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ORIGINAL PAPER

Immigrant workers and firm resilience on the export market

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Abstract
This paper studies whether firms employing immigrant workers are more resilient to an increase in competition in their export markets. Exploiting the surge of Chinese imports following its accession to the World Trade Organization and using a sample of French manufacturing exporters from 2002 to 2015, we find that an increase in the growth rate of Chinese competition in a foreign market has a negative effect on both the two-year survival and growth rate of sales of French exporters on that foreign market. This negative effect on firm performance is mitigated by the employment of immigrant workers.

Keywords Firm · Heterogeneity · Immigrant workers · Import competition · Productivity

JEL Codes: F14 F22 F16

1 Introduction

Discussions on the repercussions of a more globally intertwined economic environment for firms and workers have been animating the public debate. The accession of China to the World Trade Organization in 2001 led to a dramatic increase in the level of competition faced by firms located in developed countries, in both their domestic market and their export destinations. Meanwhile, labour migration has been increasing over the past decades, reaching almost 5 percent of all workers worldwide in 2017 (ILO 2018). A number of studies have shown that immigrant workers generate

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productivity gains within the firm boundaries, and foster exports thanks to their knowledge of specific export destinations. This paper contributes to the discussion by investigating whether firms employing immigrant workers are more resilient in their export markets to an increase in competition from a low-wage country such as China. To this end, we use firm-level data from French administrative records to build a yearly panel of French manufacturing firms that export at least once between 2002 and 2015. We target two dimensions of firm export performance: the survival in a foreign market for two consecutive years and the growth rate of sales in that market. As an identifying exogenous shock, we exploit the accession of China to the World Trade Organization. While the so-called *China shock* has mostly been studied at the aggregate level (Autor et al. 2013; Balsvik et al. 2015; Malgouyres 2017; Shen and Silva 2018), a growing literature has been focusing on the effect of trade shocks on firm-level outcomes. To the best of our knowledge, there is no literature on how firms react to the rise of competition in their export markets. Instead, most of the literature focuses on how firms reacted to the rise in import competition in their domestic market. An increase in import competition from China, or from low-wage countries more in general, has been found to have a negative impact on firm survival probability and employment growth (see Mion and Zhu 2013 or Bernard et al. 2006, among others), thus confirming the aggregate findings. However, the literature has also highlighted that firms adjust to increased competition along other dimensions. Namely, import competition has been found to induce skill-upgrading (Mion and Zhu 2013) and innovation (Bloom et al. 2016), as well as a relocation of manufacturing activity towards more capital-intensive firms within an industry (Bernard et al. 2006).

France offers a particularly suitable context for the purpose of this study for two reasons. First, the share of total immigrant workers in the country is consistently higher than the European average. According to the UNCTAD Migration Database, in 2000 France hosted around 10 percent of immigrants while the EU15 average was around 8 percent. The European and the French average share started converging only around 2015. Second, the impact of Chinese competition on French firms is substantial: Between 2002 and 2015, France has experienced a decrease of its market share in all of its major export destinations, while China has seen its market shares increase (Comtrade data). Note that we focus on Chinese imports as they represent a large part (up to two thirds) of the imports from low-wage countries to developed economies (see Martin and Mejean (2014) and Bernard et al. (2006) for France and the U.S. respectively). Figure 1 shows that the imports from China as a fraction of total imports, have been increasing over time and are significantly higher than those from other low-wage countries.

We focus on firms' employment of immigrant workers as a determinant of their ability to face a trade shock. On the one hand, immigrant workers generate productivity gains within the firm boundaries. Mitaritonna et al. (2017) for French manufacturing firms and Ottaviano et al. (2018) for British service-producing firms show that an exogenous increase in the local labour supply of immigrants is associated with an increase in firm productivity. This result emphasises the fact that firm-specific productivity depends on the regional share of immigrants who convey country-specific knowledge. However, firm-level productivity gains also stem from the

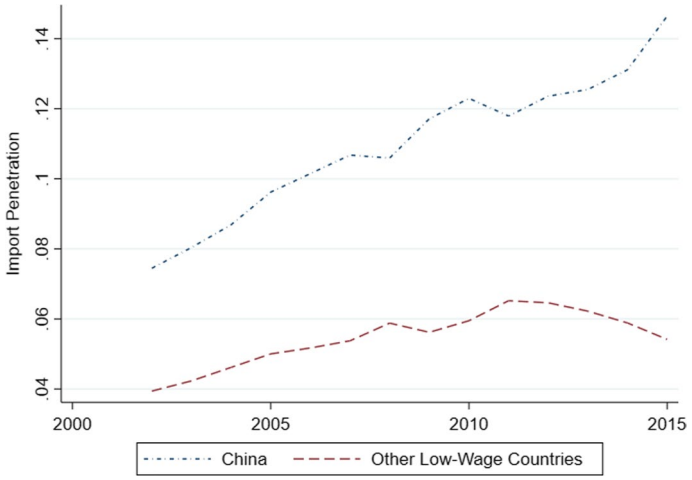

Fig. 1 Competition from China and Other Low-Wage Countries in the Export Market. *Notes:* Competition is computed as the import penetration ratio, that is the ratio between the total imports from China (or other low-wage countries) to the rest of the world (excluding France) and the total world imports (excluding imports from France). Low-wage countries include Brazil, India, South Africa and Russia. *Source*: Comtrade data

imperfect substitution between immigrant and native workers that leads to a more efficient allocation of tasks within and across firms (Foged and Peri 2016; Ottaviano et al. 2013; Peri and Sparber 2009), to firm adoption of different and possibly more efficient technologies and to innovation thanks to a broadened knowledge base (Bitzer et al. 2021; Kerr and Lincoln 2010; Lewis 2011).[1] On the other hand, immigrant workers can increase firm performance on the export market. It is now well established that immigrant workers possess a superior knowledge of foreign markets, which lowers variable and fixed export costs for the firm (among others, see Andrews et al. 2016; Hiller 2013; Ottaviano et al. 2018).

We start by describing the theoretical framework that helps rationalise the empirical question of the paper. We do so by means of a partial equilibrium model where firms operate under monopolistic competition and optimise their export sales independently across export markets, as in Melitz (2003). In such a framework, one can show that immigrant workers are more valuable for reacting to export shocks occurring in foreign markets because of the underlying assumptions that they boost the productivity of their firm and possess a specific knowledge of foreign destinations. We then exploit the variation in the level of Chinese import penetration over time and across foreign markets served by French firms,

[1] It is to be noticed that ethnic fractionalisation has been found to exert an ambiguous effect on firm productivity. As pointed out by Trax et al. (2015), cultural diversity may enhance productivity through communication and knowledge spillovers, but it may also have a negative effect if it induces social conflicts between employees or communication barriers that hamper buyer-supplier relationships. Using German firm-level data, the authors find that while the size of the group of immigrant employees has no significant impact on productivity, the diversification of the workforce in terms of citizenship increases total factor productivity.

and study how its effect on firms' survival in a foreign market for two consecutive years and their growth rate of sales varies with their employment of immigrant workers. Our strategy aims at controlling for the endogenous relationship between the two measures of firm export performance and the employment of immigrant workers. Following existing studies, we instrument the employment of immigrant workers at the firm-level using the local supply of immigrants faced by firms.

We find that an increase in import competition from China negatively affects firm export performance in an industry-destination market. A one percentage point increase in Chinese imports lowers the firm two-year survival in a foreign market by 0.25 percentage points and the export sales growth rate by 0.34 percent when the firm employs no immigrant workers. This effect is, however, smaller for firms employing immigrant workers. The survival drops by 0.19 percentage points and the export sales growth rate by 0.21 percent for a firm employing the average share of immigrant workers (that is 6.53 percent).

Additionally, we provide evidence that the positive effect of immigrants is stronger for less productive firms. We also show that this mitigation effect is present even after controlling for the fact that more productive firms better face an increase in import competition. This suggests that the mitigation effect of immigrant workers is only partly due to their productivity-enhancing effect. It is also consistent with the existing literature and the suggestive evidence we provide using the share of immigrant workers by country of origin in the district where the firm is located, and showing that immigrant workers improve the firm performance and resilience in the export markets thanks to their effect on export costs.

The contribution of this paper is twofold. First, it complements the existing literature by showing that immigrants not only foster trade, but also mitigate trade shocks that are potentially harmful for the economic stability and growth of a country. The paper most closely related to ours is a study by Mitaritonna et al. (2017). In this work, the authors highlight the effect of immigration on firm productivity and outcomes that are arguably related to productivity, such as the export volume. Although our paper has the same flavour when claiming that the mitigation effect of immigrant workers is partly due to a productivity-enhancing effect, the focus of our study is fundamentally different. While the aforementioned study focuses on the sole role of immigrants on several firm-level outcomes, our paper shows how the two aspects of globalisation (immigration and competition) interact in shaping the resilience of firms in their export market. In addition, we show that the mitigation of immigrant employment on firm-level resilience on the export market is not only channelled through productivity.

Second, this paper contributes to the literature on the firm-level consequences of an increase in Chinese competition (see Bernard et al. 2006; Bloom et al. 2016; Mion and Zhu 2013). While the literature has exclusively focused on the impact of Chinese competition on different outcomes in the domestic market, this paper explores the heterogeneous responses of firms to an increase in Chinese competition faced in their export markets. To the best of our knowledge, the only related study has been proposed by Martin and Mejean (2014) and focuses on the effect of

import competition in international markets on the quality of French exports in those markets.

The remainder of the paper is organised as follows. In Sect. 2, we describe the data we use for the analysis. In Sect. 3, we provide a set of facts on the relationship of interest, and we discuss the underlying theoretical mechanisms. In Sect. 4, we detail our empirical strategy, while in Sect. 5, we present the results and analyse the extent to which immigrant workers improve firm resilience to trade shocks in their export markets. Sect. 6 concludes.

2 Data

To investigate whether firms employing immigrant workers react differently to an increase in competition in the international market, we combine three sources of administrative data on French firms from 2002 to 2015 using a unique firm identifier (the SIREN number). First, we use administrative data consisting of annual employee declarations by wage-paying establishments located in France (*Déclarations Annuelles des Données Sociales*, DADS postes). This dataset contains information on the characteristics of the workers such as their administrative district of residence and work (French *département*), wage, type of contract, citizenship (French *versus* foreign citizens) and place of birth (France *versus* foreign country). We do not observe the exact origin country of immigrants for either definition. In the remainder of the paper, we define an immigrant as a foreign citizen, thus excluding naturalised individuals. For the baseline analysis, we prefer this definition because it only includes immigrants that are more likely to have stronger connection to their origin countries. In a robustness test, we use the alternative definition based on the place of birth. We aggregate the data at the firm-year level to obtain the total number of employees and the number of French and immigrant workers.[2]

Second, we use balance-sheet data consisting of tax reports filled in by firms located in France (*Fichier de comptabilité unifié dans SUSE*, FICUS and *Fichier approché des résultats d'Esane*, FARE). We only keep firms whose main activity belongs to the manufacturing sector (divisions 10-33 of the NACE Rév. 2 classification) for the whole period in which they appear in the dataset. This dataset provides information on firm domestic sales, main industry, main administrative districts, value added, capital stock, total assets and other variables related to their balance sheet. This dataset does not contain information on firm linkages such as their foreign affiliates.

Third, we use a dataset from the French customs that contains shipments in value and in volume by firm-product-destination-year. We aggregate the export flows of the products belonging to the same industry (NACE Rév. 2) therefore obtaining a dataset at the firm-industry-destination-year level.

[2] We start our analysis in 2002 because the individual identifier in the DADS Postes is available only from 2002 onward. Doing so, we are able to identify and keep only the main contract of an individual with several positions in one year.

In addition to the firm-level data, we use two additional sources of information. First, to build the shift-share instrument used in a robustness test, we use the 1999 French population census (*Recensement de la Population*) which contains information on the stock of native and immigrant population by country of origin and by administrative districts in 1999. Then, we use the population census for the period 2004-2015, which contains information on the stock of native and immigrant population by country of origin and by French administrative districts. 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 a period of five years, the census covers all municipalities with fewer than 10,000 inhabitants and 40% of the population in larger municipalities. We use the sample of workers to compute an imputed share of immigrant workers by country of origin in each district at time t, as well as the imputed stock of immigrant workers by country of origin in France at time t. Second, we use the Comtrade dataset that contains bilateral trade flows at the HS6 product level by origin and destination countries in U.S. dollars. Additional details on the data are provided in Appendix A.

We obtain a sample of 6,513,842 firm-industry-destination-year observations.[3] It includes 35,463 unique firm identifiers (and 219,289 firm-year observations) which export at least once over the sample period. We focus our analysis on exporting firms as only limited information is available for the domestic sales.[4] The binary variable measuring the survival of the firm in a market for two consecutive year is equal to 52.29%. It is equal to 53.85% and 53.05% before 2007 and after 2009 respectively, while during the crisis it amounts to 48.96%. The midpoint growth rate for firms that serve a market for two consecutive years is −0.18%. Yet, this statistic hides considerable heterogeneity over time, and it amounts to, respectively, 1.4% and 0.64% before 2007 and after 2009, while during the crisis it amounts to −6.36%.[5] Another interesting fact is related to the persistence of immigrant employment over time within a firm. On average, firms share of immigrant workers (over total employment) is 6.53%. Yet, out of the 54.87% firm-year observations displaying a positive number of immigrant workers, about 41.73% of the observations display no change in their number of immigrant workers from one year to another.

We report a number of summary statistics in Appendix B, Table 7. We split the sample into firm-year observations displaying a null employment of immigrants and those displaying a positive employment of immigrants. We observe that firms employing immigrant workers are significantly larger than other firms in all dimensions (revenue, assets, workforce and skilled workforce). We then focus on the distribution of immigrant workers across firms in Appendix, Figure 2. We see that among the 54.87%

[3] We use time and year interchangeably in the remainder of the paper.

[4] For the domestic market, only the industry of main activity of the firm is available. Therefore, it is not possible to identify all the industries in which a firm is active in the domestic market or whether the identification of the main activity is due to the domestic or export sales, for exporters.

[5] The average growth rate for firms that continuously serve a market includes observations with a zero growth rate but it excludes the observations referring to firm-market combinations that are served discontinuously.

of firm-year observations that exhibit a positive employment of immigrant workers, 43.39% of them employ less than 5% of immigrant workers.

3 Theoretical underpinnings

This paper aims at studying whether firms employing immigrant workers are more resilient to an increase in competition in the export market. This relationship can be rationalised by means of a partial equilibrium model where firms operate under monopolistic competition and optimise their export sales independently across export markets as in Melitz (2003). On each foreign market, each firm faces a non-negative demand function (such as the function used by Albornoz et al. 2012) which depends on a time-varying idiosyncratic shock related to foreign import competition. This shock can be interpreted as a demand shifter so that when competition increases in one market, demand decreases for this same market (see the model by Vannoorenberghe 2012).

In such a framework, two main assumptions can be made on the supply side to study the impact of firms' immigrant employment on firm resilience. First, the productivity of the firm can be related to its workforce composition. A CES aggregate that combines native and immigrant workers can account for the fact that immigrant workers increase productivity due to their imperfect substitutability with native workers, and that immigrants may affect productivity via knowledge externalities (Mitaritonna et al. 2017, see][who provide a full description of the implication of this type of production function when the differentiated labour inputs are native and immigrant workers). Second, the fixed and variable export costs of firms are a decreasing function of the employment of immigrant workers, as these workers lower informational barriers to trade (Marchal and Nedoncelle 2019).

Based on these assumptions, it is possible to show that following an increase in competition in a foreign market, immigrant workers mitigate the drop in a firm probability to serve that foreign market for two consecutive years, and in its growth rate of export sales in that market. For simplicity, consider a firm that serves a unique foreign market at a given time. The firm either employs no immigrant workers or a positive number of immigrant workers. Its foreign sales are positive, but higher when it employs immigrants. Consider next that the firm is hit by an increase in import competition. At the extensive margin, the probability that the firm remains above its profitability threshold and survives is larger if the firm employs immigrant workers. At the intensive margin, the sales growth rate of the firm drops, but the magnitude of the drop is smaller if the firm employs some immigrant workers. More intuitions are provided in Appendix C.

4 Empirical strategy

4.1 Baseline specification

This paper aims at understanding whether an increase in competition in a foreign market hinders firms performance in that market and whether this detrimental effect

is mitigated by the employment of immigrant workers. We test this hypothesis by means of the following econometric specification:

$$y^{jk}_{i,t:t+1} = \beta_0 + \beta_1 \Delta \text{Comp}^{jk}_{t:t+1} + \beta_2 \Delta \text{Comp}^{jk}_{t:t+1} \text{Immig}_{i,t-1} + \gamma_{it} + \gamma_{jt} + \varepsilon^{jk}_{i,t:t+1} \quad (1)$$

The dependent variable in Equation (1) is firm-industry-destination-year specific and denotes either the survival of a firm i in a foreign market jk for two consecutive years or its export sales growth rate on that market. The survival of the firm is measured by a binary variable equal to one if firm i sells a positive value on an industry-destination market jk at time t and $t+1$, and zero otherwise. Thus, this variable is conditioned on exporting at t. In the reminder of this study, we denoted this dummy variable by $\text{D}\left(S^{jk}_{i,t+1} > 0 | S^{jk}_{i,t} > 0\right)$. The growth rate of export sales is computed as the midpoint growth rate of the value sold by firm i on an industry-destination market jk between time t and $t+1$. In the reminder of this study, it is denoted as $S^{jk}_{i,t:t+1}$.[6]

The explanatory variables of interest are the following. $\Delta\text{Comp}^{jk}_{t:t+1}$ denotes the growth rate in competition from China faced by firm i on an industry-destination market jk between time t and $t+1$. For each market, this measure of exposure to Chinese competition is built following the literature on the China shock, in particular Bloom et al. (2016) and Martin and Mejean (2014), and reads as follows:

$$\Delta\ \text{Comp}^{jk}_{t:t+1} = \frac{M^{jk,\text{CH}}_{t+1}}{M^{jk,\text{WLD}}_{t+1}} - \frac{M^{jk,\text{CH}}_{t}}{M^{jk,\text{WLD}}_{t}} \quad (2)$$

where $M^{jk,\text{CH}}_{jt}$ denotes the imports of goods from industry j by country k from China at time t and $M^{jk,\text{WLD}}_{t}$ denotes the imports of goods from industry j by country k from the world (excluding France) at time t, and where k denotes any country but China and France.[7]

$\text{Immig}_{i,t-1}$ denotes the share of immigrant workers employed by firm i at time $t-1$.[8] Using the share of immigrants as proposed by Andrews et al. (2016), Mitaritonna et al. (2017), Marchal and Nedoncelle (2019), allows us to take into account that employing one additional immigrant worker may have a larger effect for small firms than for large ones. In other words, using a share allows us to normalise immigrant employment by the size of the firm.

[6] Similarly to Vannoorenberghe et al. (2016) (or to Davis and Haltiwanger 1992 in the job ow literature), we use a midpoint growth rate which has the benefit of being bounded and symmetric around zero. The midpoint growth rate is computed as $(S^{jk}_{i,t+1} - S^{jk}_{i,t}) / (S^{jk}_{i,t+1} + S^{jk}_{i,t})/2$ where $S^{jk}_{i,t}$ denotes the sales of firm i at time t on market jk.

[7] In that respect, our paper differs from Goldberg and Knetter (1999) who estimate the intensity of competition in international markets using the degree of the elasticity of price and quantity to *exchange rate shocks*.

[8] The literature presents instances analysing immigration in the district of the firm (Mitaritonna et al. 2017; Ottaviano et al. 2018). However, the firm immigrant employment better captures the direct contribution of these workers to their firm. We thus follow Hiller (2013) and Marchal and Nedoncelle (2019) and consider the *firm-level* employment of immigrant workers.

The main specification includes industry-year fixed effects to control for time-varying factors at the industry level, such as technological shocks, that may affect the export resilience of a firm. Additionally, when we introduce firm-year fixed effects, we are controlling for firm-specific time-varying factors that may affect the firm resilience to trade shocks and that may cause the coefficient of interest to be biased due to omitted variables. Finally, errors are clustered at the firm level. In a robustness test, we show to what extent the level of clustering affects the results.

In Equation (1), β_1 captures the unconditional effect of an increase in Chinese competition on the firm survival in a foreign market for two consecutive years and the firm export sales growth rate. An increase in import competition from China, or from low-wage countries more in general, has been found to have a negative impact on firm survival and employment growth in the domestic market (see Bernard et al. 2006 and Mion and Zhu 2013, among others), we therefore expect these results to be valid for the export market too, and β_1 to be negative. β_2 is the coefficient of interest. Following existing literature on the trade-migration nexus (see Andrews et al. 2016; Hiller 2013; Mitaritonna et al. 2017; Ottaviano et al. 2018) and the theoretical insights presented before, we expect this coefficient to be positive. In other words, immigrants should mitigate the negative effect of an increase in import competition on firm export performance.

4.2 Endogeneity concerns

The empirical specification presented in Equation (1) may suffer from endogeneity. First, firms may anticipate the negative effect of competition in their foreign markets and therefore decide to hire immigrant workers accordingly, especially if they are aware of the potential beneficial effects of these workers on their export resilience. Second, larger and more international firms are those more likely to employ immigrant workers. Therefore, these firms might be more resilient to an increase in import competition because they are larger and more productive, and not necessarily because they employ immigrant workers. While endogeneity concerns due to omitted variables at the firm-year level can be tackled by means of firm-year fixed effects, other concerns require a more sophisticated empirical strategy.

So far, studies intending to tackle similar endogeneity issues using two stage least square (2SLS) strategies have instrumented the immigrant employment either by the lagged employment of immigrants, the immigration stock in the region and/or sector of the firm (excluding the number of immigrants employed by the firm) or the immigration stock in a neighbouring country. Some other studies instrument the regional share/stock of immigrants with an imputed share (or shift-share instrument) *à la* Card (2001).

Since the data at hand allow observing the employment of immigrant workers at the firm level, we follow the work by Andrews et al. (2016) and Hiller (2013) and implement an IV-2SLS estimation in which we instrument the share of immigrant workers employed by firm i at time $t-1$ by the share of immigrant workers in the district of the firm (denoted by d) at time $t-1$, excluding the immigrant employees of the firm as follows:

$$\mathrm{IV}_{i(d),t} = \frac{(M_{dt} - M_{it})}{(M_{dt} - M_{it}) + (N_{dt} - N_{it})} \tag{3}$$

where M_{dt} and N_{dt} respectively denote the number of immigrants and natives located in district d at time t, and M_{it} and N_{it} respectively denote the number of immigrants and natives in firm i at time t. The share of immigrant workers in the district of the firm captures the potential supply of immigrant workers to which firms are exposed to. This instrument is presumably exogenous to firm i's performance since it only affects it through the employment strategy of all the other firms in the district of the firm. In the context of our study, we instrument the interaction term of interest by the interaction of the import competition measure with the instrumental variable described above ($\Delta\mathrm{Comp}^{jk}_{t:t+1}\mathrm{IV}_{i(d),t-1}$).

5 Results

5.1 Baseline results

Baseline results are presented in Table 1. Columns (1) and (2) report OLS results obtained without the interaction term of interest. These specifications allow studying the average effect of an increase in competition on firm resilience in their export markets. We find that an increase in Chinese imports lowers both measures of export performance in an industry-destination market. A 1 percentage point increase in Chinese imports lowers the firm survival in a market for two consecutive years by 0.17 percentage points (column 1) and their growth rate of sales by 0.18% (column 2). These results are consistent with and complementing those of Bernard et al. (2006) who find that an increase in import competition decreases the plant survival in the domestic market.

We then turn to the analysis of the *conditional* impact of an import competition shock from China by introducing the interaction term of interest into the regression (columns 3 and 4). In these regressions, we implement the IV-2SLS strategy described above. In column (3), we find that immigrant workers mitigate the detrimental effect of an increase in competition from China on both measures of performance. A 1 percentage point increase in Chinese imports lowers the two-year survival of the firm in a foreign market by 0.25 percentage points when it employs no immigrant workers. The coefficient associated with the interaction term is positive and highly significant. This result indicates that the negative effect of Chinese competition is mitigated by the employment of immigrant workers. For example, the survival drops by 0.19 percentage points for a firm employing the average share of immigrant workers (which is equal to 6.53%). We can compute a threshold value of the share of immigrant workers ($\mathrm{Immig}_{i,t-1}$) below which immigrants mitigate the effect of competition without overcompensating it, and above which they overcompensate it.

Then, we find that an increase by 1 percentage point in the growth rate of Chinese imports lowers the growth rate of sales of firms employing no immigrant workers by

Table 1 Baseline Results

	(1) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$	(3) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(4) $\Delta S^{jk}_{i,t:t+1}$	(5) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(6) $\Delta S^{jk}_{i,t:t+1}$
$\Delta Comp^{jk}_{t:t+1}$	−0.168***	−0.182***	−0.250***	−0.344***	−0.179***	−0.196***
	(0.006)	(0.021)	(0.015)	(0.046)	(0.007)	(0.023)
$\Delta Comp^{jk}_{t:t+1} Immig_{i,t-1}$			1.012***	2.050***	0.130***	0.180
			(0.185)	(0.547)	(0.030)	(0.113)
Observations	6,513,842	5,636,640	6,513,842	5,636,640	6,513,842	5,636,640
Firm-year FE	yes	yes	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes	yes	yes
Method	OLS	OLS	IV-2SLS	IV-2SLS	OLS	OLS
R-squared	0.124	0.099	–	–	0.124	0.099
Kleibergen-Paap F Stat.	–	–	129.95	136.20	–	–
Stock-Yogo critical value (10%)	–	–	16.38	16.38	–	–
First-stage coefficient	–	–	0.707***	0.702***	–	–
	–	–	(0.062)	(0.060)	–	–

Notes: This table reports OLS and IV-2SLS estimations. The immigration share and the interaction term are instrumented in columns (3) and (4). ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses

0.34% (column 4). The interaction term is also positive and highly significant which indicates that the negative effect of Chinese import penetration tends to be mitigated in firms that employ immigrant workers. More precisely, the sales growth rate drops by 0.21% for a firm employing the average share of immigrant workers.

In columns (3) and (4), the Kleibergen-Paap F statistic is well above the Stock-Yogo critical value which allows us to infer that the instruments are not weak. First stage results show that the instrumental variable correctly predicts the interaction term of interest. We report the OLS results in columns (5) and (6).

5.2 Robustness tests

In this section, we investigate the robustness of the baseline results to the use of different immigration variables and different levels of clustering. Additionally, we check the robustness of the results *vis-à-vis* the use of an alternative instrumentation strategy. All tables of results are presented in Appendix E.

5.2.1 Alternative immigration variables

Binary Variable for Immigrant Employment. First, we test whether the baseline specification is robust to the use of a binary variable to measure the employment of immigrant workers. Doing so, we take into account the fact the effect of immigrant workers may not be linear e.g. that the marginal benefit of hiring immigrant workers may be decreasing. We thus modify the specification by using a binary variable which equals one if the firm employs a positive number of immigrant workers at time $t-1$ and zero otherwise. The instrumental variable remains unchanged with respect to the baseline specification. Results are reported in Appendix, Table 8, columns (1) and (2). The results confirm the baseline estimates. We find that an increase in the import penetration from China lowers the two-year survival of the firm in a market, and its sales growth rate in a market. We also find evidence of a mitigation effect of immigrants for both measures of export firm performance. More precisely, we find a small overcompensation effect for the midpoint growth rate, which can be explained by the fact that the binary variable pools together firms employing a small number of immigrants, and firms employing a large number of immigrants, and that are more likely to react more to a negative shock in their foreign markets than smaller exporters.

Foreign-born Workers. Second, we define immigrant workers as foreign-born individuals, while in the baseline specification, the definition of immigrant workers is based on their citizenship. This alternative definition enlarges the sample of immigrant workers as it includes individuals who have been naturalised or were born abroad from French parents. We also change the instrumental variable accordingly and consider the share of foreign-born workers in the district of the firm excluding the foreign-born employees of the firm. Results are reported in Table 8, columns (3) and (4). Although the magnitude of the coefficients on the interaction term is smaller than in the baseline table, their sign and level of significance are in line and show

the presence of a mitigation effect of foreign-born workers on firm responses to an increase in Chinese imports.

5.2.2 Alternative level of clustering

In the baseline specification, errors are clustered at the firm-level in order to account for the fact that observations belonging to the same firm are likely to be correlated. However, our variable of interest (the interaction variable) is defined at the industry-destination level. Therefore, in an alternative specification, we cluster errors at the industry-destination level. In doing so, we account for the fact that there can be common unobserved random shocks at the industry-destination level that lead to correlation among observations within the same cell of observation. We also cluster errors at the district level to account for the fact that there can be common unobserved random shocks at the district level, which is one of the dimensions of our instrumental variable. Results are reported in Appendix, Table 9, and confirm that the baseline findings are robust to the use of an alternative level of error clustering. In all columns, the Kleibergen-Paap F statistic remains above the Stock-Yogo critical value.

5.2.3 Alternative instrumentation strategy

Finally, we modify the instrumental variable for the firm-level employment of immigrant workers. We instrument the share of immigrant workers employed by firm i located in district d at time t by a shift-share instrument à la Card (2001) in line with the studies by Mitaritonna et al. (2017) and Ottaviano et al. (2018). This instrument is computed as the imputed stock of immigrant workers in district d at time t and is built as follows:

$$\mathrm{IV}_{d,t} = \frac{\widehat{\mathrm{M}}_{dt}}{\widehat{\mathrm{M}}_{dt} + \mathrm{N}_{d1999}} \tag{4}$$

where $\widehat{\mathrm{M}}_{dt}$ is the imputed share of immigrant workers in district d at time t. The latter variable is computed by allocating immigrant workers from origin country k in France at time t ($\overline{\mathrm{Immig}}_{k,t}$) across districts d according to the national group distribution in 1999 (available from the French population census data, *Recensement de la Population, RP*), as follows:

$$\widehat{\mathrm{M}}_{dt} = \sum_{k} \frac{\mathrm{Immig}^{RP}_{d,k,1999}}{\mathrm{Immig}^{RP}_{FR,k,1999}} \overline{\mathrm{Immig}}_{k,t} \tag{5}$$

The number of immigrant workers present in France by country of origin reads as follows:

$$\overline{\mathrm{Immig}}_{k,t} = \frac{\mathrm{Immig}^{RP}_{FR,k,t}}{\mathrm{Immig}^{RP}_{FR,t}} \times \mathrm{Immig}_{FR,t} \tag{6}$$

where $\text{Immig}_{FR,t}$ denotes the total stock of immigrants in France in year t observed in the French administrative data (the *DADS postes*). The identification strategy of the shift-share approach relies on the fact that the distribution of immigrant workers across districts is persistent over time due to network effects. The past distribution of immigrant workers should, however, not have any effect on the present outcomes of the firms. However, the main caveat of this instrument with respect to the baseline instrument is that it has no variation across firms located in the same district.

Results are presented in Appendix, Table 10. Second stage results are in line with the baseline estimates both in terms of magnitude and level of significance for both measures of firm export performance. In addition, the identification test confirms that this instrument cannot be considered as weak. First stage results show that this alternative instrument well predicts the interaction term of interest and is very similar to the baseline instrument.

We now test the validity of the shift-share instrument. If past district-specific shocks were correlated with both the stock of immigrants in 1999 and the measures of the firm performance after 2004, then the exclusion restriction would be violated and the shift-share instrument would not be valid. Following Mitaritonna et al. (2017), we first compute the correlation across districts between the change in the instrument over the period 2005-2014 and the pre-period average economic outcomes in the districts.[9] In Panel A of Table 11, $\Delta\text{IV}_{d,2005:2014}$ denotes the trend in the shift-share instrument between 2005 and 2014. As it is possible to notice, the correlation between the long-run trend in the instrument and the average economic outcomes at the beginning of the period is not significant or with the opposite sign than the endogeneity argument would suggest. Then, in Panel B of Table 11, we test the validity of the instrument by studying whether its trend over the period is correlated with the trends of the variables of interest for the pre-sample period. Here again, the OLS coefficients obtained are not significant or with the opposite sign than the endogeneity argument would suggest. This lends support to the fact that the instrument is indeed valid as there is no strong correlation between past economic shocks and subsequent changes in the predicted share of immigrants across districts.

5.3 Complementary results

In this section, we further investigate the relationship of interest. First, we present results confirming that immigrant workers increase firm-level productivity. The productivity-enhancing effect of immigrant workers has been studied for the case of French firms by Mitaritonna et al. (2017). We present these results to (i) further corroborate our hypothesis that the mitigation effect of immigrant workers can be attributed to the productivity gains they generate and to (ii) complement the results by Mitaritonna et al. (2017), by exploiting the firm-level employment of immigrant workers, rather than the district stock. Second, we present evidence meant at excluding alternative explanations and therefore at showing that the employment of

[9] The first year for which we study the relationship of interest is 2005, the first year of the sample being used to build and lag the instrumental variable. The last year of the sample is lost to compute the mid-point growth rate of export sales.

immigrant workers is not a proxy for firm productivity and does not approximate a more general size effect. Third, we show that the mitigation effect of immigrant workers is present even after controlling for the fact that more productive firms face better an increase in import competition. This suggests that the mitigation effect of immigrant workers is only partly due to their productivity-enhancing effect. This is in line with the existing literature, which highlights how immigrant workers lower informational barriers. In the specific application of this paper, this means that the superior knowledge that immigrant workers have of the foreign markets allow the firms to face better an increase in import competition in those markets.

5.3.1 The productivity-enhancing effect of immigrant workers

To investigate whether immigrants have a positive impact on the productivity of French firms, we rely on the estimation strategy presented in Equation (7). To estimate total factor productivity (TFP, henceforth) at the firm level, we follow the widely used methodologies by Levinsohn and Petrin (2003) and Wooldridge (2009).[10] The estimation strategy reads as follows:

$$\ln \mathrm{TFP}_{i,t} = \beta_0 + \beta_1 \mathrm{Immig}_{i,t-1} + \Gamma' X_{i,t} + \gamma_i + \gamma_{jt} + \varepsilon_{i,t} \tag{7}$$

where the left-hand side variable is the TFP of firm i operating in its main industry j at time t and $\mathrm{Immig}_{i,t-1}$ denotes the share of immigrant workers employed by firm i at time $t-1$. The specification includes time-varying firm-level controls ($X_{i,t}$) such as the (log) size based on full-time employment, as well as firm and industry-year fixed effects (γ_i and γ_{jt}). In an alternative specification, we replace firm fixed effects with the initial productivity level of the firm. In all specifications, errors are clustered at the firm-level.

Equation (7) may suffer from endogeneity issues which are not fully controlled for by the fact that we use firm immigrant employment in the previous year, and firm fixed effects. For instance, firms may decide to hire immigrant workers if they are aware of the potential productivity gains that these workers may entail. Moreover, there might be firm-level unobserved factors that affect both the productivity of the firm and its employment decisions. To obtain causal results, we employ the instrument proposed in Sect. 4.2.

Second stage results are reported in Table 2. In column (1), we find a positive and significant effect of immigrant workers on the firm TFP obtained using the method of Levinsohn and Petrin (2003). However, in column (2), we find that this result remains positive but is no longer significant when we include firm fixed effects. The drop in significance is due to the fact that this set of fixed effects captures a large part of the variation as immigrant employment is persistent over time within firms. Alternatively, in column (3), we show that the result is robust to the inclusion of the initial level of firm TFP as an additional control variable, given that TFP is persistent over time. This set of results is robust to the use of the TFP measure estimated as suggested by Wooldridge (2009) (columns 4 to 6). Finally, in columns (1) to (6),

[10] We detail the approach in Appendix D.

Table 2 The Effect of Immigrant Workers on Firm TFP

	(1)	(2)	(3)	(4)	(5)	(6)
	$\ln TFP_{i,t}$					
TFP estimates	Levinsohn and Petrin (2003)			Wooldridge (2009)		
$Immig_{i,t-1}$	2.048***	0.830	1.142***	2.058***	0.865	1.111***
	(0.083)	(0.784)	(0.059)	(0.084)	(0.782)	(0.060)
$\ln TFP_{i,t0}$			0.471***			0.481***
			(0.007)			(0.008)
Observations	274,759	264,682	274,759	274,759	264,682	274,759
Firm-year control	yes	yes	yes	yes	yes	yes
Firm FE	no	yes	no	no	yes	no
Industry-year FE	yes	yes	yes	yes	yes	yes
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	2,359.25	14.19	2,365.73	2,359.25	14.19	2,358.51
Stock-Yogo critical value (10%)	16.38	16.38	16.38	16.38	16.38	16.38
First-stage coefficient	0.886***	0.124***	0.903***	0.886***	0.124***	0.902***
	(0.018)	(0.033)	(0.019)	(0.018)	(0.033)	(0.019)

This table reports IV-2SLS second stage estimations. The immigration share is instrumented in all columns. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses. The firm-year control consists in the logarithm of the full-time employment of the firm

the Kleibergen-Paap F statistic is well above the Stock-Yogo critical value which allows us to infer that the instruments are not weak. First stage results show that the instrument positively and significantly predicts the firm-level employment of immigrant workers.

5.3.2 Heterogeneity across firms

In this section, we address the concern that the employment of immigrant workers may only represent a proxy for firm productivity and a more general size effect. For instance, since hiring immigrants is more costly than hiring natives due to bureaucratic and cultural costs, employing immigrants could just be a signal of being a large and productive firm which can afford those costs. Failing to adequately control for the size of the firm would thus distort our interpretation of the results and lead us to falsely attribute a mitigation effect to the employment of immigrant workers that should instead be attributed to firm productivity or firm size in general.

To exclude alternative explanations behind the interpretation of the main coefficient of interest – the interaction term between the competition shock and the immigration variable – we split the sample of firms in four subsamples based on their

Table 3 Heterogeneity Across Firm Productivity

	(1) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2)	(3)	(4)	(5) $\Delta S^{jk}_{i,t:t+1}$	(6)	(7)	(8)
$\Delta Comp^{jk}_{t:t+1}$	−0.255***	−0.302***	−0.258***	−0.223***	−0.267***	−0.359***	−0.465***	−0.293***
	(0.040)	(0.036)	(0.027)	(0.024)	(0.085)	(0.129)	(0.095)	(0.078)
$\Delta Comp^{jk}_{t:t+1} Immig_{i,t-1}$	1.413***	1.100***	0.887***	0.682**	1.591*	2.269*	3.790***	0.869
	(0.454)	(0.352)	(0.305)	(0.308)	(0.884)	(1.314)	(1.102)	(1.051)
Observations	1,077,461	1,169,850	1,399,467	2,866,964	931,689	1,014,424	1,209,910	2,480,526
Sample	<25th	25-50th	50-75th	>75th	<25th	25-50th	50-75th	>75th
Firm-year FE	yes	yes	yes	yes	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes	yes	yes	yes	yes
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	22.20	19.03	64.03	57.18	22.38	23.38	62.40	64.82
Stock-Yogo critical value (10%)	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
First-stage coefficient	0.877***	0.753***	0.804***	0.546***	0.904***	0.729***	0.808***	0.530***
	(0.186)	(0.173)	(0.101)	(0.072)	(0.191)	(0.151)	(0.102)	(0.066)

This table reports IV-2SLS second stage estimations. The interaction term is instrumented in all columns. For each dependent variable, we report the results for firms with a TFP in 2002 below the 25th, between the 25th and the 50th, between the 50th and the 75th, and above the 75th percentile. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses

TFP level at the beginning of the period.[11] We distinguish between firms that exhibit a TFP below the 25th percentile in 2002, between the 25th and the 50th percentile, between the 50th and the 75th percentile and above the 75th percentile.

Results are reported in Table 3. In line with the baseline findings, we find that an increase in the import penetration from China lowers the survival of the firm in a market for two consecutive years for all groups of firms, with the unconditional results being stronger for the sample of firms whose initial level of productivity is below the median (columns 1 and 2). As for the growth rate of sales, we find that immigrant workers have a non-significant impact on the performance of firms when these firms have an initial TFP above the 75th percentile, while their impact remains positive and significant for the sample of firms with an initial TFP level below the 75th percentile.

If it is true that immigrants help firms react to an increase in competition by increasing firm-level productivity and lowering export costs, then it is reasonable that this effect is stronger for firms which are initially smaller and less productive. In particular, these results are in line with the study by Mitaritonna et al. (2017) which shows a stronger productivity effect of immigrants for firms which exhibit a lower productivity level at the beginning of the period.

To confirm the results found in Table 3, we replicate our baseline strategy on a sample of smaller exporters. In doing so, we exclude large exporters which are also more likely to be multinational companies, as well as more prone to hire a large share of immigrant workers.

Results are reported in Table 4 below. We report the results for the sample of exporters serving on average less than the number of markets served by the median exporter in columns (1) and (2), for firms serving on average less than the number of markets served by the average exporter in columns (3) and (4), and for firms on average below the 25th percentile of the distribution of export destinations in columns (5) and (6). The results show that the baseline findings of the paper hold for small exporters, that are less likely to be part of a multinational group. Although this is only suggestive evidence (since we cannot control directly for the ownership structure of the firm), these results corroborate the previous findings of Table 3.

5.3.3 Evidence on the mechanisms

We have shown that immigrants help firms mitigate trade shocks, all the more for initially less productive firms, which is also in line with existing empirical evidence (see Sect. 5.3.2). We now further investigate how immigrant workers mitigate trade shocks. In particular, we focus on whether immigrant workers mitigate trade shocks thanks to their impact on their firm productivity. To do so, we augment our baseline estimation with the interaction between the competition variable and a dummy variable equal to one for firms above a certain TFP threshold at time t (median, 75th and mean), as well as the triple interaction between the competition variable, the employment of

[11] We choose the initial year of the sample to avoid endogeneity concerns related to the TFP determination and distribution afterwards.

Table 4 Results for Small Exporters

	(1) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$	(3) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(4) $\Delta S^{jk}_{i,t:t+1}$	(5) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(6) $\Delta S^{jk}_{i,t:t+1}$
$\Delta \mathrm{Comp}^{jk}_{t:t+1}$	1.119***	1.617**	1.199***	2.034***	0.678**	0.311
	(0.208)	(0.771)	(0.183)	(0.611)	(0.305)	(1.167)
$\Delta \mathrm{Comp}^{jk}_{t:t+1} \mathrm{Immig}_{i,t-1}$	−0.254***	−0.295***	−0.267***	−0.362***	−0.159***	−0.188**
	(0.017)	(0.061)	(0.015)	(0.050)	(0.023)	(0.094)
Observations	3,192,419	2,760,415	4,672,850	4,042,964	1,556,239	1,341,736
Threshold	median	median	mean	mean	25th pctle	25th pctle
Firm-year FE	yes	yes	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes	yes	yes
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	351.67	331.08	276.81	268.25	174.72	170.61
Stock-Yogo critical value (10%)	16.38	16.38	16.38	16.38	16.38	16.38
First-stage coefficient	0.695***	0.696***	0.697***	0.710***	0.652***	0.670***
	(0.037)	(0.038)	(0.042)	(0.043)	(0.049)	(0.051)

This table reports IV-2SLS estimations. The interaction term is instrumented in all columns. We report the results for the sample of exporters serving on average less than the number of markets served by the *median* exporter in columns (1) and (2), for firms serving on average less than the number of markets served by the *average* exporter in columns (3) and (4), and for firms that are on average *below the 25th percentile* of the distribution of the number of export destinations in columns (5) and (6). ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses

Table 5 Main Evidence on the Mechanisms

	(1) $\mathrm{D}\left(\Delta S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$	(3) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(4) $\Delta S^{jk}_{i,t:t+1}$	(5) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(6) $\Delta S^{jk}_{i,t:t+1}$
$\Delta \mathrm{Comp}^{jk}_{t:t+1}$	−0.273***	−0.379***	−0.257***	−0.396***	−0.271***	−0.385***
	(0.016)	(0.049)	(0.013)	(0.046)	(0.016)	(0.060)
$\Delta \mathrm{Comp}^{jk}_{t:t+1} \mathrm{Immig}_{i,t-1}$	1.252***	2.834***	1.096***	1.713***	1.229***	2.870***
	(0.172)	(0.484)	(0.129)	(0.472)	(0.160)	(0.537)
$\Delta \mathrm{Comp}^{jk}_{t:t+1} \mathrm{T}_{i,t}$	0.047*	0.085	0.034	0.248**	0.043*	0.098
	(0.026)	(0.082)	(0.028)	(0.100)	(0.023)	(0.085)
$\Delta \mathrm{Comp}^{jk}_{t:t+1} \mathrm{Immig}_{i,t-1} \mathrm{T}_{i,t}$	−0.544*	−1.867*	−0.467	−3.811***	−0.502**	−1.969**
	(0.288)	(0.984)	(0.379)	(1.337)	(0.254)	(0.913)
Observations	6,513,842	5,636,640	6,513,842	5,636,640	6,513,842	5,636,640
Firm-year FE	yes	yes	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes	yes	yes
TFP threshold	median	median	75th perc.	75th perc.	mean	mean
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Bootstrap replications	100	100	100	100	100	100

This table reports IV-2SLS second stage estimations. The interaction term is instrumented in all columns. $\mathrm{T}_{i,t}$ denotes the TFP threshold. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Bootstrapped standard errors clustered at the firm level are reported in parentheses

immigrant workers and the TFP threshold of the firm. As in our baseline model, we include firm-year and industry-year fixed effects.

Results are presented in Table 5. We find that the baseline interaction between the competition variable and the employment of immigrant workers remains positive and significant for both measures of firm resilience, and for the three TFP thresholds we use. This latter term is also positive and significant, thus indicating that more productive firms react better to an increase in Chinese imports. Finally, the triple interaction term is always negative and significant (except in column 3). Overall, the effect appears to be stronger for the sales growth rate than for the two-year survival in a foreign market. The latter result indicates that immigrant workers have a lower mitigation effect on trade shocks when the firm exhibits a higher level of TFP. This result also indicates that the effect of immigrants is not entirely channelled through productivity, as the inclusion of the triple does not affect qualitatively the coefficient associated to the interaction between the share of immigrant workers and the competition variable.

The result that immigrant workers affect firm resilience on the export market through additional channels, other than productivity, is consistent with the idea that these workers lower trade costs. It is, in fact, well established that immigrant workers possess a superior knowledge of foreign markets which lowers variable and fixed trade costs for the firm (among others, see Andrews et al. 2016; Hiller 2013; Ottaviano et al. 2018). Although the data at hands do not allow us to test directly for this mechanism, we provide evidence of the cost-reducing effect of immigrant workers for French manufacturing firms in the context of our study.

We analyse the impact of immigrants located in the district of the firm on its survival in a market for two consecutive years and its growth rate of sales. We are able to identify the origin country of immigrant populations living in the district of the firm, and to analyse whether immigrants from origin country k impact firms' resilience on that particular market destination k. The empirical strategy reads as follows:

$$\begin{aligned} y^{jk}_{i,t:t+1} =& \beta_0 + \beta_1 \Delta \text{Comp}^{jk}_{t:t+1} + \beta_2 \text{Immig}^{k}_{d,t-1} + \beta_3 \Delta \text{Comp}^{jk}_{t:t+1} \text{Immig}^{k}_{d,t-1} \\ &+ \gamma_{it} + \gamma_{jt} + \gamma_{dt} + \varepsilon^{jk}_{i,t:t+1} \end{aligned} \tag{8}$$

where $\text{Immig}^{k}_{d,t-1}$ denotes the (imputed) share of immigrant workers from origin country k located in the district (d) of firm i at time $t-1$, and γ_{dt} denote district-year fixed effects and control, among other things, for the total share of immigrant workers in the district. $\text{Immig}^{k}_{d,t-1}$ is computed as follows:

$$\text{Immig}^{k}_{d,t} = \frac{\widetilde{M}^{k}_{dt}}{\sum_k (\widetilde{M}^{k}_{dt}) + \text{N}_{dt}} \text{ where } \widetilde{\text{M}}^{k}_{dt} = \frac{\text{M}^{RP}_{k,d,t}}{\text{M}^{RP}_{d,t}} \times \text{M}_{dt} \tag{9}$$

where $\widetilde{\text{M}}^{k}_{dt}$ denotes the (imputed) stock of immigrant workers from an origin country k in district d at time t, and N_{dt} is the stock of French workers in district d at time t. The stock of immigrant workers from an origin country k in district d at time t is calculated by multiplying the stock of individuals in a district d at time t with the share of immigrants from an origin country k represented in that district at time t. *RP* indicates that the variables are taken from the French population census.

Table 6 The Effect of Regional Immigration on Informational Barriers

	(1) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$	(3) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(4) $\Delta S^{jk}_{i,t:t+1}$
$\text{Immig}^{k}_{d,t-1}$	4.764***	4.192***	4.716***	4.142***
	(0.464)	(0.480)	(0.471)	(0.481)
$\Delta\text{Comp}^{jk}_{t:t+1}$			−0.171***	−0.198***
			(0.010)	(0.031)
$\Delta\text{Comp}^{jk}_{t:t+1}\text{Immig}^{k}_{d,t-1}$			6.109**	6.296
			(2.467)	(5.926)
Observations	6,354,027	5,558,191	6,354,027	5,558,191
Firm-year FE	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes
District-year FE	yes	yes	yes	yes
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	1040.36	1033.95	550.85	560.46
Stock-Yogo critical value (10%)	16.38	16.38	7.03	7.03
First-stage coefficients	1.124***	1.121***	1.124*** ; 1.113***	1.121*** ; 1.111***
	(0.035)	(0.035)	(0.035) ; (0.034)	(0.035) ; (0.033)

This table reports IV-2SLS estimations. $\text{Immig}^{k}_{d,t-1}$ denotes the share of working-age immigrants from origin country k located in the district (d) of firm i at time $t-1$. The immigration share and the interaction term are instrumented in all columns. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the district level are reported in parentheses

We instrument Equation (9) with a shift-share instrument, analogous to the one described before, which reads as follows:

$$\text{IV}^{k}_{d,t} = \frac{\widehat{\text{M}}^{k}_{dt}}{\sum_{k}(\widehat{\text{M}}^{k}_{dt}) + \text{N}_{d1999}} \tag{10}$$

where

$$\widehat{\text{M}}^{k}_{dt} = \frac{\text{Immig}^{RP}_{d,k,1999}}{\text{Immig}^{RP}_{FR,k,1999}} \times \overline{\text{Immig}}_{k,t} \tag{11}$$

and where

$$\overline{\text{Immig}}_{k,t} = \frac{\text{Immig}^{RP}_{FR,k,t}}{\text{Immig}^{RP}_{FR,t}} \times \text{Immig}_{FR,t} \tag{12}$$

$\widehat{M}^{k}_{dt}$ is computed by allocating immigrant workers from origin country k and present in France at time t ($\overline{\text{Immig}}_{k,t}$) across districts d according to the national group distribution in 1999, which is obtained from the French population census.

The aim of this last set of results is to provide some suggestive evidence that immigrants improve firms' resilience when the destination served by the firm is the origin country of these immigrants. The underlying assumption is that immigrant workers may be more valuable for reacting to export shocks occurring in foreign markets for which they have a specific knowledge, that is their origin country.

We report the results of this regression in Table 6. In columns (1) and (2), we show the effect of local immigration from an origin country k on firms' resilience in their export market jk. For both measures of export performance, we find a positive effect of local immigration. The coefficients are positive and highly significant. In columns (3) and (4), we replicate the structure of our baseline estimation. In column (3), we find that local immigration from an origin country k does mitigate the firm survival in a foreign market jk for two consecutive years. The coefficient is positive and significant at the 5% level. This result provides suggestive evidence that the effect of immigrant workers on firm resilience to trade shocks is channelled through an information channel. We find a similar result for the growth rate of sales in a foreign market jk in column (4), yet the coefficient of the interaction term is not significant. This indicates that the information channel is at play mostly for the survival in a foreign market for two consecutive years.

Finally, the Kleibergen-Paap F statistic is well above the Stock-Yogo critical value which allows us to infer that the instruments are not weak. First stage results show that the instrumental variable correctly predicts the terms of interest.

6 Conclusions

This paper investigates whether the employment of immigrant workers affects the resilience of firms in their export markets when they are facing an increase in competition from a low-wage country. To this end, we exploit the increase in Chinese competition that French exporting manufacturers face in the industry-destination market that they serve.

We start by describing the positive correlation between the employment of immigrant workers and the resilience of firms to Chinese competition. Using an instrumental variable strategy, we then find that an increase in Chinese imports has a negative impact on both firm survival in a market for two consecutive years and export sales growth rate. However, immigrant workers mitigate this detrimental effect. Although the mitigation effect of immigrant workers is quantitatively small, these findings may matter at the aggregate level. The results show that firms with an initially low productivity level are those benefiting the most from the employment of immigrant workers. As small firms are predominant in France, assessing their resilience to trade shock is important to evaluate the aggregate consequences of such a shock.

Lastly, we show that the mitigation effect of immigrant workers is present, even after controlling for the fact that more productive firms react better to an increase in competition. This hints towards the fact that the mitigation effect of immigrant workers is not fully channelled through their productivity-enhancing effect. We acknowledge that we are unable to further test whether the mitigation effect is conveyed through a trade-cost effect of immigrants at the firm-level, as the main drawback of the data at hand is related to the lack of information on the origin country of immigrants. We, however, exploit the share of immigrant workers by country of origin in the district where the firm is located to show that there is a positive relationship between the local presence of immigrant workers from a specific origin country and the resilience of firms located in the same district in those markets.

Our findings are important from a policy perspective for the following reasons. First, our results are instructive because strong and negative effects of import competition from low-wage countries such as China on firm survival in a market for two consecutive years and growth rate of sales may translate into lower growth and lower employment at the aggregate level. Second, we show that immigrant workers allow firms to smooth negative trade shocks, which is crucial to assess their impact on their host country and to evaluate their contribution to the economic growth. The results of this paper point towards the beneficial effects of immigrants on the performance of French exporting manufacturers over time.

A Description of the Data

A.1 Data Sources

Administrative data on employees. First, we use administrative data consisting of annual employee declarations by wage-paying establishments located in France (*Déclarations Annuelles des Données Sociales*, DADS postes). The dataset contains about 50 million individual-firm observations per year. We aggregate the data at the firm-year level to obtain firm-level measures of the workforce such as the total number of employees and the number of French and foreign employees. Once aggregate at the firm-year level and keep only the firms belonging to the manufacturing sector, the dataset contains 1,703,135 firm-year observations.

Tax records. We then use balance-sheet data consisting of tax reports filled in by firms located in France (*Fichier de comptabilité unifié dans SUSE*, FICUS and *Fichier approché des résultats d'Esane*, FARE). This dataset contains firms in the manufacturing and service sectors (and excludes the agricultural and financial sectors). Each firm is assigned only one NACE industry code (NACE rev. 1 until 2007, NACE rev. 2 from 2008). Note that all domestic sales are reported as missing in 2008. The dataset contains 44,037,418 firm-year observations. After keeping firms whose main activity belongs to the manufacturing

sector *i.e.* to the divisions 10-33 of the NACE Rév. 2 classification, we obtain a sample of 2,742,638 out of which 1,381,820 also have administrative data on employees available in the DADS data, as well as all the relevant information to compute TFP.

Customs data. Finally, we use a dataset from the French customs that contains shipments in value (Euros) and in volume (tons) by firm-product destination country-year. Firms located in France are required to report their exports of goods only if they reach the following thresholds: Before 2011, shipments to EU countries are reported only if firm's total exports are larger than 150,000 Euros and shipments to other countries are reported only if larger than 1,000 Euros or one ton. From 2011, shipments are reported only if the total exports to the EU are larger than 460,000 Euros. This, however, accounts for only a small share of total exports (Berman et al. 2015). We obtain 17,348,036 observations at the firm-year-destination-industry level. Note that firms may serve each of its industry-destination market in a discontinuous way. We therefore fill in the dataset with zeros when the firm does not serve an industry-destination in a year, but serves it at least one year before and one year after. We are then able to merge 7,967,798 observations into the DADS-tax sample.

Census data. We use the 1999 French population census (*Recensement de la population*)which contains information on the stock of native and immigrant populations by origin country and by administrative districts. We use these data to build spatial weights of the supply of foreign citizens across origin countries, that we then use to build one of the instrumental variables presented in a robustness test.

A.2 Data Structure

The observational unit in our specification is at the firm-destination-industry-year level. The set of destinations excludes the domestic market as the French tax records only contain the time-varying industry of the firm's main activity in a year. As for the export sales, the French custom data contains information on the sales of goods of French firms in each industry-destination markets served. We are then able to identify the quantity sold in each industry for each foreign destination served by the firm.

We compute the sales growth rate between two consecutive years t and $t+1$ as the midpoint growth rate of sales in an industry-destination (jk) market. When the firm is discontinuously serving an industry-destination, we fill in the export sales with a zero in the custom data between the first and the last year in which the firm appears to be serving that industry-destination. Otherwise, we would only be able to construct the growth rate for the industry-destination combination that we observe both at time t and $t+1$. This would be problematic because it would prevent us from capturing the fact that a firm may discontinuously serve an industry-destination market precisely because of the competition it faces on that market. Then, when t is also the last year in which we observe the firm in the dataset, then it is not possible to

Table 7 Summary Statistics

	Null employment of immigrants			Positive employment of immigrants			
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Diff.
Firm characteristics							
Total revenue (in thousands euros)	98,841	6,341.82	2.28e+04	120,198	4.91e+04	2.17e+05	***
Assets (in thousands euros)	98,841	2,776	3.90e+04	120,198	2.31e+04	1.61e+05	***
Nr. of employees	98,841	33.67	64.78	120,198	192.65	600.029	***
Share of employees in high-skilled occupations	98,696	0.313	0.242	120,198	0.324	0.202	***
Share of immigrant employees	0	0	0	120,198	0.119	0.188	***

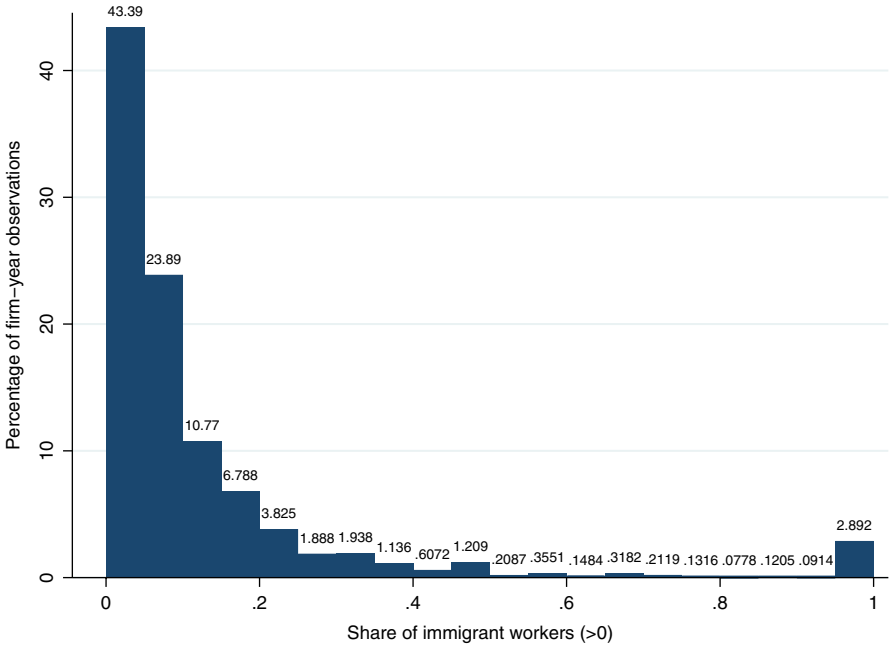

Fig. 2 Distribution of Immigrant Workers

compute the growth rate between time t and $t+1$. Conversely, when the firm is serving some other market jk' at time $t+1$, then the sales of the jk market at time $t+1$ are considered to be zero, and we are therefore able to compute the growth rate at time t.

An analogous procedure applies to build the probability which takes the value 1 when the firm serves in an industry-destination at time t *and* time $t+1$.

B Summary Statistics Descriptive Facts

C Theoretical Underpinnings

C. 1 Model Structure

We consider a world with n markets; a domestic market h (where h stands for *home*) and $n-1$ foreign markets. Mono-product firms maximise their profits independently on each market. Because we consider mono-product firms, a *market* equivalently identifies an industry-destination market or a destination market. To keep the model simple and illustrative, we assume that beachhead and fixed costs equal zero for all markets and we focus on firm performance on the export market.

The demand function faced by a firm i on a foreign market k at time t is given by:

$$q_{i,t}^{k}\left(p_{i,t}^{k}\right)=\chi_{i}^{k}-\zeta_{t}^{k}-p_{i,t}^{k} \tag{A.1}$$

Equation (A.1) is a non-negative demand function. In this function, χ_{i}^{k} denotes a time-invariant and market specific parameter that captures firm heterogeneity with respect to market k's conditions and ζ_{t}^{k} denotes a time-varying idiosyncratic shock related to foreign competition such as the competition faced from China. ζ_{t}^{k} is drawn at each period of time and is defined over a positive support. This shock can be considered as a demand shifter such that when competition increases on one market, demand decreases for this same market. In other words, ζ_{t}^{k} decreases the demand addressed to the firm for each price level. Following previous literature, we assume that there is no autocorrelation in ζ_{t}^{k} and no correlation between shocks across markets.

The profitability of firm i serving market k at time t is the following:

$$\mu_{i,t}^{k}\equiv\chi_{i}^{k}-\zeta_{t}^{k}-\frac{1}{\phi_{i,t}} \tag{A.2}$$

where $\phi_{i,t}$ denotes the productivity of the firm at time t. $\mu_{i,t}^{k}$ is a random variable which summarises the uncertainty that firm i faces on market k at time t. Upon the resolution of uncertainty (when χ_{i}^{k} and ζ_{t}^{k} are realised), $\mu_{i,t}^{k}$ determines whether the firm is able to serve the market or not.

We consider that the productivity of the firm is a positive function of its total workforce, such that $\phi_{i,t}=\Phi\left(l_{i,t}^{h},l_{i,t}^{m}\right)$, where $l_{i,t}^{h}$ and $l_{i,t}^{m}$ denote the firm employment of native and immigrant workers respectively and Φ is a CES aggregator. Both $l_{i,t}^{h}$ and $l_{i,t}^{m}$ are drawn from independent distribution functions at the beginning of period

t.[12] It follows that $\frac{\partial \phi_{i,t}}{\partial l^h_{i,t}} \geq 0$ and $\frac{\partial \phi_{i,t}}{\partial l^m_{i,t}} \geq 0$.[13] The CES production function allows to incorporate the fact that immigrant workers increase firm-level productivity because they are imperfect substitutes of native workers and through knowledge externalities.

Therefore, firm i is, *ceteris paribus*, more productive if it employs immigrant workers than otherwise, such that:

$$\phi_{i,t} \ni \left[l^m_{i,t} > 0 \right] > \phi_{i,t} \ni \left[l^m_{i,t} = 0 \right] \tag{A.3}$$

The per unit cost function faced by the firm on market k is the following:

$$v^k_{i,t} = \frac{1}{\phi_{i,t}} + \tau^k_{i,t} \tag{A.4}$$

where $\tau^k_{i,t}$ is an iceberg export cost specific to market k (with $\tau^k_{i,t} \geq 0 \forall k \neq d$ and $\tau^h_{i,t} = 0$). The variable export costs of the firm could be a decreasing function of the employment of (skilled) immigrant workers as these workers are known to lower informational barriers to trade. Adding this assumption would, however, not change the predictions of the model.

Firm i determines the quantity it will sell on market k by maximising the following programme:

$$\max_{q^k_{i,t}} \left\{ \left(\mu^k_{i,t} - \tau^k_{i,t} - q^k_{i,t} \right) q^k_{i,t} \right\} \tag{A.5}$$

which yields:

$$q^k_{i,t}\left(\tau^k_{i,t} \right) = \mathbb{1}_{\left\{ \mu^k_{i,t} > \tau^k_{i,t} \right\}} \left(\frac{\mu^k_{i,t} - \tau^k_{i,t}}{2} \right) \tag{A.6}$$

where $\mathbb{1}_{\left\{ \mu^k_{i,t} > \tau^k_{i,t} \right\}}$ is an indicator function that equals unity if the profitability of the firm on market k is larger than its export cost to that same market and zero otherwise.

C.2 Equilibrium, probability to serve a market for two consecutive years and export sales growth rate

We consider that firm i is too small to have an impact on the aggregate state of the economy. Therefore, we can infer that an equilibrium exists, and analyse firm i's

[12] We remain agnostic regarding the distributions of $l^h_{i,t}$ and $l^m_{i,t}$ by assuming that they are exogenous, and implement an instrumentation strategy in the empirical part of the paper.

[13] Assuming that immigrant workers may have a negative impact on firm productivity would not allow one to obtain a concave production function. In other words, it would not be optimal for firms to hire immigrant workers. There is, however, only limited evidence of this relationship (Parrotta et al. 2014).

probability to serve a market for two consecutive years and sales growth rate when it faces a marginal increase in competition on a foreign market k.

Chinese import competition and firm export performance. We start by studying how an increase in import competition impacts firm i's probability to serve a market for two consecutive years and its sales growth rate. Following Equation (A.6), a marginal increase in the import competition faced by firm i on market k at time t leads to a decrease in the sales of the firm on that market such that $\frac{\partial q_{i,t}^k}{\partial \zeta_t^k} = -\frac{1}{2}$. Therefore, the probability of firm i to keep serving market k when competition increases at the margin is negative and reads as follows:

$$\frac{\mathrm{dP}\left(q_{i,t}^k > 0\right)}{\mathrm{d}\zeta_t^k} < 0 \tag{A.7}$$

The sales growth rate of firm i on market k is akin to the following semi-elasticity which is also negative:

$$\frac{1}{q_{i,t}^k}\frac{\partial q_{i,t}^k}{\partial \zeta_t^k} = -\frac{1}{2q_{i,t}^k} < 0 \tag{A.8}$$

The mitigation effect of immigrant workers. We then study to what extent differences in the employment of immigrant workers may induce different firm-level responses in terms of both measures of export performance. We find that the drop in the probability of firm i to serve a market for two consecutive years is smaller if it employs immigrant workers:

$$\frac{\mathrm{dP}\left(q_{i,t}^k > 0\right)}{\mathrm{d}\zeta_t^k} \ni \left[l_{i,t}^m > 0\right] \geq \frac{\mathrm{dP}\left(q_{i,t}^k > 0\right)}{\mathrm{d}\zeta_t^k} \ni \left[l_{i,t}^m = 0\right] \tag{A.9}$$

Similarly, we find that the export sales growth rate of firm i drops by less if it employs immigrant workers:

$$\frac{1}{q_{i,t}^k}\frac{\partial q_{i,t}^k}{\partial \zeta_t^k} \ni \left[l_{i,t}^m > 0\right] \geq \frac{1}{q_{i,t}^k}\frac{\partial q_{i,t}^k}{\partial \zeta_t^k} \ni \left[l_{i,t}^m = 0\right] \tag{A.10}$$

Here, one should note that both terms of Equations (A.9) and (A.10) are negative, but the left terms are closer to zero than the right terms.

To conclude, the model predicts that, within an equilibrium defined at time t, immigrant workers mitigate the negative effect of an import competition shock on firm export performance.

D Construction of the variables of interest

D.1 Estimation of total factor productivity

In order to estimate the firm-level total factor productivity, we follow one of the most widely used approaches in the literature, and we estimate it according to the methodology outlined by Levinsohn and Petrin (2003). As a comparison, we provide estimates of TFP using the GMM approach suggested by Wooldridge (2009).

The control function approach developed by Levinsohn and Petrin (2003) is a two-step procedure that allows one to estimate production functions taking into account the correlation between unobservable productivity shocks and input levels. The production technology is assumed to be Cobb-Douglas in labour and capital, and the unobserved productivity term is expressed as a function of two observed inputs, intermediate inputs and capital.

Specifically for this paper, we estimate sector-specific productivity, *i.e.* we estimate a coefficient for the labour and the capital inputs specific to each NACE Rév. 2 2-digit industry. We use value added as left-hand side variable, and we deflate it using value-added industry-specific deflators from EU-KLEMS (base year, 2010). For the labour input, we use the number of employees (full-time equivalents) from the tax records. For the capital input, we use the book value of tangible assets as recorded in the tax records. We deflate the capital input using the industry-specific capital deflators from EU-KLEMS (base year, 2010). Finally, for the control function, we use intermediate inputs, computed as the sum of purchases of raw materials and merchandise. We deflate this using the industry-specific intermediate input deflators from EU-KLEMS (base year, 2010). To clean the data, we drop observations for which the revenues, the value added, or the labour input is less or equal to zero or missing, and we drop observations for which the capital input and the material input are missing, zero or negative. The estimates by industry, available upon request, are consistent among estimation methods.

D.2 Import competition measure

To construct the measure of import competition that a French firm faces at time t in an industry-destination pair jk, we follow the following four-step procedure.

1. We use the Comtrade data to obtain imports from China and from the World for each product-destination-year triplet.
2. We then construct a conversion table that uniquely assigns a time-invariant NACE Rév. 2 code to each HS6 code. The conversion table is built using the French custom data. In these data, a harmonised unique NACE Rév. 2 code is assigned to each product that firms export. Note that there are only 145 product lines (out of 6,000) that are assigned to more than one industry and only 8 products that are assigned to a different industry code over time. In order to overcome this problem, we construct time-invariant export-based weights to assign a time-invariant indus-

Table 8 Robustness Test: Alternative Variables of Interest

	(1) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$	(3) $\mathrm{D}\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(4) $\Delta S^{jk}_{i,t:t+1}$
$\Delta \mathrm{Comp}^{jk}_{t:t+1}$	−1.620***	−3.102***	−0.225***	−0.272***
	(0.337)	(0.916)	(0.016)	(0.046)
$\Delta \mathrm{Comp}^{jk}_{t:t+1} \mathrm{D(Immig)}_{i,t-1}$	1.786***	3.586***		
	(0.413)	(1.121)		
$\Delta \mathrm{Comp}^{jk}_{t:t+1} \mathrm{For}_{i,t-1}$			0.592***	1.020***
			(0.137)	(0.393)
Observations	6,513,842	5,636,640	5,964,517	5,153,405
Firm-year FE	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	25.09	24.11	505.85	498.56
Stock-Yogo critical value (10%)	16.38	16.38	16.38	16.38
First-stage coefficient	0.401***	0.401***	0.781***	0.788***
	(0.080)	(0.082)	(0.035)	(0.035)

This table reports IV-2SLS second stage estimations. $\mathrm{D(Immig)}_{i,t-1}$ denotes a dummy variable equal to one if firm i hires a positive number of immigrant workers at time $t-1$ and zero otherwise. $\mathrm{For}_{i,t-1}$ denotes the share of foreign-born workers employed by firm i at time $t-1$. The interaction term is instrumented in all columns. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses

try to these products. On average, the industry assigned to this product represents 84% of the export volume of that product. We are therefore able to assign a NACE Rév. 2 industry to most 6,000 products, which is roughly the same number of HS6 product lines contained in the Comtrade data.

3. We then merge the Comtrade data with the conversion table, we collapse the data by destination-industry-year triplet (jk, t).
4. Finally, we compute the measure of import competition growth as described in Eq. (2).

Additional tables of robustness tests

Table 9 Robustness Test: Alternative Level of Error Clustering

	(1) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$	(3) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(4) $\Delta S^{jk}_{i,t:t+1}$
$\Delta \text{Comp}^{jk}_{t:t+1}$	−0.250***	−0.344***	−0.250***	−0.344***
	(0.020)	(0.047)	(0.016)	(0.044)
$\Delta \text{Comp}^{jk}_{t:t+1} \text{Immig}_{i,t-1}$	1.012***	2.050***	1.012***	2.050***
	(0.216)	(0.526)	(0.173)	(0.478)
Observations	6,513,842	5,636,640	6,513,842	5,636,640
Firm-year FE	yes	yes	yes	yes
Industry-year FE	yes	yes	yes	yes
Cluster	Industry-destination	Industry-destination	District	District
Method	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	1,098.19	924.33	94.95	101.17
Stock-Yogo critical value (10%)	16.38	16.38	16.38	16.38
First-stage coefficient	0.707***	0.702***	0.707***	0.702***
	(0.021)	(0.023)	(0.072)	(0.070)

This table reports IV-2SLS second stage estimations. The interaction term is instrumented in all columns. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the industry-destination or at the district level are reported in parentheses

Table 10 Alternative Instrumentation Strategy

	(1) $D\left(S^{jk}_{i,t+1} > 0 \mid S^{jk}_{i,t} > 0\right)$	(2) $\Delta S^{jk}_{i,t:t+1}$
$\Delta \text{Comp}^{jk}_{t:t+1}$	−0.232***	−0.324***
	(0.018)	(0.056)
$\Delta \text{Comp}^{jk}_{t:t+1} \text{Immig}_{i,t-1}$	0.864***	1.881***
	(0.215)	(0.645)
Observations	5,482,223	4,716,819
Firm-year FE	yes	yes
Industry-year FE	yes	yes
Method	IV-2SLS	IV-2SLS
Kleibergen-Paap F Stat.	78.44	81.55
Stock-Yogo critical value (10%)	16.38	16.38
First-stage coefficient	0.689***	0.691***
	(0.078)	(0.077)

This table reports IV-2SLS second stage estimations. The interaction term is instrumented in all columns. Since the population census used to build the instrument (see equation 4) is available only from 2004, we lose the first two years of the sample in these regressions. ***, ** and * respectively denote significance at the 1%, 5% and 10% level. Robust standard errors clustered at the firm level are reported in parentheses

Table 11 Testing the Exclusion Restriction Assumption

	$\Delta IV_{d,2005:2014}$
$\Delta S^{jk}_{i,2004:2005}$	−0.020**
	(0.010)
	[95]
(log) Average wage in 2004	−0.000
	(0.001)
	[95]
(log) Total export value in 2004	−0.000
	(0.001)
	[95]
(log) Total employment in 2004	−0.001
	(0.001)
	[95]
(log) Total Factor Productivity in 2004	−0.004
	(0.005)
	[95]
	$\Delta IV_{d,2005:2014}$
$\Delta S^{jk}_{i,2002:2004}$	−0.004
	(0.008)
	[95]
(log) Average wage (diff. over 2002-2004)	−0.032
	(0.024)
	[95]
(log) Total export value (diff. over 2002-2004)	−0.032
	(0.024)
	[95]
(log) Total employment (diff. over 2002-2004)	−0.002
	(0.007)
	[95]
(log) Total Factor Productivity (diff. over 2002-2004)	−0.064**
	(0.028)
	[95]

This table reports OLS correlations. Standard errors are reported in parentheses. The number of observations is reported in brackets. The number of observations corresponds to the number of counties (French *départements*) available over the studied sample period

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