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EVIDENCE FROM FRANCE

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Résumé

Dans cette étude, nous utilisons des données d'entreprises pour examiner dans quelle mesure le commerce international modifie les négociations de salaires dans les entreprises françaises. Après avoir tenu compte de l'endogénéité des exportations et des importations par une technique de variables instrumentales, nous trouvons qu'un choc positif affectant les exportations d'une entreprise augmente la probabilité de signer un accord de salaire alors qu'un choc positif sur les importations a un effet inverse. Les exportations ont un effet positif sur les salaires de toutes les catégories de salariés alors que les importations ont un impact hétérogène selon les catégories. Dans les entreprises où des accords de salaire sont fréquemment signés, le gain salarial associé aux exportations est plus important et l'effet négatif des importations sur les salaires des ouvriers est atténué.

Mots-clé: commerce international, salaires, négociation collective

Codes JEL: F16, J51, E24

Abstract

Using a unique French firm-level dataset, we study how international trade affects the wage bargaining process at the firm level. Using instrumental variables techniques, we find that exports shocks have a positive effect on the probability that a firm-level wage agreement is signed, while shocks increasing imports of finished goods have the opposite effect. Exports increase wages for all occupational categories, whereas offshoring has heterogeneous effects. In firms where wage agreements are frequently signed, the export wage premium is larger, and blue-collar workers are protected against the negative impact of offshoring on wages.

Keywords: trade, wages, collective bargaining.

JEL Codes: F16, J51, E24.

Non-technical summary

In this paper we investigate the role played by collective wage bargaining institutions in shaping the effects of trade on wages in French manufacturing. More specifically, we examine how a multi-level bargaining system allowing for wage agreements both at the industry- and at the firm-level determines the impact of both exports and imports on firm-level wages. The role of collective bargaining has been thus far widely overlooked in the recent empirical trade literature. This is unfortunate. In most European countries a large part of the workforce is covered by collective agreements, and collective wage bargaining plays a key role in wage setting. France is as interesting case study: it is a large open economy with a long standing tradition of collective bargaining and an institutional setup similar to that of other European countries.

For our empirical analysis we match several detailed French administrative data sets containing firm-level information on exports and imports, balance-sheets, hourly wages by occupational category and wage agreements both at the firm- and industry-levels, for the period 2005-2009. We control for the endogeneity of exports and imports using firm-specific instruments based on world demand and supply shocks. One advantage of our data is that it allows us to study how both exports and offshoring affect wages in the same firm.

Our main findings are as follows. First, exports are estimated to have a positive and significant effect on the probability of signing a wage agreement at the firm level. On the contrary, offshoring has a negative but small effect on the occurrence of firm-level wage agreements. Besides, we find a negative correlation between industry-level wage agreements and the firm's import intensity. The results are robust to the inclusion of firm-level covariates, in particular firm size. One important implication is that wage bargaining is endogenous to trade shocks, contrary to what is commonly assumed in theoretical models. The between-firm variations in export and offshoring intensities translate into variations in bargaining regimes between firms (within narrowly-defined sectors).

Second, we provide the first comprehensive analysis of trade and wages in French manufacturing, adding to the literature highlighting between-firm variations as a driver of trade-induced wage inequality. We find a statistically significant positive effect of both exports and imports (or offshoring) on the hourly average wage. The export premium is similar for blue-collar and white-collar workers, technicians and executives. Offshoring has a

positive effect on wages of technicians and executives, whereas it has a slightly negative or statistically insignificant impact on blue-collar workers' wages. These results are in line with the standard assumption stating that offshoring and unskilled labor are potential substitutes in the production function. They are consistent with empirical evidence available for other developed economies.

Third, we investigate the effect of different wage bargaining regimes on the above results. We find that firm-level wage agreements slightly increase the export wage premium for almost all categories of workers. When the firm is not covered by a firm- or an industry-level agreement, the offshoring wage premium is negative or at most very small in all job categories. When the firm is covered by an industry-wage agreement, blue-collar and white-collar workers are protected against the negative impact of offshoring on wages. This effect of industry-level agreements on the wages of unskilled workers may explain why employers are less likely to sign wage agreements at the industry- level when offshoring increases.

The stylized facts we present can inform theoretical research. While there have been some efforts to understand how the bargaining regime (individual versus collective) shapes the effect of trade on wages the literature has not modeled how the choice is affected by trade shocks. The results showing that wage agreements neutralize the negative effects of offshoring in the wages of blue- and white-collars are consistent with the established idea that collective bargaining tends to compress the wage distribution within firms. While these aspects of unions have been studied intensively in closed economy models, our results point to their relevance in context of an open economy.

1. Introduction

What is the effect of globalization on wages in developed countries? Recent empirical contributions have shown that firm-level exports and imports are associated with higher wages, with possible heterogeneous effects according to the workers' skills or occupation (see Harrison et al., 2011, for a survey). The available empirical evidence is motivated by models assuming that wages are determined either in frictionless labor markets or through rent-sharing mechanisms, typically individual bargaining or fair-wage considerations. The role of collective bargaining has been thus far widely overlooked. This is unfortunate. In most European countries a large share of the workforce is covered by collective agreements, and collective wage bargaining plays a key role in wage setting (Venn, 2009).

In this paper we study how international trade and collective bargaining interact in wage setting. We match several detailed French administrative data sets containing firm-level information on exports and imports, balance-sheets, hourly wages by occupational category and wage agreements both at the firm- and industry-levels, for the period 2005-2009. France is a natural case study: it is a large open economy with a long standing tradition of collective bargaining and an institutional setup similar to that of other European countries (Du Caju et al., 2009).

Our first contribution is to show that international trade affects the wage bargaining process at the firm level. We control for the endogeneity of exports and imports using firm-specific instruments based on world demand and supply shocks in the spirit of Hummels et al. (2014) and Autor et al. (2013). We find that exports increase the probability that a firm-level wage agreement is signed whereas offshoring –imports of final goods – has a negative impact on that probability. The results are robust to the inclusion of firm-level covariates, in particular firm size. They extend the literature on trade integration and wage bargaining institutions. Earlier contributions studied whether union bargaining power is eroded by international competition (see, e.g., Dumont et al., 2006) but did not look at whether the bargaining regime itself is affected by trade shocks (mainly due to the non-observability of agreements in most datasets). One important implication is that the wage bargaining regime is endogenous to trade shocks, contrary to what is commonly assumed in theoretical models. The between-firm variations in export and offshoring intensities translate into variations in bargaining regimes between firms (within narrowly-defined sectors).

The second contribution of the paper is to investigate to which extent the impact of trade shocks on wages is modified by collective agreements. We proceed in two steps. First, we present the first comprehensive analysis of trade and wages in French manufacturing, adding to the literature highlighting between-firm variations as a driver of trade-induced wage

inequality.[1] One advantage of our data is that it allows us to study how both exports and offshoring affect wages in the same firm. We find that both exports and offshoring have a significant positive effect on average hourly wages. The effect of exports is similar across occupations. In the case of offshoring, our results suggest a strong heterogeneity across occupational categories: imports of final goods lead to higher wages for executives and technicians, but have negative or zero effects on the wages of blue- and white-collar workers. These results are in line with previous evidence (see, e.g., Hummels et al., 2014). Second, we look at how the above effects depend on the wage bargaining regime. The elasticity of wages to export shocks is larger in firms that frequently agree on wages, with effects being particularly significant for blue-collar workers and executives. The effects of offshoring also depend on the type and frequency of wage agreements. In firms that do not report wage agreements, offshoring reduces the wages of blue- and white-collars. In firms covered by industry-level wage agreements the effect of offshoring for blue- and white-collars is zero, and that for executives is positive and larger than in firms with firm-level wage agreements. These results add to a small but burgeoning empirical literature looking at the role of collective bargaining in shaping the effects of trade on wages (see, e.g., Braun and Schefel, 2007; Kramarz, 2010; Bastos and Wright, 2012; Felbermayr et al., forthcoming).[2] Contrary to previous works, we study the effect of both exports and imports, and we control for their endogeneity using world demand and supply shocks as instruments. Taken together, our two empirical contributions provide a comprehensive picture of the complex interactions between trade, wages, and collective bargaining institutions.

The stylized facts we present can inform theoretical research. While there have been some efforts to understand how the bargaining regime (individual versus collective) shapes the effect of trade on wages (see, e.g., Felbermayr et al., 2011, and Ranjan, 2013) the literature has not modeled how the choice is affected by trade shocks.[3] The results showing that wage agreements neutralize the negative effects of offshoring in the wages of blue- and white-collars are consistent with the established idea that collective bargaining tends to compress the wage distribution within firms. While these aspects of unions have been studied intensively in closed economy models, our results point to their relevance in context of an open economy.

[1] Helpman et al. (2012) document that, in the cases of Brazil and Sweden, between-firm wage dispersion accounts for a large share of the growth in within sector-occupation wage inequality, sustaining the view that firm heterogeneity is a fundamental driver of wage inequality.

[2] Which contrasts with an extensive body of theoretical (Naylor, 1999; Skaksen, 2004, Lommerud et al., 2009, Ranjan, 2013; to cite some of them).

[3] For endogenous bargaining choices in closed economies see, e.g., Acemoglu et al. (2001) and Taschereau-Dumpouchel (2013).

Our paper is organized as follows. Section 2 provides a brief discussion the theoretical analyses of trade and wages. In Section 3, we describe the different datasets and the construction of the estimating sample. Section 4 explains our empirical strategy to estimate the effect of trade on wages. In Section 5, we present our empirical results. Section 6 concludes.

2. Theoretical background

We now briefly review the main mechanisms and predictions of the recent theoretical models linking firm-level wages to firm's participation in international trade.

The recent literature builds upon the seminal contribution by Melitz (2003) that features firm heterogeneity in productivity and fixed export costs. Trade liberalization reallocates resources towards the more productive firms, raises their profits and leads the least productive ones to exit. The heterogeneity in profits and trade status of firms does not translate into wage heterogeneity because all workers are homogenous and labor markets are frictionless. Theoretical explanations of the higher wages paid by traders depart from those assumptions and can be roughly classified in two groups: those resorting to "composition effects" and those modeling "rent-sharing".

The first set of papers allows for worker heterogeneity in skills while maintaining the assumption of competitive labor markets. Wages reflect marginal productivities. In equilibrium exporters employ better workers and thus pay higher average wages than non-exporters. Representative examples of this class of models are Yeaple (2005) and Bustos (2011) where trade liberalization induces the most productive firms to adopt a skill-intensive technology. Verhoogen (2008) highlights the role of quality upgrading, and Burstein and Vogel (2012) and Harrigan and Reshef (*forthcoming*) assume more productive firms use more skill-intensive technologies. The effects of offshoring are also heterogeneous across workers. Different types of local workers and imported goods interact differently in the production function. Imports of goods which are complement to local workers (for example, intermediate goods) boost their marginal productivity and their demand, affecting their wages positively. Imports of goods that are substitutes to local workers have the opposite effect. In general it tends to be that skilled workers are complementary to imports. However it has been highlighted by Grossman and Rossi-Hansberg (2008) that offshorability of tasks depends on the degree of routineness of the task performed, with more routine tasks being more offshorable and thus a substitute to imports.

A second group of models focuses on the role of rent-sharing between firms and workers. This class of models generates a true "trade wage premium" in the sense that wages are above workers' marginal productivities. Rent-sharing arises in the presence of labor

market frictions that take different forms. The models by Egger and Kreickemeier (2009) and Amiti and Davis (2012) feature fair wages, where workers exert effort only if they receive a wage which is considered as fair (and that raises with firms' profits). Davis and Harrigan (2011) introduce efficiency wages *à la* Shapiro and Stiglitz (1984), where wages are risen to avoid worker shirking. A prominent class of models introduces search-and-matching frictions and individual wage bargaining that ties wages to profits, as in Felbermayr et al. (2011) and Helpman et al. (2012).[4] The importer wage premia can also be generated through rent-sharing mechanisms. Offshoring raises profits, and if wages are tied to profits via a rent-sharing mechanism, then imports positively affect wages irrespective of skill levels (assuming the rent-sharing mechanism affects all workers equally). The productivity effect of offshoring has been formalized in Grossman and Rossi-Hansberg (2008) and it is also in line with a large literature on the effects of imported inputs on domestic productivity (Amiti and Konings, 2007; Halpern et al. 2012). Amiti and Davis (2012) and Egger et al. (2013) develop Melitz-type models with fair wages fixed import costs. Workers, which are homogenous in terms of skill, capture a share of the efficiency gains in the form of higher wages.[5]

A set of models studies collective bargaining as a particular rent-sharing mechanism, with wages determined through a bargaining process between firms and trade unions. The predictions depend on the whether the elasticity of labor demand increases or decrease with trade liberalization. The reason is that unions internalize the reduction of employment entailed by wage increases[6]. Lower labor demand elasticity allows the union to demand higher wages with less negative effects on employment. The general prediction is that reductions in trade costs decrease the elasticity of labor demand, leading to a positive correlation between exports and wages (e.g. Naylor, 1998 and 1999, Bastos and Kreickemeier, 2009). However, it is theoretically possible to generate a negative effect of exports on collectively bargained wages. It is the case of models where trade liberalization leads to strong competition between firms and an increase in the elasticity of labor demand (due to variable markups as in Montagna and Nocco, 2013 or when one compares the cases of autarky and free trade in oligopoly models such as Egger and Etzel, 2009 and Naylor, 1998 and 1999). There is also an established

[4] In Helpman et al. (2012) the exporter wage premium is generated by a combination of both rent-sharing and composition effects. Other than selection, they highlight a market access effect, which leads exporters to monitor more intensively in equilibrium. As a result, exporters employ better workers than domestic firms, and these workers extract a share of the extra surpluses by individual wage bargaining.

[5] Setupathy (2013) posits a similar argument based on bilateral bargaining between workers and offshoring firms.

[6] To capture the wage-employment trade-off, most of these models are based on either the in the right-to-manage or the monopoly union models, where wages are set prior to employment. The result is that employment reacts to wages increases (i.e. firms are on the labor demand curve). This contrasts with the efficient bargaining model where wages and employment are simultaneously bargained.

literature that formalizes the wage effects of offshoring when wages are set through collecting bargaining. Here again results depend on whether offshoring increases or decreases the elasticity of home labor demand. In turns this depends on how local and foreign workers interact in the production function. When local and foreign workers are substitutes, offshoring provides the firm with an outside option: the threat of moving production abroad constrains wage demands by the local union. Hence, labor demand becomes more elastic and leads to lower union wages. A negative relationship between offshoring and union wages in the case of imports that are substitute to local workers arises.[7] The opposite is true when local and foreign workers are complements (see Skaksen and Sorensen, 2001 and Lommerud et al., 2009).

There is a prominent literature studying the effect of collective bargaining on wage outcomes. Of interest to our empirical analysis is how the level of centralization of bargaining affects wage outcomes. Calmors and Drifill (1988) argue that the relationship between wages and decentralization has an inverse U-shaped: centralized and very decentralized wage bargaining lead to wage moderation whereas intermediate levels of wage bargaining are associated with highest wage claims by unions. In particular, at the firm-level, unions are more concerned with firm-level idiosyncratic productivity shocks whereas at the industry-level, firms are more likely to shift wage increases on output prices (in a closed economy). One implication of this result is that wages negotiated at the firm level may be more closely related to firm' productivity shocks. The dispersion of wage distribution may be larger under firm-level bargaining regime than under industry-level bargaining regime.[8] In turn, wage dispersion tends to be lower with firm-level collective bargaining than with individual bargaining of the type assumed in the trade models reviewed above, where each worker negotiates bilaterally with the firm on the split of his marginal product. The theoretical literature highlights that the occurrence of collective bargaining requires a coalition between workers. Some models endogeneize these coalitions by focusing on how incentives for collective bargaining vary with worker productivity and skill. Low-marginal-product workers (generally low-skilled) tend to be in favor of collective bargaining, and high-marginal product individuals (generally high-skilled) tend to be against it (Taschereau-Dumouchel, 2012 and Acemoglu et al., 2001). An implication is that structural changes affecting the relative marginal productivities of skilled versus non-skilled individuals will impact the bargaining structure.

[7]Analytically, offshoring improves firms' bargaining power by providing an outside option. Unions respond to this threat by lowering their wage demands (in the fear of employment losses). This implies a negative relationship between "potential" offshoring and union wages. Ranjan (2013) points out that this implies that regressing wages on actual offshoring provides a lower bound of the total effect. Skaksen (2004) discusses theoretically the impact of potential versus realized offshoring on union wages.

[8] See Dahl et al. (2013) and Kristal and Cohen (2007) for empirical evidence. In a seminal contribution, Agell and Lommerud (1992) provide a theory of the welfare effects of wage compression by unions.

Our main contribution is to present novel stylized facts that can be understood through the lens of these models and can inform future research on the topic. In particular, our estimations will help us understand to which extent the wage bargaining regime affects the way international trade shocks are transmitted to wages.

3. Data

We use three administrative French data sets with firm-level information on imports and exports in values, wages and the number of hours worked, and collective wage agreements signed at the firm level. We complement these with a detailed firm balance-sheet dataset. We match the datasets using a common firm identifier. We now describe the data sources.

Trade and balance-sheet data

Our trade data comes from a quasi-exhaustive administrative file collected by the French Customs.[9] The value of imports (by country of origin and product) and the value of exports (by country of destination and product) are reported at a monthly frequency for every firm over the period 1996-2009. Products are originally classified at the CN 8-digit level (EU - Combined Nomenclature), but, in order to construct our instruments of firm-level trade flows, we aggregate trade flows at the 6-digit level of the Harmonized System (HS6). We restrict our sample to imports and exports of manufactured goods by manufacturing firms.[10] Since wage and balance sheet data are collected at an annual frequency we compute the sum of exports and the sum of imports in a given year for each firm.

The effects of imports on wages might potentially differ according to whether the imported goods complement or substitute for local production. We follow the methodology proposed by Feenstra and Hanson (1999) and define imports of "finished goods" as imports of products belonging to the industry code that the importing firm reports as its main activity (see also Hummels et al., 2014). These goods are more likely to be substitutes to local production. In practice, we map each HS6 code in our sample into one (or more) NAF Rev2 3-digit industries (French classification of economic activities, identical to the European Community

[9] Flows with non-EU countries whose value is below 1,000 Euros are not in the dataset. In the case of EU countries, the threshold is larger, varying from 40,000 to 150,000 Euros depending on the year. These thresholds leave out a very small proportion of French trade flows.

[10] Our definition of manufactured goods excludes the following HS Chapters: "Animal and Animal Products" (HS01-05), "Vegetable products" (HS06-15), "Residues from food industries, animal feed" (HS23), "Mineral products" (HS25-27), "Fertilizers" (HS31), "Raw hides and skins and leather" (HS41), "Works of art, collector's pieces and antiques" (HS97), and "Services" (HS98-99). Excluded trade flows corresponding to these products only represent about 5% and 6% of the total value of French imports and exports, respectively. We define manufacturing firms are those whose main activity falls within the 2-digit sectors 15-33 of the NACE Rev 2 classification.

classification NACE Rev2) [11]. For simplicity we use the term "narrow offshoring" or "offshoring" to refer to this subset of imports and "broad offshoring" or "imports" for total imports. By construction, all flows non-identified as final goods are classified as intermediate goods according to the Feenstra and Hanson (1999) criterion.

We match the trade data with an administrative balance sheet dataset, the BRN dataset ("Bénéfices Réels Normaux"). It provides us with firm-level balance sheet information on value added, sales, employment, material usage, capital stock and main sector of activity at the 4-digit NAF Rev 2 level (plus other variables). [12] The data is provided by INSEE and constructed from tax records which are mandatory for firms with turnover higher than 730k euro/year, and optional for firms below the threshold. The original file has information on around 700,000 firms per year belonging to all sectors of the economy. Using firm balance sheet information, we estimate total factor productivity (TFP) as the residual of a two-factor (capital and labor) Cobb-Douglas production function. TFP is estimated separately for each 2-digit industry using data on 1,026,147 observations over the period 1993-2009. Our preferred measure uses the Levinsohn and Petrin (2003) method. The BRN dataset includes over 60% of French firms. Although it leaves out small firms, the sample composed of remaining firms account for more than 90% of the value of trade flows in the Customs dataset. Previous empirical contributions matching these datasets include Eaton et al. (2004, 2011) and Berman et al. (2012).

[Insert Figure 1]

Matching the trade and balance sheet datasets we obtain a sample consisting of about 125,000 firms in manufacturing, with information on trade flows for 1996-2009. Trade flows at the firm-level are highly persistent over time. We compute for every firm the frequencies of exports, imports and offshoring which are defined as the ratio between the number of years with positive exports, imports or offshoring on the total number of years the firm is observed in our sample. Figure 1 plots the distributions of those frequencies. Firms are concentrated at both tails of the distribution (Table 1): about 20% of firms both export and import more than 50% of the years over the period 1996-2009, they are considered as "established two-way" traders. Two thirds of firms both exports and imports during less than 50% of the years, they are considered as "occasional traders" or non-traders. Finally, only 15% of our observations are firms that either import more than 50% of the years or export more than 50% of the years

[11] More specifically, we first map all HS codes into the 2007 version of the HS system. We then use a concordance table provided by Eurostat (from the RAMON Metadata Server) to map the HS2007 codes into the European product classification CPA2008. The CPA2008 is identical to the French product classification CPFRev2. Finally, we use concordance tables from INSEE to map CPFRev2 product codes into industry NAFRev2 3-digit codes. We obtain similar results if we use 4-digit codes.

[12] Close to the 4-digit NACE Rev 2 Classification (although slightly more disaggregated), which in turn is close to the 4-digit ISIC Rev3Classification

over our sample period: these firms are classified as frequent exporters or as frequent importers. Overall, the status of firms which both export and/or import does not change much over time: exporting or importing firms tend to remain exporters or importers over the whole sample period.

[Insert Table 1]

Given the above, our empirical analysis focuses on how variation in the intensive margin of trade impacts wages, (i.e. conditional on observing positive trade values).[13] In practice, we restrict our sample to "established two-way" trades, defined as firms that both import and export at least 50% of years they appear in the panel.[14] This allows us to exclude occasional traders that might generate spurious results.

Wages and wage agreement data

Data on wages come from an administrative exhaustive data set called DADS ("*Déclaration Annuelle de Données Sociales")*. All French firms must report information on wages and workers' characteristics for their employees once a year (usually in December). For every plant located in France with at least one employee, we have information on the total wage bill (calculated as the sum of annual wages paid by the firm, net of employer contributions and excluding bonuses), and the total number of hours worked over the period 2005-2009 for each of the four following job categories: "administrative and commercial executives (including engineers)", "technicians and supervisors", "white-collar employees", "production (blue collar) workers". These job categories are based on the French "*Nomenclature des professions et catégories socioprofessionnelles"* (PCS). We compute the firm's average hourly wage rate in each year between 2005 and 2009 and for each job category. We also compute the average hourly wage for a given firm as the sum of wage bills of all job categories divided by the sum of hours worked in a given firm for all categories of workers. Finally, the DADS dataset provides the number of jobs in each category in each year between 1996 and 2009, which we use as a proxy for the share of skilled workers.[15] We restrict our sample to firms for which we are able to compute an average hourly wage for all categories of workers.

[13] It is very difficult to come up with suitable instruments that account for selection into exports and imports.

[14] To check for robustness, we have also restricted our sample using a threshold of 75%. Results remain very similar.

[15] Each job corresponds to an individual worker in a plant. Given that observation frequency is annual, it might happen that a worker has moved between two plants of the same firm. We have checked for this and in more than 98% of observations the number of jobs is equal to the number of employees. Although the data refers to occupations, it has often been used to proxy for the workers' skill level. See recent examples in Cahuc et al. (2006) and Eaton et al. (2011). Caliendo et al. (2012) show that average wages are inversely linked to the position in the PCS.

We also have information on wage bargaining at the firm- and industry- levels. French firms are required by law to negotiate on wages every year (since 1982). Every concluded agreement must be reported to the French Ministry of Labor. The Ministry of Labor gathers firm- and industry levels agreements and constructs a research firm-level dataset containing all agreements concluded over the period 1994-2009. The variables contained in this dataset include a firm identifier, the date of the agreement and the main scope of the agreement (wages, bonuses, workweek reduction, employment, discrimination, etc.). We only consider agreements dealing with wages. Firm-level agreements in France cover all workers within the firm, independent of whether they are members of a trade union or not (unlike the cases of the US and the UK for example). Avouyi-Dovi et al. (2013) report that about 20% of employees are covered by a firm-level wage agreement and that wage agreements are more frequent in large firms. Finally, we have information on the occurrence of a wage agreement at the industry-level for the 300 largest industries in France (called *branches* in French). Each year, about two thirds of employees are covered by an industry-wage agreement. More details on the agreements data are available in Avouyi-Dovi et al. (2013).

The estimating sample

Our matched sample contains about 22,000 observations for a little less than 7,000 firms which account for about two thirds of the total value of both exports and imports over the period 2005-2009. The main variables included in our baseline sample are firm-level hourly wages (both on average and by occupational category), yearly values of export and import flows, a dummy variable indicating whether a firm is covered by a firm-level or an industry-level wage agreement in a given year, firm-level controls (number of employees, TFP, proportion of temporary workers, domestic sales, share of skilled workers and capital-labor ratio) and the local unemployment rate.

Table 2 reports some descriptive statistics on trade and average hourly wages in the firms observed in our sample over the period 2005-2009. Exports and imports increased steadily from 2005 to 2008, before dropping sharply in 2009. While the hourly wage of blue- and white-collar workers increased on average by a little less than 3% (even between 2008 and 2009),[16] the hourly wage of supervisors and executives dropped after the beginning of the 2008 crisis. We will test for the impact of the Great Recession on our results by excluding the year 2009 from some of our estimations.

[Insert Table 2]

Instrumentation strategy

[16] This increase is partly driven by national minimum wage increases which are linked to past inflation.

We face a potential endogeneity problem. Unobservable shocks might simultaneously affect wages, export and import flows in a given firm and a given year. These biases make OLS estimates inconsistent. To reduce these potential biases we use instrumental variables which should reflect exogenous shocks to the profitability of exporting and importing and be uncorrelated with firm-level wage-setting policies. A recent strand of literature shows that such instruments can be constructed using demand and supply shocks occurring in the rest of the world (e.g. Hummels et al., 2014, Autor et al., 2013). The underlying idea is that a shock to the demand of a given product *p* in a given country *c* would translate into higher imports of product *p* for the country *c*. French firms exporting the product *p* would then benefit from this increased demand and raise their exports to country *c*. Exogeneity is ensured by the fact that demand shocks in foreign locations are independent of French firms' wage determination. Similarly, increases in world exports of product *p* by country *c* should reflect increases in the competitiveness of country *c* for the product *p* (which can be due to exogenous variations in productivity, costs or product quality in country *c*). French firms would respond to these shocks by increasing their imports of product *p* from country *c*. These shocks help us to generate variations in French firms' imports which are exogenous to their wage setting behavior.

We construct our instruments using trade data at the 6-digit level of the Harmonized System HS, obtained from the BACI dataset constructed by CEPII.[17] Our instruments provide country-time-product variation which is firm-specific, by virtue of firm-level specialization in trade patterns. For every French firm, we consider world demand (respectively, supply) only from countries where a given French firm actually exports (respectively, imports) and for products a given firm actually exports (respectively, imports). More precisely: for a given firm, we select all pairs of exported (respectively, imported) products and countries of destination (respectively, origin) and aggregate world demand $\mathrm{WD}_{\mathrm{cpt}}$ (respectively, supply $\mathrm{WS}_{\mathrm{cpt}}$) (excluding France) corresponding to those pairs of products and countries (*c,p*) at date t. To aggregate world demand (respectively, supply) at the firm-level, we use shares s_{icp} of each pair (product *p*, country *c*) in total exports (respectively, imports) of a given firm *i*: The world demand addressed to firm *i* in year *t* is thus:

$$WD_{it} = \sum_{c,p} s_{icp} WD_{cpt}$$

Similarly, the world supply associated with firm *i* in year *t* is defined as:

[17]The BACI dataset is constructed using bilateral trade data at HS 6-digit level from COMTRADE. It can be downloaded at http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=1

$$WS_{it} = \sum_{c,p} s_{icp} WS_{cpt}$$

One issue here is to define the firm-specific shares s_{icp} in the equations above. We need to identify quite precisely the set of product-country combinations towards which the firm potentially exports (respectively, from which it potentially imports), so that instruments have a rather good predictive power. Hummels et al. (2014) suggest that a good approximation for Denmark is to take, for each firm *i*, the pre-sample set of imported (exported) product country pairs as the relevant set of market shares for firm *i*. One advantage of using pre-sample values is that they reduce endogeneity concerns, arising for example from technological changes prompting the firm to change the set of products and its wage setting simultaneously. An obvious drawback is that instruments rely only on a few years of observations to derive the relevant markets of firm *i* and the set of products exported or imported. This may raise measurement error concerns on the shares of pairs (country, products) if those pairs change quite frequently and temporarily. Another potential concern is that if the set of products do actually change over time (permanently or temporarily), the representativeness of pre-sample values fades away, potentially creating a problem of weak instruments. Hummels et al. (2014) argue that in the case of Danish firms, this is a small concern since the set of imported and exported products is relatively stable over time. Berman et al. (2012) show that the sets of products and countries are far less stable for French firms and they define s_{icp} as the average share of each pair (product *p*, country *c*) in total exports (respectively, imports) of a given firm *i* on the whole period the firm is observed. Here, we construct our instruments using weights computed over the period 1996-2004 and alternatively over the period 1996-2009. We present only results using instruments calculated for the period 1996-2004 but results are very similar when instruments are calculated over the period 1996-2009.[18]

We then assume that $\ln exp_{it}$ and $\ln imp_{it}$ are generated by the following linear equations:

$$\ln exp_{it} = \gamma_{WD} \ln WD_{it} + \gamma_{exp} x_{it} + \alpha_i^{exp} + \lambda_t^{exp} + \epsilon_{it}$$

and

$$\ln imp_{it} = \gamma_{WS} \ln WS_{it} + \gamma_{imp} x_{it} + \alpha_i^{imp} + \lambda_t^{imp} + \zeta_{it}$$

[18] We also have included exchange rates in the set of instruments but they were found to have a small or even insignificant impact on exports and imports. This may be due to the large share of trade within the Euro area, implying a small variability on average exchange rates.

where x_{it} are firm-level controls including a dummy variable indicating whether a firm is covered by a an industry-level wage agreement in a given year, number of employees, TFP, the proportion of temporary workers, domestic sales, the share of skilled workers and capital-labor ratio) and the local unemployment rate, ${\alpha_i}^{exp}$ and ${\alpha_i}^{imp}$ are fixed effects (specific to firm *i*), ${\lambda_t}^{exp}$ and ${\lambda_t}^{imp}$ are year dummies (common to all firms), and ϵ_{it} and ζ_{it} are i.i.d. random terms (white noises) with mean 0 and variances ${\sigma_\epsilon}^2$ and ${\sigma_\zeta}^2$, respectively. Slope parameters γ_{WD}, γ_{WS}, γ_{exp} and γ_{imp} are unknown and have to be estimated. Those two regressions yield consistent estimates of $\ln exp_{it}$ and $\ln imp_{it}$, which are denoted $\ln \widehat{exp}_{it}$ and $\ln \widehat{imp}_{it}$.

[Insert Table 3]

Table 3 reports parameter estimates of the first-stage regressions of the logarithms of exports and imports ("broad offshoring" or "narrow offshoring") on firm-level instrumental variables and controls for the period 2005-2009. Each first-step regression is estimated both with and without firm controls. In each case, the regression includes firm-specific fixed effects and year dummies. Standard errors are clustered at the firm level. As expected, world demand (respectively, supply) has a positive and statistically significant effect on exports (respectively, on imports). The values of the F-statistics indicate that these instruments are not weak. The estimations show that size, productivity and capital- and skill-intensity are associated with larger values of firm-level imports and exports, consistent with firm heterogeneity theories of international trade. Their inclusion reduces the magnitude of the coefficient associated with the instruments, without affecting their significance levels.

4. The impact of trade on wage agreements

Before investigating the impact of trade on the occurrence of wage agreements at the firm- and at the industry levels, we describe the main features of the wage bargaining sytem in France.

Wage bargaining institutions in France

The institutional features of collective wage bargaining in France are very similar to that of continental European countries (Du Caju et al., 2009). The main characteristics of the French system are the following. First, wages can be set in France at three different bargaining levels: (i) at the national level, a binding minimum wage is set by the government according to a formula; (ii) at the industry level, employers' organisations and unions bargain on wage scales by occupation; (iii) at the firm level, employers and unions usually bargain on wage increases. There is a strict hierarchy between the different levels of wage

bargaining: a collective agreement must set forth, broaden or enhance an agreement which has been previously signed at a higher bargaining level. By law, all firms or industries must bargain on wages with unions even if an agreement cannot be reached at the end of the bargaining process. If there is no collective wage agreement, individual wage increases are possible. Industry-level wage agreements are quite common, covering more than two thirds of the labor force, whereas firm-level wage agreements cover about 20% of employees (Avouyi-Dovi et al., 2013). In France the unionization rate is very low (less than 10 percent) whereas the coverage of wage agreements is quite large (over 70%). To main explanations are often advanced: (i) firm-level agreements cover all workers within the firm and not only unionized workers (unlike the case of United States or the United Kingdom); (ii) at the industry level, administrative extension procedures allow agreement to cover all workers within an industry. Extension procedures are common in France and no specific criterion is needed to obtain an extension. Finally, while in several European countries a clear trend towards decentralization of wage bargaining is observed over the last thirty years (see, e.g., Du Caju et al., 2009, Dahl et al., 2013), frequencies of industry- and firm-level wage agreements are rather stable over our sample period in France (see Avouyi-Dovi et al., 2010).

In our sample, about 24% of firms signed a wage agreement over our sample period. Heterogeneity among firms is quite large. On average, 43% of firms with more than 100 employees signed a wage agreement, versus only 7% for firms with less than 100 employees. At the industry level, 82% of firms are covered by a wage agreement with no differences due to firm size.

[Insert Figure 2]

Descriptive evidence

We now relate firm trade activities to wage bargaining. For every firm in our sample, we compute export and import (or offshoring) intensities as the ratio of exports on total sales, and the ratio of imports (or offshoring) on inputs, respectively. For each quintile of the distributions of export and import (or offshoring) intensities, we calculate the frequency of wage agreements. Figure 2 plots the frequency of firm-level wage agreements by trade intensity. Figure 2a uses all firms and Figure2b considers separately large (over 100 employees) and small firms (less than 100 employees). Among firms with the lowest export intensity (i.e., belonging to the first quintile), 17% sign a wage agreement, whereas 30% of firms characterized by the highest export intensity (i.e., belonging to the highest quintile) do so. This result is quite similar for small (from 5 to 9%) and large firms (from 40 to 50%). Thus the occurrence of a wage agreement appears to be positively correlated with the firm's export

intensity (and this is not driven by firm size). The correlation between the frequency of wage agreements and firms' import intensity is less clear. It seems quite stable over the quintiles of the distribution of import or offshoring activities. However, for small firms, the frequency of wage agreements decreases from 9% to 4% when going from the first to the last quintiles of the distribution of offshoring intensity.

[Insert Figure 3]

Figure 3 plots the frequency of industry-wage agreements by trade intensity for all firms (exports on Figure 3a and imports on Figure 3b). The frequency of industry-level wage agreements seems only weakly positively correlated with the export intensity. The negative correlation between import (or offshoring) intensity and the proportion of industry-level wage agreements is larger than for firm-level agreements. For instance, the frequency of industry-wage agreements decreases from 85% to 78% between the first and the last quintile of the distribution of firms' import intensity.

At the disaggregate industry level (4-digit), we calculate the median trade intensity (export, import and offshoring) and the frequency of firm- and industry-level wage agreements. Table 4 reports simple correlations between those variables. We find a significant negative correlation between offshoring and both the frequency of industry- and firm-level agreements (whereas the correlation between export intensity and the frequency of wage agreements is positive but small and statistically insignificant).

[Insert Table 4]

Empirical model

We estimate a Probit model relating the occurrence of a firm-level a wage agreement to exports and imports over the period 2005-2009. Our basic model is the following:

$$y_{it} = 1 \ if \ y_{it}^{*} > 0$$

and

$$y_{it} = 0 \ if \ y_{it}^{*} \leq 0$$

with $y_{it}^{*} = \beta_{exp} \ln exp_{it} + \beta_{imp} \ln imp_{it} + \beta_x x_{it} + \alpha_i \quad + \lambda_t \quad + \varepsilon_{it}$

and where y_{it} is a variable equal to 1 if a wage agreement has been signed in a given firm *i* and in a given year *t*, $\ln exp_{it}$ is the logarithm of exports of firm *i* in year *t*, $\ln imp_{it}$ is the logarithm of imports or offshoring of firm *i* in year *t*, x_{it} is a vector of covariates including firm-level controls in year *t* (number of employees, TFP, domestic sales, the proportion of temporary workers, the share of skilled workers and capital-labor ratio), the local unemployment rate, a dummy variable equal to one if a wage agreement is signed the same

year at the industry-level, industry(4-digit)-level dummies, α_i is a random effect (specific to firm *i*), λ_t is a year dummy, and ε_{it} is an i.i.d. random term (white noise) with mean 0 and variance ${\sigma_\varepsilon}^2$.

[Insert Table 5]

Table 5 reports the results. First, without controlling for the potential endogeneity of exports and imports (first column of the table), exports have a statistically significant positive impact on the probability of a wage agreement at the firm level: marginal effects suggest that a 1% increase of exports leads to a 0.4 pp increase in the probability of a wage agreement at the firm-level.[19] After controlling for endogeneity of exports, the impact remains positive and statistically significant (second column). The marginal effect is estimated to be a little larger (0.5 pp) and even larger when we estimate the model over the period 2005-2008 (0.6 pp).

The effect of narrow offshoring is negative in all specifications but not statistically significant when we estimate the model over the period 2005-2009. When we exclude the year 2009, offshoring is estimated to have a negative and statistically significant effect on the frequency of firm-level wage agreements. The marginal effect is a little smaller than -0.3 pp.

If we consider broad offshoring (including imports which are complement to local production), increasing imports has a positive significant effect. Increasing imports by 1% leads to a 0.6 pp increase in the probability of occurrence of a firm-level wage agreement (whereas the marginal effect of exports decreases to 0.3 pp and becomes statistically insignificant). This result suggests that when imports are substitutes for local production, the impact of offshoring is lower than when total imports are considered:

Our estimations show that export shocks may lead workers to negotiate more frequently on wages. The results sit well with the idea that the extra surpluses created by foreign demand prompt workers to bargain collectively to extract some of these rents. This idea fits within the long-standing notion that unions are rent-seeking entities.[20] However, and interestingly, we find that shocks leading to offshoring of finished goods have the opposite effect. This result is consistent with the idea that offshoring provides firms with substitution possibilities that weaken worker bargaining power.

Finally, control variables have the expected effects (see Avouyi-Dovi et al., 2013). Firm size appears as a crucial determinant: the marginal effect is over 10 pp. This size effect might be at least partly associated with the bargaining power of employees since in large firms, union rates are higher. The share of temporary workers is found to have a statistically

[19] Since the wage agreement process is highly persistent, our identification relies mainly on variations between firms.

[20] Hauptmann , Capuano and Schmerer (2014) provides a model that rationalizes this results.

significant negative impact. Temporary workers may have a lower bargaining power, which reduces the frequency of wage agreements. The impact of the skill share is negative, consistent with the idea that collective bargaining favours relatively unskilled individuals, but it is however not statistically significant. Finally, industry-level and firm-level agreements are positively correlated. When a firm is covered by an industry-level agreement, the likelihood of a wage agreement at the firm level is higher (Table 5).

5. How do bargaining institutions shape the effect of trade on wages?

We now study the impact of import and export flows on firm wage levels according to the wage bargaining regime and by job category.

Descriptive evidence

Figure 4 plots the firm's average hourly wage (considering all workers employed in the firm, whatever their job category) as a function of export, import and offshoring intensities. Wages and export intensity are positively correlated: the average hourly wage is 15.4 Euros for firms with the lowest export intensity (i.e., those in the first quintile of the distribution) and 17.6 Euros for firms with the highest export intensity (i.e., those in the last quintile of the distribution).

[Insert Figure 4]

This positive export wage premium is observed for all categories of workers (Figure 5). The wage difference between firms with the lowest and the highest export intensities is higher than 5% for all job categories. Import and offshoring intensities are also positively correlated with the average total hourly wage: the average hourly wage is 16 Euros for firms with the lowest import intensity (i.e., those in the first quintile of the distribution) and 16.9 Euros for firms with the highest import intensity (i.e., those in the last quintile). However, there are important differences across job categories (Figure 5). For blue-collar and white-collar workers, the average hourly wage remains quite stable across the different quintiles of the distributions of import and offshoring intensities. In the last quintile of the sample distribution of offshoring intensity, a small decrease of the average hourly wage is however observed: the difference between average hourly wages in the first and in the last quintile is about -1.7%. For technicians and executives, the average hourly wage is positively related with import and offshoring intensities. Finally, for executives, the positive import wage premium is particularly high: the average hourly wage is about 30 Euros in the first quintile of the distribution of import intensity and close to 32 Euros in the last quintile (i.e. a wage difference larger than 5%).

[Insert Figure 5]

In Table 6, we consider three groups of firms according to their wage bargaining regimes: *(i)* firms which are uncovered by a wage agreement (at the industry- or at the firm-levels[21], corresponding to 14% of observations in our sample); *(ii)* firms which are covered only by an industry-level wage agreement in a given year (60% of observations); *(iii)* firms which frequently sign a firm-level wage agreement[22] (26% of observations). For these three bargaining regimes, we compute the average hourly wage for firms below the median of export/import/offshoring intensity and the average hourly wage for firms above this median. Finally, we compute the differences between those two average wages to obtain the export/import/offshoring wage premium (in percent). When we consider the average hourly wage for all workers, the export wage premium is always positive, whatever the wage bargaining regime is. It is then comprised, between 5.9 and 8% (see Table 6) and it is higher when firms are covered by at least one type of wage agreement.

[Insert Table 6]

There are some significant differences across job categories (see Table 7). For blue-collar workers, when there is no wage agreement, the export wage premium is 3.3% whereas it is about 7% when a wage agreement is signed at the firm-level. For white-collar workers, the export wage premium is slightly larger when firms are covered by a wage agreement: it is equal to 3.4% when there is no wage agreement and comprised between 3.7 and 4% when there is a wage agreement either at the firm- or at the industry-level. For technicians, supervisors and executives, export wage premia are larger when firms are covered by a firm-level wage agreement than when firms are either covered only by an industry-level agreement or uncovered. For instance, the export wage premium of executives is 2% when firms are covered by a wage agreement at the industry-level whereas it is 4.7% when firms are frequently covered by a firm-level wage agreement.

[Insert Table 7]

When we consider the link between import and offshoring intensities and the firms' average hourly wages, we find stronger differences between bargaining regimes: the

[21] We distinguish here firms in which a firm-level wage agreement is signed very frequently (i.e., when the ratio between the number of annual wage agreements signed in a firm and the number of years in which this firm is observed in our sample is higher than 20%) and firms in which firm-level wage agreements are less frequent (i.e., when this ratio is less than 20%). The threshold of 20% corresponds to the median frequency of firm-level wage agreements over the sample observation period.

[22] In this regime, firms can be covered or not by an industry-level wage agreement. However, when firms are covered by a firm-level wage agreement, few of them are not covered by an industry-level agreement (slightly less than 1,000 observations in our sample among 5,800 observations classified in this regime). We choose to include all firms covered by a firm-level agreement in a single regime in order to provide robust statistics.

offshoring wage premium is close to 1% when firms are not covered by a wage agreement whereas it increases to 3.7% when they are covered only by an industry-level agreement and to 4.1% when they are covered by a firm-level agreement (see Table 6). There are some differences across job categories (Table 7). When there is no wage agreement, blue-collar and white-collar workers experience negative wage premia (comprised between -1.5% and -3.5%). On the contrary, when a wage agreement is signed at both the industry- and the firm-levels, the wage premia turn to be positive (about 1.5%). For technicians and executives, (broad or narrow) offshoring leads to a positive wage premium which increases with the coverage by wage agreements. In particular, trade wage premia are higher when a wage agreement is signed at the industry level, but firm-level agreements do not seem to provide additional (even moderate) wage premia when firms are only covered by an industry-level wage agreement (see Table 7).

Trade and wages: the econometric model

To investigate more deeply to which extent wage bargaining regimes shape the wage effects of the intensive margin of trade, our basic wage equation is the following:

$$\ln w_{it} = \beta_{exp} \ln exp_{it} + \beta_{imp} \ln imp_{it} + \beta_x x_{it} + \alpha_i{}^w + \lambda_t{}^w + \varepsilon_{it}$$

where $\ln w_{it}$ is the logarithm of the net hourly wage in firm *i* and year *t*, $\ln exp_{it}$ is the logarithm of exports of firm *i* in year *t*, $\ln imp_{it}$ is the logarithm of imports of firm *i* in year *t*, x_{it} is a vector of covariates including the local unemployment rate and firm-level controls in year *t* (number of employees, TFP, domestic sales, proportion of temporary workers, share of skilled workers and capital-labor ratio), $\alpha_i{}^w$ is a firm-specific effect, $\lambda_t{}^w$ is a year dummy (common to all firms) and ε_{it} is an i.i.d. random term (white noise) with mean 0 and variance $\sigma_\varepsilon{}^2$. Slope parameters β_{exp}, β_{imp} and β_x are unknown and have to be estimated. Given that the wage and the trade variables are expressed in logs, there parameters are elasticities of wages with respect to changes in firm exports and imports.

Since our sample period is rather short (2005-2009), variations of firm wages over time are rather limited (see Table 2). Moreover, if our instrumentation strategy allows us to capture satisfactorily differences in exports and imports between firms, our model predicts less accurately their variations over time.[23] This feature of the data makes the identification of export and import effects on wages using their within-firm variations over time difficult. Consequently we can mainly identify wage differences between firms, consistently with theories of firm heterogeneity. To control at least partly for those differences, we add disaggregate industry (4-digit)-level dummies, the firm's average TFP, domestic sales and the

[23] These patterns of the data are generally observed in the trade literature; see, for instance, Hauptmann and Schmerer (2013).

firm's average ratio between capital and labor to the list of regressors included in the log-wage equation.[24] Since all these supplementary variables are time-invariant, we assume that the firm-specific effect $\alpha_i{}^w$ which appears in the above log-wage equation is random. Then our specification of the log-wage equation corresponds to Mundlak's formulation of the linear panel data model. This formulation is known to allow for possible correlations between the time-varying explanatory variables and the firm-specific fixed effects.

[Insert Table 8]

Table 8 reports parameter estimates of our basic wage regressions using or not instrumental variables to control for the potential endogeneity of exports and imports. The dependent variable is the log hourly net wage rate in firm *i* and year *t*. Standard errors are clustered at the firm level. We find that exports and offshoring have both a positive effect on the overall average hourly wage; the impact of exports is larger than that of offshoring. Once firm-level controls are added, the impacts of exports and offshoring are reduced but still positive and statistically significant: if exports (respectively, offshoring) increase by 1%, the firm's average wage increases by 0.8% (respectively, by 0.2%). When we use broad offshoring (total imports) rather than narrow offshoring, the effects of imports are estimated to be slightly higher.[25] Firm-level controls have significant effects on wages. For instance, the firm's TFP and domestic sales have a positive impact on wages. The local unemployment rate has no significant effect whereas the proportion of temporary workers in a firm is found to have a statistically significant negative effect on wages.

[Insert Table 9]

In Table 9, we report results from similar regressions but consider the log hourly net wage for different categories of workers. For all categories of workers (except technicians), the estimated export wage premium is positive and statistically significant. This export wage premium is rather similar across categories once exports and imports are instrumented: if exports increase by 1%, the average wage rate increases by 0.3% for all job categories.[26] Using Danish data, Hummels et al. (2014) obtain no significant difference in the export wage premium between high-skilled and low-skilled workers.

On the contrary, we find a heterogeneous impact of offshoring across job categories. Increasing offshoring has a negative but statistically insignificant effect on wages of blue-collar and white-collar workers, whereas it significantly improves wages of technicians and

[24] We have also included other average firm-level variables that do not appear to be statistically significant or do not vary sufficiently over time.

[25] We find similar results when we restrict our sample to the period 2005-2008, namely when we exclude the post-crisis year 2009 (see Table A1 in Appendix). In this case, the difference in the import wage premia estimated with broad and with narrow offshoring is even larger.

[26] Similar results are obtained for the period 2005-2008 (see Table A2 in Appendix).

executives. This result is quite consistent with evidence provided by Hummels et al. (2014) concerning Denmark. At the firm level, both importing and offshoring activities have statistically significant and positive effects on average wages in France, but our results are due to a compositional effect since substitution effects could lead to a negative wage premium for low-skilled workers, and a positive one for high-skilled workers. However, in contrast with the estimates reported by Hummels et al. (2014), we find that the negative effect of offshoring on wages of low-skilled workers, namely blue-collar workers and white-collars employees, is not large. Our conjecture is that wages are more downward rigid in France. Another possible explanation is that the relatively high national minimum wage binds and generates less dispersion in the French wage distribution.

Finally, we find that TFP has a larger effect on wages of executives and that unemployment has a statistically significant negative impact on wages of blue-collar workers only, whereas the proportion of temporary workers has a negative impact whose magnitude is the same for all categories of workers (but statistically insignificant for executives).

The results concerning offshoring are largely consistent with the predictions relating firm-level wages to offshoring that we discuss in Section 2. Offshoring tends to create wage dispersion by increasing the wages of high-skilled workers who are more likely to be complement to imports. Our results showing that exports have rather homogeneous effects across occupations are in line with existing evidence on Denmark.[27]

Collective agreements, wages and trade

We now look at the role played by collective wage agreements in shaping the effects of trade on wages. We first estimate the impact of exporting and offshoring on wages according to the bargaining regime characterizing the firm. We consider the three different bargaining regimes introduced above: *(i)* firms which are uncovered by a wage agreement (at the industry- or at the firm-level); *(ii)* firms which are covered only by an industry-level wage agreement; *(iii)* firms which are covered by a firm-level wage agreement. For each of these three groups of firms, we estimate the same wage regression model linking hourly average wage for all workers employed in the firm to the firm's exports and imports. We estimate these models over two periods, 2005-2009 and 2005-2008 (excluding 2009), by controlling for firm-level variables and for the endogeneity of exports and imports. Regressions include firm-specific random effects, disaggregated industry-level dummies and year controls. Results are reported in Table 10.

[Insert Table 10]

[27] There might be skill upgrading within categories behind the wage increases that we are not able to pick up. Our results show that the forces of offshoring to create heterogeneous effects are strong and seen at the occupational level.

Over the period 2005-2009, the export wage premium is estimated to be positive in all wage bargaining regimes. The export wage premium seems however slightly higher in firms where firm-level wage agreements are frequent: the elasticity is 0.012 for firms with frequent wage agreements versus less than 0.01 in other regimes. These results are consistent with rent-sharing models applied to the export wage premium. Using German wage data, Felbermayr et al. (forthcoming) obtain quite similar conclusions: the wage premium associated with exports is larger for firms where a wage agreement is signed either at the firm- or at the industry level. The effect of offshoring on wages is positive and significant only in the case where firms are only covered by industry-level wage agreements. However, this effect is rather limited and smaller than the impact of exports. When the firm is not covered by any wage agreement, impact becomes negative (and significant for the period 2005-2008). Results are very similar if we consider broad offshoring instead of narrow offshoring (see Table A5 in Appendix).

In Table 11, we stratify our analysis by distinguishing the three bargaining regimes and the four job categories. The results are obtained using IV-OLS regressions with firm-specific effects over the two periods 2005-2009 and 2005-2008.

[Insert Table 11]

For blue-collar and white-collar workers, exports are found to have positive and statistically significant effects on wages for all bargaining regimes over each period, 2005-2009 and 2005-2008. It seems however that over the period 2005-2008, the export wage premium for blue collar workers is slightly higher when firms frequently sign wage agreements. For white-collar workers, the export wage premia are estimated to be similar in the three bargaining regimes. Those results are similar when narrow offshoring is replaced by broad offshoring (see Table A6 in Appendix). For technicians and executives, the export wage premium is positive and statistically significant when firms are covered by a firm-level wage agreement. On the opposite, when firms are either not covered by a wage agreement or only covered by an industry-level wage agreement, the export wage premium is small and statistically not different from zero. However, overall differences in the export wage premia are sizeable across bargaining regimes only for blue-collar workers and executives.[28]

For blue-collar and white-collar workers, the effect of offshoring on wages varies across wage bargaining regimes. When there is no wage agreement at both the firm- and at the industry-levels, the offshoring wage premium is negative and statistically significant (in particular over the period 2005-2008). On the contrary, when firms are covered by an industry-level agreement only, the negative wage premium disappears. It appears that wage

[28] It is also possible that export wage premia are better statistically identified in the case of executives and technicians since variations over time and across firms are larger in that category, contrary to blue-collar or white-collar workers for whom variations of wages across firms are more limited.

agreements (in particular industry-level wage agreements) protect workers from the negative effect of offshoring on wages. Similar results are obtained when we consider broad offshoring (rather than narrow offshoring); however, differences across bargaining regimes are even amplified in that case (see Table A6 in Appendix). For instance, for white-collar workers, the offshoring wage premium becomes positive and statistically significant when firms are covered by a firm-level wage agreement. For technicians and executives, the offshoring effect on wages is positive and significant for firms covered by an industry-level wage agreement. Compared to industry-level agreements, firm-level agreements do not provide significant additional wage premia. They even moderate wage premia. Differences between wage bargaining regimes are larger when we consider broad offshoring instead of narrow offshoring (see Table A6 in Appendix).

Overall it appears that firm-level agreements are associated with larger export wage premia whereas industry-level agreements seem to impact positively import wage premia. Consistent with predictions rent-sharing models, firm-level wage agreements are more frequent when firms are large exporters and rents associated with exports are captured through bargaining by workers. On the contrary, it seems that when offshoring intensity is high, the frequency of industry-wage agreements is lower since firms may be more exposed to international competition. When industry-level wage agreements are signed, they imply larger import wage premia which may reduce competitiveness of firms. This negative effect is reduced in the bargaining regime with frequent firm-level agreements for executives and technicians.

When firms and unions bargain on wages, it might have negative consequences on employment, especially since international markets are highly competitive (thus possibly implying a larger labor demand elasticity – see the discussion in Section 2). To investigate consequences of wage bargaining regimes on employment, we estimate the impact of exporting and offshoring activities on hours worked at each firm. As before, this analysis is stratified according to the bargaining regime. We estimate the models over the period 2005-2009 controlling for firm-level variables and for the endogeneity of exports and imports. Regressions include firm-level random effects. Results are reported in Table 12. First we find that exports and imports are associated with a significant increase in hours worked (first column). This increase is larger for exports than for imports. This positive effect of exports is almost the same across bargaining regimes whereas the impact of imports is positive and statistically significant only in the industry-level bargaining regime.[29]

[Insert Table 12]

[29] Similar results are obtained when we use broad offshoring (see Table A7 in Appendix).

Table 13 reports results by job categories. Exports and imports are found to have positive and statistically significant effects on hours worked for all job categories. However the impact of exports on hours worked is larger for executives. Additionally, when we distinguish the three different bargaining regimes, it appears that exports have a larger impact on hours worked in firms which are covered by wage agreements (either at the firm or at the industry level). In particular, when firms sign frequent wage agreements at their level, the elasticity of hours worked to exports is higher for all job categories. In each job category, the estimated effect of offshoring on hours does not seem to be much affected by the bargaining regime (except for the blue-collar workers). It seems however that the elasticity of hours worked to imports is higher when firms are only covered by an industry-level agreement.[30]

[*Insert Table 13]*

6. Conclusion

In this paper we investigate the role played by collective wage bargaining institutions in shaping the effects of trade on wages. More specifically, we examine effects of a multi-level bargaining system allowing for wage agreements both at the industry- and at the firm-level. Such a system is implemented in several European countries, especially in France, which is our case study.

Our main results are as follows. First, we find that exports have a positive and significant effect on the probability of observing a wage agreement at the firm level, which is consistent with predictions of rent-sharing theory. Offshoring has a negative but small effect on the occurrence of firm-level wage agreements. Besides, we find a negative correlation between industry-level wage agreements and the firm's import intensity, whereas exports seem to play a very limited role on wage agreements at the industry level.

Second, we provide results on the effects of trade on wages of French firms. We find a statistically significant positive effect of both exports and imports (or offshoring) on the hourly average wage. The export premium is similar for blue-collar and white-collar workers, technicians and executives. Offshoring has a positive effect on wages of technicians and executives, whereas it has a slightly negative or statistically insignificant impact on blue-collar workers' wages. The results suggest that offshoring and unskilled labor are potential substitutes in the production process of manufacturing firms. They are consistent with those obtained in the recent empirical literature concerning the effects of exports and imports on firms' wages.

[30] Consistent results are obtained when we replace narrow offshoring by broad offshoring (see Table A8 in Appendix).

We also investigate the effect of several wage bargaining regimes on those results. We find that firm-level wage agreements slightly increase the export wage premium for almost all categories of workers. When the firm is not covered by a firm- or an industry-level agreement, the offshoring wage premium is negative or at most very small in all job categories. When the firm is covered by an industry-wage agreement, blue-collar and white-collar workers are protected against the negative impact of offshoring on wages. This effect of industry-level agreements on wages of unskilled workers may explain why employers are less likely to sign wage agreements at the firm level when offshoring increases. We hope that the stylized facts we present can be fruitful in informing future theoretical research.

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Table 1: Export and import activities of French firms over the period 1996-2009

Number of observations (%)		Exports		
		Infrequent	Frequent	Total
Imports	Infrequent	78,923 (63.66)	8,474 (6.84)	87,397 (70.50)
	Frequent	9,986 (8.06)	26,589 (21.45)	36,575 (29.50)
	Total	88,909 (71.72)	35,063 (28.28)	123,972 (100)

Notes: Statistical units are "firm" observations. We report the number of firms and in brackets, the proportion of firms in each category. The sample consists of all firms which are observed over the period 1996-2009 and for which we have information on balance-sheet (from the BRN data set). A firm is defined as a "frequent exporter" (respectively, "infrequent exporter") if its exports are strictly positive in more (respectively, less) than 50% of the period during which we observe this firm. A similar definition is applied for imports.

Table 2: Descriptive statistics on trade and wages (2005-2009)

Year	2005	2006	2007	2008	2009
Trade (in millions Euros)					
- Exports	75,173.4	76,389.8	76,759.3	76,367.3	67,490.1
- Broad offshoring	51,915.8	52,697.9	54,470.0	53,712.7	43,804.7
- Narrow offshoring	22,991.0	21,520.6	22,368.7	22,498.8	21,046.1
Average hourly wage (in Euros)					
- All workers	15.6	15.9	16.5	17.0	17.2
- Blue-collar workers	11.8	12.2	12.6	13.0	13.4
- White-collar workers	12.7	13.1	13.5	14.0	14.5
- Technicians and supervisors	17.2	17.5	18.0	18.5	18.3
- Executives	29.7	30.2	31.0	32.1	30.7

Notes: We compute the sum (by year) of exports and imports for the firms observed in our sample (in millions of Euros). The average hourly wage is calculated as the average hourly wage by job category and by year for the firms of our sample. The sample consists of firms that either export or import at least half of the time over the observation period.

Table 3: First-stage IV regressions (2005-2009)

Dependent variable	Ln(exports)		Ln(imports) "Broad offshoring"		Ln(offshoring) "Narrow offshoring"	
Ln WD, exports	0.150***	0.096**	0.157***	0.092***	0.153**	0.086
	(0.046)	(0.039)	(0.042)	(0.033)	(0.066)	(0.060)
Ln WS, imports	0.118***	0.079*	0.282***	0.204***	0.263***	0.199***
	(0.043)	(0.040)	(0.053)	(0.048)	(0.062)	(0.061)
Ln(TFP)		0.353***		0.264***		0.201***
		(0.025)		(0.023)		(0.058)
Ln(firm size)		0.825***		0.671***		0.714***
		(0.052)		(0.047)		(0.078)
Capital/labor ratio		0.168***		0.165***		0.115**
		(0.034)		(0.032)		(0.052)
Share of high-skilled workers within the firm		-0.059		0.110		0.389**
		(0.095)		(0.084)		(0.177)
Domestic sales		-0.035		0.187***		0.224**
		(0.024)		(0.035)		(0.040)
Intercept	11.363***	7.177***	9.176***	4.564***	7.897***	2.882**
	(0.638)	(0.646)	(0.670)	(0.663)	(0.944)	(1.036)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic for the IV	63.62	78.59	148.93	147.54	43.66	41.68
Observations	21,806	21,806	21,806	21,806	21,806	21,806
Number of firms	6,744	6,744	6,744	6,744	6,744	6,744
Average obs. per firm	3.2	3.2	3.2	3.2	3.2	3.2
Within R-squared	0.024	0.076	0.061	0.144	0.019	0.042
Between R-squared	0.049	0.425	0.044	0.490	0.018	0.208
Overall R-squared	0.046	0.418	0.040	0.489	0.014	0.198

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in brackets. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies and firm fixed-effects are included in all specifications. Product shares entering WD and WS are calculated at their overall sample (1996-2004) firm value. The sample consists of firms that either export or import at least half of the period during which they are observed.

Table 4: Frequency of wage agreements (firm- and industry-level) and trade intensity: cross sectoral correlations

	Export share	Offshoring share	Import share
Frequency of firm-level agreements	0.075 (0.279)	-0.180 (0.009)	-0.075 (0.281)
Frequency of industry-level agreements	0.050 (0.473)	-0.203 (0.003)	-0.272 (0.000)
Nb of observations	208	208	208

Notes: We compute in this table simple correlation coefficients between the frequency of firm-level (or industry-level) wage agreements calculated at the industry level and the median export (import or offshoring) share also computed at the industry level. P-values are in brackets. The frequency of wage agreements is computed as the ratio between the number of firms covered by a wage agreement divided by the total number of firms in a given industry. Export intensity is calculated as the median of the ratio between the value of exports and the value of total sales (at the firm level) for a given industry. Same calculations are made for import and offshoring. The sample consists of firms which both export and import at least half of the observation period during the period 2005-2009.

Table 5: Panel probit model for the occurrence of a firm-level wage agreement

Dependent variable	Occurrence of a firm level wage agreement in a given year				
	Narrow offshoring			Broad offshoring	
	2005-2009	2005-2009	2005-2008	2005-2009	2005-2008
Ln(exports)	0.028*	0.036**	0.045**	0.020	0.027
	(0.015)	(0.018)	(0.019)	(0.018)	(0.020)
Ln(imports)	-0.002	-0.019	-0.027*	0.044*	0.043
	(0.011)	(0.014)	(0.015)	(0.026)	(0.028)
Ln(TFP)	0.092	0.092	0.002	0.079	-0.011
	(0.057)	(0.057)	(0.067)	(0.058)	(0.067)
Ln(firm size)	1.029***	1.030***	1.041***	1.007***	1.017***
	(0.036)	(0.048)	(0.054)	(0.048)	(0.054)
Capital/labor ratio	0.219***	0.219***	0.231***	0.206***	0.217***
	(0.033)	(0.034)	(0.037)	(0.034)	(0.037)
Share of high-skilled workers within the firm	-0.140	-0.129	0.025	-0.140	0.006
	(0.174)	(0.174)	(0.196)	(0.174)	(0.196)
Local unemployment rate	0.038***	0.039***	0.044***	0.037***	0.041***
	(0.014)	(0.014)	(0.015)	(0.014)	(0.015)
Share of temporary workers	-1.020***	-1.016***	-1.272***	-1.023***	-1.281***
	(0.325)	(0.325)	(0.369)	(0.325)	(0.369)
Industry-wage agreement	0.122***	0.122***	0.178***	0.122***	0.178***
	(0.045)	(0.045)	(0.055)	(0.045)	(0.055)
Domestic sales	-0.006	0.002	0.019	-0.023	-0.009
	(0.040)	(0.030)	(0.054)	(0.031)	(0.035)
IV	No	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Observations	21,806	21,806	17,961	21,806	17,961
Number of firms	6,744	6,744	6,408	6,744	6,408
Average obs. per firm	3.2	3.2	2.8	3.2	2.8
Log-likelihood	-7150.8	-7150.0	-5884.0	-7149.5	-5882.6

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in brackets. Period: 2005-2009. Year dummies, industry dummies and firm-specific random effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table 6: Average hourly wage by bargaining regime and by trade status (2005-2009)

All workers

Firm-level wage agreement		No	No	Yes
Industry-level wage agreement		No	Yes	-
Average wage (in euros)	- *High export intensity*	16.27	16.64	18.03
	- *Low export intensity*	15.37	15.49	16.69
Wage difference (in %)		**5.90**	**7.40**	**7.99**
Average wage (in euros)	- *High offshoring intensity*	15.88	16.31	18.02
	- *Low offshoring intensity*	15.69	15.73	17.02
Wage difference (in %)		**1.23**	**3.65**	**5.87**
Average wage (in euros)	- *High import intensity*	15.85	16.24	17.84
	- *Low import intensity*	15.73	15.81	17.14
Wage difference (in %)		**0.73**	**2.75**	**4.11**

Notes: For different wage bargaining regimes, we report the average hourly wage in euros (i.e., the wage bill divided by the number of hours worked by four categories of workers: blue collar workers, white collar-workers, technicians and supervisors, executives, over the period 2005-2009). Then we compute the difference in average wages (in %) between firms with a high export intensity and firms with a low export intensity. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). Firms with a high export intensity are firms above the median of the export intensity distribution. Same calculations are made for import and offshoring intensities (import and offshoring intensities are calculated as the ratio between imports or offshoring values and the value of input materials at the firm level). The category "Firm-level wage agreement" is defined according to the frequency of wage agreements in a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years over the period 2002-2009, "No" less than 20% of wage agreements on the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

Table 7: Average hourly wage by bargaining regime, by trade status, and by job category

Blue-collar workers

Firm-level wage agreement		No	No	Yes
Industry-level wage agreement		No	Yes	-
Average wage (in euros)	- *High export intensity*	12.25	12.51	13.95
	- *Low export intensity*	11.86	11.99	13.06
Wage difference (in %)		**3.30**	**4.30**	**6.84**
Average wage (in euros)	- *High offshoring intensity*	11.91	12.22	13.68
	- *Low offshoring intensity*	12.20	12.23	13.51
Wage difference (in %)		**-2.38**	**-0.06**	**1.23**
Average wage (in euros)	- *High import intensity*	11.91	12.23	13.71
	- *Low import intensity*	12.20	12.22	13.49
Wage difference (in %)		**-2.33**	**0.06**	**1.65**

White collar workers

Firm-level wage agreement		No	No	Yes
Industry-level wage agreement		No	Yes	-
Average wage (in euros)	- *High export intensity*	13.29	13.51	14.59
	- *Low export intensity*	12.86	12.99	14.08
Wage difference (in %)		**3.35**	**3.96**	**3.65**
Average wage (in euros)	- *High offshoring intensity*	12.98	13.29	14.49
	- *Low offshoring intensity*	13.16	13.17	14.28
Wage difference (in %)		**-1.40**	**0.95**	**1.45**
Average wage (in euros)	- *High import intensity*	12.85	13.25	14.51
	- *Low import intensity*	13.32	13.21	14.27
Wage difference (in %)		**-3.52**	**0.34**	**1.70**

Technicians and supervisors

Firm-level wage agreement		No	No	Yes
Industry-level wage agreement		No	Yes	-
Average wage (in euros)	- *High export intensity*	17.86	17.77	18.59
	- *Low export intensity*	17.71	17.55	18.09
Wage difference (in %)		**0.83**	**1.26**	**2.79**
Average wage (in euros)	- *High offshoring intensity*	17.89	17.81	18.56
	- *Low offshoring intensity*	17.65	17.51	18.20
Wage difference (in %)		**1.33**	**1.74**	**1.99**
Average wage (in euros)	- *High import intensity*	17.81	17.81	18.53
	- *Low import intensity*	17.75	17.50	18.26
Wage difference (in %)		**0.31**	**1.77**	**1.47**

Executives

Firm-level wage agreement		No	No	Yes
Industry-level wage agreement		No	Yes	-
Average wage (in euros)	- *High export intensity*	30.62	30.43	32.83
	- *Low export intensity*	30.02	29.87	31.34
Wage difference (in %)		**1.99**	**1.89**	**4.74**
Average wage (in euros)	- *High offshoring intensity*	30.47	30.79	32.86
	- *Low offshoring intensity*	30.10	29.52	31.58
Wage difference (in %)		**1.24**	**4.31**	**4.05**
Average wage (in euros)	- *High import intensity*	30.22	30.43	32.70
	- *Low import intensity*	30.39	29.83	31.82
Wage difference (in %)		**-0.56**	**2.02**	**2.77**

Notes: We report the average hourly wage in euros by job categories (over the period 2005-2009). Then we compute the difference in average wages (in %) between firms with a high export intensity and firms with a low export intensity. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). Firms with a high export intensity are firms above the median of the export intensity distribution. Same calculations are made for import and offshoring intensities (import and offshoring intensities are calculated as the ratio between imports or offshoring values and the value of input materials at the firm level). The category "Firm-level wage agreement" is defined according to the frequency of wage agreements in a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years over the period 2002-2009, "No" less than 20% of wage agreements on the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

Table 8: Firm-level average hourly wage regressions (total, 2005-2009)

Dependent variable	Ln (net hourly wage)					
	Narrow offshoring		Narrow offshoring		Broad offshoring	
	(1)	(2)	(3)	(4)	(5)	(6)
Exports	0.010***	0.021***	0.005***	0.008***	0.004***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Imports	0.004***	0.011***	0.002***	0.002***	0.004***	0.003***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
TFP			0.023***	0.022***	0.023***	0.022***
			(0.003)	(0.003)	(0.003)	(0.003)
Size			0.002	-0.003	0.002	-0.004
			(0.003)	(0.003)	(0.003)	(0.003)
Capital/labor			0.013***	0.013***	0.012***	0.013***
			(0.003)	(0.003)	(0.003)	(0.003)
High skilled workers			0.399***	0.397***	0.399***	0.398***
			(0.011)	(0.011)	(0.011)	(0.011)
Unemployment rate			-0.000	-0.000	-0.000	-0.000
			(0.001)	(0.001)	(0.001)	(0.001)
Temporary contracts			-0.029***	-0.028***	-0.029***	-0.028***
			(0.011)	(0.011)	(0.011)	(0.011)
Domestric sales			0.004**	0.003*	0.003*	0.003*
			(0.002)	(0.002)	(0.002)	(0.002)
Intercept	2.588***	2.284***	1.900***	1.876***	1.889***	1.869***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Controls	No	No	Yes	Yes	Yes	Yes
IV	No	Yes	No	Yes	No	Yes
Observations	21,806	21,806	21,806	21,806	21,806	21,806
Number of firms	6,744	6,744	6,744	6,744	6,744	6,744
R-Squared	0.342	0.366	0.645	0.645	0.645	0.645

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table 9: Firm-level wage regressions (by job category, 2005-2009)

"Narrow offshoring"

Dependent variable	Ln (net hourly wage)							
	Blue collar		White-collar		Technicians		Executives	
	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV
Exports	0.003***	0.003***	0.003***	0.005***	0.002**	0.002**	0.003***	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Offshoring	0.001	-0.000	-0.000	-0.000	0.002***	0.003***	0.002***	0.005***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TFP	0.018***	0.018***	0.013***	0.013***	0.028***	0.028***	0.032***	0.031***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Size	0.023***	0.023***	0.023***	0.021***	-0.008***	-0.009***	0.015***	0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Capital/labor	0.007**	0.007**	0.015***	0.015***	0.012**	0.012**	0.000	0.001
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)
High skilled workers	0.040***	0.040***	0.004	0.003	-0.115***	-0.116***	-0.037**	-0.039**
	(0.010)	(0.010)	(0.011)	(0.011)	(0.012)	(0.012)	(0.015)	(0.015)
Unemployment rate	-0.002**	-0.002**	0.001	0.001	-0.001	-0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Temporary contracts	-0.046***	-0.045***	-0.070***	-0.069***	-0.069***	-0.069***	-0.020	-0.020
	(0.011)	(0.011)	(0.015)	(0.015)	(0.016)	(0.016)	(0.021)	(0.021)
Domestic sales	0.005**	0.005**	0.002	0.002	0.004	0.004	0.007*	0.006
	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Intercept	2.006***	2.009***	2.198***	2.189***	2.403***	2.396***	2.766***	2.754***
	(0.028)	(0.028)	(0.029)	(0.029)	(0.034)	(0.034)	(0.040)	(0.040)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV								
Observations	21,806	21,806	21,806	21,806	21,806	21,806	21,806	21,806
Number of firms	6,744	6,744	6,744	6,744	6,744	6,744	6,744	6,744
R-Squared	0.428	0.428	0.266	0.267	0.190	0.190	0.196	0.197

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table 10: Firm-level wage regressions by wage bargaining regime (total -"Narrow offshoring")

Dependent variable	Ln (net hourly wage)					
	2005-2009			2005-2008		
Firm wage agreement	No	No	Yes	No	No	Yes
Industry wage agreement	No	Yes	-	No	Yes	-
Exports	0.009***	0.007***	0.012***	0.009***	0.006***	0.011***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Imports	-0.002	0.004***	0.000	-0.004**	0.004***	0.001
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
TFP	0.019*	0.021***	0.021***	0.029**	0.016***	0.018***
	(0.011)	(0.004)	(0.005)	(0.012)	(0.005)	(0.005)
Size	-0.011*	-0.005	-0.005	-0.009	-0.006	-0.002
	(0.007)	(0.004)	(0.006)	(0.008)	(0.004)	(0.006)
Capital/labor	0.015	0.013***	0.005	0.025*	0.014***	0.006
	(0.014)	(0.005)	(0.007)	(0.015)	(0.005)	(0.007)
High skilled workers	0.505***	0.392***	0.442***	0.529***	0.443***	0.520***
	(0.024)	(0.014)	(0.027)	(0.024)	(0.017)	(0.036)
Unemployment rate	0.001	-0.000	-0.001	0.003	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Temporary contracts	-0.047	-0.032**	-0.056*	-0.035	-0.042***	-0.077***
	(0.032)	(0.013)	(0.030)	(0.035)	(0.014)	(0.028)
Domestic sales	0.022	0.003	-0.002	0.023**	0.004	0.001
	(0.014)	(0.003)	(0.003)	(0.011)	(0.003)	(0.003)
Intercept	1.863***	1.930***	1.842***	1.836***	1.894***	1.824***
	(0.047)	(0.032)	(0.063)	(0.051)	(0.035)	(0.062)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,059	12,981	5,766	2,409	10,855	4,697
Number of firms	2,178	4,813	1,474	1,715	4,526	1,439
R-Squared	0.638	0.617	0.737	0.641	0.631	0.752

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years over the period 2002-2009, "No" less than 20% of wage agreements over the same period. The category "Industry-level wage agreement" means that a firm is covered by an industry-wage agreement in a given year

Table 11: Firm-level wage regressions by bargaining regime and by job category ("Narrow offshoring")

	2005-2009			2005-2008		
Firm wage agreement	No	No	Yes	No	No	Yes
Industry wage agreement	No	Yes	-	No	Yes	-
Blue-collar workers						
Exports	0.003*	0.001	0.007***	0.003	0.001	0.006***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Offshoring	-0.003*	0.001	-0.001	-0.005***	0.000	-0.000
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
R-Squared	0.443	0.359	0.520	0.440	0.359	0.523
White-collar workers						
Exports	0.007***	0.004***	0.005**	0.006**	0.004***	0.006**
	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)	(0.003)
Offshoring	-0.004**	0.000	0.000	-0.007***	0.000	0.000
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
R-Squared	0.295	0.207	0.354	0.272	0.197	0.355
Technicians and supervisors						
Exports	0.006**	0.001	0.005**	0.005	0.001	0.004*
	(0.003)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Offshoring	-0.002	0.003***	0.002	-0.004	0.003***	0.002
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
R-Squared	0.217	0.169	0.338	0.222	0.173	0.345
Executives						
Exports	0.001	0.000	0.014***	0.001	0.000	0.013***
	(0.003)	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)
Offshoring	0.001	0.006***	0.004**	-0.000	0.006***	0.004**
	(0.003)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
R-Squared	0.219	0.167	0.327	0.222	0.175	0.342
Observations	3,059	12,981	5,766	2,409	10,855	4,697
Number of firms	2,178	4,813	1,474	1,715	4,526	1,439

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Robust standard errors are clustered at the firm level. We only report coefficients associated with exports and imports but firm-level controls, year dummies and random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category"Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years during the period 2002-2009, "No" less than 20% of wage agreements during the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

Table 12: Firm-level total hours regressions by wage bargaining regime (total, 2005-2009, "Narrow offshoring")

Dependent variable	Ln (total hours)			
Firm wage agreement	-	No	No	Yes
Industry wage agreement	-	No	Yes	-
Exports	0.017***	0.010***	0.016***	0.011***
	(0.001)	(0.002)	(0.002)	(0.002)
Imports	0.006***	0.002	0.007***	0.001
	(0.001)	(0.002)	(0.001)	(0.001)
TFP	-0.013	-0.019	-0.012	-0.006
	(0.008)	(0.026)	(0.010)	(0.017)
Average nb of employees	0.949***	0.951***	0.952***	0.965***
	(0.004)	(0.009)	(0.005)	(0.007)
Capital/labor	-0.117***	-0.113***	-0.125***	-0.089**
	(0.015)	(0.033)	(0.018)	(0.040)
High skilled workers	0.133***	0.175***	0.123***	0.125***
	(0.011)	(0.032)	(0.014)	(0.020)
Unemployment rate	-0.002**	-0.000	-0.003**	-0.000
	(0.001)	(0.002)	(0.001)	(0.001)
Temporary contracts	0.068***	0.035	0.060*	0.131***
	(0.026)	(0.067)	(0.031)	(0.048)
Intercept	7.149***	7.007***	7.182***	7.319***
	(0.030)	(0.058)	(0.039)	(0.039)
Controls	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes
Observations	21,806	3,059	12,981	5,766
Number of firms	6,744	2,178	4,813	1,474
R-Squared	0.984	0.978	0.977	0.981

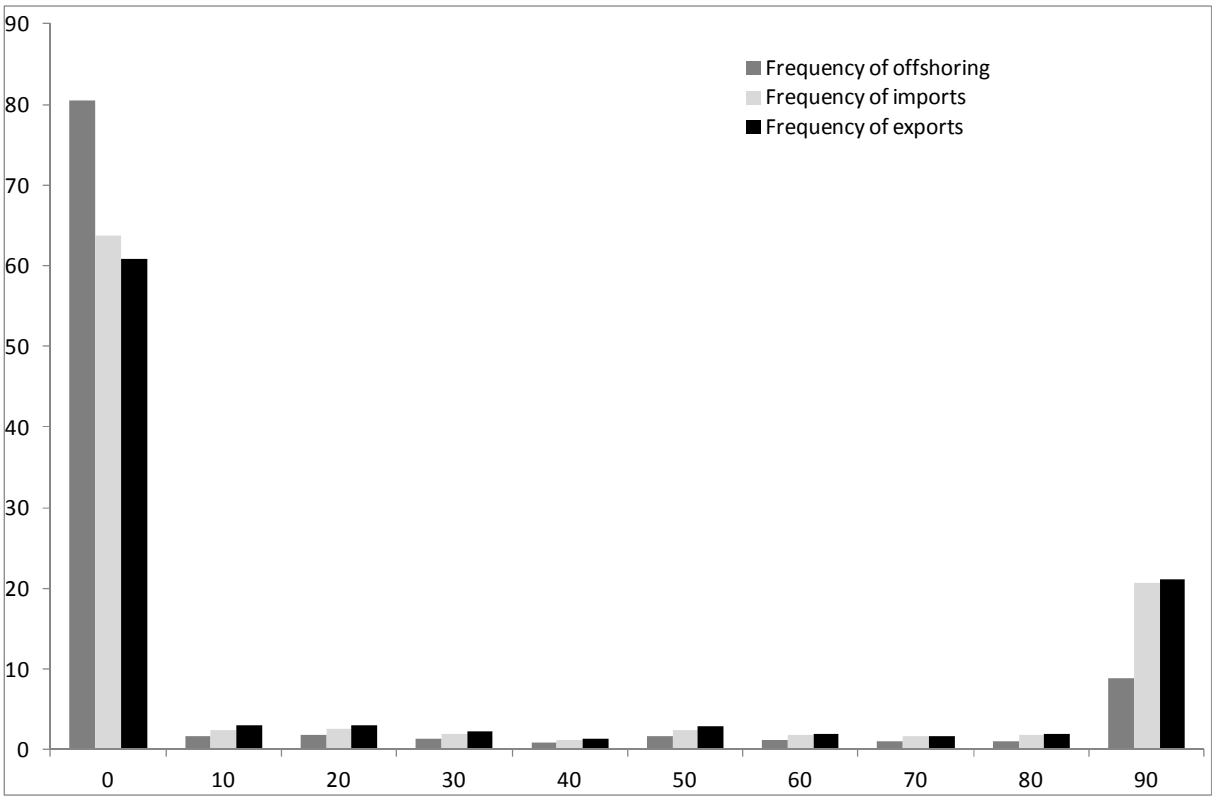
Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years over the period 2002-2009, "No" less than 20% of wage agreements over the same period. The category "Industry-level wage agreement" means that a firm is covered by an industry-wage agreement in a given year

Table 13: Firm-level total hour regressions by bargaining regime and by job category (2005-2009, "Narrow offshoring")

Firm wage agreement	-	No	No	Yes
Industry wage agreement	-	No	Yes	-
Blue-collar workers				
Exports	0.045***	-0.001	0.028***	0.061***
	(0.006)	(0.010)	(0.007)	(0.012)
Offshoring	0.012***	-0.009	0.007	0.019***
	(0.004)	(0.006)	(0.005)	(0.006)
R-Squared	0.859	0.823	0.808	0.851
White-collar workers				
Exports	0.042***	0.008	0.031***	0.084***
	(0.006)	(0.013)	(0.007)	(0.014)
Offshoring	0.040***	0.042***	0.039***	0.029***
	(0.005)	(0.010)	(0.006)	(0.009)
R-Squared	0.652	0.619	0.578	0.671
Technicians and supervisors				
Exports	0.047***	0.011	0.045***	0.063***
	(0.005)	(0.010)	(0.006)	(0.009)
Offshoring	0.022***	0.015*	0.022***	0.014**
	(0.004)	(0.008)	(0.005)	(0.006)
R-Squared	0.839	0.772	0.760	0.875
Executives				
Exports	0.099***	0.083***	0.089***	0.131***
	(0.006)	(0.012)	(0.007)	(0.012)
Offshoring	0.034***	0.024***	0.041***	0.014*
	(0.004)	(0.009)	(0.005)	(0.007)
R-Squared	0.810	0.718	0.723	0.849
Observations	21,806	3,059	12,981	5,766
Number of firms	6,744	2,178	4,813	1,474

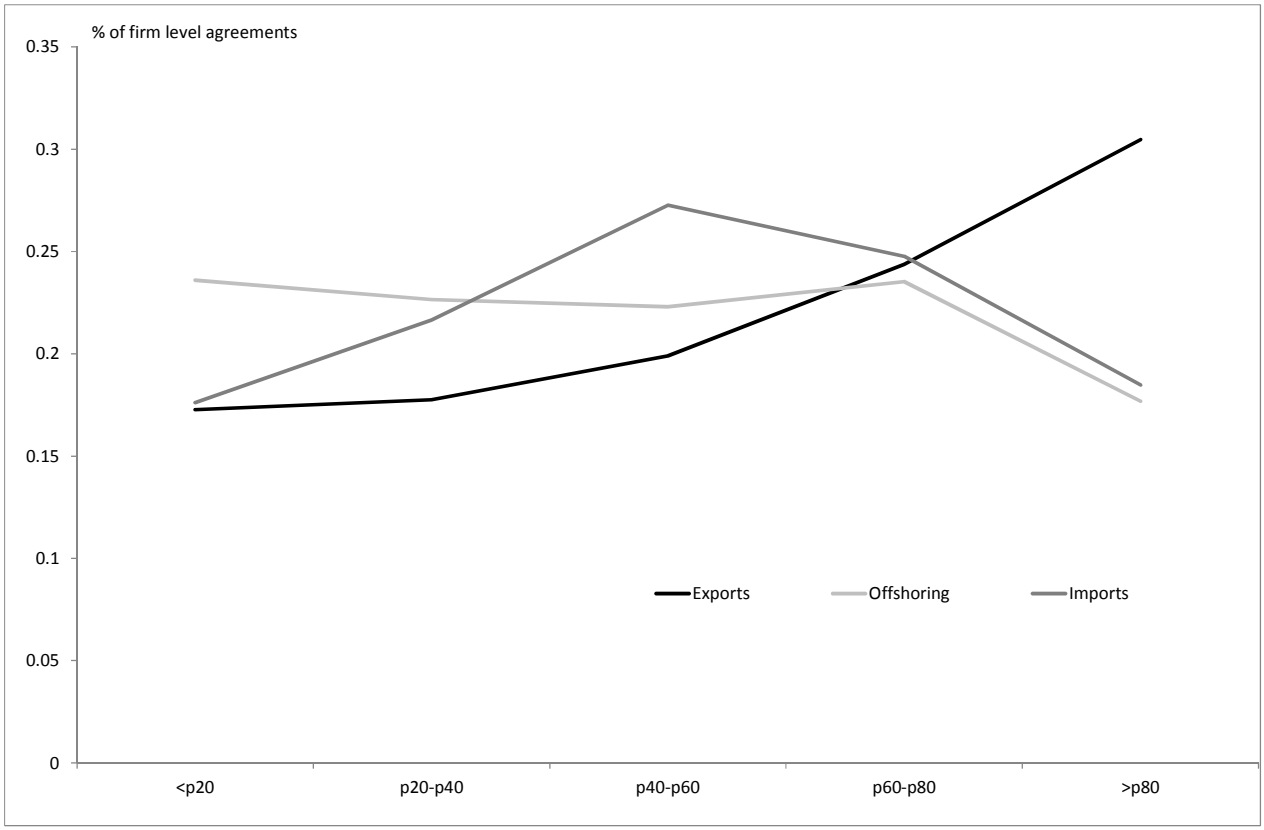
Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Robust standard errors are clustered at the firm level. We only report coefficients associated with exports and imports but firm-level controls, year dummies and random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years during the period 2002-2009, "No" less than 20% of wage agreements during the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

Figure 1: Frequency of trade activities (1996-2009, in %)



Notes: Each observation is a firm. The sample consists of all firms that are observed over the period 1996-2009 and for which we have balance-sheet information (BRN data set). "Frequency of exports" is defined as the ratio between the number of years when a given firm exports and the total number of years. Similar calculations are made for imports and offshoring.

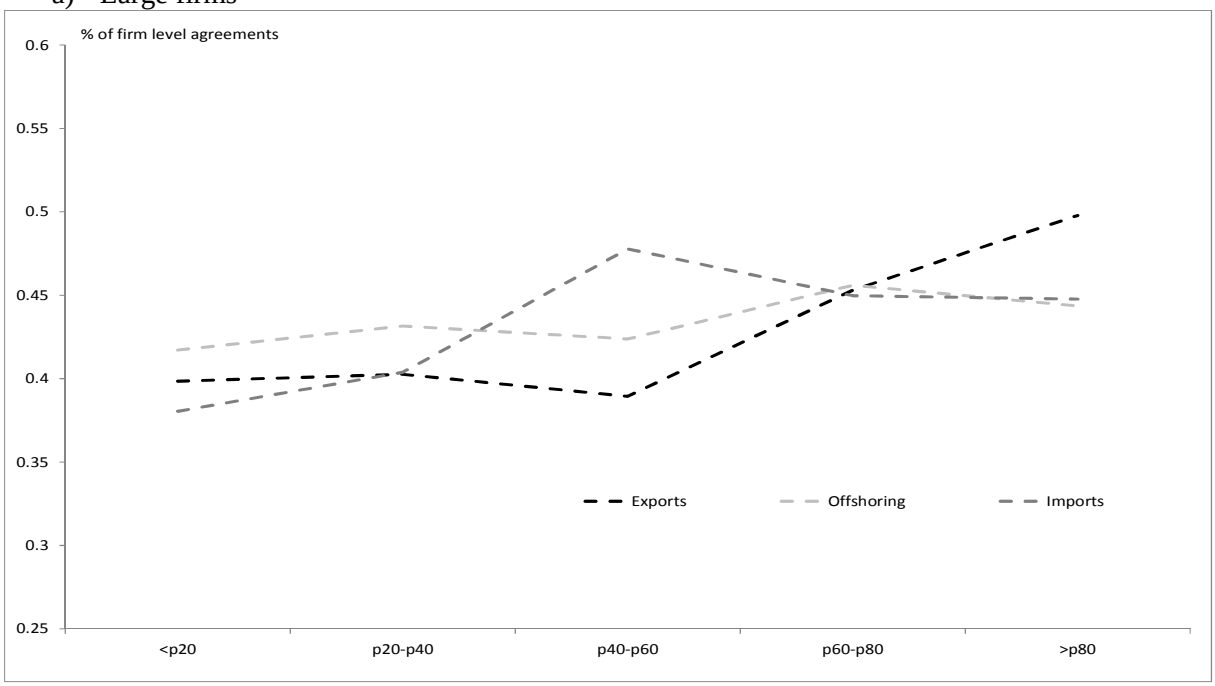
Figure 2a: Frequency of firm-level wage agreements (in %) by export, import and offshoring intensity (quintiles) - All firms



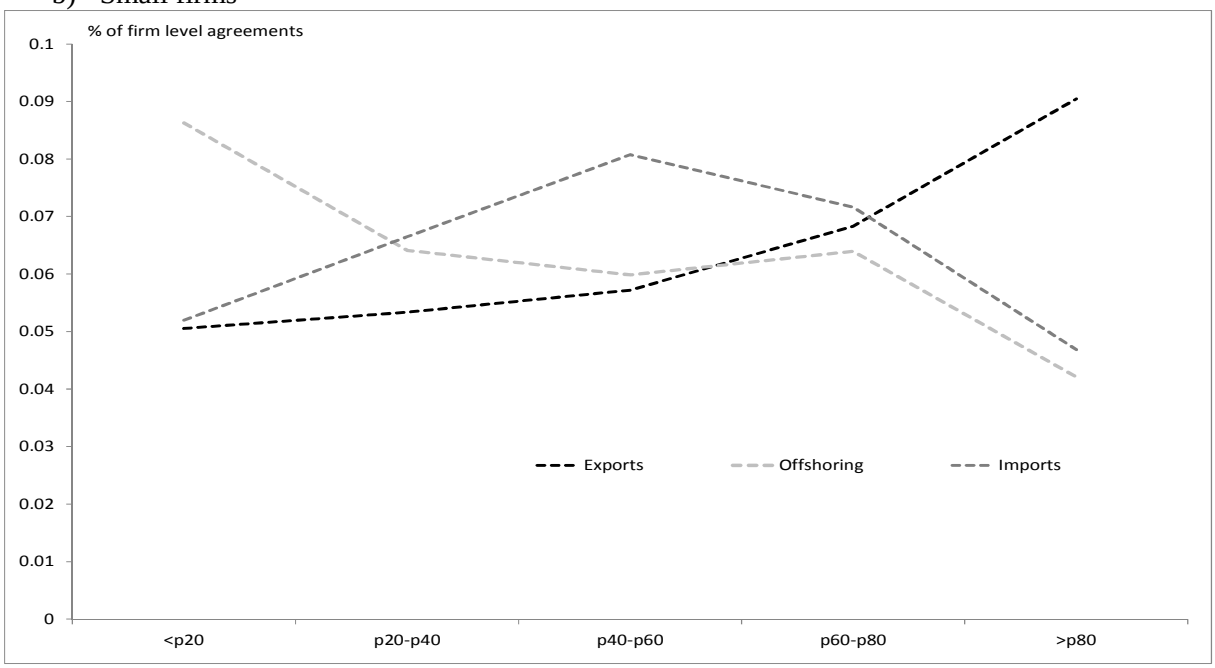
Notes: This figure plots the frequency of firm-level wage agreements as a function of the trade intensity of firms. The frequency of wage agreements is computed as the ratio between the number of firms covered by a firm-level wage agreement divided by the total number of firms. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). We then compute quintiles of its sample distribution. We compute the frequency of wage agreement at each quintile of the export intensity distribution. Same calculations are made for import and offshoring intensities (import and offshoring intensities are calculated as the ratio between imports or offshoring values and the value of inputs at the firm level). The sample consists of firms observed over the period 2005-2009 and which both export and import at least half of the observation period.

Figure 2b: Frequency of firm-level wage agreements (in %) by export, import and offshoring intensity (quintiles) – large and small firms

a) Large firms

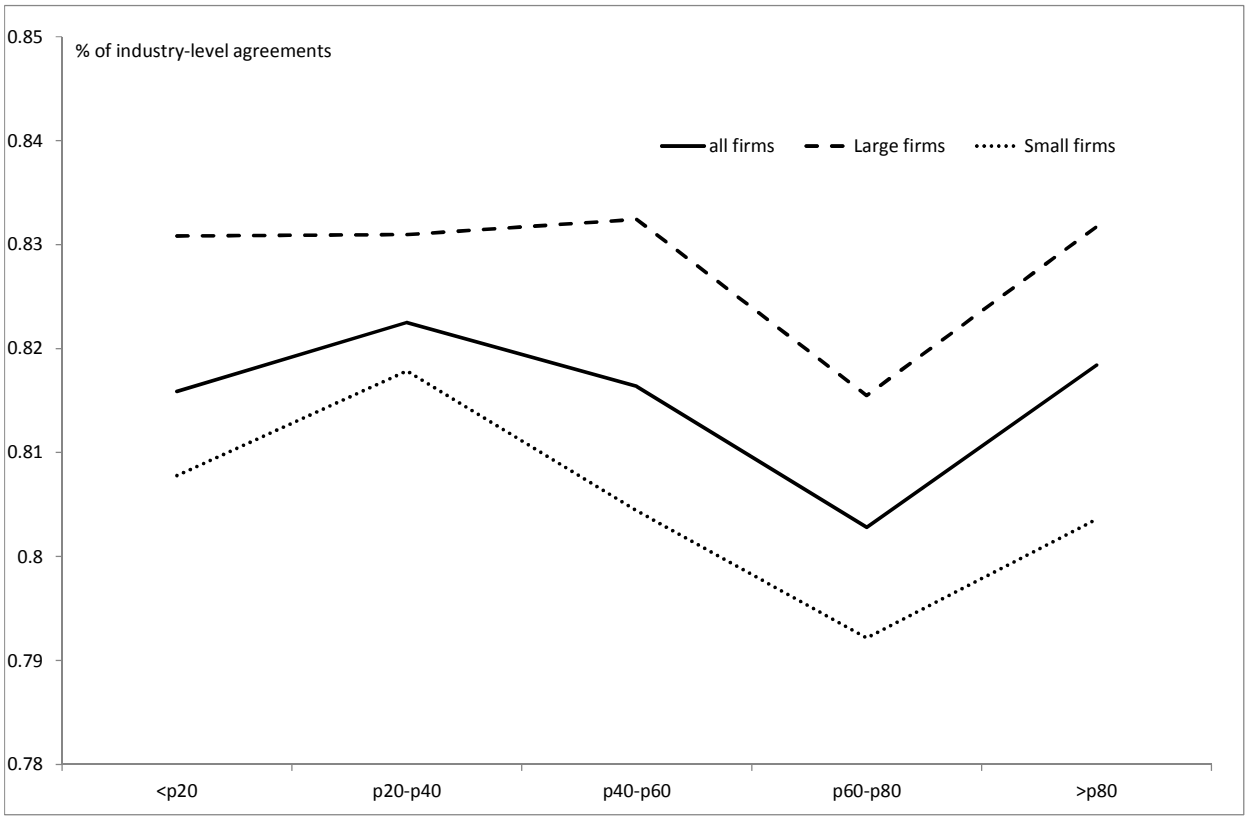


b) Small firms



Notes: This figure plots the frequency of firm-level wage agreements as a function of the trade intensity of firms. The frequency of wage agreements is computed as the number of firms covered by a firm-level wage agreement divided by the total number of firms. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). We then compute quintiles of its sample distribution. We compute the frequency of wage agreements at each quintile of the export intensity distribution. Same calculations are made for import and offshoring intensities (import and offshoring intensities are calculated as the ratio between imports or offshoring values and the value of inputs at the firm level). The sample consists of firms observed over the period 2005-2009 and which both export and import at least half of the observation period. We calculate the frequencies of wage agreements for large firms (more than 100 employees) and for small firms (less than 100 employees).

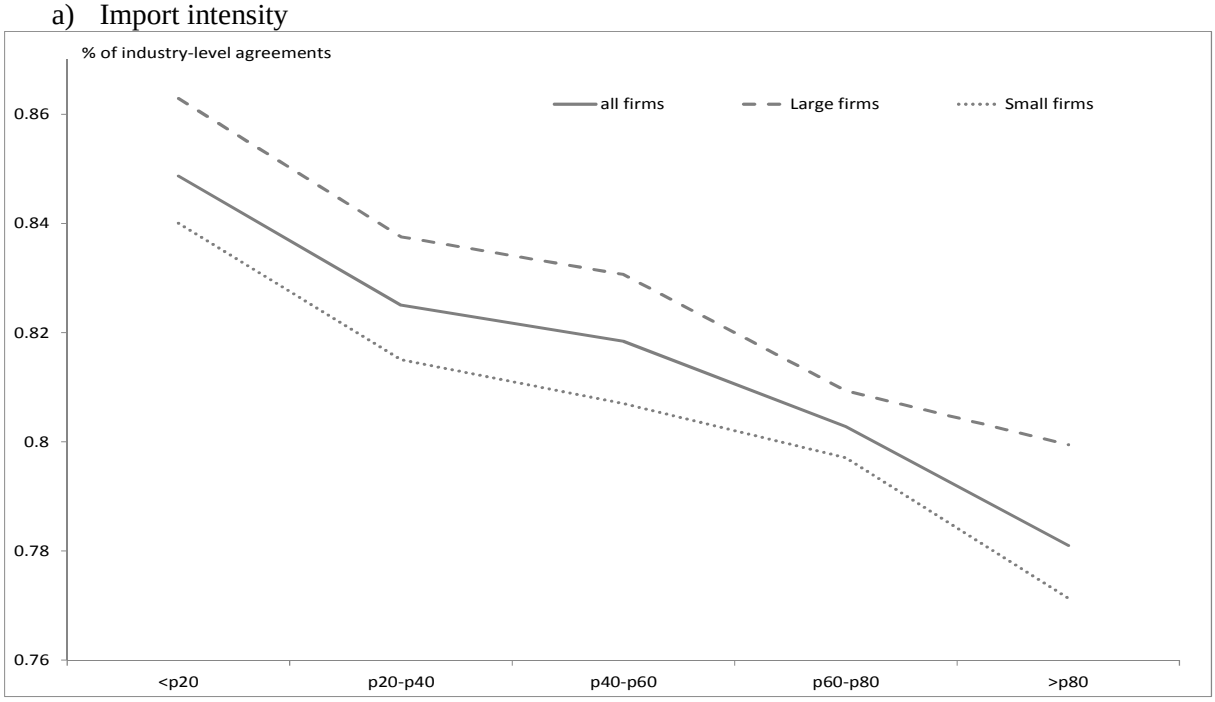
Figure 3a: Frequency of industry-level wage agreements (in %) by export intensity (quintiles)



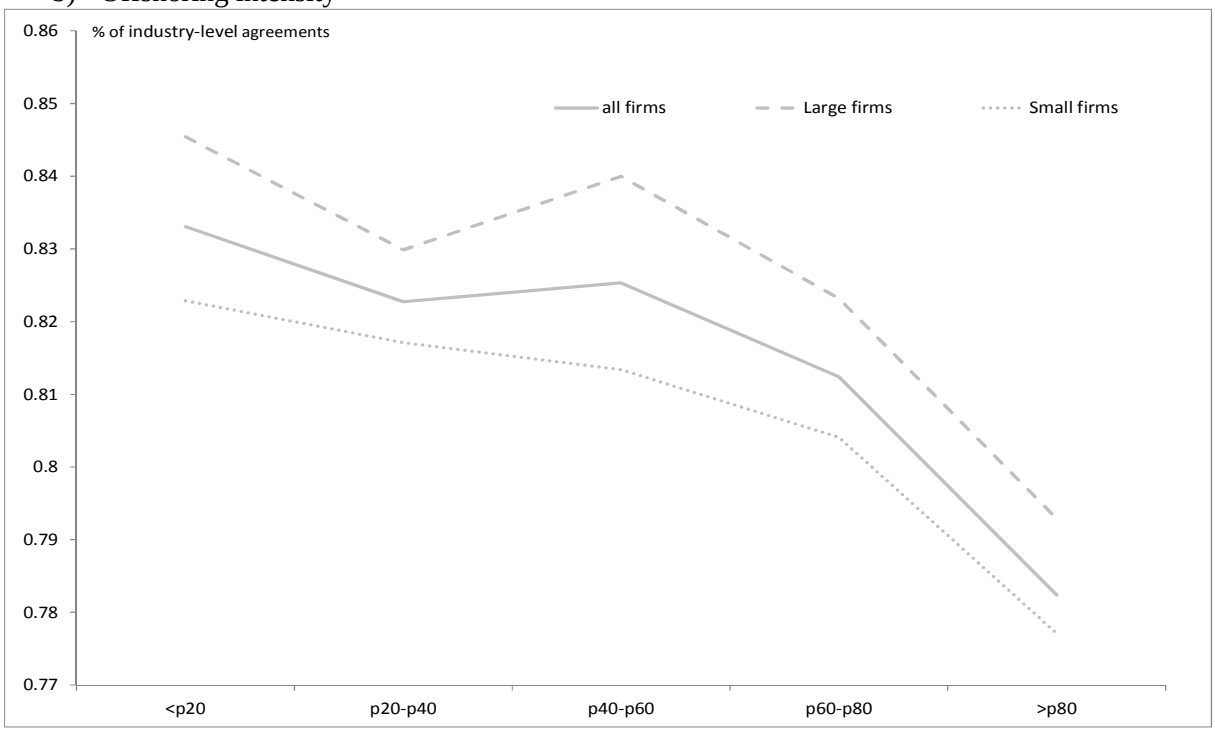
Notes: This figures plot the frequency of industry-level wage agreements as a function of the export intensity of firms. The frequency of wage agreements is computed as the ratio between the number of firms covered by an industry-level wage agreement divided by the total number of firms. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). We then compute quintiles of its sample distribution. We compute the frequency of wage agreements at each quintile of the export intensity distribution. The sample consists of firms observed during the period 2005-2009 and which both export and import at least half of the observation period. We calculate the frequencies of wage agreements for large firms (more than 100 employees) and for small firms (less than 100 employees).

Figure 3b: Frequency of industry-level wage agreements (in %) by import and offshoring intensity (quintiles)

a) Import intensity

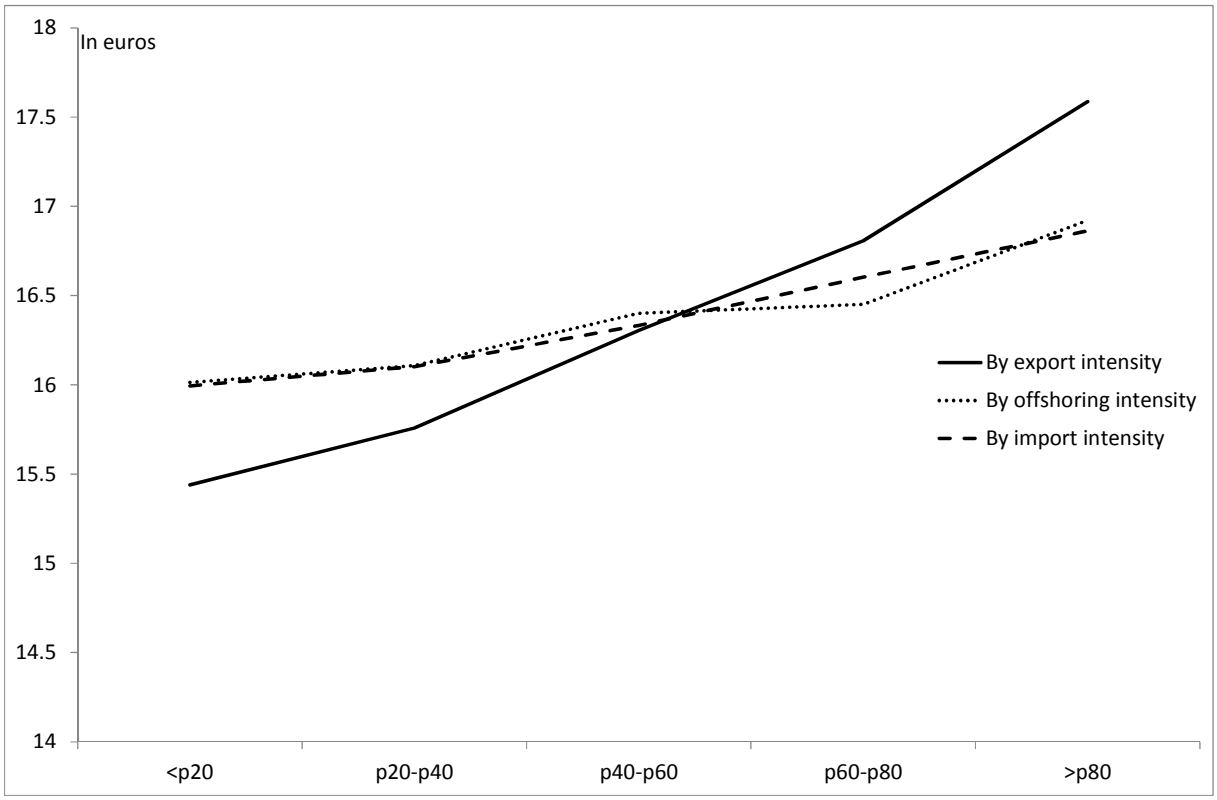


b) Offshoring intensity



Notes: This figures plot the frequency of industry-level wage agreements as a function of import or offshoring intensity of firms. The frequency of wage agreements is computed as the ratio between the number of firms covered by an industry-level wage agreement divided by the total number of firms. Import or offshoring intensity is calculated as the ratio between imports or offshoring values and the value of inputs at the firm level. We then compute quintiles of the sample distribution. We compute the frequency of wage agreements at each quintile of the export intensity distribution. The sample consists of firms observed over the period 2005-2009 and which both export and import at least half of the observation period. We calculate the frequencies of wage agreements for large firms (more than 100 employees) and for small firms (less than 100 employees).

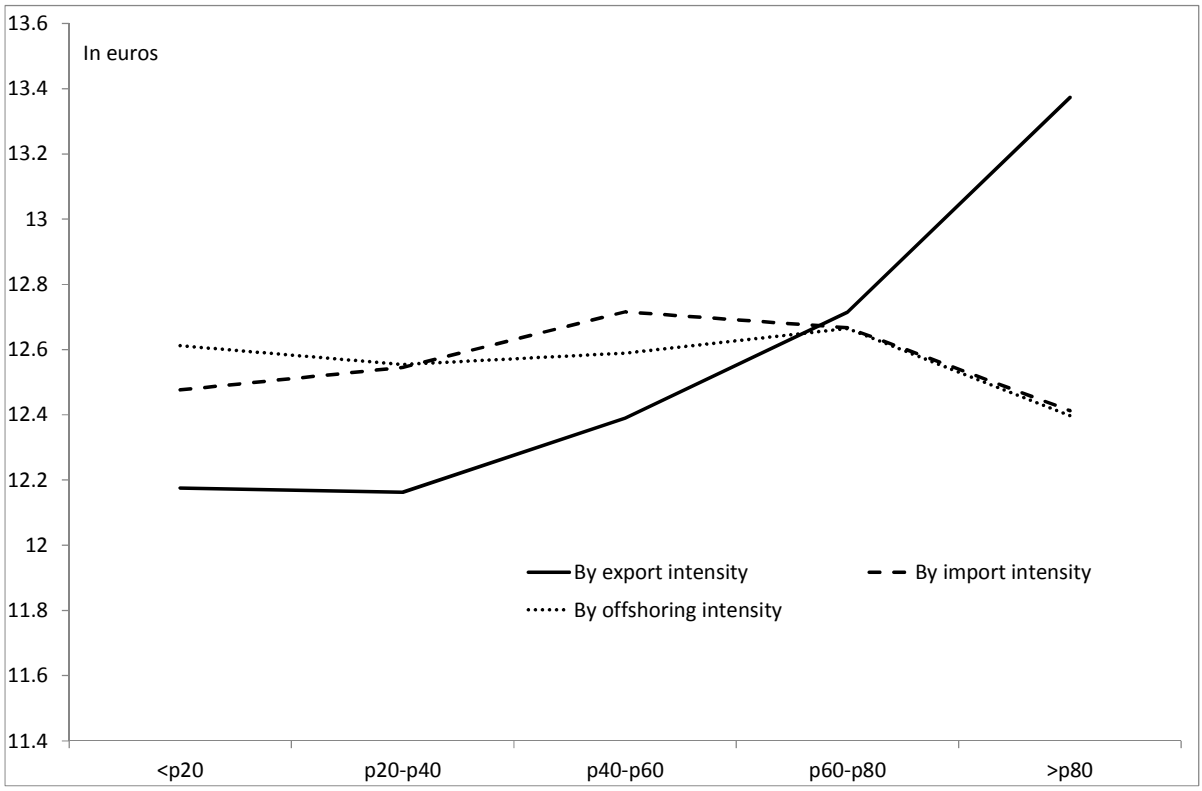
Figure 4: Average hourly net wage (in euros, firm level) by export, import and offshoring intensity (quintiles)



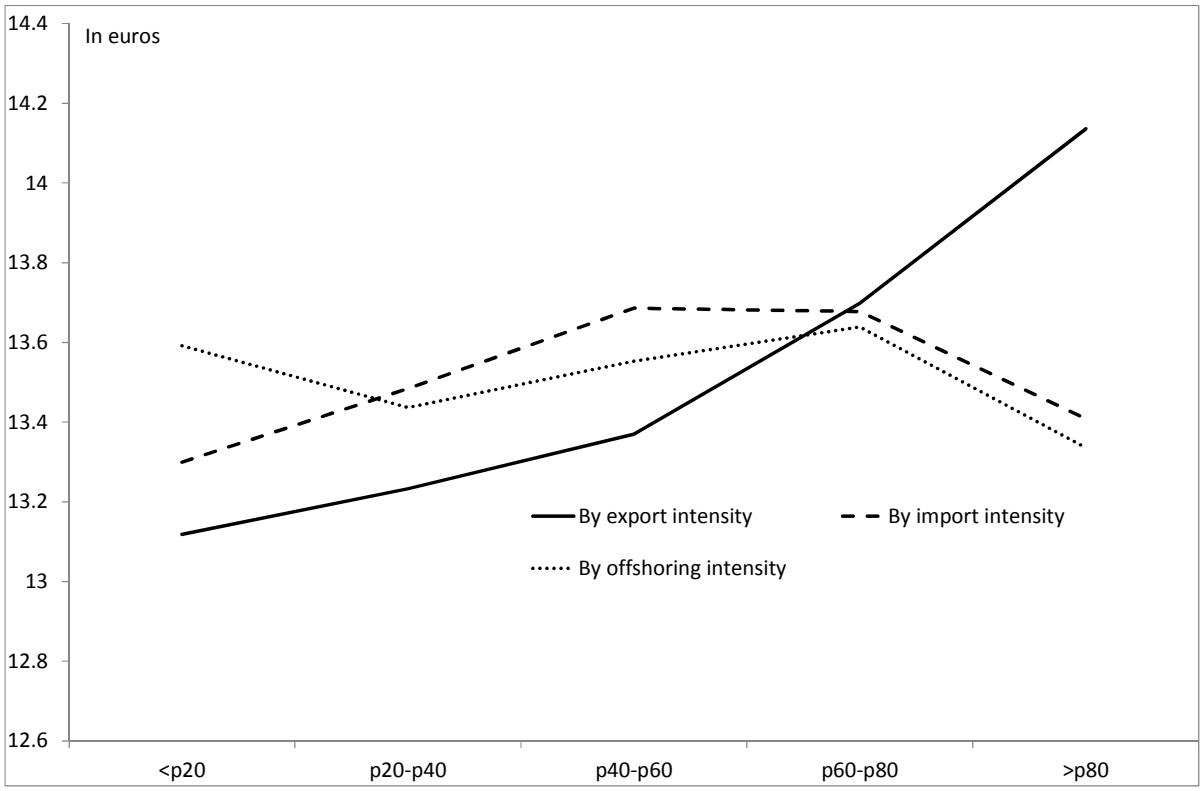
Notes: We report the average hourly wage in euros (calculated from the wage bill of four categories of workers: blue-collar workers, white collar-workers, technicians and supervisors, and executives) divided by the number of hours worked by these four categories over the period 2005-2009, as a function of the trade intensity of firms. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). We then compute the quintiles of the sample distribution. We compute the average hourly wage at each quintile of the export intensity distribution. Same calculations are made for import and offshoring intensities (import and offshoring intensities are calculated as the ratio between imports or offshoring values and the values of inputs at the firm level). The sample consists of firms observed over the period 2005-2009 and which both export and import at least half of the observation period.

Figure 5: Average hourly net wage (in euros, firm level) by export, import and offshoring intensity (quintiles)

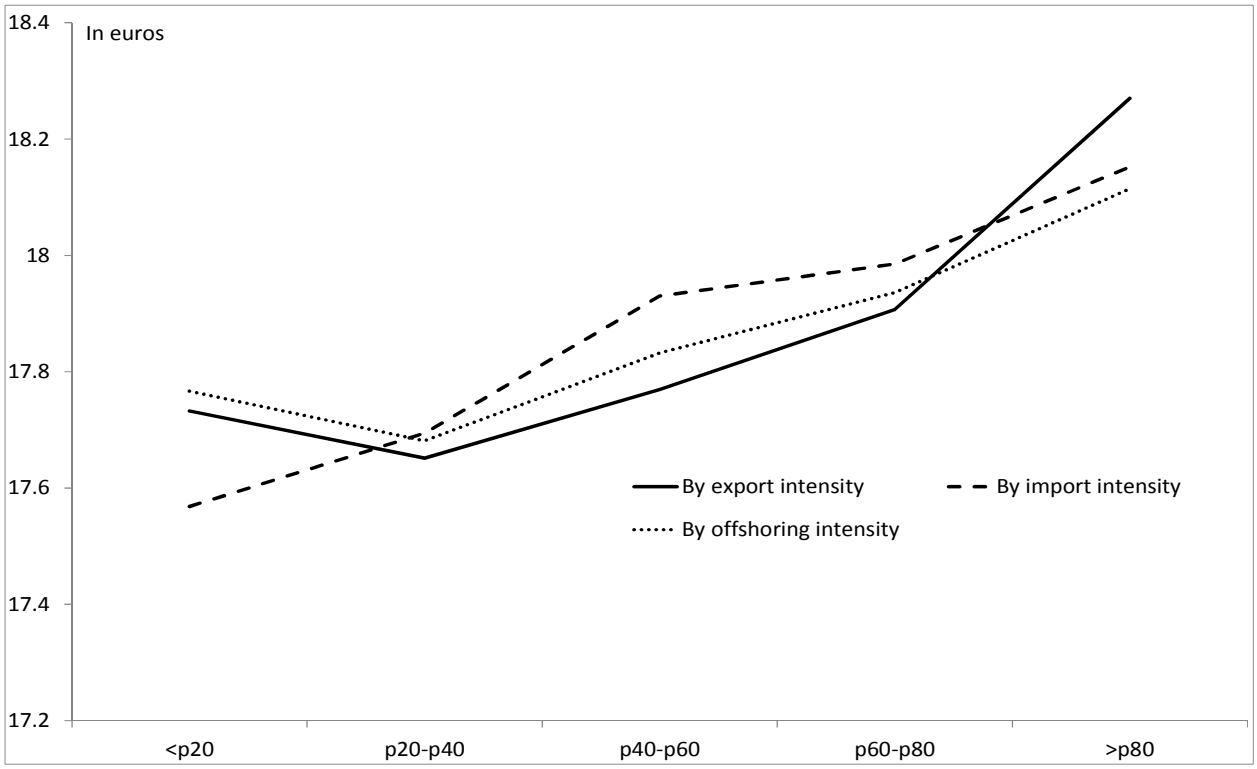
Blue-collar workers



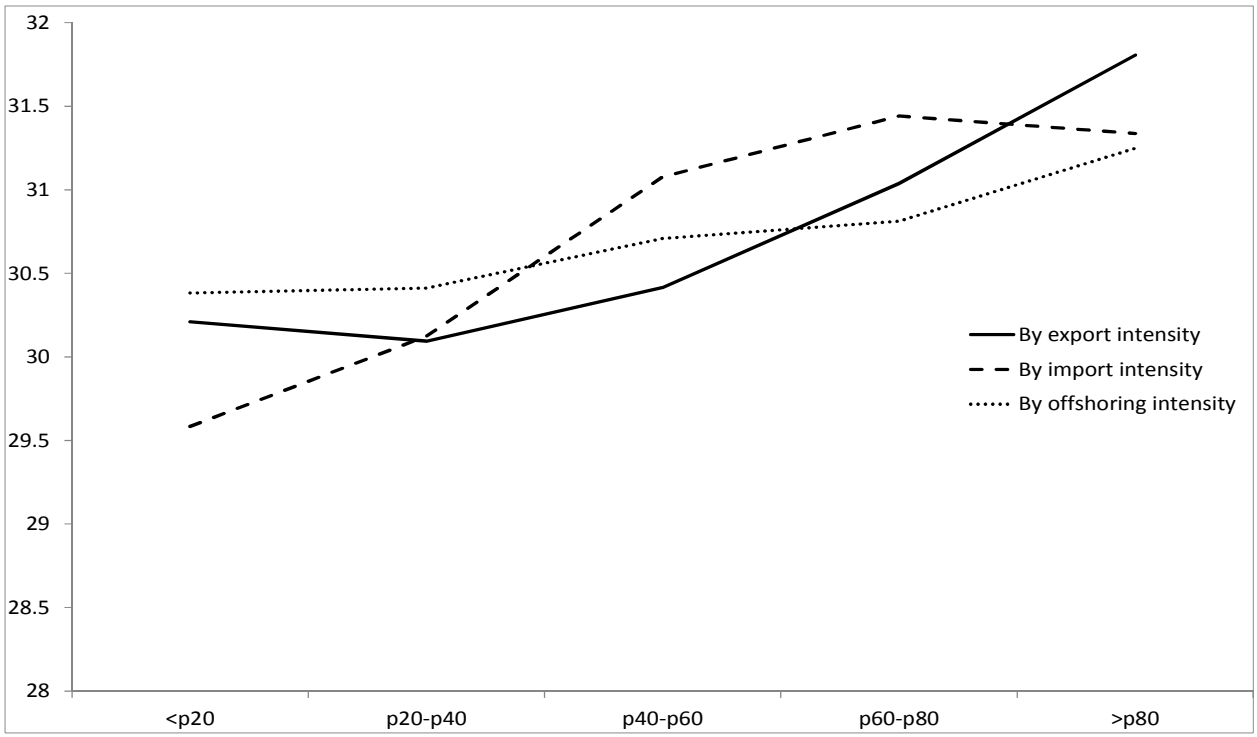
White-collar workers



Technicians and supervisors



Executives



Notes: We report the average hourly wage in euros as a function of the trade intensity of firms. Export intensity is calculated as the ratio between the value of exports and the value of total sales (at the firm level). We then compute quintiles of the sample distribution. We compute the average hourly wage at each quintile of the export intensity distribution. Same calculations are made for import and offshoring intensities (import and offshoring intensities are calculated as the ratio between imports or offshoring values and the values of inputs at the firm level). The sample consists of firms observed over the period 2005-2009 and which both export and import at least half of the observation period.

APPENDIX

Table A1: Firm-level average hourly wage regressions (total, 2005-2008)

Dependent variable	Ln (net hourly wage)					
	Narrow offshoring		Narrow offshoring		Broad offshoring	
	(1)	(2)	(3)	(4)	(5)	(6)
Exports	0.011***	0.021***	0.004***	0.008***	0.004***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Imports	0.005***	0.011***	0.002***	0.002***	0.004***	0.004***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
TFP			0.021***	0.020***	0.021***	0.020***
			(0.003)	(0.003)	(0.003)	(0.003)
Size			0.003	-0.002	0.002	-0.003
			(0.003)	(0.003)	(0.003)	(0.003)
Capital/labor			0.014***	0.014***	0.014***	0.014***
			(0.004)	(0.004)	(0.004)	(0.004)
High skilled workers			0.456***	0.454***	0.457***	0.455***
			(0.014)	(0.014)	(0.014)	(0.014)
Unemployment rate			0.000	0.000	0.000	0.000
			(0.001)	(0.001)	(0.001)	(0.001)
Temporary contracts			-0.036***	-0.035***	-0.036***	-0.035***
			(0.011)	(0.011)	(0.011)	(0.011)
			0.005**	0.004*	0.004**	0.004*
			(0.002)	(0.002)	(0.002)	(0.002)
Intercept	2.567***	2.351***	1.863***	1.840***	1.853***	1.832***
	(0.029)	(0.027)	(0.025)	(0.026)	(0.026)	(0.026)
Controls	No	No	Yes	Yes	Yes	Yes
IV	No	Yes	No	Yes	No	Yes
Observations	17,961	17,961	17,961	17,961	17,961	17,961
Number of firms	6,408	6,408	6,408	6,408	6,408	6,408
R-Squared	0.345	0.367	0.657	0.657	0.657	0.657

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table A2: Firm-level wage regressions (by job category, 2005-2008)

"Narrow offshoring"

Dependent variable	Ln (net hourly wage)							
	Blue collar		White-collar		Technicians		Executives	
	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV
Exports	0.002**	0.002**	0.004***	0.005***	0.001	0.001	0.003**	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Offshoring	0.000	-0.000	-0.000	-0.000	0.001*	0.002**	0.002**	0.005***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TFP	0.013***	0.013***	0.008*	0.007	0.024***	0.023***	0.031***	0.031***
	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)	(0.006)	(0.006)
Size	0.025***	0.025***	0.022***	0.021***	-0.009***	-0.010***	0.013***	0.011**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Capital/labor	0.011***	0.011***	0.015***	0.015***	0.014**	0.014**	-0.006	-0.005
	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)
High skilled workers	0.080***	0.080***	0.022*	0.021*	-0.078***	-0.079***	-0.023	-0.026
	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.016)	(0.016)
Unemployment rate	0.000	0.000	0.001	0.001	-0.001	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Temporary contracts	-0.050***	-0.050***	-0.086***	-0.086***	-0.070***	-0.070***	-0.034	-0.034
	(0.011)	(0.011)	(0.015)	(0.015)	(0.017)	(0.017)	(0.022)	(0.022)
Domestic sales	0.004*	0.004*	0.002	0.001	0.004	0.003	0.008**	0.007*
	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Intercept	1.954***	1.955***	2.155***	2.148***	2.436***	2.430***	2.786***	2.770***
	(0.027)	(0.027)	(0.029)	(0.029)	(0.035)	(0.036)	(0.041)	(0.041)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	No	Yes	No	Yes	No	Yes	No	Yes
Observations	17,961	17,961	17,961	17,961	17,961	17,961	17,961	17,961
Number of firms	6,408	6,408	6,408	6,408	6,408	6,408	6,408	6,408
R-Squared	0.429	0.429	0.256	0.256	0.190	0.190	0.199	0.200

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table A3: Firm-level wage regressions (by job category, 2005-2008)

"Broad offshoring"

Dependent variable	Ln (net hourly wage)							
	Blue collar		White-collar		Technicians		Executives	
	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV
Exports	0.002**	0.002**	0.003***	0.004***	0.001	0.001	0.002*	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Imports	0.001	-0.000	0.002	0.002	0.004***	0.004**	0.006***	0.011***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
TFP	0.013***	0.013***	0.007	0.007	0.023***	0.023***	0.031***	0.030***
	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)	(0.006)	(0.006)
Size	0.025***	0.025***	0.022***	0.020***	-0.010***	-0.010***	0.011***	0.009**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Capital/labor	0.011***	0.011***	0.015***	0.015***	0.014**	0.014**	-0.006	-0.005
	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)
High skilled workers	0.080***	0.080***	0.021*	0.020*	-0.078***	-0.078***	-0.022	-0.024
	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.016)	(0.016)
Unemployment rate	0.000	0.000	0.001	0.001	-0.001	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Temporary contracts	-0.050***	-0.050***	-0.087***	-0.087***	-0.071***	-0.070***	-0.035	-0.035
	(0.011)	(0.011)	(0.015)	(0.015)	(0.017)	(0.017)	(0.022)	(0.022)
Domestic sales	0.004*	0.004*	0.001	0.001	0.003	0.003	0.007*	0.006
	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Intercept	1.951***	1.955***	2.146***	2.139***	2.425***	2.422***	2.766***	2.743***
	(0.027)	(0.027)	(0.029)	(0.029)	(0.036)	(0.036)	(0.041)	(0.042)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	No	Yes	No	Yes	No	Yes	No	Yes
Observations	17,961	17,961	17,961	17,961	17,961	17,961	17,961	17,961
Number of firms	6,408	6,408	6,408	6,408	6,408	6,408	6,408	6,408
R-Squared	0.429	0.429	0.256	0.256	0.190	0.190	0.201	0.201

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table A4: Firm-level wage regressions (by job category, 2005-2009)

"Broad offshoring"

Dependent variable	Ln (net hourly wage)							
	Blue collar		White-collar		Technicians		Executives	
	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV	OLS	OLS-IV
Exports	0.003***	0.003***	0.003***	0.004***	0.001	0.002*	0.002*	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Imports	0.002	-0.000	0.002*	0.002	0.005***	0.004**	0.006***	0.010***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
TFP	0.018***	0.018***	0.013***	0.012***	0.028***	0.028***	0.031***	0.030***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Size	0.022***	0.023***	0.022***	0.020***	-0.009***	-0.010***	0.014***	0.012***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Capital/labor	0.007**	0.007**	0.015***	0.015***	0.012**	0.012**	0.000	0.000
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)
High skilled workers	0.040***	0.040***	0.004	0.003	-0.115***	-0.115***	-0.036**	-0.037**
	(0.010)	(0.010)	(0.011)	(0.011)	(0.012)	(0.012)	(0.015)	(0.015)
Unemployment rate	-0.002***	-0.002**	0.000	0.000	-0.001	-0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Temporary contracts	-0.046***	-0.045***	-0.071***	-0.070***	-0.070***	-0.069***	-0.022	-0.021
	(0.011)	(0.011)	(0.015)	(0.015)	(0.016)	(0.016)	(0.021)	(0.021)
Domestic sales	0.004**	0.005**	0.001	0.001	0.003	0.003	0.006	0.004
	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Intercept	2.001***	2.010***	2.190***	2.182***	2.390***	2.389***	2.748***	2.730***
	(0.028)	(0.028)	(0.029)	(0.029)	(0.034)	(0.035)	(0.041)	(0.041)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	No	Yes	No	Yes	No	Yes	No	Yes
Observations	21,806	21,806	21,806	21,806	21,806	21,806	21,806	21,806
Number of firms	6,744	6,744	6,744	6,744	6,744	6,744	6,744	6,744
R-Squared	0.429	0.428	0.267	0.267	0.190	0.190	0.197	0.197

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies, disaggregate industry-level dummies, random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period.

Table A5: Firm-level wage regressions by wage bargaining regime (total)

"Broad offshoring"

Dependent variable	Ln (net hourly wage)					
	2005-2009			2005-2008		
Firm wage agreement	No	No	Yes	No	No	Yes
Industry wage agreement	No	Yes	-	No	Yes	-
Exports	0.010***	0.006***	0.012***	0.009***	0.006***	0.010***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Offshoring	-0.005*	0.006***	0.002	-0.006**	0.006***	0.004
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
TFP	0.019*	0.020***	0.021***	0.029**	0.016***	0.017***
	(0.011)	(0.004)	(0.005)	(0.012)	(0.005)	(0.005)
Size	-0.011*	-0.005	-0.006	-0.008	-0.007*	-0.004
	(0.007)	(0.004)	(0.006)	(0.007)	(0.004)	(0.006)
Capital/labor	0.015	0.013***	0.005	0.026*	0.014***	0.006
	(0.014)	(0.005)	(0.007)	(0.015)	(0.005)	(0.007)
High skilled workers	0.504***	0.394***	0.442***	0.527***	0.445***	0.521***
	(0.024)	(0.014)	(0.027)	(0.024)	(0.017)	(0.036)
Unemployment rate	0.001	-0.000	-0.001	0.003	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Temporary contracts	-0.046	-0.033**	-0.056*	-0.034	-0.042***	-0.077***
	(0.032)	(0.013)	(0.030)	(0.035)	(0.014)	(0.029)
Domestic sales	0.023*	0.003	-0.002	0.023**	0.004	0.000
	(0.014)	(0.003)	(0.003)	(0.011)	(0.003)	(0.003)
Intercept	1.873***	1.920***	1.835***	1.848***	1.883***	1.808***
	(0.047)	(0.033)	(0.064)	(0.051)	(0.035)	(0.062)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,059	12,981	5,766	2,409	10,855	4,697
Number of firms	2,178	4,813	1,474	1,715	4,526	1,439
R-Squared	0.638	0.617	0.737	0.641	0.631	0.753

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies and random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years during the period 2002-2009, "No" less than 20% of wage agreements during the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

Table A6: Firm-level wage regressions by bargaining regime and by job category

"Broad offshoring"

	2005-2009			2005-2008		
Firm wage agreement	No	No	Yes	No	No	Yes
Industry wage agreement	No	Yes	-	No	Yes	-
Blue-collar workers						
Exports	0.005**	0.001	0.006**	0.004*	0.001	0.005*
	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.003)
Offshoring	-0.008***	-0.000	0.003	-0.009***	-0.000	0.006*
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
R-Squared	0.444	0.359	0.520	0.441	0.359	0.524
White-collar workers						
Exports	0.008***	0.004***	0.003	0.006**	0.004***	0.003
	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)	(0.003)
Offshoring	-0.008**	0.003	0.008***	-0.011***	0.003	0.011***
	(0.003)	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)
R-Squared	0.295	0.207	0.356	0.272	0.198	0.358
Technicians and supervisors						
Exports	0.007**	0.001	0.004*	0.004	0.000	0.003
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Offshoring	-0.004	0.004**	0.004	-0.003	0.004*	0.005
	(0.004)	(0.002)	(0.003)	(0.004)	(0.002)	(0.004)
R-Squared	0.217	0.169	0.338	0.222	0.173	0.345
Executives						
Exports	0.001	-0.002	0.014***	0.000	-0.002	0.013***
	(0.003)	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)
Offshoring	0.002	0.014***	0.004	0.004	0.015***	0.005
	(0.005)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)
R-Squared	0.219	0.170	0.326	0.222	0.178	0.341
Observations	3,059	12,981	5,766	2,409	10,855	4,697
Number of firms	2,178	4,813	1,474	1,715	4,526	1,439

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Robust standard errors are clustered at the firm level. We only report coefficients associated with exports and imports but firm-level controls, year dummies and random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years over the period 2002-2009, "No" less than 20% of wage agreements over the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

Table A7: Firm-level total hour regressions by wage bargaining regime (total, 2005-2009)

"Broad offshoring"

Dependent variable	Ln (total hours)			
Firm wage agreement	-	No	No	Yes
Industry wage agreement	-	No	Yes	-
Exports	0.014***	0.009***	0.013***	0.008***
	(0.001)	(0.003)	(0.001)	(0.002)
Offshoring	0.021***	0.007**	0.019***	0.013***
	(0.002)	(0.003)	(0.002)	(0.003)
TFP	-0.016**	-0.020	-0.014	-0.008
	(0.008)	(0.026)	(0.010)	(0.017)
Average nb of employees	0.945***	0.951***	0.949***	0.962***
	(0.004)	(0.008)	(0.005)	(0.007)
Capital/labor	-0.117***	-0.113***	-0.125***	-0.089**
	(0.015)	(0.033)	(0.018)	(0.040)
High skilled workers	0.129***	0.174***	0.120***	0.123***
	(0.011)	(0.032)	(0.014)	(0.020)
Unemployment rate	-0.002**	-0.001	-0.003**	-0.000
	(0.001)	(0.002)	(0.001)	(0.001)
Temporary contracts	0.065**	0.033	0.057*	0.130***
	(0.025)	(0.067)	(0.031)	(0.048)
Intercept	7.090***	6.990***	7.133***	7.274***
	(0.031)	(0.059)	(0.040)	(0.041)
Controls	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes
Observations	21,806	3,059	12,981	5,766
Number of firms	6,744	2,178	4,813	1,474
R-Squared	0.984	0.978	0.977	0.981

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Period: 2005-2009. Robust standard errors are clustered at the firm level. Year dummies and random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years during the period 2002-2009, "No" less than 20% of wage agreements during the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year

Table A8: Firm-level total hour regressions by bargaining regime and by job category

"Broad offshoring"

Firm wage agreement	-	No	No	Yes
Industry wage agreement	-	No	Yes	-
Blue-collar workers				
Exports	0.027***	-0.007	0.016**	0.026***
	(0.006)	(0.011)	(0.007)	(0.010)
Offshoring	0.077***	0.016	0.051***	0.134***
	(0.009)	(0.015)	(0.010)	(0.018)
R-Squared	0.858	0.823	0.807	0.846
White-collar workers				
Exports	0.040***	0.006	0.028***	0.087***
	(0.006)	(0.013)	(0.008)	(0.014)
Offshoring	0.055***	0.049***	0.056***	0.028
	(0.008)	(0.017)	(0.010)	(0.020)
R-Squared	0.650	0.617	0.577	0.670
Technicians and supervisors				
Exports	0.042***	0.009	0.042***	0.058***
	(0.005)	(0.011)	(0.006)	(0.009)
Offshoring	0.043***	0.020	0.035***	0.032**
	(0.007)	(0.015)	(0.008)	(0.013)
R-Squared	0.838	0.772	0.759	0.874
Executives				
Exports	0.096***	0.089***	0.087***	0.120***
	(0.006)	(0.013)	(0.007)	(0.011)
Offshoring	0.051***	0.003	0.053***	0.055***
	(0.008)	(0.015)	(0.009)	(0.016)
R-Squared	0.808	0.718	0.721	0.847
Observations	21,806	3,059	12,981	5,766
Number of firms	6,744	2,178	4,813	1,474

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. Robust standard errors are clustered at the firm level. We only report coefficients associated with exports and imports but firm-level controls, year dummies and random firm-level effects are included in all specifications. The sample consists of firms that both export and import at least half of the observation period. The category "Firm-level wage agreement" is defined according to the frequency of firm-level wage agreements for a given firm, "Yes" corresponds to firms that agree on wages more than 20% of years over the period 2002-2009, "No" less than 20% of wage agreements over the same period. The category "Industry-level wage agreement" means that a firm is covered by the effects of an industry-wage agreement in a given year.

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