Tariff reductions and labor demand elasticities : evidence from Chinese firm-level data

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Keywords: Labor demand elasticities, tariff reductions, intermediate inputs
JEL classification: F14, F16

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Tariff Reductions and Labor Demand Elasticities: Evidence from Chinese Firm-level Data*

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Abstract

International production fragmentation has been a global trend for decades, becoming especially important in Asia where the manufacturing process is fragmented into stages and dispersed around the region. Observers now widely believe that joining global production networks is crucial for a country's successful economic development. This paper examines the effects of input and output tariff reductions on labor demand elasticities at the firm level. For this purpose, we consider a simple heterogenous firm model in which firms are allowed to export their products and to use imported intermediate inputs. The model predicts that only productive firms can use imported intermediate inputs (outsourcing) and tend to have larger constant-output labor demand elasticities. Input tariff reductions would lower the factor shares of labor for these productive firms and raise conditional labor demand elasticities further. We test these empirical predictions, constructing Chinese firm-level panel data over the 2000–2006 period. Controlling for potential tariff endogeneity by instruments, our empirical studies generally support these predictions.

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1 Introduction

The effects of globalization on labor markets have long been a serious concern in public debates. Admitting that economic globalization could generate large benefits but their distribution may be uneven both within a country and across countries, international societies recently have stressed that globalization should be "inclusive"—which means that the benefits of globalization are shared by all economic agents.[1] In the academic literature, the impact of globalization on labor markets has also been widely studied. One important strand of the literature is the effects of international trade on wages. Among them, the Stolper-Samuelson theorem that predicts that trade liberalization increases the relative returns to abundant factors has been intensively studied with respect to its empirical relevance.[2] Another important strand of the literature has explored the impact of globalization on the responsiveness of employment to changes in wages.

Rodrik (1997), an influential early work on this issue, emphasized that globalization would increase firms' labor demand elasticities and influence labor markets at least in three respects. First, higher labor demand elasticities lead to more volatile employment, which decreases job security and lowers workers' utility. Second, high labor demand elasticities would decrease workers' bargaining power against employers, which may lead to lower wages. Third, higher labor demand elasticities are likely to make the effect of non-wage costs on wages and employment more serious for workers. Motivated by Rodrik (1997), several empirical studies followed. However, early studies yielded only mixed results about to what extent trade liberalization would increase the elasticity of labor demand although they often found that the elasticity of labor demand tended to increase over years (Slaughter (2001), Krishna, Mitra, and Chinoy (2001), and Hasan, Mitra, and Ramaswamy (2007)). As foreign direct investment (FDI) and international production fragmentation have been a global trend for these two decades, the impact of globalization on the elasticity of labor demand has renewed researchers' interests. Several studies asked whether the subsidiaries of multinational

[1] For example, in his speech in 2008, Robert Zoellick, the former World Bank Group President said, "Inclusive refers first to the need to make sure that the benefits of growth and globalization are felt throughout societies, that its not just a benefit for certain businesses or certain professional classes but it runs throughout the system." (The whole speech is available at http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21690802 pagePK:34370 piPK:34424 theSitePK:4607,00.html)

[2] A recent example is Chiquiar (2008). He examined changes in skill premium in Mexico caused by NAFTA and found that regions with a larger exporter to international markets (i.e., regions close to the Mexico-U.S. border) exhibited a relative increase in wages and a decrease in skill premium, as predicted by the Stolper-Samuelson theorem.

enterprises (MNEs) had larger labor demand elasticities than indigenous firms (Fabbri, Haskel, and Slaughter (2003) and Navaretti, Checchi, and Turrini (2003)). Other studies focused on the effects of outsourcing on labor demand elasticities (Hijzen and Swaim (2010) and Senses (2010)). However, these recent studies also provided limited evidence on the contribution of offshoring to raising labor demand elasticities. One difficulty in examining whether globalization would increase labor demand elasticities is to identify appropriate measures of globalization. For example, a commonly used index for the degree of outsourcing is the share of imported intermediate inputs in total intermediate inputs.[3] However, this index is obvioulsy endogenous, which implies that to detect the direction of causality is difficult. For example, because firms with high labor demand elasticities can easily substitute labor with materials, which might increase the use of imported intermediate inputs.

In this paper, we examine the effects of tariff reductions on labor demand elasticities at the firm level. The first contribution of this paper is to rigorously examine the causality between trade liberalization and increases in labor demand elasticities. For this purpose, we construct Chinese firm-level panel data over the 2000–2006 period and examine the effects of tariff reductions in intermediate inputs and the final goods. Our sample data correspond to the period of China's accession to the World Trade Organization (WTO), and tariffs declined in a broad range of manufacturing sectors at various speed in the sample period. We exploit this large policy change. In addition, using firm-level panel data allows us to control for firm-level heterogeneity and capture within-firm changes in labor demand elasticities.

Our second contribution is to study the firm-level effects of tariff reductions on labor demand elasticities. The recent heterogenous firm trade literature emphasizes that the degree of internationalization may vary across firms even within a narrowly defined industry (e.g., Melitz (2003)). As we show in this paper, tariff reductions may differently affect firms' labor demand elasticities, depending on the firm's internationalization status. More specifically, inspired by Amiti and Davis (2012) and Kasahara and Lapham (2013), we consider a heterogenous firm model in which firms may export their products and use imported intermediate inputs by incurring fixed costs. Firms are heterogenous in their productivity and only productive firms, thus, can export their final products and use imported intermediate inputs. Our key idea is that given that the elasticity of substitution

[3] Feenstra and Hanson (1999) introduced this index as a proxy of outsourcing. This index including its variants is widely used in the empirical trade literature, such as Slaughter (2001), Hijzen and Swaim (2010), and Senses (2010).

between labor and the composite of intermediate inputs is greater than one, decreases in the price of the composite of intermediate inputs lead to higher constant-output labor demand elasticities (more elastic) through lowering the factor share of labor. Productive firms face lower prices of the composite of intermediate inputs relative to unproductive firms because productive firms tend to use more varieties of imported intermediate inputs, which lowers the price of the composite of intermediate inputs. Thus, our model predicts that given other things constant, more productive firms are likely to have more elastic conditional labor demand than unproductive firms. Furthermore, the effect of tariff reduction in intermediate inputs (input tariff reduction) on conditional labor demand elasticities is more pronounced for productive firms than unproductive firms. Our empirical study generally supports these predictions.

The third contribution is to test the effects of outsourcing on labor demand elasticities at the firm-level. Unlike the existing literature, we directly measure the effect of outsourcing by changes in input tariffs. To what extent outsourcing would affect domestic labor markets has been a great concern especially in Asia. International production fragmentation has been a global trend for decades, becoming especially important in Asia–which Baldwin (2006) called "Factory Asia", where the manufacturing process is fragmented into stages and dispersed around the region. Observers now widely believe that joining global production networks is crucial for a country's successful economic development. In this regard, assessing the effects of input and output tariff reductions on labor demand elasticities is crucial for policy design.

The rest of the paper is organized as follows. Section 2 presents a theoretical framework and derives testable predictions. Section 3 describes the data and Section 4 describes our empirical strategy, deriving the estimated equations. Section 5 reports the estimation results. Section 6 concludes.

2 Theoretical Background

2.1 Labor demand elasticity

Consider firms competing with other firms in a monopolistically competitive manner. Each firm faces the following demand function:

$$Q = \left[\frac{p}{\bar{P}}\right]^{-\eta} \frac{E}{\bar{P}}, \quad \eta > 1, \tag{1}$$

where p and Q are the price and quantity of the product, η is the constant product demand elasticity, $\bar{P}$ is the industry average price, and E is total expenditure for the differentiated final goods.

For simplicity and without loss of generality, it is assumed that differentiated final goods are produced by combining labor and the composite of intermediate goods with a constant returns to scale technology such that $Q = \varphi F(L, M)$ where φ represents firm specific productivity, L is the labor input, and M is the composite of intermediate inputs. The composite of intermediate goods has a form of symmetric CES such that

$$M = \left[\int_0^n m(j)^{(\gamma-1)/\gamma} dj \right]^{\gamma/(\gamma-1)}, \tag{2}$$

where $m(j)$ is the amount of intermediate input j used and $\gamma > 1$ represents the elasticity of substation between intermediate inputs. It is assumed that each country produces a continuum of symmetric intermediate inputs with unit measure. For simplicity, we normalize the factory-gate price of intermediate inputs to one. Further, firms have to incur an iceberg-type trade cost $\tau_m \geq 1$ for each imported intermediate variety while there are no such trade costs for domestic intermediate inputs. Thus, given that a firm imports intermediated inputs from n countries, the firm's price of composite intermediated inputs is given by

$$P_m = \left[\int_0^1 1^{1-\gamma} dj + \int_0^n \tau_m^{1-\gamma} dj \right]^{1/(1-\gamma)} = [1 + n\tau_m^{1-\gamma}]^{1/(1-\gamma)}. \tag{3}$$

Note that $[1 + n\tau_m^{1-\gamma}]^{1/(1-\gamma)} < 1$ as long as $n > 0$. Further, the price of composite of intermediate inputs P_M is decreasing in n and increasing in τ_m.

The firms in the final good sector apply the standard markup pricing rule. Thus, the variable costs (i.e., the sum of wage bills and payments to the composite of intermediate inputs) is equal to $r(\eta - 1)/\eta$, where r denotes the firm's total revenue. Further, we assume that each firm must incur iceberg trade costs τ_e to serve a foreign market. Thus, denoting the local price by p, the exporting price is $\tau_e p$. When the firm ships x_e units of the final good to a foreign market, only x_e/τ_e arrive at the foreign market. Thus, letting x_d be the supply for the local market and $x(= x_e + x_d)$ be total output, this firm's total revenue is given by $px_d + \tau_e p x_e/\tau_e = p(x_d + x_e) = px$. Therefore, the factor share of labor s_L can be expressed by

$$s_L = \frac{F_L(L, M)L}{F(L, M)}, \tag{4}$$

where F_L denotes the partial derivative of F with respect to L. Note that s_L depends only on the relative factor prices P_M/w because of the homogeneity of the production function.

Since the production technology is linear homogenous, letting $l(w, P_m, \varphi)$ be the unit requirement of labor, the firm's labor demand L_d is expressed by

$$L_d = l(w, P_m, \varphi)Q(p(w, P_m, \varphi)). \tag{5}$$

Thus, the total labor demand elasticity η_{LL} is given by

$$\eta_{LL} = -(1 - s_L)\sigma - s_L\eta, \tag{6}$$

where σ represents the elasticity of substitution between labor and the composite of intermediates.[4] Equation (6) is the same as the one based on linear homogeneous technology and perfect competition. As Hamermesh (1993) clarifies as the "fundamental law of factor demand," equation (6) decomposes the total labor demand elasticity η_{LL} into the *substitution* effect (the first term) and the *scale* effect (the second term). The first term, the constant-output labor demand elasticity, suggests that for a given output level, the total labor demand elasticity increases (more negative) when the elasticity of substitution between labor and the composite of intermediate inputs, σ, increases and/or the factor share of labor, s_L, decreases. Even σ does not change, the constant-output labor demand elasticity may vary according to the factor share of labor because a lower labor share implies that the firm uses more intermediate inputs toward which firms will substitute when the wage rises.

The second term of equation (6) implies that an increase in the wage that the firm faces raises the unit cost and the firm's output declines, which leads to the firm's lower labor demand. It is quite straightforward that as the factor share of labor decreases, the scale effect on the total labor demand elasticity will be weakened.

In order to facilitate analysis on the link between firms' labor demand and trade liberalization, we specify the production function of the final goods by the following CES form:

$$Q = \varphi \left[L^\rho + M^\rho\right]^{1/\rho}. \tag{7}$$

[4]The derivation of equation (6) is relegated to the Appendix. The final good sector is under monopolistic competition. However, we assume that labor and the composite of intermediate inputs are not used for the fixed cost. Thus, the elasticity of output with respect to any factor equals its share in output and the rewards to factors exhaust the total output net to the fixed cost.

From this specification, we obtain s_L as follows:

$$s_L = \frac{1}{1 + [1 + n\tau_m^{1-\gamma}]^{(1-\sigma)/(1-\gamma)}}, \tag{8}$$

where equation (3) is used for w/P_M and $\sigma \equiv 1/(1-\rho)$. If the elasticity of substitution between labor and the composite of intermediate inputs equals to 1 (i.e., $\sigma = 1$), the production function becomes a Cobb-Douglas, so that s_L is 0.5 and independent from the relative factor price P_M/w. However, if $\sigma > 1$, the labor share s_L is increasing in the relative price of the composite of intermediates. As is already discussed, the relative price of the composite of intermediates decreases as the mass of available varieties of intermediate inputs increases (extensive margins) and/or decreases in the import price of each variety of intermediates (intensive margins).

2.2 Imported intermediates and export

The sequence of firms' decision making in the final-goods sector follows Melitz (2003). After observing their specific productivity φ which is assigned by a stochastic process when firms are born, the least productive firms immediately exit from the market. The remaining firms determine whether they should export as well as whether they should use imported intermediates.

Following Amiti and Davis (2012) and Kasahara and Lapham (2013), it is assumed that firms have to incur fixed costs to use imported intermediates. Specifically, the fixed costs for using imported intermediates is measured by units of the numeraire goods and denoted by f_m per country. Thus, profits for a firm that does not use imported intermediates are given by

$$\pi_d(\varphi) = (w^{1-\sigma} + 1)^{(1-\eta)/(1-\sigma)} (\alpha \bar{P})^{\eta-1} \varphi^{\eta-1} - f, \tag{9}$$

where f denotes a fixed cost that all firms in production have to incur and is measured in the units of the numeraire goods. Similarly, profits for a firm that does use imported intermediates are given by

$$\pi_m(\varphi) = (w^{1-\sigma} + P_m^{1-\sigma})^{(1-\eta)/(1-\sigma)} (\alpha \bar{P})^{\eta-1} \varphi^{\eta-1} - (f + nf_m). \tag{10}$$

While these fixed costs are common for all firms, the benefit from using imported intermediates is increasing in φ. Equations (9) and (10) suggest that only more productive firms use imported intermediates and the others use only domestically produced intermediate inputs.

When exports are allowed, the sorting pattern becomes more complicated. For simplicity, we consider n symmetric country case. Denoting iceberg-type trade costs by τ_e and entry fixed costs by f_e, profits for an exporting firm are expressed by

$$\pi_{de}(\varphi) = (1 + n\tau_e^{1-\eta})(w^{1-\sigma} + 1)^{(1-\eta)/(1-\sigma)}(\alpha\bar{P})^{\eta-1}\varphi^{\eta-1} - (f + nf_e), \tag{11}$$

if the firm does not use imported intermediates, and otherwise, the firm earns

$$\pi_{me}(\varphi) = (1 + n\tau_e^{1-\eta})(w^{1-\sigma} + P_m^{1-\sigma})^{(1-\eta)/(1-\sigma)}(\alpha\bar{P})^{\eta-1}\varphi^{\eta-1} - [f + n(f_e + f_m)]. \tag{12}$$

Firms compare these profits, and choose the most profitable mode. Observing equations from (9) through (12), it is straightforward to see that the most productive firms use imported intermediates and export their products, whereas the least productive firms use only domestically produced intermediates and serve only the local market. However, sorting patterns for firms in the middle productivity range depend on parameter specifications and are complicated. Rather than exhausting all possibilities of the sorting patterns, we here focus on the pattern relevant to our research interests, namely the link between the labor demand elasticity and trade liberalization (especially tariff reductions for imported intermediates and the final goods).

2.3 Tariff reductions and the labor demand elasticity

As the preceding literature suggests, trade liberalization may affect the labor demand elasticity through several channels (e.g., Slaughter (2001)). First, in the monopolistic competition model considered here, the mass of firms will increase as a result of trade liberalization in the final goods sector. For example, a decreases in τ_e (and/or decreases in the final goods tariffs in foreign countries) will increase the total mass of firms in the final goods sector, which leads to a higher η.[5] As a result, holding other things constant, the total labor demand elasticity will increase (see equation (6)).

Second, trade liberalization may affect the total labor demand elasticity by altering the elasticity of substitution between labor and the composite of intermediate inputs, σ, and/or the factor share of labor, s_L. In our model, the elasticity of substitution between labor and the composite of intermediate inputs is exogenously given at σ. However, as is already discussed, given that $\sigma > 1$, s_L decreases as the price of the composite of intermediates, P_m, decreases. In our model, decreases in τ_m obviously

[5] The iso-elastic demand is an approximation when the number of differentiated varieties is relatively large (Helpman and Krugman (1985, Ch. 6)).

lower P_m. Note that s_L oppositely works for the scale effect. Thus, whereas tariff reductions in the intermediate inputs increase the constant-output labor demand elasticity, their effect on the total labor demand elasticity is ambiguous.

The model suggests that holding output constant, productive firms tend to have more elastic labor demand than unproductive firms since only productive firms use imported intermediates. Tariff reductions for intermediated inputs would lower such productive firms' labor factor share further, which leads to higher constant-output labor demand elasticities. Thus, the impact of tariff reductions in intermediate inputs is not universe across firms.

In summary, the model yields the following empirical predictions.

- Holding other things constant, productive firms are likely to have larger constant-output (conditional) labor demand elasticities than unproductive firms.
- Tariff reductions in the imported intermediate goods tend to increase the constant-output labor demand elasticity by decreasing the factor share of labor. This elasticity increase is more pronounced for productive firms.
- Whereas tariff reductions in the final goods may increase the total labor demand elasticity by increasing η, they are not likely to affect the constant-output elasticity.

In the following sections, we will empirically examined the validity of these theoretical predictions.

3 Data

To examine the effects of trade liberalization on labor demand elasticities at the firm level, we use three data sets. The first data set is from the World Trade Organization (WTO), from which we obtain China's tariff data at the HS six-digit level for year 2001–2006. Because the tariff data for China is unavailable for year 1999–2000 in the WTO, we supplement tariff data for the missing years using World Integrated Trade Solution (WITS) software maintained by the World Bank. The 1996 HS codes (for tariff data 1999–2001) are matched to the 2002 HS codes using concordance table from the United Nations Statistics Division. We then use the concordance from the National Bureau of Statistics (NBS) of China and convert the HS six-digit codes to the 2002 four-digit Chinese industrial classification (CIC).

Following Topalova and Khandelwal (2011), we construct the input tariff in sector s as a weighted average of tariffs for the goods that sector s procures:

$$input\ tariff_{st} = \sum_{j} \omega_{sj} \times tariff_{jt}, \quad \omega_{sj} = \frac{input_{js}}{\sum_j input_{js}}, \tag{13}$$

where $input_{js}$ is the value of intermediate inputs from sector j to produce the unit value of output in sector s. Thus, the weight ω_{sj} is the input share from sector j in the total input in sector s. The data for $input_{js}$ are from the China's Input-Output Table for 2002.[6]

The second data set comes from the Annual Survey of Industrial Firms (ASIF) conducted by the NBS of China for the 2000–2006 period. These surveys covered all state-owned enterprises (SOEs) and non-SOE firms with annual sales above 5 million Chinese yuan (about US$827,000). The data provide more than 100 variables, including firms' basic information (e.g., address, industry affiliation, and ownership) and financial variables from accounting statements (e.g., employment, wage bills, sales, materials, fixed assets, and export). The unit in the surveys is a firm (not a plant), but the number of firm identifiers indicates that over 95% of all observations in the sample are single-plant firms.

Following Brandt, Van Biesebroeck, and Zhang (2012), we link the ASIF data over the sample period and construct firm-level panel data. Basically, we use unique firm official identifications given by the ASIF to link firms over the period of 2000–2006. For firms that receive a new identification as a result of restructuring, mergers, or privatization, we use as much information as possible on firms' name, street address, industry code, and etc. to link them over the sample period.

To mitigate the potential effect of low quality data, we clean the sample as follows. First, we delete observations with missing values such as gross output, sales, labor, materials, and fixed assets. Second, firms with fewer than eight workers are dropped since they are highly likely to suffer from the lack of proper accounting system. Third, we drop observations where total assets are less than liquid assets/net value of fixed assets; or annual depreciation is less than accumulated depreciation. After these filtering procedures, we obtain unbalanced panel data in which the number of manufacturing firms varies from 100,600 in 2000 to 206,801 in 2006.

Firm's wages are calculated by dividing each firm's total wage bill by the number of employees. However, the wage bill may underestimate true labor costs because it exclude firms' non-wage

[6] We assume a zero tariff for non-tradable goods.

payments to workers (Qian and Zhu (2012)). We measure total wage bill as the sum of firm's wage bill and employee supplementary compensation such as bonus and insurance.

The ASIF reports nominal values of output and material costs. To convert them into real terms, we use the sector-level ex-factory price index for output and the input deflators for material costs. These two price deflators are constructed by Brandt, Van Biesebroeck, and Zhang (2012).

The ASIF does not contain information on firm's fixed investment, but provides the book value of firm's fixed assets at original purchase prices (BVFA). Since the reported book values are the sum of nominal values from various years, they should not be used directly. To retrieve real capital stock, we first calculate firm's real capital stock at birth year and then use the perpetual inventory method as Brandt, Van Biesebroeck, and Zhang (2012). Specifically, the real capital stock of firm i in the founding year t_f is $BVFA_{i,t_f} = BVFA_{i,t_a}/(1 + r_{ps,t_a})^{t_f - t_a}$, where $BVFA_{i,t_a}$ is the book value of fixed assets when firm i first appears in year t_a in the data set. $r_{ps,t_a} = (BVFA_{ps,t_a}/BVFA_{ps,1993})^{1/(t_a-1993)}$ is the geometric-average nominal capital stock growth rate at province(p)-sector(s) level calculated from 1993 (the earliest year that the authors can obtain nominal fixed assets data) to the year that the firm is first observed in the data (from 1998 and onwards). Given firm's real capital stock at birth year, we adopt the perpetual inventory method to calculate the real capital stock of firm i in year t as follows: $K_{i,t} = (1 - \delta)K_{i,t-1} + (BVFA_{i,t} - BVFA_{i,t-1})/p_t$, where $\delta = 0.05$ is the depreciation rate as calibrated by Song and Wu (2013), and p_t is the investment deflator constructed by Perkins and Rawski (2008).

The third data is transaction-level trade data from China's Customs General Administration over 2000–2006 (the maximum sample period that the authors have access to). The data report information on import and export values and quantities at the HS eight-digit level for each trading firm, by destinations (over 200 countries), firm ownership, customs regime (ordinary and processing trade), and means of transportation. To identify firm's customs regime, and whether a firm conducts importing, exporting and both, we rely on information from the transaction-level trade data. Because the coding systems are different between the ASIF and the trade data, we merge the two data sets based on firm identifiers such as company name, address, zip code, and phone number. About 70% of export value and 57% of import value are successfully merged to the ASIF data. About 66% of trading firms in the trade data are merged.

4 Empirical Specification

Our theoretical discussions in Section 2 emphasize that if the elasticity of substitution between labor and the composite of intermediate inputs is greater than one, tariff reductions for imported intermediates would raise the constant-output labor demand elasticity through decreasing the factor share of labor. The preceding studies often used log-linear specifications of the labor demand function to estimate elasticities of labor demand (e.g., Slaughter (2001), Krishna, Mitra, and Chinoy (2001), and Hijzen and Swaim (2010)). However, the log-linear specification is not appropriate for examining our theoretical implications because the embedded production technology is a Cobb-Douglas. Thus, to investigate the effects of trade liberalization on labor demand elasticities, we employ a two-stage approach as Fabbri, Haskel, and Slaughter (2003) and Senses (2010). The first stage estimates labor demand elasticities at the firm level from a flexible cost function. Then, the second stage regresses the estimated labor demand elasticities on variables of our interest, such as tariffs on intermediate inputs.

4.1 Labor demand elasticities

For empirical specification, we employ a translog cost function with a second order approximation:

$$\ln c = \alpha_0 + \sum_m \alpha_m \ln w_m + \alpha_y \ln y + \frac{1}{2}\sum_m \sum_n \gamma_{mn} \ln w_m \ln w_n + \frac{1}{2}\gamma_{yy}(\ln y)^2 + \sum_m \gamma_{my} \ln w_m \ln y + \theta_z z + \frac{1}{2}\theta_{zz} z^2 + \sum_m \theta_{zm} z \ln w_m + \theta_{zy} z \ln y, \quad (14)$$

where c is total cost, w_m and w_n are factor prices of labor (L), capital (K), and intermediate inputs (M), y is output, and z is the index of technology. As is well-known, this functional form is sufficiently flexible, allowing for non constant returns to scale, nonlinear expansion paths, and biased technological change.

Differentiating Equation (14) with respect to the log of wages ($\ln w_L$), we obtain the factor share of labor s_L as follows:

$$s_L = \alpha_L + \sum_n \gamma_{Ln} \ln w_n + \gamma_{Ly} \ln y + \theta_{zL} z. \quad (15)$$

In the first stage, our interest is to estimate the coefficient for the log of wages, γ_{LL}. Assuming that firms within the three-digit industry face the same prices with respect to capital and intermediate inputs, we then estimate Equation (15) for each three-digit industry with the following empirical specification:

$$s_{Lit} = \beta_0 + \beta_1 \ln wage_{it} + \beta_2 \ln y_{it} + \lambda_i + \eta_t + \epsilon_{it}, \tag{16}$$

where subscripts i and t denote firm and year, respectively. s_{Lit} is firm i's share of wage bill in its total cost. Firm i's wage, $wage_{it}$, is calculated by dividing its total wage bill by the number of employees. y_{it} is firm i's real output. λ_i is firm-specific fixed effects, controlling for all time-invariant differences across firms. η_t is year-specific fixed effects, controlling for macroeconomic shocks common to all firms including sectoral-level technological change. ϵ_{it} is the error term.

To calculate s_{Lit}, the total cost is defined as the sum of total wage bill, user cost of capital, and material costs (payment to intermediate inputs). The user cost of capital is obtained by multiplying the investment deflator in Perkins and Rawski (2008) by the sum of the interest rate and the depreciation rate. The interest rate is taken from People's Bank of China and the depreciation rate is set to be 0.05.

Using the estimates from Equation (16), we calculate the constant-output labor demand elasticity ε_{it} as follows:

$$\varepsilon_{it} = \frac{\hat{\beta}_1}{s_{it}} + s_{it} - 1, \tag{17}$$

where the hat notation means estimation. It is noteworthy that the aforementioned estimation procedure assumes firms' cost minimization behavior. We assume cost minimization behavior for non-SOEs. However, SOEs with state intervention do not necessarily make cost-minimizing choices and their decision behaviors would be different from those of non-SOEs. Therefore, we estimate the labor demand elasticities separately for SOEs and non-SOEs.[7]

[7] According to the definition reported in the China Industrial Economy Statistical Yearbook, SOEs include firms of three types, i.e., domestic SOEs, state-owned joint venture enterprises, and state-owned and collective joint venture enterprises.

4.2 Effects of trade liberalization

To study the effects of tariff reductions on labor demand elasticities, we consider the following empirical specification:

$$\varepsilon_{it} = \delta_0 + \delta_1 input\ tariff_{s,t} + \delta_2 output\ tariff_{s,t} + \delta \mathbf{X_{it}} + \lambda_i + \eta_t + \mu_{it}, \quad (18)$$

where $input\ tariff_{s,t}$ and $output\ tariff_{s,t}$ represent tariffs for intermediate inputs and for final goods in sector s, respectively. The coefficients for theses tariffs are of our main interest. The theory in Section 2 suggests that tariff reductions in intermediate goods increase the constant-output labor demand elasticity (δ_1 is positive), while tariff reductions in the final goods do not influence the constant-output labor demand elasticity (δ_2 is zero). $\mathbf{X_{it}}$ is a vector of explanatory variables that control for firm characteristics including the logarithm of productivity, age, capital-labor ratio, and indictor variables for state-owned enterprises (SOEs) and foreign-invested enterprises (FIEs).[8] λ_i is firm-specific fixed effects, η_t is year-specific fixed effects, and ϵ_{it} is the error term. To deal with the potential heteroskedasticity and serial autocorrelation, we cluster the standard errors at the firm level.

Furthermore, our theory in section 2 emphasizes that the effect of tariff reductions in intermediate inputs on the constant-output labor demand elasticity would be more pronounced for productive firms because such firms tend to use more imported inputs than unproductive firms. To test this empirical prediction, we add the interaction terms to the regression in (18):

$$\begin{aligned}\varepsilon_{it} = {} & \delta_0 + \delta_1 input\ tariff_{s,t} + \delta_2 (input\ tariff_{s,t} \times TFP_{it}) \\ & + \delta_3 output\ tariff_{s,t} + \delta_4 (output\ tariff_{s,t} \times TFP_{it}) + \delta \mathbf{X_{it}} + \lambda_i + \eta_t + \mu_{it}, \quad (19)\end{aligned}$$

where TFP_{it} represents the log of firm i's total factor productivity (TFP).

4.3 Endogeneity of trade policy

The aforementioned empirical identification may be biased due to potential tariff endogeneity. Several sources may cause the reverse causality between tariff reductions and the elasticity of labor demand. For example, firms with low elasticities of labor demand would lobby the government for protection, which may lead to high output tariffs. Alternatively, the government would use tariff

[8] We use the Olley-Pakes approach to calculate firm-level productivity.

barriers to protect some industries with either high or low labor demand elasticities, which would lead to a biased estimate of tariff reductions. To address the engogenity bias, output and input tariffs should be instrumented although finding appropriate interments for tariffs is difficult. We here follow Yu (forthcoming) and rely on one-year lagged output and input tariffs as instruments to conduct instrumental variable (IV) regressions. The embedded idea of using one-year lagged tariffs as instruments is that the government is unlikely to change tariffs rapidly because of political pressures from interest groups.[9]

5 Empirical Results

5.1 Baseline results

Before proceeding the results of estimating equations (18) and (19), it is worthwhile to briefly report labor demand elasticities estimated in the first stage. Table 1 reports summary statistics of the sample data. The mean of estimated labor demand elasticities is -0.37 and the standard deviation is 0.15. The existing studies report labor demand elasticities within similar ranges.[10] Hence, our estimates on labor demand elasticities take reasonable values.

Input and output tariffs greatly vary across the 4-digit CIC. Input tariffs range from 0.8% to 19.9% with the mean 6.9% while output tariffs range from 0.0% to 65.0% with the mean 12.9%. Figure 1 plots labor demand elasticities on the vertical axis and tariffs on the horizontal axis (output tariffs in the left panel and input tariffs in the right panel). At first look, tariff levels do not appear to be correlated with labor demand elasticity although input tariffs show a weak negative correlation.

Table 2 reports the regression results from (18). The first column controls for time-invariant firm specific effects and macroeconomic shocks common to all sectors. Whereas the coefficient for output tariffs is close to zero and insignificant, that for input tariffs is positive and significant. Since tariffs are percentages, the parameter estimate of 0.0041 for input tariffs means that a 10 percent

[9] Examining Indonesian data, Amiti and Konings (2007) uses tariff levels at the first sample year as instruments. The basic idea is the same: tariffs in later years are strongly influenced by those in the initial year because of political pressures. However, our sample data correspond to periods during which China participated in the WTO and began tariff reduction in various manufacturing products. Therefore, the tariff levels in the initial sample year may not appropriately instrument tariffs in late sample years. Thus, we use one-year lagged tariffs as instruments.

[10] For example, constant-output labor demand elasticities reported by Fabbri, Haskel, and Slaughter (2003) that studied indigenous and multinational firms in the U.K. vary from -0.40 to -0.26, depending on sample periods and firms' nationality. Görg, Henry, Strobl, and Walsh (2009) report constant-output labor demand elasticities from -0.27 to -0.22 for Irish manufacturing plants. With respect to labor demand elasticities at the industry level, Hijzen and Swaim (2010) report figures from -0.50 to -0.37 using the sample data for OECD countries. Senses (2010) estimated the US labor demand elasticities at the industry level and obtained about -0.5 in the long-run and -0.2 in the short-run.

reduction in input tariffs would raise the elasticity of labor demand by 0.041 (more elastic). If the elasticity of labor demand starts from the mean of the data (i.e., -0.37), it would increase to -0.41. When input and output tariffs are instrumented, the results are close to those without instrument variables (the second column).

Although the first two regressions are consistent with our theoretical predictions, the degree of fitness is quite low. Thus, we add several control variables to regression (columns 3 and 4). Regardless of the use of instruments, the coefficients for input tariffs remain positive and statistically significant. Furthermore, they are slightly higher (more elastic) than those without the control variables.

The coefficients for TFP are negative, which implies that productive firms tend to have more elastic labor demand than unproductive firms. The result is consistent with one of our theoretical predictions. By contrast, the coefficient for capital intensity K/L is positive: firms with high capital intensity tend to have less elastic labor demand. Although its interpretation is not straightforward, one possible explanation is that firms with high capital intensity employ more skilled workers (or non-production workers) because of the complementarity between capital and skilled workers. In fact, the literature on skill-biased technological change theoretically and empirically shows that capital upgrading stemming from technological progress would generate labor demand skewed toward skilled labor (e.g., Doms, Dunne, and Troske (1997)). Because of the data availability, we cannot separately estimate labor demand elasticities for skilled and unskilled workers (or production and non-production workers). However, the existing studies agree that labor demand elasticities are higher (more elastic) for production workers than non-production workers (e.g., Slaughter (2001), Hijzen and Swaim (2010), and Senses (2010)). Hence, the regressor of capital intensity may capture the effect of high ratios of non-production workers on labor demand elasticities.

We also introduce dummy variables for state-owned enterprises (SOEs) and multinational enterprises (MNEs). As is discussed earlier, it is highly likely that SOEs do not purse cost minimization as much as private enterprises. In the context of the elasticity of labor demand, SOEs may not quickly adjust their employment levels in responce to wage changes. Thus, SOEs' labor demand elasticities are expected to be less elastic than private firms' labor demand elasticities. The results in Table 2 support our hypothesis on SOEs: the coefficients of the SOE dummy variable is positive and significant (columns 3 and 4). The dummy variable for MNEs is motivated by the preceding studies that examined whether multinationals' affiliates had larger labor demand elasticities than indigenous firms. The received wisdom is that multinationals' labor demand is more elastic than indigenous firms because multinationals are likely to access production inputs (labor and/or intermediate goods) in foreign countries more easily than indigenous firms. Indeed, the existing studies in general found that multinationals' labor demand elasticities were larger than indigenous firms.[11] Interestingly, our estimates are negative but statistically insignificant, that is, we cannot reject the null hypothesis that multinationals' labor demand elasticities are not different from indigenous firms'.

It is likely that labor markets are geographically separated because of transportation costs incurred by workers. This implies that if employment regulations vary across regions, the rigidity of labor markets also would vary (Hasan, Mitra, and Ramaswamy (2007)). Unfortunately, regional-level indexed of labor market regulations are not available. Thus, we control for regional differences in labor market rigidity by province × year fixed effects. Furthere, these dummies also absorb any other province-level shocks over the sample period. Estimation results are reported in columns 5 and 6 in Table 2. The results are qualitatively and quantitatively not different from those without province × year fixed effects.

5.2 Sensitivity

To check the robustness of the effects of tariff reductions on labor demand elasticities, we estimate alternative specifications of regression equation in (18). Specifically, the data allows us to categorize sample firms into multi-product firms, processing-trade firms, and pure exporters. Holding other firms' characteristics constant, these firms may have different labor demand elasticities. Multi-product firms tend to have large production scale which may help to use imported inputs. Our theory suggests that holding other things constant, such firms are likely to have larger labor demand elasticities (more elastic labor demand). Thus our results in Table 2 may be largely driven by such

[11] Fabbri, Haskel, and Slaughter (2003) studied manufacturing plants located in the U.K. and found that multinational plants had larger increases than domestic plants in the elasticity of labor demand for production workers. Navaretti, Checchi, and Turrini (2003) examined firm-level data for eleven European countries, and concluded that multinationals' affiliated adjust employment more quickly than indigenous firms because multinationals are "footloose." Görg, Henry, Strobl, and Walsh (2009) examined whether labor demand in multinationals' affiliates becomes less elastic if they have backward linkages with domestic firms. Their findings are that while multinationals do have more elastic labor demand than domestic firms, the local backward linkages tend to decrease labor demand elasticities in multinationals.

firms. Processing firms are also likely to access imported inputs more easily than non-processing firms. Because foreign firms that subcontract their production process to a processing firm usually provide the processing firms with necessary parts and materials. Pure exporters in our sample are those that export their final products but do not use imported intermediate inputs. Thus, input tariff reductions may not be important for pure exporters.

Table 4 in the Appendix reports the results from cases in which we exclude these three types of firms one by one. In essence, all regression results reveal that the results in Table 3 are not driven by multi-product firms or processing firms. In addition, the exclusion of pure exporters from the sample does not alter the main results quantitatively although we expect higher coefficients for input tariffs in such subsample regressions. This may be due to a relatively small portion of pure exporters.

5.3 Heterogeneous effect on labor demand elasticities

Another important theoretical prediction is that the effect of input tariff reductions on labor demand elasticities is more pronounced for productive firms. Table 3 reports the results of estimates in regression equation (19) that tests the prediction. We use three alternative specifications for the interaction term: import dummy variable, import share, and firm productivity (TFP). All three different interaction terms exhibit theoretically consistent and statistically significant coefficients. Tariff reductions in imported inputs would raise labor demand elasticities further (more elastic) when firms use imported inputs (columns 1 and 2). When we replace import dummies with import share, the results do not change. The effect of input tariff reductions is greater for firms with higher share of imported inputs. Furthermore, the interaction term with firm-level TFP shows positive and significant in both FE and FE with instrument variable regressions. Therefore, our theoretical prediction on the heterogenous effect of input tariff reductions on labor demand elasticities has empirical validity.

6 Concluding Remarks

This paper studies the effects of tariff reductions on labor demand elasticities at the firm level. In particular, we consider both input tariffs and output tariffs. For this purpose, motivated by Amiti and Davis (2012) and Kasahara and Lapham (2013), we propose a simple heterogenous firm model in which firms may export their products and use imported intermediate inputs. Firms are heterogenous in their productivity and only productive firms can export their final products and use imported intermediate inputs because of fixed costs for export and import.

If the elasticity of substitution between labor and the composite of intermediate inputs is greater than one, decreases in the price of the composite of intermediate inputs would raise constant-output labor demand elasticities (more elastic) by lowering the factor share of labor. Productive firms face lower prices of the composite of intermediate inputs relative to unproductive firms because productive firms tend to use more varieties of imported intermediate inputs, which lowers the price of the composite of intermediate inputs. Thus, our model yields the following empirically testable predictions: i) holding other things unchanged, more productive firms are likely to have higher conditional labor demand elasticities than unproductive firms; ii) input tariff reductions increase constant-output labor demand elasticities more for productive firms; and iii) output tariffs do not affect constant-output labor demand elasticities.

To test these theoretical predictions, we construct Chinese firm-level panel data over the 2000–2006 period. Our sample data correspond to the period of China's WTO accession, and tariffs declined in a broad range of manufacturing sectors at various speeds in the sample period. Our empirical study generally supports these predictions.

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Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Labor demand elasticities	641, 240	−0.37	0.15	−0.63	−0.01
Input tariff	641, 240	6.89	2.95	0.84	19.91
Output tariff	641, 240	12.88	8.22	0.00	65.00
Import dummy	641, 240	0.16	0.37	0.00	1.00
Import share	641, 240	0.06	0.20	0.00	1.00
(log) TFP	641, 240	0.66	0.30	−4.83	8.86
(log) K/L	641, 240	3.82	1.21	−6.20	9.51
(log) age	641, 240	2.05	0.90	0.00	5.83
SOEs dummy	641, 240	0.07	0.25	0.00	1.00
FIEs dummy	641, 240	0.22	0.42	0.00	1.00

Note: Observations with labor demand elasticites belong to between the 1st and the 99th percentiles are reported. Input and output tariffs are in percents.

Table 2: Tariff Reductions and Labor Demand Elasticities

Labor demand elasticities	Baseline FE (1)	Baseline IV (2)	More controls FE (3)	More controls IV (4)	Province-year dummies FE (5)	Province-year dummies IV (6)
Output Tariff	−0.0001	0.0001	−0.0001	0.0000	−0.0001	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Input Tariff	0.0041***	0.0034***	0.0045***	0.0038***	0.0042***	0.0036***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
(log)TFP			−0.0406***	−0.0406***	−0.0413***	−0.0413***
			(0.0017)	(0.0013)	(0.0017)	(0.0013)
(log)K/L			0.0312***	0.0312***	0.0306***	0.0306***
			(0.0007)	(0.0006)	(0.0007)	(0.0006)
(log)age			0.0087***	0.0086***	0.0085***	0.0085***
			(0.0019)	(0.0014)	(0.0019)	(0.0014)
SOEs dummy			0.0471***	0.0470***	0.0496***	0.0496***
			(0.0028)	(0.0021)	(0.0028)	(0.0021)
FIEs dummy			−0.0021	−0.0021	−0.0020	−0.0020
			(0.0031)	(0.0024)	(0.0031)	(0.0024)
Firm fixed effect	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	N	N
Province-year	N	N	N	N	Y	Y
F-test for excluded instruments		(0.00)***		(0.00)***		(0.00)***
Observations	641,240	532,267	641,240	532,267	641,240	532,267

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Heteroskedasticity-robust standard errors are in parentheses.

Table 3: Imports, Tariff Reductions, and Labor Demand Elasticities

Labor demand elasticities	Import dummy OLS (1)	Import dummy IV (2)	Import share OLS (3)	Import share IV (4)	Firm TFP OLS (5)	Firm TFP IV (6)
Output Tariff * Import dummy	−0.0001	0.0001				
	(0.0002)	(0.0002)				
Input Tariff * Import dummy	0.0012**	0.0009**				
	(0.0004)	(0.0004)				
Output Tariff * Import share			−0.0004	−0.0001		
			(0.0003)	(0.0003)		
Input Tariff * Import share			0.0020**	0.0014**		
			(0.0008)	(0.0007)		
Output Tariff * (log) TFP					0.0002	0.0000
					(0.0002)	(0.0002)
Input Tariff * (log) TFP					0.0015**	0.0022***
					(0.0005)	(0.0004)
Output Tariff	−0.0001	0.0000	−0.0001	0.0001	−0.0002	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)
Input Tariff	0.0041***	0.0035***	0.0043***	0.0036***	0.0036***	0.0024***
	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0005)	(0.0004)
Import dummy	−0.0018	−0.0017				
	(0.0029)	(0.0023)				
Import share			−0.0047	−0.0036		
			(0.0052)	(0.0042)		
(log)TFP	−0.0406***	−0.0406***	−0.0406***	−0.0406***	−0.0539***	−0.0556***
	(0.0017)	(0.0013)	(0.0017)	(0.0013)	(0.0036)	(0.0029)
(log)K/L	0.0311***	0.0311***	0.0311***	0.0311***	0.0312***	0.0312***
	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0006)
(log)age	0.0085***	0.0085***	0.0087***	0.0087***	0.0093***	0.0093***
	(0.0019)	(0.0014)	(0.0019)	(0.0014)	(0.0019)	(0.0014)
SOEs dummy	0.0475***	0.0473***	0.0473***	0.0471***	0.0474***	0.0473***
	(0.0028)	(0.0021)	(0.0028)	(0.0021)	(0.0028)	(0.0021)
FIEs dummy	−0.0023	−0.0024	−0.0022	−0.0022	−0.0020	−0.0020
	(0.0031)	(0.0024)	(0.0031)	(0.0024)	(0.0031)	(0.0024)
Firm fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
F-test for excluded instruments		(0.00)***		(0.00)***		(0.00)***
Observations	641,240	532,267	641,240	532,267	641,240	532,267

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Heteroskedasticity-robust standard errors are in parentheses.

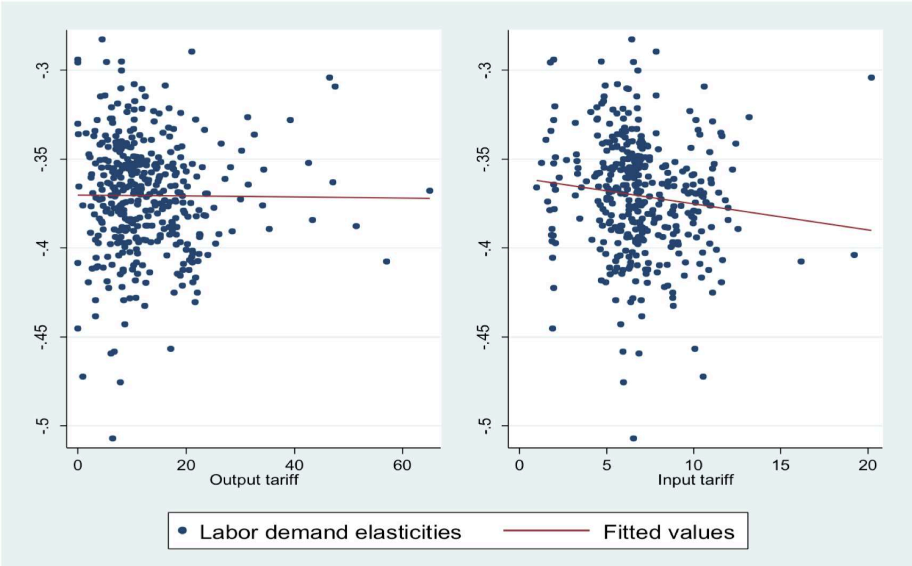

Figure 1: Labor Demand Elsticiteis vs. Input and Output Tariffs

A Labor Demand Elasticities

We use the market clearing condition for a variety of the final goods and two first-order conditions for profit maximization. They are given by

$$\varphi F(L, M) = Q(p), \tag{A.1}$$
$$\alpha p \varphi F_L = w, \tag{A.2}$$
$$\alpha p \varphi F_M = P_m, \tag{A.3}$$

where $\alpha \equiv (\eta - 1)/\eta$ is the inverse of the markup rate. Partially differentiating these three equations with respect to w, we obtain

$$\varphi F_L \frac{\partial L}{\partial w} + \varphi F_M \frac{\partial M}{\partial w} = -\eta \frac{Q}{p} \frac{\partial p}{\partial w}, \tag{A.4}$$
$$\alpha \varphi F_L \frac{\partial p}{\partial w} + \alpha p \varphi \left[F_{LL} \frac{\partial L}{\partial w} + F_{LM} \frac{\partial M}{\partial w} \right] = 1, \tag{A.5}$$
$$F_M \frac{\partial p}{\partial w} + p \left[F_{ML} \frac{\partial L}{\partial w} + F_{MM} \frac{\partial M}{\partial w} \right] = 0, \tag{A.6}$$

where $\eta \equiv -Q'(p)p/Q$, F_{LL} and F_{MM} are the second-order partial derivatives and F_{LM}, and F_{ML} are the cross second order partial derivatives.

Since $F(L, M)$ is linear homogenous, $F_{LL} = -(M/L)F_{LM}$ and $F_{MM} = -(L/M)F_{MM}$. Further, the elasticity of substitution between the two factors is given by $\sigma = \varphi F_L F_M/(QF_{LM})$. With this expression of σ, the second-order partial derivatives can be rewritten such that

$$F_{LL} = -\frac{M}{L}\frac{\varphi F_L F_M}{\sigma Q}, \quad F_{MM} = -\frac{L}{M}\frac{\varphi F_L F_M}{\sigma Q}, \quad \text{and} \quad F_{LM} = \frac{\varphi F_L F_M}{\sigma Q}. \tag{A.7}$$

Applying (A.2), (A.3), and (A.7) to equations (A.5), and (A.6) and rearranging them lead to

$$\eta Q \frac{\partial p}{\partial w} + w \frac{\partial L}{\partial w} + P_m \frac{\partial M}{\partial w} = 0, \tag{A.8}$$
$$\alpha \sigma Q \frac{\partial p}{\partial w} - \frac{M}{L} P_m \frac{\partial L}{\partial w} + P_m \frac{\partial M}{\partial w} = \frac{\alpha \sigma p Q}{w}, \tag{A.9}$$
$$\alpha \sigma Q \frac{\partial p}{\partial w} + w \frac{\partial L}{\partial w} - \frac{L}{M} w \frac{\partial M}{\partial w} = 0. \tag{A.10}$$

Solving this system of equations with respect to $\partial L/\partial w$ and $\partial M/\partial w$, we obtain

$$\frac{\partial L}{\partial w} = -\frac{L}{w}\left[\frac{p_m M}{\alpha p Q}\sigma + \frac{wL}{\alpha^2 p Q}\eta \right], \tag{A.11}$$
$$\frac{\partial M}{\partial w} = \frac{LM}{\alpha p Q}\left[\sigma - \frac{\eta}{\alpha} \right], \tag{A.12}$$

where $wL + P_m M = \alpha p Q$ is used. Thus, denoting the labor share by $s_L = wL/\alpha p Q$, the total labor demand elasticity is given by

$$\eta_{LL} = -(1 - s_L)\sigma - s_L \frac{\eta}{\alpha}. \tag{A.13}$$

B Sensitivity Analysis

Table 4: Robustness Check

	Multi-product firms excl.		Processing firms excl.		Pure exporters excl.	
Labor demand elasticities	OLS (1)	IV (2)	FE (3)	IV (4)	OLS (5)	IV (6)
Output Tariff	−0.0001	−0.0000	−0.0001	0.0000	−0.0002	−0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Input Tariff	0.0046***	0.0038***	0.0042***	0.0033***	0.0044***	0.0036***
	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0003)
(log)TFP	−0.0384***	−0.0385***	−0.0402***	−0.0402***	−0.0435***	−0.0435***
	(0.0020)	(0.0015)	(0.0018)	(0.0014)	(0.0018)	(0.0013)
(log)K/L	0.0311***	0.0311***	0.0309***	0.0309***	0.0322***	0.0322***
	(0.0009)	(0.0006)	(0.0008)	(0.0006)	(0.0008)	(0.0006)
(log)age	0.0102***	0.0101***	0.0085***	0.0084***	0.0097***	0.0097***
	(0.0021)	(0.0016)	(0.0020)	(0.0015)	(0.0020)	(0.0015)
SOEs dummy	0.0478***	0.0476***	0.0485***	0.0484***	0.0482***	0.0481***
	(0.0030)	(0.0023)	(0.0029)	(0.0022)	(0.0028)	(0.0021)
FIEs dummy	0.0009	0.0009	−0.0022	−0.0023	−0.0026	−0.0026
	(0.0041)	−0.0031	(0.0035)	(0.0026)	(0.0035)	(0.0027)
Firm fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
F-test for excluded instruments		(0.00)***		(0.00)***		(0.00)***
Observations	507,911	405,802	567,269	462,391	577,533	469,254

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Heteroskedasticity-robust standard errors are in parentheses.