Institut de Recerca en Economia Aplicada Regional i Pública
Research Institute of Applied Economics
Document de Treball 2023/07, 36 pàg.
Working Paper 2023/07, 36 pag.

Grup de Recerca Anàlisi Quantitativa Regional
Regional Quantitative Analysis Research Group
Document de Treball 2023/04, 36 pàg.
Working Paper 2023/04, 36 pag.

"Labor Market Monopsony and Firm Behavior: Evidence from Spanish Exporters"

Akin A. Cilekoglu

UBIREA
Research Institute of Applied Economics
AQR
Regional Quantitative Analysis Research Group

UBIREA | Institut de Recerca en Economia Aplicada Regional i Pública
UNIVERSITAT DE BARCELONA

WEBSITE: www.ub-irea.com • CONTACT: irea@ub.edu

AQR
Grup de Recerca Anàlisi Quantitativa Regional
Regional Quantitative Analysis Research Group

WEBSITE: www.ub.edu/aqr/ • CONTACT: aqr@ub.edu

Universitat de Barcelona
Av. Diagonal, 690 • 08034 Barcelona

The Research Institute of Applied Economics (IREA) in Barcelona was founded in 2005, as a research institute in applied economics. Three consolidated research groups make up the institute: AQR, RISK and GiM, and a large number of members are involved in the Institute. IREA focuses on four priority lines of investigation: (i) the quantitative study of regional and urban economic activity and analysis of regional and local economic policies, (ii) study of public economic activity in markets, particularly in the fields of empirical evaluation of privatization, the regulation and competition in the markets of public services using state of industrial economy, (iii) risk analysis in finance and insurance, and (iv) the development of micro and macro econometrics applied for the analysis of economic activity, particularly for quantitative evaluation of public policies.

Abstract

In this paper, I develop a method to estimate the effect of firm behavior on labor market monopsony power. Using China's accession to WTO for the identification, I employ the proposed empirical framework to analyse the impact of Spanish firms' exports on their labor market monopsony power. The findings suggest that higher exports raised monopsony power of firms in labor markets between 1996 and 2007. After 2001, more intensely exporting firms reduced their wages by 36-45 percentage points and paid their employees around 39-49 percent of their marginal revenue product. Aligned with increased monopsony power, exporting firms experienced a decline labor productivity and labor share while they employed more low-skilled workers and temporary contracts.

JEL Classification: J42, D22, F16, F14, J21.

Keywords: Labor market monopsony, Firm behavior, Exports, Trade.

Akin A. Cilekoglu: AQR-IREA Research Group, University of Barcelona. Email: akin.cilekoglu@gmail.com

Acknowledgements

I would like to thank Erol Taymaz for his support and suggestions, who has been my host at Middle East Technical University (METU) during my visiting as a PhD student. I am also grateful to my advisors Raul Ramos and Rosina Moreno for the comments and suggestions. Thanks to Carsten Eckel, Monika Schnitzer, Cladia Steinwender and Jonas Casper for comments on the theoretical model. All errors are my own.

1 Introduction

Firms' labor market power has been a growing concern in recent years because increasing number of empirical evidences reflect the presence of market failures. Although monopsony (or oligopsony) power has been largely neglected for a long time since the idea was originated with Robinson (1933), we have an accumulated evidence today and a growing consensus on rising monopsony power of firms in labor markets across various industries and countries (See Boal and Ransom, 1997; Ashenfelter et al., 2010; Manning, 2011; Sokolova and Sorensen, 2021; Manning, 2021; Ashenfelter et al., 2022; Card, 2022, for review studies on the topic). Rapidly growing empirical literature suggests that employers possess some market power in wage setting and such labor market irregularities unlikely comply with perfectly competitive models.

Monopsony power in labor market refers to a case in which there is a single buyer (an employer) and many sellers in the market (workers).[1] Theoretically, monopsonistic labor market induces that labor supply curve to a firm is not infinitely elastic and firms face upward sloping labor supply curve. In that case, wage is not equated to marginal revenue generated by workers and workers are paid less than their worth to the firm.[2]

Search frictions and idiosyncratic preferences of workers are considered to be the main sources of labor market frictions. Geographical restrictions and workers' lack of information about better or similar outside job opportunities generate search frictions because matching between employers and workers (searching, finding and changing a job) is a costly process and it takes time (Burdett and Mortensen, 1998; Manning, 2011). In the models of idiosyncratic preferences, workers have heterogeneous preferences in job search and idiosyncratic utility of different jobs allows firms to exploit workers (Card et al., 2018). More recently, a growing body of literature also emphasizes that firms may gain monopsony power because of employer concentration (e.g. Benmelech et al., 2022; Azar et al., 2022), tax changes (e.g. Berger et al., 2022), institutional settings and legal restrictions to mobility (e.g. Naidu, 2010; Naidu and Yuchtman, 2013; Naidu et al., 2016; Krueger and Ashenfelter, 2022; Balasubramanian et al., 2022).

Market failures and anti-competitive practices in product markets have been major concerns among academics, lawyers and antitrust authorities over the past decades but the

[1] More typical market structures tend to be those with few employers and many workers and referred as oligopsony or monopolistic competition, see Bhaskar et al. (2002) for a detailed discussion. However, I prefer to use the term monopsony power in the remaining of the paper because the method I introduce is an extension of the standard monopsony model.

[2] In contrast, perfectly competitive labor market induces that workers seek better job options and reduce their labor supply if the firm deviates from the wage determined at the market level. Wage elasticity of labor supply curve to the firm then becomes infinitely elastic and thus the employer loses its workers when it cuts wages. In other words, firms do not have wage-setting power if labor market is competitive ($\partial W/\partial L = 0$) and labor supply elasticity becomes equal to zero $\varepsilon = 0$. In this case, marginal revenue product of labor becomes equal to wage $MRPL/W = 1$ and workers are paid as much as they contribute to the firm revenue.

implications of antitrust in labor markets have been neglected (Posner, 2021). However, strategic interactions of firms can be subject to antitrust enforcement because collusive and anti-competitive behavior might lead to concentration of employers and generate imperfections in labor markets. In this respect, recent studies discover that monopsonistic competition in labor market may arise because of no-poaching and non-solicidation agreements (e.g. Ashenfelter et al., 2022), non-compete clauses (e.g. Balasubramanian et al., 2022), franchise agreements (e.g. Krueger and Ashenfelter, 2022) and mergers and acquisitions (e.g. Arnold, 2019; Prager and Schmitt, 2021).[3]

How does exporting affects monopsony power of firms in labor markets? In this paper, I develop a simple empirical method to measure the impact of a firm's decision on its monopsony power in labor market. Using this model and exploiting China's accession to the World Trade Organization (WTO) in a difference-in-differences setting, I estimate the impact of increased exports on monopsony power of Spanish manufacturing firms. I find that more intensely exporting firms paid their workers around 39-49% of their marginal revenue product, which declined from 60-88% in absence of the effect of exports. Hence, higher exports reduced workers' pay by 36-45% for the period 2002-2007 compared to 1996-2001.

The findings additionally suggest that higher exports reduced labor share and labor productivity. More intensely exporting raised the demand for low-skill workers while did not affect the employment of high-skill workers within firms but induced higher temporary contracts in some industries during the 2002-2007 period. The results in this paper provide robust evidences on increased labor market power of exporting firms and suggest that additional public policies might be needed to address trade induced labor market monopsony.

The main contribution of this paper is to develop a new framework to estimate the effect of firm-level decisions on their monopsony power in labor markets. Labor economics literature developed several methods to measure monopsony power while many studies in recent years adopted a framework proposed by De Loecker and Warzynski (2012). Relying on production function estimation and the assumption of a perfectly competitive materials market, their approach is originally developed to measure markups but also allows to obtain firm-level labor supply elasticity (wage markdowns).[4] My approach is simple and neither requires estimating the production function nor relies on strong assumptions. Hence, the model introduced in this paper is not restrictive and it can be implemented using any choice variable of a firm.

Standard approach in labor economics literature estimates the labor supply elasticity

[3]See Naidu et al. (2018) and Naidu and Posner (2022) for the discussions on whether anti-trust policies can correct imperfections in labor markets.

[4]See Doraszelski and Jaumandreu (2021) and Bond et al. (2021) for strong criticisms on the estimation procedure of De Loecker and Warzynski (2012).

that captures the gap between marginal revenue contribution of the worker and average wage (e.g. Falch, 2010; Staiger et al., 2010). On the other hand, Manning (2003) provides an alternative framework referred as dynamic monopsony. Based on the dynamic decision-making processes of workers and employers, his method incorporates the elasticities of recruitment and quit functions (e.g. Hirsch et al., 2010; Ransom and Sims, 2010). A recently growing body of papers utilize the insights from the industrial organization (IO) literature and explain monopsony power with employer concentration based on Cournot oligopsony model. These studies measure concentration ratios of vacancies or employers such as Herfindahl-Hirschman Index (HHI) (e.g. Azar et al., 2020; Benmelech et al., 2022; Azar et al., 2022).[5] The methodology I introduce extends the textbook model of monopsony in a way that it allows to identify how much a firm activity increases or decreases firms' labor market power. Therefore, my approach differs from the current models that examine whether or how much firms have market power, which is a different research question.

I additionally contribute to recently growing empirical trade literature investigating the labor market outcomes of trade in presence of labor market imperfections. Previous trade models tended to rely on the assumption of perfectly competitive labor markets and the role of firms' labor market monopsony power has received little attention until recently. Focusing on China's accession to WTO in 2001, Lu et al. (2019) find that FDI liberalization increased monopsony power in China while Kondo et al. (2022) find that input trade liberalization reduced labor market monopsony power of Chinese firms. Moreover, Caselli et al. (2021) find that import competition from China reduced monopsony power of firms in France. Similar to these researches, the analysis in this paper also considers China's accession to WTO but studies the impact of China's integration to world trade on the behavior of Spanish exporting firms.

Additionally, Felix (2021) finds that trade liberalization raised Brazilian firms' labor market monopsony power through increased labor market concentration from 1990 to 1994. MacKenzie (2021) discovers that trade induced higher labor market power for large firms but lower for small firms in India for the years 2008-2009. This paper departs from these studies by analysing a longer period and examining the labor market outcomes of trade in a developed country. Finally, some researchers studied the implications of trade in the presence of monopsony power in labor markets (e.g. Jha and Rodriguez-Lopez, 2021; Egger et al., 2022; Macedoni and Tyazhelnikov, 2022; Méndez and Van Patten, 2022). However, this is a different strand of literature which does not investigate how trade affects monopsony power, but rather how trade affects wages and employment when

[5]However, HHI is no longer used as an appropriate measure of market power in industrial organization literature. Labor economics literature recently adopted concentration ratios such as the HHI to identify employer's market power in labor market. These studies have been subject to criticisms because such measures can reflect product market power as well and they are considered to be endogenous market outcome (e.g. Berry et al., 2019; Syverson, 2019; Langella and Manning, 2021).

the labor market is monopsonistic.

The rest of the paper is organized as follows. Section 2 introduces the model and discuss the channels that might have contributed to increase in monopsony power of exporting firms. Section 3 describes the dataset. Section 4 presents the empirical analysis whereas Section 4.1 estimates the wage and employment elasticities to exporting. Section 4.2, Section 4.3 and Section 4.4 examine and discuss various channels of the findings such as labor share, labor productivity and the demand for low-skill, high-skill and temporary workers. Section 5 concludes.

2 Theoretical Framework

This section presents a method to estimate the effects of firm behavior on its monopsony power, which is developed as an extension to the standard monopsony measure. I describe the differences and implications of the textbook model and my approach. I further discuss potential channels through which larger exports affect monopsony power because I employ this framework for exporting in the empirical analysis.

The standard model of monopsony in the literature of labor economics relies on estimating the labor supply elasticity. In recent years, a growing number of theoretical and empirical models have been developed to discover the presence of imperfectly competitive labor markets (e.g. Beaudry et al., 2018; Lamadon et al., 2022; Berger et al., 2022) but there is still a lack of a unified approach for the measurement of firms' monopsony power in labor markets (Langella and Manning, 2021).

In contrast to perfectly competitive labor markets that take the wage as given to the firm and defined as W, the wage is considered to be a function of employment in a monopsonistic environment and defined as $W(L)$. A monopsonist firm then chooses the level of employment to maximize its profits

$$\max_{L} \pi = R(L) - W(L)L \tag{1}$$

where $R(L)$ denotes the firm revenue, $W(L)$ denotes the firm's average wage and L denotes the number of workers employed at the firm. In equilibrium, the deviation of last hired worker's contribution to firm revenue (referred as marginal revenue product of labor) from wage becomes equal to the cost of hiring that last worker: $\partial R(L)/\partial L = \partial\Big(W(L)L\Big)/\partial L$. We then obtain

$$\frac{MRPL - W}{W} = \frac{1}{\varepsilon}, \tag{2}$$

where $MRPL = \partial R/\partial L$ denotes the marginal revenue product of labor and ε represents the labor supply elasticity. A monopsonist faces an upward-sloping supply curve and holds bargaining power to set the wage ($\varepsilon = \frac{\partial L}{\partial W}\frac{W}{L} > 0$).

I introduce a new framework that allows to measure how the firm behaviour changes its monopsony power in labor market. This method relies on nonrigid assumptions and the parameters to be estimated are integrated to the standard monopsony measure of labor supply elasticity. I start by using the level of exports as a demand shifter and assume that employment is a function of firm's exports denoted as E:

$$L(E). \tag{3}$$

E refers to export volumes rather than exporting status, i.e. exporting at the intensive margin. In this paper, I study exporting at the intensive margin but export status as the extensive margin of trade can also be the subject of a study.

The assumption above induces that exporting affects the level of labor demand. This is a realistic and reasonable definition because trade literature documents that expansion to new export markets allows exporters to boost their production and therefore employ more workers. Notice that this formulation is different because conventional approach shown in Equation (2) defines the employment as L and does not consider that a firm behavior might affect firm's employment decision.

In a perfectly competitive labor market, the demand shock to a firm should not affect wages because they are set at the market level. However, in a monopsonistic environment, wage is assumed to be the function of employment because the firm's demand for labor can affect the wages. Instead of assuming that labor demand determines the firm's wage, which leads to Equation (2), I assume that exporting (or any other firm activity) might also affect wage either directly through rent sharing due to the expansion of markets or indirectly through the changes in labor demand. Therefore, I define the wage as a function of both exporting and employment:

$$W\Big(E, L(E)\Big). \tag{4}$$

Consider a profit-maximizing firm choosing how much to export. The firm's problem is then given as

$$\max_{E} \pi = R\Big(L(E)\Big) - W\Big(E, L(E)\Big)L(E) \tag{5}$$

where $R\Big(L(E)\Big)$ denotes the firm's revenue. Revenue is a function of employment just as in the standard monopsony model but the difference in this setting is that revenue is also a function of exporting through employment. The first-order condition for a monopsonistic firm involved in exporting yields

$$\frac{MRPL - W}{W} = \varepsilon^{-1} + \frac{\rho^W}{\rho^L} \tag{6}$$

where $\rho^W = \frac{\partial W/\partial E}{W/E}$ denotes the elasticity of wage to exporting and $\rho^L = \frac{\partial L/\partial E}{L/E}$ denotes the elasticity of employment to exporting. These elasticities must be appropriately

estimated to measure the effects of the firm behaviour on monopsony power. The details of deriving Equation (6) are provided in the Appendix A.

The equilibrium in Equation (6) is similar to the standard static monopsony measure expressed in Equation (2) but includes additional elasticities (ρ^W and ρ^L) representing the impacts of the choice variable on firms' monopsony power. The left hand side of the equation, which is identical to the conventional approach, shows how much wage deviates from marginal revenue product of labor in percentage level. In other words, it measures the difference between the last hired worker's contribution to revenue ($MRPL$) and firm's average wage paid (W). Larger this gap, less competitive the market is.

The right hand side of the Equation (6) includes several elasticities to be estimated. $\varepsilon > 0$ indicates that the firm has wage-setting power while $\varepsilon = 0$ suggests that the market is perfectly competitive. ρ^W measures to what extend exports affect firm's average wage. If the firm's exports do not affect its wage setting power directly or indirectly through the changes in labor demand, we have $\rho^W = 0$. On the other hand, ρ^L measures to what extend exports affect firm's employment and $\rho^L = 0$ implies that exports do not affect labor demand. In case of $\rho^W = 0$ or $\rho^L = 0$, the equilibrium boils down to the standard formula of monopsony power in Equation (2).

Figure 1 illustrates the effect of a firm's behavior on labor market monopsony power. The labor supply curve to an individual employer is upward-sloping. The left panel and the right panel depict how wage changes when labor demand increases and decreases for a monopsonist firm, respectively. The initial position of labor demand is labelled as $MRPL$. The intersection of $MRPL$ and Labor Supply curve is the competitive outcome denoted as E_c in which the competitive wage and employment are denoted as W_c and L_c, respectively. The point labelled as E_m is the monopsony equilibrium in which the monopsonist's labor demand and wage are respectively denoted as L_m and W_m. Notice that in both panels, wage and employment are lower in monopsony equilibrium than in perfectly competitive equilibrium, $W_m < W_c$ and $L_m < L_c$.

Suppose there is an increase in labor demand as shown on the left panel. $MRPL$ then shifts upward to $MRPL_m^{'}$ where equilibrium wage and employment respectively become $W_m^{'}$ and $L_m^{'}$. Wages increase with higher labor demand above W_m but still remain below competitive wage $W_m^{'} < W_c$. On the other hand, a decrease in labor demand induces a downward shift from $MRPL$ to $MRPL_m^*$ as demonstrated on the right panel. In this case, the firm reducing its labor demand to L_m^* lowers wages to the point W_m^*, below both competitive and monopsony equilibrium wage, W_c and W_m.

There may be two reasons of a shift in marginal revenue product of labor ($MRPL$) curve. On the one hand, technical change or quality upgrading might generate a positive demand shock and shift $MRPL$ curve upward by raising the appeal of the firm's product. In this case, the quantity of products sold might increase without any change in the price

of the product, i.e. $\partial P/\partial L = 0$, therefore $MRPL = \partial R/\partial L = P\partial Q/\partial L$. In contrast, quality downgrading would generate a negative demand shock and shift $MRPL$ curve downwards by reducing the appeal of products to consumers. Alternatively, we can relax the assumption on perfectly competitive product markets and consider that the firm has a price setting power in product market such that $MRPL = \partial R/\partial L = \frac{\partial P}{\partial Q}\frac{\partial Q}{\partial L}Q + P\frac{\partial Q}{\partial L}$. In this scenario, $MRPL$ curve might move upward or downward because of the variations in price setting behavior or product quality related changes, or both.

Several mechanisms might explain the changes in the monopsony power of exporters. One possibility is through the variation in labor share. A robust evidence on the fall of labor share has been documented across countries and industries in recent years (e.g. Karabarbounis and Neiman, 2014; Grossman and Oberfield, 2022). Lower labor share indicates that workers receive smaller share of income generated in firm's revenue. In a monopsonistic labor market, labor share might fall if the firm does not raise wages proportionately in response to increased exports. Thus, firms might extract rents from exporting through market expansion and raise their bargaining power on their workforce. Furthermore, exporting might raise firm revenue, but not necessarily labor share, if the adoption of new technologies displace workers from the tasks they are performing.[6]

The rise in monopsony might also be related to labor productivity. A large body of literature documents that exporting tends to raise productivity through larger capital investments and the adoption of new technologies (e.g. Lileeva and Trefler, 2010; Bustos, 2011).[7] Theoretically, any firm-level characteristics including labor productivity should be irrelevant in determination of wages in a competitive market. However, Card et al. (2016) show that labor productivity measured as value-added per worker is significantly related to wages, which reflects an imperfectly functioning labor market. In fact, workers would have limited opportunities outside of their current job position if they become less productive and lose their bargaining power because their attractiveness to competitor firms, i.e. the outside job options, falls. Hence, firms might obtain higher (lower) monopsony power when workers are less (more) productive.[8]

The framework introduced in this paper allows to measure how firms' decisions affect their labor market monopsony power and highlights the role of demand shocks in monopsony power. In order to estimate the elasticities unbiasedly, the method requires only the data on firm's activity as a demand shifter (e.g. exports, imports, innovation,

[6]For instance, Kline et al. (2019) find that productivity shocks generated from patenting increases revenue more than wages.

[7]See Bernard et al. (2007), Bernard et al. (2012), Melitz and Trefler (2012) and Shu and Steinwender (2019) for excellent reviews on the relevant literature and corresponding references.

[8]Note that there might be a reverse relationship between labor productivity and employers' monopsony power as well. For example, firms might have monopsony power and this might reduce the productivity of workforce. However, the direction of this relationship is not the subject of this study. In this paper, I analyse how trade affects monopsony power and test whether this is associate with workers' productivity to some extent.

R&D expenditures), average wage and employment. While this approach can be used in various settings to investigate firm behavior in labor market monopsony, I implement it for Spanish manufacturing firms' exporting activity in this paper.[9] One caveat is that the researcher additionally needs to estimate labor supply elasticity as well to identify how much monopsony power changed, which requires to overcome endogeneity problem.

3 Data

In this section, I present the firm-level dataset used in the empirical analysis, reveal some descriptive facts on firms and provide some information on labor market conditions in Spain.

I use the Encuesta Sobre Estrategias Empresariales (ESEE) dataset, a firm-level data provided by the SEPI foundation in Madrid. The ESEE is a manufacturing sector representative panel dataset comprised of around 2000 firms with 10 or more employees surveyed every year. Appendix C presents the list of variables used in the analysis and their codes in the dataset. The data distinguish 20 different industries at the two-digit level of NACE classification and 17 regions of NUTS2 classification. I use industry-level price indices to deflate firm-level variables obtained from the Spanish Statistical Office (Instituto Nacional de Estadistica, INE).

The approach I introduce relies on estimating wage and employment elasticities to a firm behavior. For measuring the elasticities, ρ^W and ρ^L, I primarily need information on average wage, employment and export level, which I observe in my dataset. I also obtain substantial amount of details on employment of low-skill, high-skill and temporary workers. All these variables allow me to investigate the channels that might have contributed to the changes in monopsony power, making this dataset suitable to estimate the effects of exporting on firms' labor market monopsony power.

Table 1 presents summary statistics of variables used in the analysis for the period before and after China's accession to WTO, i.e. 1996-2001 and 2002-2007. Labor share is reported in percentage level and all the other variables are in natural logarithm. Wage, labor productivity, high-skill workers and labor costs are higher after 2001. Moreover, exports, imports, domestic sales and value-added are also higher on average between 2002 and 2007. Employment, low-skill workers, temporary workers, labor share and capital investments have lower mean values during the 2002-2007 period compared to China's pre-accesion period.

[9]Trade induced changes in firms' demand for labor might depend on whether the firm operates in input or output markets as well as depending on the type of trade activity, importing or exporting. Shu and Steinwender (2019) highlight this point and reviews how trade affects output producers (import competition and larger export markets in output markets) and input producers (import competition in input markets and larger input import opportunities). While the framework introduced here can allow to incorporate such details, I do not analyse inputs and output markets separately because of data restrictions.

In the empirical analysis, I focus on exporting at the intensive margin and restrict the sample to firms involved in exporting activity. The reason of this choice is that I want to identify the within-firm effects of exporting at various intensities rather than the impact of entry to or exit from export markets on employees. The changes at the extensive margin have significant implications on general equilibrium outcomes and would require considering the reallocation of resources, which is not the subject of this paper. However, the method allows to examine the exporting status as well as other firm behaviors.

Figure 2 depicts the relationship between wage and exports on the left panel and the relationship between employment and exports on the right panel. It is evidently seen that the slope of the graph on the left panel is flat, suggesting that wage is rigid and does not change much with considerably higher export levels. On the right panel, the slope of the graph is much steeper, indicating that labor demand is monotonically increasing in exports. These plots show the underlying mechanism in the empirical analysis in which labor demand is more responsive to exports than wages.

Spain has chronic labor market problems documented in various studies. Vacancy rate has been declining and unemployment rate has been increasing during the 2000s (OECD, 2014). In comparison to other EU countries, unemployment rate has been higher and more volatile for decades (Dolado et al., 2021). Youth employment is low and the youth to adult unemployment ratio is high (Dolado, 2017). Moreover, firing costs are high due to severance pay, notice periods and court procedures (Bentolila et al., 2012).

Mobility restrictions is one of the main reasons of increased monopsony power as originally analysed in Robinson (1933).[10] In Spain, potential job opportunities of workers are restricted because geographical mobility is very low (OECD, 2005; Vandenbrande et al., 2006). Finally, according to the OECD database, collective bargaining coverage in Spain has considerably declined from 84.8% in 2000 to 76.5% in 2006.[11] All these statistics point out considerable labor market frictions in Spain and I continue with a more detailed analysis in the next section to provide robust evidence on labor market monopsony.

4 Empirical Analysis

I want to examine whether more intensely exporting firms increased their labor market power from 1996 to 2007. All of my estimations employ difference-in-differences approach and compare the impact of exporting on labor market outcomes before and after China's accession to WTO. In Section 4.1, I introduce the empirical model and estimate the wage

[10] Robinson (1933) considered a single firm in a town to explain monopsony power. She assumed that many workers compete for jobs offered by a single employer in which the lack of outside options in and outside the town due to mobility restrictions increases the bargaining power of the single employer and give monopsony power.

[11] The data are obtained from https://stats.oecd.org/Index.aspx?DataSetCode=CBC

and employment elasticities to exporting. After identifying the parameter estimates, I investigate the changes in labor share in Section 4.2, labor productivity in Section 4.3 and skill demand and temporary workers in Section 4.4.

4.1 Wage and Employment Elasticities

In this section, I estimate the wage and employment elasticities to exporting, ρ^W and ρ^L respectively demonstrated in Equation (6). The estimations compare the impact of exporting on wage and employment before and after China's accession to World Trade Organization (WTO).

To obtain the elasticity of wage to exporting, I estimate the following equation:

$$\begin{aligned}\log(W_{ijt}) = \alpha_i^W + \beta^W \log(E_{ijt}) + \rho^W * WTO * \log(E_{ijt}) \\ + \phi \log(L_{ijt}) + \gamma X'_{ijt} + \mu_{jt} + \delta_{rt} + \varepsilon_{ijt}^W,\end{aligned} \tag{7}$$

where i denotes the firm, j denotes the industry, r denotes the region that the firm is located and t denotes the year. W_{ijt} represents the firm-level average wage and E_{ijt} represents the value of firm exports. To find the elasticity of employment to exporting, I estimate the following model:

$$\log(L_{ijt}) = \alpha_i^L + \beta^L \log(E_{ijt}) + \rho^L * WTO * \log(E_{ijt}) + \eta X'_{ijt} + \mu_{jt} + \delta_{rt} + \varepsilon_{ijt}^L, \tag{8}$$

where L_{ijt} denotes the number of employees. I define WTO as a binary variable equal to 1 from the year 2002 to 2006 and equal to 0 from 1996 to 2001. ε_{ijt}^W and ε_{ijt}^L are the error terms. I cluster the standard errors at the firm-level because the main explanatory variable is measured at the firm-level. The model in Equation (7) includes L as a control variable because wage is assumed to be a function of exporting and employment as shown in Equation (6).

The main variables of interest are the interaction terms. I argue that exporting in Spain after China's accession to WTO in 2001 has differential effects on labor market outcomes at the firm level, conditional on covariates. Respectively, ρ^W and ρ^L establish how increased exports after 2001 affected wages and labor demand.

These specifications are perhaps not free of endogeneity problems and I control for various covariates to reduce potential omitted variable bias. Some firms might have better negotiating skills for wage setting or human resources management. To control for such unobserved firm characteristics, I incorporate firm fixed-effects α_i^W in Equation (7) and α_i^L in Equation (8).

Notice that time-varying idiosyncratic demand shocks cannot be captured by firm fixed effects. For instance, the accession of China to WTO might have increased firms' access to cheaper intermediate imports and Spanish firms might have then more easily imported cheaper intermediate inputs with China's integration to international markets

(e.g. Amiti and Konings, 2007). Firms might have also increased capital investments because of the expansion of market size (e.g. Lileeva and Trefler, 2010; Bustos, 2011). On the other hand, offshoring some of the production processes to China might have affected wages as well as employment (e.g. Hummels et al., 2018). Finally, domestic sales of firms might have declined due to import competition from China after 2001 and negative demand shocks might have reduced wages and employment. Thus, I control for firm-level covariates such as imports, domestic sales and capital investments denotes as X'_{ijt}.

I condition on a set of fixed effects to control for sectoral and regional developments. First, I include industry-year pair fixed-effects μ_{jt}. These take into account the sectoral shocks such as import competition from China, industry specific technological and regulatory changes. I further control for region-year fixed effects denoted as δ_{rt}. They accommodate the possibility that tougher international markets affected more intensely exporting firms differentially across regions.

The results from estimating Equation (7) and (8) are shown in Table 2. Panel A presents the elasticity for wage (ρ^W) and Panel B presents the elasticity for employment (ρ^L). Column 1 shows the results with firm fixed effects. Increased exporting has a significant positive impact on wages and employment in normal times but the magnitude for employment (0.0821) is higher than for wage (0.0279). Higher exports induce larger increase in employment than in wages, which is consistent with the sharper curve employment-exports relationship and flatter curve wage-exports relationship in Figure 2. However, in the period after 2001, this positive impact was reversed and the impact of exporting on wage and employment became significantly negative, i.e. the accession of China to WTO had negative impact of exporting firms on firm-level labor market outcomes. Column 2 includes firm-level covariates. The magnitudes change slightly but they all remain significant at 1% level.

Columns 3-6 show the results with the inclusion of industry-year and region-year fixed effects. My preferred specification is presented in Column 6 that incorporates time-varying sectoral and regional controls as well as firm-level imports, domestic sales and capital investments. The elasticities are stable across estimations and the results are robust to the inclusion of full set of control variables.

According to Equation (6), the ratio of wage and employment elasticities approximately corresponds to 0.92 ($-0.00890/-0.00968$). Sokolova and Sorensen (2021) collect the mean and median values of labor supply elasticity estimates for Europe documented in the literature. They report that the median estimate is 1.49, which induces that firms pay their employees 60% of marginal revenue product,[12] and the mean estimate is 6.96, which induces that firms pay their employees 88% of marginal revenue product.[13] I take

[12]This can be obtained from $W = 100/(1/1.49 + 1) = 60$.
[13]This can be obtained from $W = 100/(1/6.96 + 1) = 88$.

these mean and median estimates as a rough measure for labor supply elasticity and plug it into Equation (6) to obtain the effect of exporting on monopsony power. These computations suggest that when we consider the impact of exporting on monopsony, workers are paid in a range of 39-49% of their marginal revenue product,[14] which implies a 36-45% decrease in workers' pay, i.e. increase in monopsony power due to exporting.[15]

4.2 The Impact of Trade on Labor Share

As discussed in Section 2, rising monopsony power might be associated with the fall in labor share. A growing body of literature relates the decline in labor share to imperfections in product markets, largely through the rise of superstar firms (e.g. Autor et al., 2020; Barkai, 2020). In this context, the decline in labor share might arise from higher markups (charging higher price) without any change in labor market conditions. However, monopsonistic competition in labor markets has a potential to explain recently documented fall in labor share (e.g. Brooks et al., 2021; Gouin-Bonenfant, 2022).[16]

I estimate the model using labor share in revenue as the outcome variable. I must emphasize that, rather than asserting any causal relationship between monopsony power and labor share, I investigate how exports affected labor share and evaluate whether the exports induced increase in monopsony power after 2001 is reconciled with the fall in labor share.

The regression results are reported in Table 3. Columns 1 (without firm-level controls) and 2 (with firm-level controls) show that during the period of China's increasing prevalence in international trade from 2002 to 2007, labor share in Spanish manufacturing industries increased by 6.7%. Moreover, 1% increase in exports merely reduced labor share by around 0.013 unit. The coefficient estimate on the interaction term is negative, significant at the 1% level but smaller in magnitude than the coefficient on exports. Therefore, exporting reduced labor share between 1996 and 2007 but the fall was greater before 2001 than after 2001.

To understand the decline in labor share, I estimate the model using the two components of labor share, labor costs and sales (firm revenue), as the dependent variables separately. Table B1 in Appendix B presents the results for labor costs in Panel A and for sales in Panel B. Positive and significant coefficients on WTO and Exports suggest that labor costs increased after China's accession to WTO for all firms while more intensely exporting raised the labor costs during the overall sample period of 1996-2007. However, as evidently shown in all specifications of Panel A, the coefficient estimate on the interaction term with significantly negative sign indicates that higher exports particularly

[14] This can be obtained from $W = 100/(1/1.49 + 0.92 + 1) = 39$ and $W = 100/(1/6.96 + 0.92 + 1) = 49$.
[15] This can be obtained from $(39 - 60)/60 = -36\%$ and $(49 - 88)/88 = -45\%$.
[16] Grossman and Oberfield (2022) and Manning (2021) reviews the literature on how labor share might be related to monopsony power.

after 2001 reduced labor costs of firms. In contrast, larger volume of exports during the 2002-2007 period did not reduce sales as in labor costs. Hence, we can conclude that the decline in labor share despite magnified exports after 2001 was due to the fall in labor costs while larger exports did not affect firm sales.

The estimations are robust to controlling for industry-year and region-year fixed effects, time-invariant firm characteristics and firm-level demand shocks. These findings suggest that larger exports reduced labor share in revenue but the fall in labor share has been milder after 2001. Aligned with the findings in previous studies, the rise in monopsony power appears to be related to the decline in labor share.

4.3 Productivity and Monopsony

Previously in Section 2, I discussed the potential channel that the fall in productivity might have contributed to rising monopsony power. To analyse whether firms' exports after China's entry to WTO induced a fall in labor productivity in parallel with the increases in monopsony power, I use value-added per worker as a measure of labor productivity. The results are presented in Table 4.

Column 1 shows the results of difference-in-differences estimates. Larger exports are positively and significantly related to labor productivity while labor productivity within firms increased after China's integration to world markets. However, exports after 2001 are negatively associated with labor productivity. The inclusion of firm-level controls (in Column 2) slightly reduces the magnitude of the additional significant impact after 2001 for exporters and for all firms on average, but raises the overall magnitude of exporting on labor productivity. From 2002 to 2007, Spanish manufacturing firms experienced 19% increase in labor productivity even though exporting firms experienced a decline in labor productivity.

In Columns 3-6, I drop dummy variable for the period 2002-2007 and control for industry-year and region-year fixed effects. The coefficient estimate on exports remain significant and I find that every 1% increase in firm exports is associated with 0.05% higher labor productivity on average. The coefficient estimate on the interaction term remains statistically significant at the 5% level and negative. With China's accession to WTO, 1% increase in firm exports after 2001 induced a 0.0143% decline in labor productivity. Hence, sectoral and regional developments are not the main determinants of the negative impact of exports on labor productivity after China's integration to international markets in 2001.

Recall that labor productivity is defined as value-added per worker. Therefore, a fall in labor productivity might be due to the changes in value-added, in number of workers or both. I estimate the model by using value-added as a dependent variable to reveal what has been driving the the results. Table B2 in Appendix B reports the regression

results.

In all specifications, the coefficients on the interaction term are negative and significant at the 1% level. The magnitude of coefficient estimates are in a range of -0.021 and -0.026 and smaller than the employment elasticity that vary within the range of -0.009 and -0.01 presented in Table 2. Hence, the findings suggest that the fall in labor productivity seems to be because of larger decline in value-added than in number of workers.

In the estimations, I find that more intensely exporting decreased labor productivity for the 2002-2007 period even though higher exports are positively associated with labor productivity from 1996 to 2007.[17] Lower productivity of Spanish manufacturing firms after China's accession to WTO might explain the increased monopsony power of exporters because the fall in labor productivity would reduce the outside option of workers, as discussed in Section 2.

4.4 Skill Demand and Temporary Workers

The effects of trade activities may be more pronounced for more skill-intensive firms (e.g. Kondo et al., 2022). For instance, exporting may require the performance of different tasks in the production through the reallocation of capital and product mix. More specifically, exporting firms might utilize better technologies (e.g. Lileeva and Trefler, 2010; Bustos, 2011), produce different products (e.g. Bernard et al., 2011; Mayer et al., 2021) and demand more skilled workers (e.g. Bustos, 2005; Brambilla et al., 2012). Hence, firms might have reduced their relative demand for low-skill workers with respect to high-skill workers, which might reflect the reduced bargaining power of firms.

To examine whether larger export volumes raised monopsony power through the changes in skill composition, I use the IHS transformed values of high-skill and low-skill workers as the outcome variables in the model.[18] Table 5 presents the results where the dependent variable is high-skill workers in Panel A and low-skill workers in Panel B.

The estimated coefficient on exports is positive and significant at the 1% level in all specifications of Panel A. This finding is aligned with the previous literature that larger exports raise the demand for skilled workforce. However, the coefficient on the interaction term is not significant in any specification, indicating that exports did not affect the demand for high-skill workers for the 2002-2007 period. Furthermore, the results in Panel B show that while more intensely exporting firms employed more low-skill workers over the 1996-2007 period, larger export volumes after China's accession to WTO in 2001 reduced the demand for low-skill workers. The coefficient on the interaction

[17] This finding is somewhat consistent with several previous studies which documented that TFP in Spain has been declining steadily from 1990 until the Great Recession (e.g. Dolado, 2017; García-Santana et al., 2020).

[18] IHS (Inverse Hyperbolic Sine) is a commonly used approximation of the logarithm. In the sample, there are many observations with values between zero and one. IHS transformation allows to keep them in the analysis.

term is statistically significant at the 1% level in Column (1) and significant at the 5% level in Columns (2) and (6) which incorporates the full set of covariates.

On the other hand, empirical evidences suggest that a considerable share of Spanish employers carry out temporary contracts (Dolado et al., 2021). The share of temporary contracts has been increasing steadily from 2002 to 2006 (Sanz-de Galdeano and Terskaya, 2020) and Spain had one of the highest share of temporary employment in total employees among the OECD countries in 2007 (OECD, 2014). While restrictions on temporary contracts are not rigid due to the lack of monitoring by authorities (Bentolila et al., 2012), around 90% of entries to labor market are based on temporary contracts with very short job duration and only 3.5% of temporary job contracts have converted to permanent job contracts between 2002 and 2010 (Cahuc et al., 2016). In the 2000s, around 70% of Spanish firms reported that they dismissed mostly temporary workers in response to demand shocks (OECD, 2014).[19] In fact, government regulations aimed to increase labor market flexibility and reduce chronic unemployment problem by facilitating temporary contracts, therefore institutional settings must have played an important role in causing such disruptions in labor market.

In Table 6, I report the results from estimating the model using temporary workers as a dependent variable. In Column (1) and (2), the estimated coefficient on the interaction term is positive and significant at the 1% level. However, I lose the significance on the coefficient of interest once I control for time-varying industry characteristics as shown in Column (3). When I control for regional developments over time, the coefficient estimate remains statistically significant at the 5% level but smaller in magnitude. The results suggest that larger exports raised the demand for temporary workers after 2001 but such increases were driven by time varying industry factors.

5 Conclusion

How does exporting affect monopsony power in labor markets? In this paper, I examine the impact of exports on labor market monopsony power using a firm-level dataset. I develop a new method to estimate the effects of a firm behavior on monopsony power. My approach can be easily used in various settings and requires to have firm-level data on employment and wage for estimating the elasticities without relying on strong assumptions.

I rely on my empirical framework to analyse the impact of China's accession to WTO on Spanish exporters' labor market monopsony power. Empirical results show that more intensely exporting firms decreased the workers' pay by 36-45% from 1996 to 2007 and they paid their workers 39-49% of their marginal revenue product. The findings reveal

[19] This figure is considered to be very high compared to roughly 40% in other European countries.

that larger exports led to a deviation from perfectly competitive environment in labor markets and raised the monopsony power of Spanish manufacturing firms.

In parallel with the increases in monopsony power between 1996 and 2007, I find a decline in labor share and labor productivity. These findings are consistent with recent evidences that relate rising market power firms to the fall in labor share (e.g. Autor et al., 2020) as well as the changes in labor productivity to wages (e.g. Card et al., 2016). The findings also reveal that after China's accession to WTO in 2001, larger exports reduced the employment of low-skilled workers but did not affect the demand for high-skill workers within firms and raised the number of temporary workers in some industries.

To assess its suitability, the proposed framework can be used for studying various firm behaviors apart from exporting such as extensive margins of trade, importing, R&D investing or innovation. Researchers might then identify what kind of firm activities can affect labor market monopsony power and whether they increase or decrease employers' bargaining power. On the other hand, exporters in different countries can be examined with this method. Considering a limited but a growing evidence on trade induced monopsony power, the future research can study how exporting (both at the intensive and extensive margins) affects labor market monopsony power of firms in other countries using a different dataset to evaluate external validity of the findings.

Trade induced labor market monopsony might induce large welfare losses through the misallocation of labor and have profound implications for trade policies. Therefore, identifying the conditions and factors in which trade can affect labor market monopsony power of firms may incline policymakers to reconsider the changes in trade relations and current labor laws. The findings in this paper provide robust evidences on rising trade induced labor market monopsony power, highlight the need for additional public policies to address monopsony and correct such market failures.

References

Amiti, Mary and Jozef Konings (2007) "Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia," *American Economic Review*, 97 (5), 1611–1638.

Arnold, David (2019) "Mergers and acquisitions, local labor market concentration, and worker outcomes," *Local Labor Market Concentration, and Worker Outcomes (October 27, 2019)*.

Ashenfelter, Orley C, Henry Farber, and Michael R Ransom (2010) "Labor market monopsony," *Journal of Labor Economics*, 28 (2), 203–210.

Ashenfelter, Orley Clark, David Card, Henry Farber, and Michael R Ransom (2022) "Monopsony in the Labor Market New Empirical Results and New Public Policies," *Journal of Human Resources*, 57 (SpecialIssue 1), S1–S10.

Autor, David, David Dorn, Lawrence F Katz, Christina Patterson, and John Van Reenen (2020) "The fall of the labor share and the rise of superstar firms," *The Quarterly Journal of Economics*, 135 (2), 645–709.

Azar, José, Ioana Marinescu, and Marshall Steinbaum (2022) "Labor market concentration," *Journal of Human Resources*, 57 (S), S167–S199.

Azar, José, Ioana Marinescu, Marshall Steinbaum, and Bledi Taska (2020) "Concentration in US labor markets: Evidence from online vacancy data," *Labour Economics*, 66, 101886.

Balasubramanian, Natarajan, Jin Woo Chang, Mariko Sakakibara, Jagadeesh Sivadasan, and Evan Starr (2022) "Locked in? The enforceability of covenants not to compete and the careers of high-tech workers," *Journal of Human Resources*, 57 (S), S349–S396.

Barkai, Simcha (2020) "Declining labor and capital shares," *The Journal of Finance*, 75 (5), 2421–2463.

Beaudry, Paul, David A Green, and Ben M Sand (2018) "In search of labor demand," *American Economic Review*, 108 (9), 2714–57.

Benmelech, Efraim, Nittai K Bergman, and Hyunseob Kim (2022) "Strong employers and weak employees how does employer concentration affect wages?" *Journal of Human Resources*, 57 (S), S200–S250.

Bentolila, Samuel, Pierre Cahuc, Juan J Dolado, and Thomas Le Barbanchon (2012) "Two-tier labour markets in the great recession: France Versus Spain," *The Economic Journal*, 122 (562), F155–F187.

Berger, David, Kyle Herkenhoff, and Simon Mongey (2022) "Labor market power," *American Economic Review*, 112 (4), 1147–93.

Bernard, Andrew B, J Bradford Jensen, Stephen J Redding, and Peter K Schott (2007) "Firms in international trade," *Journal of Economic Perspectives*, 21 (3), 105–130.

——— (2012) "The empirics of firm heterogeneity and international trade," *Annual Review of Economics*, 4 (1), 283–313.

Bernard, Andrew B, Stephen J Redding, and Peter K Schott (2011) "Multiproduct firms and trade liberalization," *The Quarterly Journal of Economics*, 126 (3), 1271–1318.

Berry, Steven, Martin Gaynor, and Fiona Scott Morton (2019) "Do increasing markups matter? Lessons from empirical industrial organization," *Journal of Economic Perspectives*, 33 (3), 44–68.

Bhaskar, Venkataraman, Alan Manning, and Ted To (2002) "Oligopsony and monopsonistic competition in labor markets," *Journal of Economic Perspectives*, 16 (2), 155–174.

Boal, William M and Michael R Ransom (1997) "Monopsony in the labor market," *Journal of Economic Literature*, 35 (1), 86–112.

Bond, Steve, Arshia Hashemi, Greg Kaplan, and Piotr Zoch (2021) "Some unpleasant markup arithmetic: Production function elasticities and their estimation from production data," *Journal of Monetary Economics*, 121, 1–14.

Brambilla, Irene, Daniel Lederman, and Guido Porto (2012) "Exports, export destinations, and skills," *American Economic Review*, 102 (7), 3406–3438.

Brooks, Wyatt J, Joseph P Kaboski, Yao Amber Li, and Wei Qian (2021) "Exploitation of labor? Classical monopsony power and labor's share," *Journal of Development Economics*, 150, 102627.

Burdett, Kenneth and Dale T Mortensen (1998) "Wage differentials, employer size, and unemployment," *International Economic Review*, 257–273.

Bustos, Paula (2005) "The impact of trade liberalization on skill upgrading. Evidence from Argentina."

——— (2011) "Trade liberalization, exports, and technology upgrading: Evidence on the impact of MERCOSUR on Argentinian firms," *American Economic Review*, 101 (1), 304–340.

Cahuc, Pierre, Olivier Charlot, and Franck Malherbet (2016) "Explaining the spread of temporary jobs and its impact on labor turnover," *International Economic Review*, 57 (2), 533–572.

Card, David (2022) "Who Set Your Wage?"Technical report, National Bureau of Economic Research.

Card, David, Ana Rute Cardoso, Joerg Heining, and Patrick Kline (2018) "Firms and labor market inequality: Evidence and some theory," *Journal of Labor Economics*, 36 (S1), S13–S70.

Card, David, Ana Rute Cardoso, and Patrick Kline (2016) "Bargaining, sorting, and the gender wage gap: Quantifying the impact of firms on the relative pay of women," *The Quarterly Journal of Economics*, 131 (2), 633–686.

Caselli, Mauro, Lionel Nesta, and Stefano Schiavo (2021) "Imports and labour market imperfections: firm-level evidence from France," *European Economic Review*, 131, 103632.

De Loecker, Jan and Frederic Warzynski (2012) "Markups and firm-level export status," *The American Economic Review*, 102 (6), 2437–2471.

Dolado, Juan J (2017) "European Union dual labour markets: consequences and potential reforms," *Economics Without Borders: Economic Research for European Policy Challenges*, 73–112.

Dolado, Juan J, Florentino Felgueroso, and Juan F Jimeno (2021) "Past, present and future of the Spanish labour market: when the pandemic meets the megatrends," *Applied Economic Analysis*.

Doraszelski, Ulrich and Jordi Jaumandreu (2021) "Reexamining the De Loecker & Warzynski (2012) method for estimating markups,"Technical report, CEPR Discussion Papers.

Egger, Hartmut, Udo Kreickemeier, Christoph Moser, and Jens Wrona (2022) "Exporting and offshoring with monopsonistic competition," *The Economic Journal*, 132 (644), 1449–1488.

Falch, Torberg (2010) "The elasticity of labor supply at the establishment level," *Journal of Labor Economics*, 28 (2), 237–266.

Felix, Mayara (2021) "Trade, Labor Market Concentration, and Wages."

Sanz-de Galdeano, Anna and Anastasia Terskaya (2020) "The labor market in Spain, 2002-2018," *IZA World of Labor*.

García-Santana, Manuel, Enrique Moral-Benito, Josep Pijoan-Mas, and Roberto Ramos (2020) "Growing like spain: 1995–2007," *International Economic Review*, 61 (1), 383–416.

Gouin-Bonenfant, Émilien (2022) "Productivity Dispersion, Between-Firm Competition, and the Labor Share," *Econometrica*, 90 (6), 2755–2793.

Grossman, Gene M and Ezra Oberfield (2022) "The elusive explanation for the declining labor share," *Annual Review of Economics*, 14, 93–124.

Hirsch, Boris, Thorsten Schank, and Claus Schnabel (2010) "Differences in labor supply to monopsonistic firms and the gender pay gap: An empirical analysis using linked employer-employee data from Germany," *Journal of Labor Economics*, 28 (2), 291–330.

Hummels, David, Jakob R Munch, and Chong Xiang (2018) "Offshoring and labor markets," *Journal of Economic Literature*, 56 (3), 981–1028.

Jha, Priyaranjan and Antonio Rodriguez-Lopez (2021) "Monopsonistic labor markets and international trade," *European Economic Review*, 140, 103939.

Karabarbounis, Loukas and Brent Neiman (2014) "The global decline of the labor share," *The Quarterly Journal of Economics*, 129 (1), 61–103.

Kline, Patrick, Neviana Petkova, Heidi Williams, and Owen Zidar (2019) "Who profits from patents? rent-sharing at innovative firms," *The Quarterly Journal of Economics*, 134 (3), 1343–1404.

Kondo, Illenin, Yao Amber Li, and Wei Qian (2022) "Trade Liberalization and Labor Monopsony: Evidence from Chinese Firms," *Available at SSRN 4088005*.

Krueger, Alan B and Orley Ashenfelter (2022) "Theory and evidence on employer collusion in the franchise sector," *Journal of Human Resources*, 57 (S), S324–S348.

Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler (2022) "Imperfect competition, compensating differentials, and rent sharing in the US labor market," *American Economic Review*, 112 (1), 169–212.

Langella, Monica and Alan Manning (2021) "Marshall lecture 2020: The measure of monopsony," *Journal of the European Economic Association*, 19 (6), 2929–2957.

Lileeva, Alla and Daniel Trefler (2010) "Improved access to foreign markets raises plant-level productivity... for some plants," *The Quarterly Journal of Economics*, 125 (3), 1051–1099.

Lu, Yi, Yoichi Sugita, Lianming Zhu et al. (2019) "Wage and Markdowns and FDI Liberalization,"Technical report, Hitotsubashi Institute for Advanced Study, Hitotsubashi University.

Macedoni, Luca and Vladimir Tyazhelnikov (2022) "Oligopoly and Oligopsony in International Trade."

MacKenzie, Gaelan (2021) "Trade and market power in product and labor markets,"Technical report, Bank of Canada Staff Working Paper.

Manning, Alan (2003) *Monopsony in Motion: Imperfect Competition in Labor Markets*: Princeton University Press.

——— (2011) "Imperfect Competition in the Labor Market," *Handbook of Labor Economics*, 4, 973–1041.

——— (2021) "Monopsony in labor markets: A review," *ILR Review*, 74 (1), 3–26.

Mayer, Thierry, Marc J Melitz, and Gianmarco IP Ottaviano (2021) "Product mix and firm productivity responses to trade competition," *The Review of Economics and Statistics*, 103 (5), 874–891.

Melitz, Marc J and Daniel Trefler (2012) "Gains from trade when firms matter," *Journal of Economic Perspectives*, 26 (2), 91–118.

Méndez, Esteban and Diana Van Patten (2022) "Multinationals, Monopsony, and Local Development: Evidence From the United Fruit Company," *Econometrica*, 90 (6), 2685–2721.

Naidu, Suresh (2010) "Recruitment restrictions and labor markets: Evidence from the postbellum US South," *Journal of Labor Economics*, 28 (2), 413–445.

Naidu, Suresh, Yaw Nyarko, and Shing-Yi Wang (2016) "Monopsony power in migrant labor markets: evidence from the United Arab Emirates," *Journal of Political Economy*, 124 (6), 1735–1792.

Naidu, Suresh and Eric A Posner (2022) "Labor Monopsony and the Limits of the Law," *Journal of Human Resources*, 57 (S), S284–S323.

Naidu, Suresh, Eric A Posner, and Glen Weyl (2018) "Antitrust remedies for labor market power," *Harvard Law Review*, 132 (2), 536–601.

Naidu, Suresh and Noam Yuchtman (2013) "Coercive contract enforcement: law and the labor market in nineteenth century industrial Britain," *American Economic Review*, 103 (1), 107–144.

OECD (2005) *OECD Employment Outlook 2005*: OECD Publishing Paris, France.

——— (2014) *The 2012 labour market reform in Spain: A preliminary assessment*: OECD Publishing Paris.

Posner, Eric A (2021) *How antitrust failed workers*: Oxford University Press.

Prager, Elena and Matt Schmitt (2021) "Employer consolidation and wages: Evidence from hospitals," *American Economic Review*, 111 (2), 397–427.

Ransom, Michael R and David P Sims (2010) "Estimating the firm's labor supply curve in a "new monopsony" framework: Schoolteachers in Missouri," *Journal of Labor Economics*, 28 (2), 331–355.

Robinson, Joan (1933) "The Economics of Imperfect Competition," *London: Macmillan.*

Shu, Pian and Claudia Steinwender (2019) "The impact of trade liberalization on firm productivity and innovation," *Innovation Policy and the Economy*, 19 (1), 39–68.

Sokolova, Anna and Todd Sorensen (2021) "Monopsony in labor markets: A meta-analysis," *ILR Review*, 74 (1), 27–55.

Staiger, Douglas O, Joanne Spetz, and Ciaran S Phibbs (2010) "Is there monopsony in the labor market? Evidence from a natural experiment," *Journal of Labor Economics*, 28 (2), 211–236.

Syverson, Chad (2019) "Macroeconomics and market power: Context, implications, and open questions," *Journal of Economic Perspectives*, 33 (3), 23–43.

Vandenbrande, Tom, Laura Coppin, Peter van der Hallen, Peter Ester, Didier Fourage, Anette Fasang, Sara Geerdes, and Klaus Schömann (2006) "Mobility in Europe. Analysis of the 2005 Eurobarometer survey on geographical and labour market mobility. European Foundation for the Improvement of Living and Working Conditions," *Luxembourg: Office for Official Publications of the European Communities.*

Tables

Table 1: Summary Statistics

	1996-2001			2002-2007		
	Mean	SD	Obs.	Mean	SD	Obs.
Exports	15.480	2.442	5283	15.521	2.518	5014
Wage	10.463	0.426	5283	10.534	0.368	5014
Employment	5.160	1.353	5283	5.139	1.334	5014
Labor share	0.217	0.147	5283	0.213	0.117	5014
Labor productivity	10.909	0.648	5222	10.938	0.649	5002
High-skill workers	2.610	1.674	5205	2.784	1.666	4965
Low-skill workers	5.771	1.337	5205	5.738	1.316	4965
Temporary workers	3.206	1.880	5283	2.952	2.030	5014
Imports	14.792	2.520	5283	14.879	2.542	5014
Domestic sales	16.779	1.787	5283	16.816	1.763	5014
Capital investments	13.589	2.131	5283	13.440	2.215	5014
Labor costs	15.624	1.575	5283	15.673	1.522	5014
Value-added	16.069	1.655	5222	16.077	1.626	5002

Notes: The table presents the summary statistics for exporters for the periods 1996-2001 (before China's accession to WTO) and 2002-2007 (after China's accession to WTO). Mean values, standard deviations and the number of observations for the variables used in the analysis are reported. Exports, Wage, Employment, Labor productivity, High-skill workers, Low-skill workers, Temporary workers, Imports, Domestic sales, Capital investments, Labor costs and Value-added are in logs. Labor share is given in percentage and defined as the share of total labor costs in firm revenue. Wage is defined as the average wage paid to workers in a given year. Labor productivity is defined as value-added per worker. Labor costs represent the total wage paid to the workers in a given year.

Table 2: Wage and Employment Elasticities of Exporting 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: ρ^W						
WTO*Exports	-0.0119***	-0.0118***	-0.00910***	-0.0113***	-0.00901***	-0.00890***
	(0.00226)	(0.00217)	(0.00231)	(0.00219)	(0.00225)	(0.00214)
WTO	0.297***	0.289***				
	(0.0375)	(0.0359)				
Employment	-0.162***	-0.240***	-0.174***	-0.175***	-0.172***	-0.240***
	(0.0202)	(0.0230)	(0.0206)	(0.0201)	(0.0200)	(0.0224)
Exports	0.0279***	0.0318***	0.0209***	0.0238***	0.0207***	0.0256***
	(0.00387)	(0.00390)	(0.00350)	(0.00376)	(0.00347)	(0.00356)
Imports		0.00665***				0.00383*
		(0.00241)				(0.00208)
Domestic Sales		0.0788***				0.0717***
		(0.0124)				(0.0112)
Capital Investment		0.00772***				0.00689***
		(0.00200)				(0.00189)
Observations	9963	9963	9963	9962	9962	9962
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.910	0.917	0.926	0.918	0.928	0.933
Panel B: ρ^L						
WTO*Exports	-0.0120***	-0.00972**	-0.0120***	-0.0113**	-0.0119**	-0.00968**
	(0.00429)	(0.00377)	(0.00466)	(0.00448)	(0.00469)	(0.00414)
WTO	0.227***	0.172***				
	(0.0697)	(0.0611)				
Exports	0.0821***	0.0721***	0.0775***	0.0792***	0.0781***	0.0718***
	(0.00773)	(0.00630)	(0.00798)	(0.00802)	(0.00815)	(0.00678)
Imports		0.0245***				0.0235***
		(0.00494)				(0.00483)
Domestic Sales		0.171***				0.171***
		(0.0227)				(0.0217)
Capital Investment		0.0313***				0.0308***
		(0.00368)				(0.00359)
Observations	9963	9963	9963	9962	9962	9962
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.978	0.982	0.979	0.979	0.980	0.983

Notes: The table reports the elasticities of wage and employment to exporting. Dependent variable is the natural logarithm of firm-level average wage in Panel A, which presents the wage elasticity denoted as ρ^W. Dependent variable is the natural logarithm of firm's total employment in Panel B, which presents the employment elasticity denoted as ρ^L. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. Explanatory variables Employment, Exports, Imports, Domestic Sales and Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

Table 3: The Impact of Exporting on Labor Share, 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
WTO*Exports	-0.00407***	-0.00452***	-0.00205*	-0.00355***	-0.00193*	-0.00232**
	(0.000797)	(0.000744)	(0.00108)	(0.000842)	(0.00110)	(0.00108)
WTO	0.0679***	0.0802***				
	(0.0133)	(0.0125)				
Exports	-0.0138***	-0.0129***	-0.0141***	-0.0135***	-0.0142***	-0.0137***
	(0.00395)	(0.00441)	(0.00399)	(0.00368)	(0.00392)	(0.00429)
Imports		-0.00387**				-0.00423***
		(0.00164)				(0.00150)
Domestic Sales		-0.0373***				-0.0322***
		(0.00762)				(0.00769)
Capital Investment		0.000650				0.000576
		(0.00167)				(0.00158)
Observations	9963	9963	9963	9962	9962	9962
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.695	0.710	0.715	0.712	0.727	0.737

Notes: This table presents the estimation results for the relationship between labor share and exporting. Dependent variable is labor share defined as the ratio of labor costs to firm revenue. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. Explanatory variables Employment, Exports, Imports, Domestic Sales and Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

Table 4: The Impact of Exporting on Labor Productivity, 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
WTO*Exports	-0.0141***	-0.0120**	-0.0147**	-0.0139***	-0.0159***	-0.0143**
	(0.00518)	(0.00515)	(0.00577)	(0.00523)	(0.00598)	(0.00592)
WTO	0.238***	0.190**				
	(0.0807)	(0.0805)				
Exports	0.0487***	0.0538***	0.0477***	0.0471***	0.0470***	0.0551***
	(0.00791)	(0.00792)	(0.00796)	(0.00787)	(0.00794)	(0.00804)
Imports		-0.0124**				-0.0122**
		(0.00572)				(0.00603)
Domestic Sales		0.144***				0.146***
		(0.0260)				(0.0292)
Capital Investment		-0.00321				-0.00513
		(0.00562)				(0.00560)
Observations	9892	9892	9892	9891	8922	8922
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.711	0.720	0.721	0.720	0.733	0.740

Notes: This table reports the effects of exporting on labor productivity. Dependent variable is the natural logarithm of labor productivity. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. Explanatory variables Employment, Exports, Imports, Domestic Sales and Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

Table 5: Exporting, High-Skilled and Low-Skilled Workers, 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: High-skilled Workers						
WTO*Exports	-0.00131	0.000422	-0.00534	-0.00145	-0.00678	-0.00557
	(0.00797)	(0.00791)	(0.00935)	(0.00853)	(0.00963)	(0.00956)
WTO	0.257**	0.212*				
	(0.127)	(0.126)				
Exports	0.0720***	0.0619***	0.0537***	0.0546***	0.0514***	0.0503***
	(0.0111)	(0.0105)	(0.0109)	(0.0112)	(0.0109)	(0.0107)
Imports		0.0260***				0.0105
		(0.00884)				(0.00873)
Domestic sales		0.152***				0.133***
		(0.0268)				(0.0258)
Capital Investment		0.0288***				0.0238***
		(0.00635)				(0.00659)
Observations	9840	9840	9840	9839	8866	8866
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.934	0.936	0.939	0.938	0.942	0.944
Panel B: Low-skilled Workers						
WTO*Exports	-0.0122***	-0.0103**	-0.0113**	-0.0116**	-0.0103**	-0.00895**
	(0.00449)	(0.00401)	(0.00496)	(0.00469)	(0.00494)	(0.00451)
WTO	0.218***	0.168***				
	(0.0729)	(0.0647)				
Exports	0.0801***	0.0701***	0.0762***	0.0775***	0.0713***	0.0667***
	(0.00748)	(0.00613)	(0.00773)	(0.00769)	(0.00775)	(0.00676)
Imports		0.0247***				0.0245***
		(0.00503)				(0.00515)
Domestic Sales		0.166***				0.164***
		(0.0218)				(0.0226)
Capital Investment		0.0311***				0.0288***
		(0.00371)				(0.00358)
Observations	9840	9840	9840	9839	8866	8866
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.977	0.981	0.978	0.977	0.979	0.983

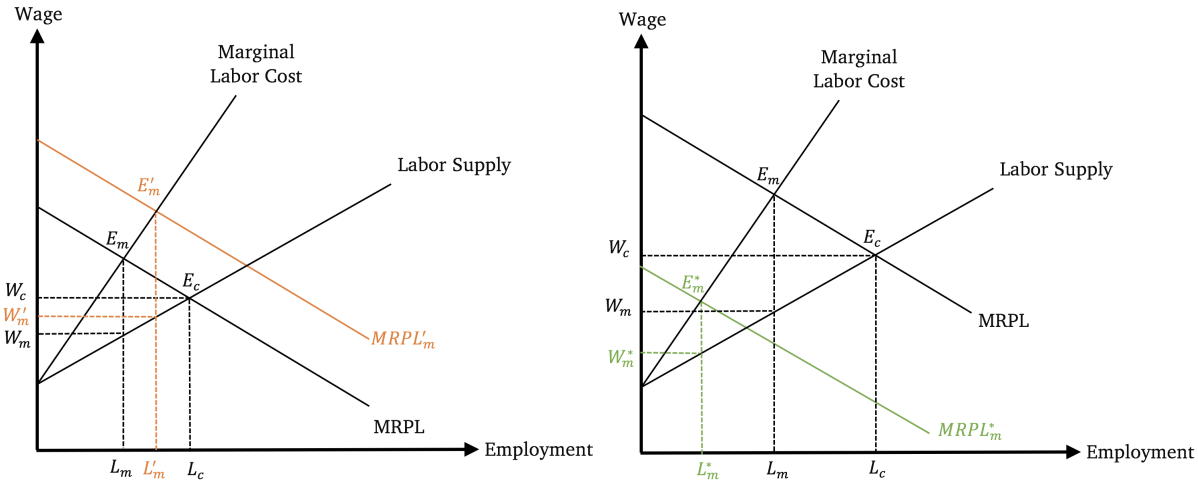
Notes: This table reports the effects of exporting on high-skill and low-skill workers. Dependent variable is the IHS transformed values of high-skilled and low-skilled workers in Panel A and Panel B, respectively. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. The remaning explanatory variables Exports, Imports, Domestic Sales, Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

Table 6: The Effects of Exporting on Temporary Workers, 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
WTO*Exports	0.0469***	0.0503***	0.0152	0.0375**	0.0118	0.0149
	(0.0172)	(0.0170)	(0.0184)	(0.0183)	(0.0191)	(0.0188)
WTO	-1.047***	-1.108***				
	(0.267)	(0.263)				
Exports	0.0542**	0.0416*	0.0759***	0.0699***	0.0784***	0.0664***
	(0.0221)	(0.0214)	(0.0223)	(0.0231)	(0.0230)	(0.0224)
Imports		0.00714				0.0231
		(0.0172)				(0.0182)
Domestic Sales		0.207***				0.214***
		(0.0441)				(0.0465)
Capital Investment		0.0999***				0.0974***
		(0.0146)				(0.0151)
Observations	9963	9963	9963	9962	9962	9962
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.755	0.760	0.766	0.763	0.773	0.777

Notes: This table reports the effects of exporting and importing on temporary workers. Dependent variable is logged temporary workers employed by the firm. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. The remaning explanatory variables Exports, Imports, Domestic Sales, Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

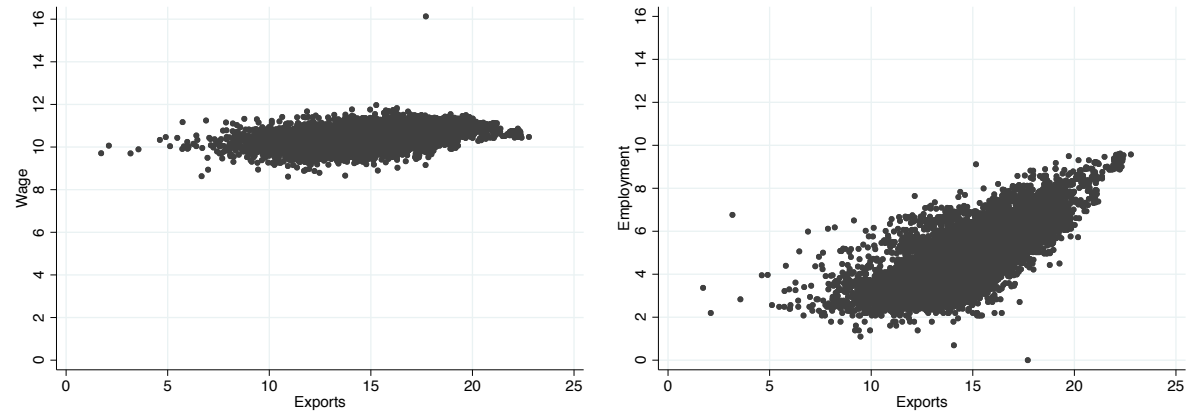
Figures



(a) Panel A. Positive Demand Shock **(b)** Panel B. Negative Demand Shock

Figure 1: Firm Behavior and Labor Market Monopsony

Note: $MRPL$ is the marginal revenue product of labor, W denotes the wage and L denotes the employment level. E represents the equilibrium point. Subscripts m and c refer to monopsony and competitive market equilibrium, respectively. Left panel depicts the case of positive demand shock while right panel shows the case of negative demand shock.



(a) Panel A. Wage-Exports Relationship **(b)** Panel B. Employment-Exports Relationship

Figure 2: Wages, Employment and Exports

Note: The figures show the wage-exports relationship on the left panel and employment-exports relationship on the right panel for the 1996-2007 period. Wage denotes the annually paid average firm-level wage per worker. Employment denotes the total number of workers employed annually at the firm in logs. Exports denotes the annual value of exports of the firm. All variables are in natural logarithm.

Appendix

A Theoretical Derivations

The profit function of a firm is given as

$$\pi = R\Big(L(E)\Big) - W\Big(E, L(E)\Big)L(E) \tag{A.1}$$

where $R\Big(L(E)\Big)$ represents the revenue, $W\Big(E, L(E)\Big)$ represents the average wage and $L(E)$ represents the employment level. Firm chooses the level of exporting to maximize its profits. We then obtain

$$\frac{\partial R}{\partial L}\frac{\partial L}{\partial E} = \left(\frac{\partial W}{\partial E} + \frac{\partial W}{\partial L}\frac{\partial L}{\partial E}\right)L + W\frac{\partial L}{\partial E}. \tag{A.2}$$

Dividing both sides by $\partial L/\partial E$ yields

$$\underbrace{\frac{\partial R}{\partial L}}_{\text{MRPL}} = \underbrace{\left(\frac{\partial W/\partial E}{\partial L/\partial E} + \frac{\partial W}{\partial L}\right)L + W}_{\text{MLC}} \tag{A.3}$$

The intersection of MRPL and MLC shown in above equation determines the monopsony equilibrium for employment and wage. Here the left hand side of the equation represents the marginal revenue product of labor and the right hand side of the equation represent the marginal labor cost.

I reorganize the Equation (A.2) to obtain elasticities as

$$MRPL\frac{\partial L}{\partial E}\frac{E}{L}\frac{L}{E} = \left(\frac{\partial W}{\partial E}\frac{E}{W}\frac{W}{E} + \frac{\partial W}{\partial L}\frac{L}{W}\frac{W}{L}\frac{\partial L}{\partial E}\frac{E}{L}\frac{L}{E}\right)L + W\frac{\partial L}{\partial E}\frac{E}{L}\frac{L}{E}. \tag{A.4}$$

I denote the employment elasticity as $\rho^L = \frac{\partial L}{\partial E}\frac{E}{L}$, wage elasticity as $\rho^W = \frac{\partial W}{\partial E}\frac{E}{W}$ and labor supply elasticity as ε^{-1}. Using these elasticities, then above equation becomes

$$MRPL\rho^L\frac{L}{E} = \left(\rho^W\frac{W}{E} + \frac{1}{\varepsilon}\frac{W}{L}\rho^L\frac{L}{E}\right)L + W\rho^L\frac{L}{E}. \tag{A.5}$$

Simplifying the equation yields

$$\frac{MRPL}{W}\rho^L = \rho^W + \frac{1}{\varepsilon}\rho^L + \rho^L \tag{A.6}$$

and we finally have the Equation (6)

$$\frac{MRPL - W}{W} = \frac{1}{\varepsilon} + \frac{\rho^W}{\rho^L}. \tag{A.7}$$

B Appendix Tables

Table B1: Exporting, Labor Costs and Sales (1996-2007)

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Costs						
WTO*Exports	-0.0219***	-0.0192***	-0.0190***	-0.0206***	-0.0173***	-0.0153***
	(0.00430)	(0.00362)	(0.00454)	(0.00439)	(0.00442)	(0.00378)
WTO	0.487***	0.420***				
	(0.0702)	(0.0588)				
Exports	0.0967***	0.0865***	0.0850***	0.0892***	0.0794***	0.0757***
	(0.00836)	(0.00671)	(0.00812)	(0.00849)	(0.00823)	(0.00691)
Imports		0.0253***				0.0228***
		(0.00507)				(0.00488)
Domestic Sales		0.209***				0.200***
		(0.0261)				(0.0266)
Capital Investment		0.0315***				0.0285***
		(0.00378)				(0.00363)
Observations	9963	9963	9963	9962	8989	8989
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.983	0.987	0.984	0.984	0.986	0.989
Panel B: Sales						
WTO*Exports	-0.00177	0.00261	-0.00623	-0.00195	-0.00625	-0.00300
	(0.00522)	(0.00378)	(0.00554)	(0.00523)	(0.00535)	(0.00399)
WTO	0.160*	0.0478				
	(0.0848)	(0.0623)				
Exports	0.137***	0.121***	0.126***	0.128***	0.119***	0.113***
	(0.0111)	(0.00832)	(0.0106)	(0.0109)	(0.0106)	(0.00851)
Imports		0.0477***				0.0431***
		(0.00653)				(0.00617)
Domestic Sales		0.345***				0.327***
		(0.0420)				(0.0442)
Capital Investment		0.0299***				0.0277***
		(0.00386)				(0.00361)
Observations	9963	9963	9963	9962	8989	8989
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes
R-squared	0.980	0.989	0.982	0.981	0.983	0.991

Notes: This table reports the effects of exporting on labor costs and sales. In Panel A, dependent variable is the log of total labor costs. In Panel B, dependent variable is the log of firm sales. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. The remaning explanatory variables Exports, Imports, Domestic Sales, Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

Table B2: Exporting and Value-Added (1996-2007)

	(1)	(2)	(3)	(4)	(5)	(6)
WTO*Exports	-0.0260***	-0.0215***	-0.0267***	-0.0253***	-0.0265***	-0.0231***
	(0.00617)	(0.00554)	(0.00687)	(0.00630)	(0.00687)	(0.00618)
WTO	0.464***	0.358***				
	(0.0977)	(0.0874)				
Exports	0.131***	0.127***	0.126***	0.127***	0.121***	0.124***
	(0.0115)	(0.00980)	(0.0115)	(0.0117)	(0.0116)	(0.0102)
Imports		0.0124*				0.0114
		(0.00735)				(0.00754)
Domestic Sales		0.317***				0.316***
		(0.0443)				(0.0485)
Capital Investment		0.0287***				0.0243***
		(0.00620)				(0.00603)
Observations	9899	9899	9899	9898	8929	8929
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	No	Yes	Yes
Region-year FEs	No	No	No	Yes	Yes	Yes

Notes: This table reports the effects of exporting on value-added. WTO is a dummy variable equal to 1 for the period 2002-2007 and 0 for the period 1996-2001. The remaning explanatory variables Exports, Imports, Domestic Sales, Capital Investments are in logs. Standard errors are clustered at the firm level in the parentheses. ***, ** and * Significant at 1, 5 and 10 percent level, respectively.

C Variable Definitions

This section provides the details of variable definitions with their codes in the ESEE dataset.

- Exports (VEXPOR): Variable which records the value of exports in Euros.
- Labor Costs (CP): Account 64 (PGC). It records gross salaries and wages, compensations, social security contributions paid by the company, the contributions made to supplementary pension systems and other social expenses. In Euros.
- Amount paid in compensations (IIND): Amount in thousands of pesetas of the compensation paid for lay-offs, early retirements or voluntary redundancies included in labor costs. In Euros.
- Employment (PERTOT): Total personnel employed at the company on December 31st.
- Wage: (CP-IIND)/(PERTOT)
- Sales (VENTAS): Account 70 (PGC). It includes the sales of goods, the sales of transformed products (finished and half-finished), the provision of services and other sales (packages, packaging, byproducts and waste), rappels and sales returns excluded. Units: Euros.
- Labor costs: CP-IIND
- Labor share: (CP-IIND)/(VENTAS)
- Labor productivity: VA/PERTOT
- Skill-intensity = PIL/100
- High-skill workers: PERTOT*PIL/100
- Low-skill workers: PERTOT - (PERTOT*PIL/100)
- Proportion of temporary workers (PEVEN): Percentage which the eventual personnel represents on total personnel employed at the company on December 31st.
- Temporary workers: PEVEN/100*PERTOT
- Imports (VIMPOR): Variable which records the value of imports in Euros.
- Domestic sales: VENTAS-VEXPOR

- Capital investments (INBE): Accounts 212,213,214,215,216,217,218 and 219 (PGC). It is defined as the sum of the purchases of information processing equipment, technical facilities, machinery and tools, rolling stock and furniture, office equipment and other tangible fixed assets. In Euros.

- Value-added (VA): It is defined as the sum of the sales, the variation in stocks and other management income, minus the purchases and external services. Units: Euros.

UBIREA

Institut de Recerca en Economia Aplicada Regional i Pública
Research Institute of Applied Economics

WEBSITE: www.ub.edu/irea • **CONTACT:** irea@ub.edu

AQR

Grup de Recerca Anàlisi Quantitativa Regional
Regional Quantitative Analysis Research Group

WEBSITE: www.ub.edu/aqr/ • **CONTACT:** aqr@ub.edu

Universitat de Barcelona
Av. Diagonal, 690 • 08034 Barcelona