Errors are clustered at the *département*-year level.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

categories because this last set of fixed effects does not reflect price differences due to quality as straightforwardly as the set of fixed effects used in the baseline specification. Equation (19) is further modified as follows:

$$\ln \text{Price}_{fpot} = \beta_0 + \beta_1 \text{Sh.Immig}_{dt}^o + \beta_2 \text{Sh.Immig}_{dt}^o \times \mathbb{D}[\mathbb{I} = \text{Diff.}]_p + X'_{ft} \Gamma + \theta_{pot} + \theta_{dt} + \varepsilon_{fpot},$$

where the fixed effects  $\theta_{dt}$  capture the overall productivity and price effects of the share of immigrant workers in the department, so that the coefficients  $\beta_1$  and  $\beta_2$  identify the additional effect that the immigrants from a particular origin have on prices due to a reduction in information frictions.<sup>36</sup> Finally, on the same line, I augment Equation (10) with firm-fixed effects ( $\theta_f$ ) to capture any time-invariant omitted variables that might affect markups.<sup>37,38</sup>

The results in Columns (2) of Table 9 confirm that there is a positive and significant relationship between the local supply of immigrant workers and changes in the price that a firm charges for differentiated products. A 1 p.p. increase in the share of immigrant workers increases the price of differentiated products by 0.26%. The results in Table 9 reconcile with those in Table 3 as they show that immigrant workers are positively associated with the price of products for which there is scope for quality differentiation. That is, immigrant workers are positively associated with price differences that are likely to reflect quality differences, which are captured by the fixed effects ( $\theta_{pct}$ ) in Table 3 and by the positive interaction in Table 9. The suggested mechanism in this paper is that these workers improve quality via improved access to better intermediate inputs.



TABLE 9 Within-firm analysis: 2SLS.

	ln Price <sub>pct</sub>		$\hat{\lambda}_{pct}$		ln MU <sub>ft</sub>		ln Price <sub>foot</sub>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sh.Immig <sub>dt</sub>	0.101 (0.151)	−0.935*** (0.131)	0.029 (0.131)	−1.033*** (0.124)	0.499*** (0.052)	−0.281*** (0.068)	−1.079*** (0.094)		
Sh.Immig <sub>dt</sub> × $\mathbb{D}[\mathbb{1} = \text{Diff}]_p$		1.196*** (0.139)		1.269*** (0.139)			1.203*** (0.088)		
Sh.Immig <sub>dt</sub> <sup>o</sup>								−0.620 (0.599)	−12.143*** (1.228)
Sh.Immig <sub>dt</sub> <sup>o</sup> × $\mathbb{D}[\mathbb{1} = \text{Diff}]_p$									16.350*** (1.528)
Effect for differentiated products	−	0.261* (0.157)	−	0.236* (0.139)	−	−	0.124* (0.071)	−	4.20*** (0.775)
Observations	4,786,396	4,786,396	4,130,630	4,130,630	134,062	2,654,773	2,654,773	2,649,485	2,649,485
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
FE	FPC-RT	FPC-RT	FPC-RT	FPC-RT	F-ST-RT	FPO-RT	FPO-RT	FPO-DT	FPO-DT
K-Paap Stat.	532.65	281.07	573.7	301.64	766.82	821.85	405.55	919.68	456.92
1st-stage coeff. Sh.Immig <sub>dt</sub>	1.304*** (0.057)	1.357*** (0.049)	1.323*** (0.055)	1.381*** (0.049)	1.383*** (0.500)	1.397*** (0.049)	1.441*** (0.047)	−	−
1st-stage coeff.	−	1.435*** (0.043)	−	1.447*** (0.043)	−	−	1.485*** (0.040)	−	−
Sh.Immig <sub>dt</sub> × $\mathbb{D}[\mathbb{1} = \text{Diff}]_p$	−	−	−	−	−	−	−	−	−
1st-stage coeff. Sh.Immig <sub>dt</sub> <sup>o</sup>	−	−	−	−	−	−	−	1.597*** (0.053)	1.627*** (0.058)
1st-stage coeff.	−	−	−	−	−	−	−	−	−
Sh.Immig <sub>dt</sub> <sup>o</sup> × $\mathbb{D}[\mathbb{1} = \text{Diff}]_p$	−	−	−	−	−	−	−	−	1.666*** (0.078)

Note: Markup estimates in columns (5) are based on a Cobb-Douglas production function. The sample includes only the firms that both export and import in year  $t$ . Firm-level controls include the firm's capital intensity, skill intensity, wage bill deviation from the *dst*-average, and (log) productivity. *Département*-level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in previous tables. First-stage coefficients refer to the endogenous variable (immigrant share and its interaction). Errors are clustered at the *département*-year level.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

TABLE 10 Firm-level immigrant employment: 2SLS.

	ln Price <sub>fpct</sub>		$\hat{\lambda}_{fpct}$		ln MU <sub>it</sub>		ln Price <sub>fpot</sub>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sh.Immig <sub>it</sub>	2.189*** (0.732)	-1.712*** (0.322)	2.738*** (0.762)	-1.544*** (0.287)	0.686*** (0.127)	1.245*** (0.093)	0.976** (0.440)	-2.228*** (0.247)
Sh.Immig <sub>it</sub> × D[1 = Diff] <sub>p</sub>		2.347*** (0.268)		2.097*** (0.261)				2.449*** (0.208)
Effect for differentiated products	-	0.635* (0.360)	-	0.553+ (0.371)	-	-	-	0.221+ (0.137)
Observations	5,917,821	5,197,895	4,350,620	3,302,823	133,946	100,642	3,309,424	2,398,657
Controls	YES	YES	YES	YES	YES	YES	YES	YES
FE	PCY-RT	FPC-RT	PCY-RT	PCY-RT	ST-RT	F-ST-RT	POY-RT	FPO-RT
K-Paap Stat.	27.80	20.83	30.52	15.89	302.91	264.16	75.55	55.13
1st-stage coeff. Sh.Immig <sub>it</sub>	0.399*** (0.076)	0.659*** (0.085)	0.426*** (0.077)	0.697*** (0.090)	0.627*** (0.036)	0.571*** (0.035)	0.460*** (0.053)	0.581*** (0.066)
1st-stage coeff.	-	0.841***	-	0.809***	-	-	-	0.936***
Sh.Immig <sub>it</sub> × D[1 = Diff] <sub>o</sub>	-	(0.093)	-	(0.094)	-	-	-	(0.068)

Note: Markup estimates in columns (5)–(6) are based on a Cobb–Douglas production function. The sample includes only the firms that both export and import in year *t*. Firm-level controls include the firm’s capital intensity, skill intensity, wage bill deviation from the *dst*-average, and (log) productivity. *Département*-level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in previous tables. First-stage coefficients refer to the endogenous variable (immigrant share and its interaction). Errors are clustered at the *département*-year level.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10, +p < 0.15.

Consistently, immigrant workers do not have such a positive effect on homogeneous products, for which such a mechanism is not at play. For these products, it is more likely that immigrant workers allow firms to charge a lower price because they lower the exporting costs related to marketing and distribution networks. Overall, the results in Columns (2) of Table 9 are consistent with firms competing on quality for differentiated products (quality sorting), while competing on price for homogeneous products (efficiency sorting).

Next, the results in Column (7) of Table 9 confirm a positive and significant relationship between the local supply of immigrant workers and changes in the price a firm pays for its differentiated intermediate inputs. A 1 p.p. increase in the share of immigrant workers increases the price of differentiated intermediate inputs by 0.12%. The results in Table 9 reconcile with those in Table 5 as they show that immigrant workers are positively associated with the price of intermediate inputs for which there is scope for quality differentiation. Consistent with the information friction mechanisms proposed in this paper, immigrant workers do not have such a positive effect on homogeneous products, for which immigrant workers cannot provide information on better suppliers, but possibly on cheaper suppliers. This idea is further corroborated by the results in Column (9), showing that immigrant workers from origin country  $o$  have a positive and significant effect on the price of differentiated intermediate inputs sourced from country  $o$ : Noting that the average bilateral share of immigrants across departments is equal to 0.003, a 10% increase in the bilateral share of immigrant workers is associated with a 0.13% increase in the price of differentiated inputs. In contrast, the effect is negative for the homogeneous intermediate inputs. This is consistent with the idea that immigrant workers lower information frictions on better (high-quality) suppliers when there is scope for quality differentiation, and likely on cheaper suppliers when the quality ladder is shorter, as for the case of homogeneous inputs.<sup>39</sup>

### 7.3 | Specification: Firm-level immigrant share

I then replicate the main results from Column (2) and Column (6) of Table 3, from Column (2) of Table 4, and Table 5, as well as Column (2), (4), (5), and (7) of Table 9 using the share of immigrant workers employed in the firm.<sup>40</sup> The identification strategy relies on the same instrument presented in Equation (7).<sup>41</sup> I provide evidence in Table 10 that the results presented in the main analysis are qualitatively unchanged when I use the share of immigrant workers employed in the firm, with the point estimates being larger in Table 10. In particular, Columns (2)–(4)–(6)–(8) show the effect of a change in the within-firm employment of immigrant workers on all the performance measures, thus reducing any remaining endogeneity concern related to omitted variable bias.<sup>42,43</sup>

## 8 | CONCLUSIONS

This paper contributes to the debate on the consequences of the presence of immigrant workers for host economies and firms by taking a novel perspective that looks at firm-level quality. It studies how immigrant workers can help firms stay competitive in international markets via quality upgrading stemming from immigrants' ability to overcome informational frictions. Information frictions might constitute a major impediment to producing higher-quality goods, and it is, therefore, important to lower them, as quality upgrading represents a source of competitive advantage for firms in international markets. The results of this paper hint towards the encouragement of policies that facilitate immigration to produce more sophisticated goods. This paper

represents a first attempt to study the relationship between immigrant workers and firm competitiveness, via quality upgrading. However, given the data at hand, it is not possible to study the relationship between immigrant workers and firms' markups at the product(-destination) level, nor to quantify to what extent the effect of immigrant workers on markups is channeled through prices and/or marginal costs. Future research could then shed additional light in this respect.

## ACKNOWLEDGMENTS

This work is funded by a public grant overseen by the French and the German national research agencies (ANR and DFG) for the project NAWaCC (ANR-17-FRAL-0011). The access to the administrative data is supported by a public grant overseen by the French National Research Agency (ANR) as part of the 'Investissements d'avenir' program (ANR-10-EQPX-17 Centre d'accès sécurisé aux données CASD). I thank the CTEI at IHEID for financing the data access. I am grateful to Andrea Ariu, Richard Baldwin, Maria Bas, Julia Cajal-Grossi, Katharina Erhardt, Léa Marchal, Gianluca Orefice, Joel Stiebale, and two anonymous referees for their remarks. I thank the participants of the 2021 GTDW workshop, the GSIE seminar, the RIEF Conference 2022, and ETSG 2023 for their useful comments. Open Access funding enabled and organized by Projekt DEAL.

## CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

## DATA AVAILABILITY STATEMENT

In this paper, I use confidential French firm-level data which I access through the French Secure Data Access Centre (CASD). I am thus not allowed to provide these data for replication.

## ORCID

Giulia Sabbadini  <https://orcid.org/0009-0006-0181-5094>

## ENDNOTES

- <sup>1</sup> France is a particularly suitable setting for this study since it is a large recipient of immigrants and its stock of immigrants has consistently grown over time, with immigrants with higher education amounting to approximately 20% of the total immigrant population (author's calculation based on IAB Data). Finally, France relies heavily on imported intermediate inputs: imports of intermediate inputs accounted for approximately 60% of total imports in the period on which this paper focuses (author's calculation based on Comtrade Data).
- <sup>2</sup> France is divided into 100 administrative units (including overseas territories), called *départements*. I focus on the French mainland territory.
- <sup>3</sup> Mitaritonna et al. (2017) use the same data and identification strategy to show that immigrant workers affect firm-level productivity and several related outcomes. My paper fundamentally differs from their work as it focuses on the informational advantage that immigrant workers bring on upstream markets and how this translates in several measures of downstream performance.
- <sup>4</sup> Kneller and Yu (2016) and Bellone et al. (2016) extend the model by Melitz and Ottaviano (2008) to account both for quality and spatial differentiation.
- <sup>5</sup> When products are not vertically differentiated, firms compete on prices and the most productive firms charge lower prices, gain a larger market share, and earn higher revenues. This is the underlying mechanism in Melitz (2003).
- <sup>6</sup> In Antoniadis (2015) quality upgrading materializes through a different channel, that is innovation.
- <sup>7</sup> When a worker has multiple contracts, the DADS postes indicates which one is the worker's main activity, that is the one commanding the highest salary (*poste principale du salarié*).

- <sup>8</sup> For multi-establishment firms, I follow Mitaritonna et al. (2017) and use the *département* where the firm employs most of its employees.
- <sup>9</sup> The main *département* of the firm is generally time invariant. When a firm changes its *département*, I keep the most frequent one.
- <sup>10</sup> The main industry of the firm is generally time-invariant. When a firm changes its industry of main activity over the period, I keep the most frequent one.
- <sup>11</sup> Divisions 10-33 of the NACE Rév. 2 classification, excluding divisions 12 and 19.
- <sup>12</sup> While there were minor early updates of the NC8 classification, the main ones aligned with those of the HS6 classification in 2007 and 2012.
- <sup>13</sup> I exclude products that belong to the category of capital and consumption goods. In this article, import flows refer to import of intermediate inputs only.
- <sup>14</sup> These fixed effects control for demand and competition shocks in the export market for a specific product and specific trade costs. Additionally, they control for product-country-specific inflation.
- <sup>15</sup> The use of the share of immigrant workers at the *département*-level should also attenuate concerns related to the alternative explanation where immigrant workers could help firms become more productive thanks to better production technology. Arguably, information externalities are more local labor market-specific than productivity externalities. Therefore, the use of the share of immigrant workers at the *département*-level should be more informative about the former type of spillover. Mitaritonna et al. (2017) find that the local labor supply of immigrant workers increases firm-level productivity, however, they identify the increase in the firm's employment of immigrant workers as one of the factors through which this effect is channeled.
- <sup>16</sup> The instrument presented below, is at the *département*-level and therefore the type of variation exploited for identification would be the same, even when the main explanatory variable is at the firm-level. In Section 7.3, I replicate all the main results using the share of immigrant workers at the firm level.
- <sup>17</sup>  $T = 2$ . As Mitaritonna et al. (2017) point out, defining the period over two years allows the fixed effects to control for changes in labor market legislation as well as technology shocks that evolve slowly over time.
- <sup>18</sup> Total factor productivity is computed as described in Appendix A.1.
- <sup>19</sup> I add the controls progressively to attenuate concerns related to the inconsistency of productivity estimates carrying over with the consistency of the other estimates in the paper.
- <sup>20</sup> See, for example, the work by Mitaritonna et al. (2017), Moriconi et al. (2020), Cattaneo et al. (2013) and Foged and Peri (2016).
- <sup>21</sup> Given the lack of information on product-level sales in the domestic market, it is not possible to compute markups at the product-(destination) level. Short of being able to observe markups at this more disaggregated level, it is not feasible to compute marginal cost.
- <sup>22</sup>  $\beta_2$  potentially picks up price differences, as well, i.e., demand conditions, not only efficiency differences. Nevertheless, if  $\beta_1$  remains positive and significant, it means that price differences still play a role in explaining markup differences. I show the results with firm fixed effects in Section 7.2.
- <sup>23</sup> Additionally, these fixed effects allow controlling for the potential concentration of suppliers in the upstream market to ensure that the observed price is not due to upstream market power.
- <sup>24</sup> In Appendix D.1, I present the classification of occupations.
- <sup>25</sup> A similar instrument is used in Brunello et al. (2020), where  $\bar{M}_{dt}$  is built by treating all the immigrants as if they were coming from the same origin country.
- <sup>26</sup> The two coefficients are significantly different from each other at the 1% level.
- <sup>27</sup> The imputed share of immigrant workers by all the other origin countries is computed as the difference between the total share of immigrant workers and the immigrant workers from origin  $o$ .
- <sup>28</sup> The imputed share of workers by all the other origins is instrumented with an instrument analogous to the one in Equation (16), where the numerator is replaced by  $\hat{M}_{dt}^{other}$ .
- <sup>29</sup> There are 4 income groups: low income, lower middle income, upper middle income, and high income. The division of countries into income groups comes from the World Bank.
- <sup>30</sup> I exclude the group of high-income French-speaking countries, as native workers might have a similar effect to immigrant workers for this subset.
- <sup>31</sup> The two coefficients are statistically different from each other at the 1% level.
- <sup>32</sup> An alternative, although not mutually exclusive, explanation is that immigrant workers might help firms customize their products for destination markets. This would increase exports' appeal and price. It is not possible

to rule out that this could be part of the overall effect that immigrant workers have on export prices. However, if the effect of immigrant workers on exported goods were entirely due to downstream customization, this would not be consistent with the finding that only the share of immigrant workers from the same country of origin as the intermediate inputs affects their price (quality), especially when the inputs are sourced from countries that can produce high-quality inputs, but that are characterized by higher information frictions.

<sup>33</sup> In unreported results, available upon request, I conduct two additional robustness checks where I use as an instrument the alternative shift-share proposed by Brunello et al. (2020) and presented in Equation (12), and where I exclude from the analysis the firm-year observations that are in the top 3rd percentile of the department-year distribution of immigrants employment. In doing so, I tackle the problem of reverse causality, beyond the instrumental variable strategy, where firm-level outcomes might influence the demand of immigrant employment in the local labor market. Results are unchanged.

<sup>34</sup> Additionally, I replicate the results of Tables 5–7 by replacing the import price with a measure of import quality. The measure of input quality is analogous to the one of export quality, developed by Khandelwal et al. (2013) and presented in the baseline results in Table 3. However, for the import case, this measure of input quality does not have a structural interpretation as the one of export quality, even though the economic intuition is analogous. This is the same strategy used by Bas and Paunov (2021) to measure import quality. The results show that immigrant workers have a positive and significant effect on import quality, the effect being driven by white-collar immigrant workers and by immigrant workers from the same origin country as the intermediate inputs. Results are available upon request.

<sup>35</sup> On the left-hand side, the price of exports (import) is deflated using industry-specific output deflators from the OECD STAN database. The interpretation is thus slightly modified into changes in price with respect to the domestic deflator.

<sup>36</sup> Additionally, this strategy allows avoiding a specification with four endogenous variables (the share of immigrants from *o* and *other* countries, and their respective interaction with the differentiation dummy) in the equation which is more difficult to interpret.

<sup>37</sup> Since the firm location and sector are time-invariant, the firm fixed effects control for sector and region time-invariant factors as well.

<sup>38</sup> OLS results for Table 9 are available upon request.

<sup>39</sup> As explained in Section 5.1 and 6.1, the baseline specification exploits the across-firm (within-variety) dimension of the data as arguably it better reflects price differences stemming from quality differences, while controlling for firm-level confounding factors through a battery of covariates. Additionally, the across-firm specification is preferred because there is only one effect of immigrant employment on prices, thus making it more intuitive to interpret and reconcile the results obtained on prices and markups. On the contrary, the within-firm dimension of the data in Table 9 shows two effects on prices depending on the type of product, homogeneous versus differentiated. While this result is more informative of the type of information frictions that immigrant workers help lower, it is also more difficult to interpret in a unified framework with the evidence on markups as, due to data limitation, it is not possible to compute markups at the product level.

<sup>40</sup> In unreported results available upon request, I show that firms exposed to a larger supply of immigrant workers are more likely to hire at least one of them.

<sup>41</sup> An analogous identification strategy is used in Moriconi et al. (2020).

<sup>42</sup> Since the share of immigrant workers at the firm level displays a large incidence of zeros (40% of the firm-year observations) as well as little variation within a firm, I constrain the analysis in Columns (2)–(4)–(6)–(8) to firms that at least once over the period have positive employment of immigrant workers.

<sup>43</sup> OLS results for the Table 10 are available upon request.

<sup>44</sup> The authors show that the two are the same only in perfect competition.

<sup>45</sup> The ratio is corrected for measurement error in output as follows:  $\alpha_{it}^L = \frac{w_{it}L_{it}}{p_{it}Q_{it}^{exp(i_{it})}}$ .

<sup>46</sup> OLS results are available upon request.

## REFERENCES

- Akerberg, D. A., Caves, K., & Frazer, G. (2015). Identification properties of recent production function estimators. *Econometrica*, 83(6), 2411–2451.

- Andrews, M. J., Schank, T., & Upward, R. (2016). *Do Foreign Workers Reduce Trade Barriers? Microeconomic Evidence*. The World Economy.
- Antoniades, A. (2015). Heterogeneous firms, quality, and trade. *Journal of International Economics*, 95(2), 263–273.
- Ariu, A. (2022). Foreign workers, product quality, and trade: Evidence from a natural experiment. *Journal of International Economics*, 139, 103686.
- Bahar, D., & Rapoport, H. (2018). Migration, knowledge diffusion and the comparative advantage of nations. *The Economic Journal*, 128(612), F273–F305.
- Baqaei, D. R., & Farhi, E. (2020). Productivity and misallocation in general equilibrium. *The Quarterly Journal of Economics*, 135(1), 105–163.
- Bas, M. (2012). Input-trade liberalization and firm export decisions: Evidence from Argentina. *Journal of Development Economics*, 97(2), 481–493.
- Bas, M., & Paunov, C. (2021). Input quality and skills are complementary and increase output quality: Causal evidence from Ecuador's trade liberalization. *Journal of Development Economics*, 151, 102668.
- Bas, M., & Strauss-Kahn, V. (2014). Does importing more inputs raise exports? Firm-level evidence from France. *Review of World Economics*, 150(2), 241–275.
- Bas, M., & Strauss-Kahn, V. (2015). Input-trade liberalization, export prices and quality upgrading. *Journal of International Economics*, 95(2), 250–262.
- Bas, M., & Strauss-Kahn, V. (2024). Lower prices or higher quality? Firms' response to increased competition following trade liberalization. *Review of World Economics*, 160, 279–309.
- Bastos, P., & Silva, J. (2010). Identifying vertically differentiated products. *Economics Letters*, 106(1), 32–34.
- Bastos, P., Silva, J., & Verhoogen, E. (2018). Export destinations and input prices. *American Economic Review*, 108(2), 353–392.
- Bellone, F., Musso, P., Nesta, L., & Warzynski, F. (2016). International trade and firm-level markups when location and quality matter. *Journal of Economic Geography*, 16(1), 67–91.
- Bergounhon, F., Lenoir, C., & Mejean, I. (2018). A guideline to French firm-level trade data. (unpublished manuscript).
- Brunello, G., Lodigiani, E., & Rocco, L. (2020). Does low-skilled immigration increase profits? Evidence from Italian local labour markets. *Regional Science and Urban Economics*, 85, 103582.
- Card, D. (2001). Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration. *Journal of Labor Economics*, 19(1), 22–64.
- Caselli, M., Nesta, L., & Schiavo, S. (2021). Imports and labour market imperfections: firm-level evidence from France. *European Economic Review*, 131, 103632.
- Cattaneo, C., Fiorio, C. V., & Peri, G. (2013). Immigration and careers of European workers: effects and the role of policies. *IZA Journal of European Labor Studies*, 2(1), 17.
- De Loecker, J., & Scott, P. (2022). Markup estimation using production and demand data. An application to the US brewing industry. Working paper.
- De Loecker, J., & Warzynski, F. (2012). Markups and firm-level export status. *American Economic Review*, 102(6), 2437–2471.
- Egger, P. H., Erhardt, K., & Lassmann, A. (2019). Immigration and firms' integration in international production networks. *European Economic Review*, 111, 1–34.
- Eichengreen, B. (2018). *The Populist Temptation: Economic Grievance and Political Reaction in the Modern Era*. Oxford University Press. <https://books.google.de/books?id=BVZYDwAAQBAJ>
- Fielier, A. C., Eslava, M., & Xu, D. Y. (2018). Trade, quality upgrading, and input linkages: Theory and evidence from Colombia. *American Economic Review*, 108(1), 109–146.
- Foged, M., & Peri, G. (2016). Immigrants' effect on native workers: New analysis on longitudinal data. *American Economic Journal: Applied Economics*, 8(2), 1–34.
- Fontagné, L., Guimbard, H., & Orefice, G. (2022). Tariff-based product-level trade elasticities. *Journal of International Economics*, 137, 103593.
- Gandhi, A., Navarro, S., & Rivers, D. A. (2020). On the identification of gross output production functions. *Journal of Political Economy*, 128(8), 2973–3016.
- Goldsmith-Pinkham, P., Sorkin, I., & Swift, H. (2020). Bartik instruments: What, when, why, and how. *American Economic Review*, 110(8), 2586–2624.



- Hatzigeorgiou, A., & Lodefalk, M. (2021). A literature review of the nexus between migration and internationalization. *The Journal of International Trade & Economic Development*, 30(3), 319–340.
- Hiller, S. (2013). Does immigrant employment matter for export sales? Evidence from Denmark. *Review of World Economics*, 149(2), 369–394.
- Hornok, C., & Muraközy, B. (2019). Markups of exporters and importers: Evidence from Hungary. *The Scandinavian Journal of Economics*, 121(3), 1303–1333.
- Khandelwal, A. K., Schott, P. K., & Wei, S.-J. (2013). Trade liberalization and embedded institutional reform: Evidence from Chinese exporters. *American Economic Review*, 103(6), 2169–2195.
- Kneller, R., & Yu, Z. (2016). Quality selection, sectoral heterogeneity and Chinese exports. *Review of International Economics*, 24(4), 857–874.
- Kugler, M., & Verhoogen, E. (2009). Plants and imported inputs: New facts and an interpretation. *American Economic Review*, 99(2), 501–507.
- Kugler, M., & Verhoogen, E. (2012). Prices, plant size, and product quality. *The Review of Economic Studies*, 79(1), 307–339.
- Liu, H., Xu, M., & Zhong, T. (2019). Import competition and export markups: Evidence from Chinese multi-product exporters. *Annals of Economics and Finance*, 20(1), 357–385.
- Manova, K., & Yu, Z. (2017). Multi-product firms and product quality. *Journal of International Economics*, 109, 116–137.
- Manova, K., & Zhang, Z. (2012). Export prices across firms and destinations. *The Quarterly Journal of Economics*, 127(1), 379–436.
- Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6), 1695–1725.
- Melitz, M. J., & Ottaviano, G. I. (2008). Market size, trade, and productivity. *The Review of Economic Studies*, 75(1), 295–316.
- Mitaritonna, C., Orefice, G., & Peri, G. (2017). Immigrants and firms' outcomes: Evidence from France. *European Economic Review*, 96, 62–82.
- Moriconi, S., Peri, G., & Pozzoli, D. (2020). The role of institutions and immigrant networks in firms' offshoring decisions. *Canadian Journal of Economics/Revue canadienne d'économique*, 53(4), 1745–1792.
- Olney, W. W., & Pozzoli, D. (2021). The impact of immigration on firm-level offshoring. *Review of Economics and Statistics*, 103(1), 177–195.
- Peri, G. (2016). Immigrants, productivity, and labor markets. *Journal of Economic Perspectives*, 30(4), 3–30.
- Petrin, A., & Levinsohn, J. (2012). Measuring aggregate productivity growth using plant-level data. *The RAND Journal of Economics*, 43(4), 705–725.
- Rauch, J. E. (1999). Networks versus markets in international trade. *Journal of International Economics*, 48(1), 7–35.
- Rauch, J. E. (2001). Business and social networks in international trade. *Journal of Economic Literature*, 39(4), 1177–1203.
- Rauch, J. E., & Trindade, V. (2002). Ethnic Chinese networks in international trade. *Review of Economics and Statistics*, 84(1), 116–130.
- Stiebale, J., & Szücs, F. (2022). Mergers and market power: evidence from rivals' responses in European markets. *The RAND Journal of Economics*, 53(4), 678–702.
- Verhoogen, E. A. (2008). Trade, quality upgrading, and wage inequality in the Mexican manufacturing sector. *The Quarterly Journal of Economics*, 123(2), 489–530.
- Wooldridge, J. M. (2009). On estimating firm-level production functions using proxy variables to control for unobservables. *Economics Letters*, 104(3), 112–114.

**How to cite this article:** Sabbadini, G. (2024). Firm-level prices, quality, and markups: The role of immigrant workers. *Review of International Economics*, 32(5), 2259–2295. <https://doi.org/10.1111/roie.12772>

## APPENDIX A. DATA AND VARIABLES CONSTRUCTION

### A.1 Markup estimation

To estimate markups, I rely on the framework developed by De Loecker and Warzynski (2012). Starting from the cost-minimization problem of a producer, an expression for markups is obtained as the ratio between the output elasticity with respect to a flexible input and that input's revenue share.<sup>44</sup> I choose labor as the flexible input so that the markup is equal to:

$$\mu_{ft} = \theta_{ft}^L \times (\alpha_{ft}^L)^{-1}, \quad (\text{A1})$$

where  $\theta_{ft}^L$  is the output elasticity of labor and  $\alpha_{ft}^L$  is the wage bill as a fraction of total revenue.<sup>45</sup> In the baseline, I use a (gross-output) Cobb-Douglas production function in capital, labor, and intermediate inputs of the following form:

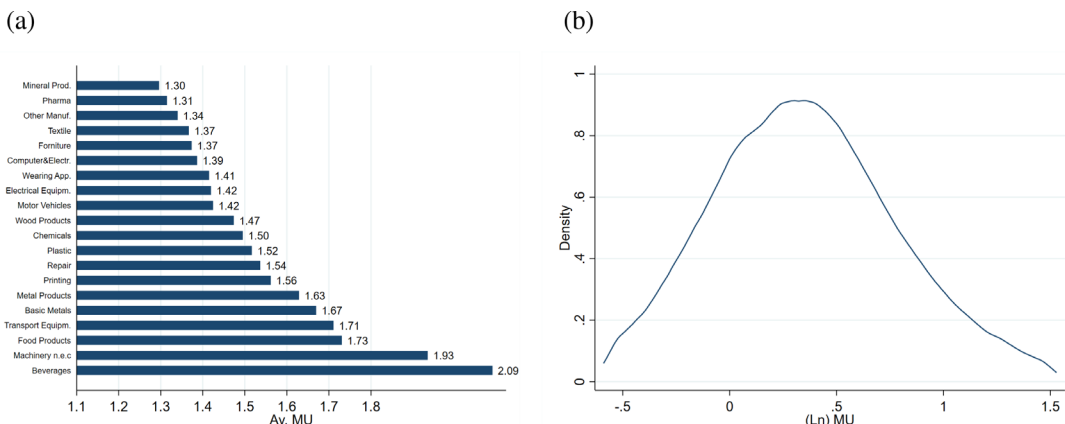
$$y_{ft} = \beta_l l_{ft} + \beta_k k_{ft} + \beta_m m_{ft}.$$

Therefore, the elasticity of labor is obtained as follows:

$$\hat{\theta}_{ft}^L = \hat{\beta}_l.$$

Figure A1 shows the average firm-level markups across industries, as well as their distribution across firms.

To estimate productivity, I use balance-sheet data on revenues ( $y_{ft}$ ), the number of full-time equivalent workers ( $l_{ft}$ ), book value of tangible assets ( $k_{ft}$ ) and expenditure in material intermediate inputs ( $m_{ft}$ ). I follow Caselli et al. (2021) and estimate a sector-specific production function in two steps. First, I obtain a measure of expected output ( $\hat{y}_{ft}$ ) and measurement error ( $\hat{\varepsilon}_{ft}$ ) by regressing the firm gross output on a third-degree polynomial in inputs. Then, I estimate by two-digit sector a production function of the type:



**FIGURE A1** Markups: Descriptive statistics. (A) Average firm-level MU in the industry. (B) Distribution of firm-level MU. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

$$\hat{y}_{ft} = f_s(l_{ft}, k_{ft}, m_{ft}, \mathbf{B}) + \omega_{ft} + \eta_{ft},$$

where  $f_s = \beta + \beta_l l + \beta_k k + \beta_m m_{ft}$ , and  $\omega_{ft}$  is the productivity term observed by the firm but not by the econometrician, and  $\mathbf{B}$  is the vector of input elasticities to be estimated. The main issue with estimating  $\mathbf{B}$  is the simultaneity bias given by the correlation between unobserved productivity shocks and input choice. Therefore, I follow the method developed by Wooldridge (2009) and implemented by Petrin and Levinsohn (2012) and approximate the unobserved productivity term by a third-order polynomial in lagged capital and material inputs and then implement an instrumental variable estimation where the endogenous variables, labor and material inputs, are instrumented with their first and second lags, respectively. In Table A1 I report the output elasticities of the different inputs by industry.

## A.2 Descriptive statistics

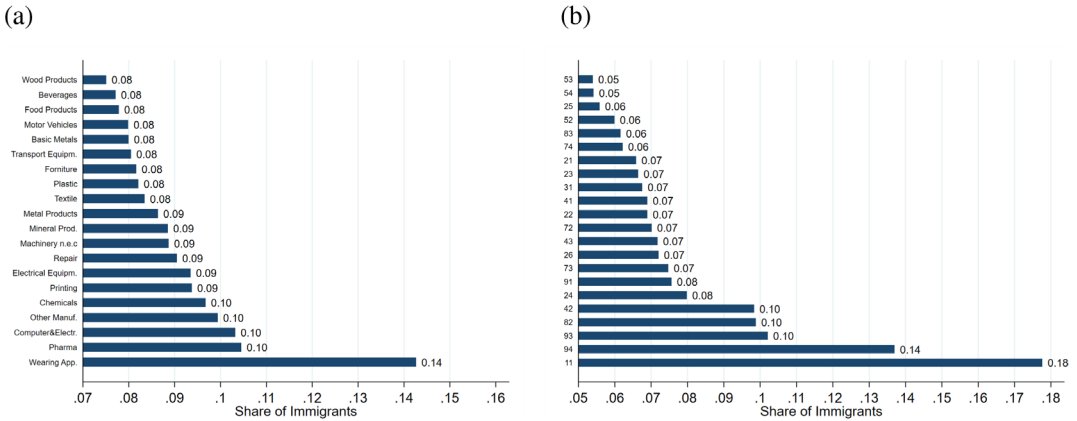
In Table A2, I provide some descriptive statistics on the main variables of interest. In Figure A2, I provide the detailed distribution of immigrant workers across regions and industries.

TABLE A1 Output elasticities.

Nace Rev.2	$\beta_l$	$\beta_k$	$\beta_m$	Nace Rev.2	$\beta_l$	$\beta_k$	$\beta_m$
10	0.234	0.0434	0.442	23	0.281	0.128	0.477
11	0.241	0.138	0.431	24	0.313	0.054	0.509
13	0.274	0.053	0.420	25	0.414	0.060	0.339
14	0.244	0.073	0.600	26	0.374	0.127	0.393
16	0.268	0.056	0.722	27	0.341	0.114	0.312
28	0.474	0.039	0.335	29	0.262	0.118	0.511
18	0.393	0.082	0.316	30	0.460	0.165	0.274
20	0.246	0.096	0.403	31	0.334	0.029	0.523
21	0.290	0.060	0.262	32	0.315	0.079	0.513
22	0.311	0.062	0.494	33	0.549	0.090	0.157

TABLE A2 Summary statistics: Firms that import and export at time  $t$ .

	Obs.	Mean	Std. Dev.
Sh.Immig <sub>ft</sub>	133,946	0.063	0.141
White-collar share	134,062	0.330	0.201
(Ln) MU (CD)	134,062	0.354	0.427
(Ln) TFP (CD)	134,062	1.968	0.222
FTE	134,062	129.886	413.994
Tangible assets	134,062	1.81e+07	1.41e+08
Total sales	134,062	3.56e+07	1.44e+08
Wage bill	134,062	6.74e+06	2.60e+07
Total imports	134,062	5.30e+06	3.26e+07
Total exports	134,062	1.17e+07	6.40e+07
(Ln) P <sup>II</sup>	3,544,065	2.632	1.991
(Ln) P <sup>EX</sup>	6,942,254	3.080	1.844



**FIGURE A2** Immigrants distribution. (A) Distribution of immigrants across industries. (B) Distribution of immigrants across regions. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

## APPENDIX B. STYLIZED FACTS

In this section, I replicate for the sample of French manufacturing firms some of the facts presented in Manova and Zhang (2012) for Chinese firms, on the correlation between output prices and revenues, and output quality and input prices.

The first correlation confirms the correlation between prices and quality for French manufacturers: firms producing products of higher quality charge higher prices because consumers value quality and are willing to pay for it. Following Manova and Zhang (2012), I show in columns (1)–(2) of Table B1 the results of the following equation:

$$\ln P_{fpct} = \beta_0 + \beta_1 \ln(\text{Revenues})_{fpct} + \beta_2 \ln(\text{Revenues})_{fpct} \times \mathbb{D}[1 = \text{Diff}]_p + \theta_{pct} + \varepsilon_{fpct}. \quad (\text{B1})$$

The left-hand side is the (log) price that firm  $f$  charges for product  $p$  in destination  $c$  at time  $t$ . On the right-hand side, the explanatory variables include the total revenues of the firm in market  $pc$  and a dummy taking value one if product  $p$  is differentiated according to the Rauch (1999) classification ( $\mathbb{D}[1 = \text{Diff}]_p$ ). The results show that firms charging higher prices earn higher revenues and that this result is driven by differentiated products—that is, products for which there is scope for quality differentiation (Bastos & Silva, 2010). Additionally, columns (3)–(5) of Table B1 present the results of the three specifications below, which follow the approach of Manova and Zhang (2012):

$$\ln P_{fpot} = \beta_0 + \beta_1 \text{Average Export price}_{ft} + \theta_p + \theta_t + \varepsilon_{fpot}, \quad (\text{B2})$$

$$\ln P_{fpot} = \beta_0 + \beta_1 \ln(\text{Exports})_{ft} + \theta_p + \theta_t + \varepsilon_{fpot}, \quad (\text{B3})$$

$$\eta_{fpct} = \beta_0 + \beta_1 \text{Average Import price}_{ft} + \theta_p + \theta_t + \varepsilon_{fpct}. \quad (\text{B4})$$

TABLE B1 Prices and export performance.

	$\ln(\text{Price})_{fpct}$		$\ln(\text{Price})_{fpot}$		$\eta_{fpct}$
	(1)	(2)	(3)	(4)	(5)
$\ln(\text{Revenues})_{fpct}$	0.044*** (0.001)	0.002 (0.001)			
$\ln(\text{Revenues})_{fpct} \times \mathbb{D}[\mathbb{1} = \text{Diff}]_p$		0.051*** (0.002)			
Average Export price <sub>ft</sub>			0.301*** (0.011)		
$\ln(\text{Exports})_{ft}$				0.029*** (0.003)	
Average Import price <sub>ft</sub>					0.431*** (0.016)
Observations	5,919, 912	5,919, 912	3,525,175	3,525,175	5,034,317
$R^2$	0.635	0.636	0.598	0.579	0.080
FE	PCT	PCT	P-T	P-T	P-T

Note: The sample includes only firms that both import and export at time  $t$ . Errors are clustered at the product-destination level in columns (1)–(2) and at the firm-level in columns (3)–(5).

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

The left-hand side is either the (log) price that firm  $f$  pays for product  $p$  sourced from country  $o$  at time  $t$ , or the quality of the product  $p$  that firm  $f$  sells in destination  $c$ . On the right-hand side, the explanatory variable Average Export price<sub>ft</sub> (Average Import price<sub>ft</sub>) represents the weighted average of all the (log) firm-product-destination (origin) prices, which have been demeaned by their product-specific average, while  $\ln(\text{Exports})_{ft}$  is the total export revenues. The results suggest that firms using higher-quality inputs produce more expensive, higher-quality products and enjoy better export performance.

## APPENDIX C. ALTERNATIVE MARKUP ESTIMATION

In Table C1, I report the results of Equation (10), where I use alternative estimation methods to compute firm-level markups. First, in Columns (1)–(2), I address the possible bias introduced by the use of revenues instead of quantities in the production function estimation as well as the potential additional bias due to unobserved firm-level inputs prices by building a firm-level price index used to deflate sales as well as in the control function for input prices. Then, in Columns (3)–(4), I estimate markups using the number of hours worked rather than the number of full-time equivalent workers. This is because the number of hours worked might be adjusted more flexibly, sometimes between  $t - 1$ , when capital is chosen, and  $t$  when material inputs are chosen and the productivity shock arrives. Next, I address the critique by Gandhi

TABLE C1 Firm-level markups and immigrant employment: Alternative estimations.

	Firm price index		Nr. hours		Value added		Avg. wage		Accounting	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sh.Immig <sub>it</sub>	0.553*** (0.047)	0.298*** (0.066)	0.524*** (0.050)	0.284*** (0.067)	0.460*** (0.042)	0.174*** (0.064)	0.602*** (0.048)	0.123** (0.059)	0.056*** (0.016)	0.086*** (0.018)
lnTFP <sub>it</sub>	0.014*** (0.002)	0.188*** (0.004)	3.452*** (0.221)	4.126*** (0.093)	1.148*** (0.057)	1.456*** (0.054)	1.225*** (0.071)	2.626*** (0.060)	0.661*** (0.036)	0.212*** (0.014)
Observations	117,672	118,976	123,814	124,495	123,226	123,702	128,838	129,152	134,061	134,061
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
FE	F-ST-RT	ST-RT	F-ST-RT	ST-RT	F-ST-RT	ST-RT	F-ST-RT	ST-RT	F-ST-RT	ST-RT
K-Paap Stat.	788.51	637.40	786.31	642.77	801.01	651.98	781.87	647.77	766.70	641.13
1st-stage coeff.	1.390*** (0.050)	1.072*** (0.042)	1.391*** (0.050)	1.075*** (0.042)	1.390*** (0.050)	1.073*** (0.042)	1.386*** (0.050)	1.073*** (0.042)	1.383*** (0.050)	1.073*** (0.042)

Note: 2SLS estimates. The sample includes only the firms that export and import in year  $t$ . Firm-level controls include the firm's capital intensity, skill intensity, wage bill deviation from the  $dst$ -average, and (log) productivity.  $D\acute{e}partement$ -level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in Table 4. First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the  $d\acute{e}partement$ -year level.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

et al. (2020) in two different ways. First, in Columns (5)–(6), I estimate markups using a value-added production function. Gandhi et al. (2020) show that gross output production function estimation is subject to an identification problem when the output elasticity of material inputs has to be estimated and materials also enter the control function. Value-added production functions can be interpreted as gross value production functions that are Leontief in material inputs. With this specification, the critique by Gandhi et al. (2020) does not apply as material inputs only enter the control function, and therefore the output elasticity to material inputs does not have to be estimated. I estimate the production function using the methodology by Akerberg et al. (2015), which is more suitable for estimating value-added production functions, rather than gross output ones (Akerberg et al., 2015). Second, following De Loecker and Scott (2022) and Stiebale and Szücs (2022), in Columns (7)–(8), I include the (log of) average wage in the control function. Finally, I compute markups using the accounting profits approach suggested by Baqaee and Farhi (2020). Markup estimates are based on the ratio between sales and costs (sales minus operating income). The results are presented in Columns (9)–(10). The estimates in Table C1 are consistent and comparable in magnitude with the baseline ones in Table 4.<sup>46</sup>

## APPENDIX D. MECHANISMS

### D.1 Classification of occupations

### D.2 Information- and purchase-related occupations

I replicate here the results shown in Table 6 by distinguishing between the share of immigrant workers employed in information- and purchase-related occupations (IP) versus other occupations (Other). Table D1 illustrates how the different occupations are divided between the two groups. The idea is to distinguish between workers who are employed in sales as well as in technical occupations and are therefore informed on the type of specialized inputs that the employing firm might need. The results in Table D2 show that the share of workers in this group drives the results on import prices, lending support to the information friction mechanism.



TABLE D1 French classification of occupations.

CS code	Occupation (French)	Occupation (English)	(1)	(2)
<b>1</b>	<b>Agriculteurs exploitants</b>	<b>Farmers</b>		
11	Agriculteurs sur petite exploitation	Farmers on small farms	—	—
12	Agriculteurs sur moyenne exploitation	Farmers on medium-sized farms	—	—
13	Agriculteurs sur grande exploitation	Farmers on large farms	—	—
<b>2</b>	<b>Artisans, commerçants et chefs d'entreprise</b>	<b>Craftsmen, traders and business leaders</b>		
21	Artisans	Craftsmen	—	O
22	Commerçants et assimilés	Traders and similar persons	—	IP
23	Chefs d'entreprise de 10 salariés ou plus	Entrepreneurs with 10 or more employees	—	IP
<b>3</b>	<b>Cadres et professions intellectuelles supérieures</b>	<b>Executives and higher intellectual professions</b>		
31	Professions libérales	Liberal professions	W	O
33	Cadres de la fonction publique	Public service executives	W	O
34	Professeurs, professions scientifiques	Professors, scientific professions	W	O
35	Professions de l'information, des arts et des spectacles	Information, arts and entertainment occupations	W	O
37	Cadres administratifs et commerciaux d'entreprise	Corporate administrative and commercial executives	W	IP
38	Ingénieurs et cadres techniques d'entreprise	Engineers and business technical executives	W	IP
<b>4</b>	<b>Professions Intermédiaires</b>	<b>Intermediate occupations</b>		
42	Professeurs des écoles, instituteurs et assimilés	Teachers of schools, teachers and assimilated	W	O
43	Professions intermédiaires de la santé et du travail social	Intermediate health and social work occupations	W	O
44	Clergé, religieux	Clergy, religious	W	O
45	Professions intermédiaires administratives de la fonction publique	Intermediate administrative professions in public service	W	O
46	Professions intermédiaires administratives et commerciales des entreprises	Intermediate administrative and commercial professions in companies	W	IP
47	Techniciens	Technicians	W	IP
48	Contremaîtres, agents de maîtrise	Foremen, supervisors	W	IP

(Continues)

TABLE D1 (Continued)

CS code	Occupation (French)	Occupation (English)	(1)	(2)
<b>5</b>	<b>Employés</b>	<b>Clerical workers</b>		
52	Employés civils et agents de service de la fonction publique	Civilian employees and public service employees	B	O
53	Policiers et militaires	Police and military	B	O
54	Employés administratifs d'entreprise	Corporate administrative employees	B	IP
55	Employés de commerce	Commercial employees	B	IP
56	Personnels des services directs aux particuliers	Direct service personnel to individuals	B	O
<b>6</b>	<b>Ouvriers</b>	<b>Labourers</b>		
62	Ouvriers qualifiés de type industriel	Industrial skilled workers	B	O
63	Ouvriers qualifiés de type artisanal	Skilled craft workers	B	O
64	Chauffeurs	Drivers	B	O
65	Ouvriers qualifiés de la manutention, du magasinage et du transport	Skilled workers in handling, storage and transport	B	O
67	Ouvriers non qualifiés de type industriel	Unskilled industrial workers	B	O
68	Ouvriers non qualifiés de type artisanal	Unskilled craft workers	B	O
69	Ouvriers agricoles	Agricultural workers	B	O

Note: Column (1) classifies occupations into blue- or white-collar occupations (respectively denoted B and W). Column (2) classifies occupations into information/purchase-related occupations, or other occupations (denoted respectively IP and O).

TABLE D2 Import prices and share of immigrant workers: Information- and purchase-related occupations.

	$\ln Price_{fpt}$			
	(1)	(2)	(3)	(4)
Sh.Immig. $IP_{dt}$	1.945*** (0.544)	1.693*** (0.563)	2.765*** (0.458)	2.712*** (0.481)
Sh.Immig. $Other_{dt}$		0.362 (0.282)		0.261 (0.229)
Sh.Skill $_t$	0.563***	0.510***	0.558***	0.506***
Observations	3,310,608	3,310,608	3,310,608	3,310,608
Method	2SLS	2SLS	OLS	OLS
K-Paap Stat.	695.43	331.66		
1st stage coeff. Sh.Immig. $IP_{dt}$	0.900*** (0.034)	0.954*** (0.038)		
1st stage coeff. Sh.Immig. $Other_{dt}$		0.823*** (0.032)		

Note: Fixed effects are at the product-source country-year level and region-by-period level. The sample includes only the firm-year observations in which the firm imports and exports at time  $t$ . Firm-level controls include the firm's skill intensity, wage bill deviation from the  $dst$ -average, (log) productivity, and capital intensity. *Département*-level controls include the (log) average number of employees. The sign and significance of the control variables are comparable to those in Table 5.

First-stage coefficient refers to the endogenous variable (immigrant share). Errors are clustered at the *département*-year level.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .