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Tariffs and the Organization of Trade in China

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Abstract

This paper examines the impact of China's falling import tariffs on the organization of exports between ordinary and processing trade. These trade forms differ in terms of tariff treatment and the ability of firms to sell on the domestic market. At the industry level, we find that falling input tariffs are the source of 90 percent of the average increase in the share of exports occurring through ordinary trade, most of which occurs on the extensive margin through new entry. The choice of trade is also tied to the size of the domestic market, which processing firms cannot access. Consistent with the literature, we also document that the domestic content share of ordinary exports is 30 percentage points higher than for processing. Our back of the envelope calculations imply an increase in demand for local factors of production of 12-21 billion U.S. dollars in 2006 associated with the change in the composition of trade from processing to ordinary exports resulting from tariff cuts between 2000-2006.

Keywords: China, Processing Trade, Domestic Content, Tariffs

JEL classification: F14, F15, F16

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1 Introduction

Between 1990 and 2009, China's share of world manufacturing exports grew from only 2 percent to 13 percent (Hanson, 2012). An important dimension of this impressive growth has been the prominent, albeit declining role of processing exports.[1] In 1999, processing exports represented 57.3 percent of China's total exports, but by 2006 this fell to 53.6 percent and in 2012 were only 34.8 percent.[2] The role of China's ordinary trade increased *pari passu*. Recent work by Koopman, Wang, and Wei (KWW, 2012) and Kee and Tang (KT, 2012) finds that ordinary exports embody more than twice as much domestic value added per USD as do processing exports. This suggests potentially important implications for factor demand in China and its trading partners from changes in the composition of trade between these two forms. This paper examines the organization of this trade.

These two trade forms differ in terms of tariff treatment and the ability of firms to sell on the domestic market. Most notably, firms involved in the processing trade enjoy the right to duty-free imports of intermediate goods and capital equipment that are used in export processing activity, but face restrictions in selling to the domestic market. For firms exporting through ordinary, it is the reverse. Beginning in the mid-1990s, China embarked on an ambitious program of tariff liberalization that saw average tariffs fall from over 40 percent in 1995 to less than 10 percent following their accession to WTO (Branstetter and Lardy, 2008). In principal, this should have eroded some of the policy advantages processing exports enjoyed relative to ordinary trade.

Drawing on Chinese Customs data for the period between 2000 and 2006, we find strong evidence that the recent shift from processing to ordinary trade is causally-linked to falling input tariffs. Our estimates suggest that 90 percent of the change in the organization of trade at the six-digit industry level over this six-year period can be explained by input tariff

[1]Export processing zones and regimes have been a common development strategy existing in various forms in countries such as Mexico, Vietnam, Senegal, and Kenya. Radelet and Sachs (1997) and Radelet (1999) emphasize the importance of export processing zones in export-led development. See Madani (1999) for a review of export processing zones around the world.

[2]The estimates for 1999 and 2006 are taken from Koopman, Wang, and Wei (2012, pg. 184). For 2012, *The China Daily* reported that "processing trade imports and exports accounted for 34.8 percent of the total value of foreign trade, down 9.2 percentage points compared with 2011." *http://usa.chinadaily.com.cn/epaper/*2013 − 01/28/*content*_16180791.*htm* (retrieved February 12th, 2013).

cuts. Empirically, especially important is the role of the extensive margin, which includes the entry of new exporters that organize through ordinary trade and the addition of new product lines under ordinary trade by existing firms. These findings complement other recent work emphasizing the importance of entry of new firms in explaining dynamics in China's manufacturing sector (e.g Brandt, Van Briesebrock, and Zhang, 2012 and Brandt, Van Biesebroeck, Wang, and Zhang, 2012). In the cross-section, we also find evidence that ordinary trade is more prevalent in industries in which the domestic market is larger relative to export demand, consistent with domestic market size being a significant determinant of the organization of trade.

We corroborate our finding for exports through a similar analysis of the organization of imports. Our results are strongest for the imports of intermediate inputs, in contrast to exports where the impact of falling input tariffs on the trade organization of exports is pervasive across all types of goods. This is consistent with a model in which firms can use imported intermediate inputs to produce a variety of goods and choose the organizational form that maximizes profits.

Consistent with KWW (2012) and KT (2012), we document that the domestic content of ordinary exports is 30 percentage points higher than it is for processing. Especially important to this difference is the higher domestic content of new exporters and new products exported by existing exporters. Our back of the envelope calculations imply an increase in the demand for local factors of production of 12-21 billion U.S. dollars in 2006 associated with the change in the composition of trade from processing to ordinary shipments resulting from tariff cuts between 2000 and 2006.

To motivate our empirical work, we sketch out a simple partial equilibrium model of firm organizational choice following Melitz (2003) and Helpman, Melitz, and Yeaple (2004). Under processing trade, firms import intermediate inputs duty free but are restricted from selling on domestic markets. For these firms, the opportunity cost of processing trade is forgone domestic sales; for the marginal firm, the ability to source duty free is offset by restrictions on selling in the domestic market. As a result, lower input tariffs reduce firms' incentive to organize through processing trade. Moreover, lower input prices due to falling tariffs can allow new ordinary exporters to overcome the fixed costs of exporting, thereby resulting in the entry of new firms organizing through ordinary trade.

This paper is linked to several literatures within international trade. First, it is linked to an extensive literature on fragmentation of the supply chain and production sharing in the context of China (e.g. Feenstra and Hanson, 2005) and the global trading system in general (Yi, 2003). Second, it is linked to a literature on the organization of trade that builds on theories of the boundaries of the firm (e.g. Antras, 2003; Antras and Helpman, 2004; Feenstra and Hanson, 2005; Fernandes and Tang, 2012). And third, it is linked to a broad literature on firm-level responses to input tariff liberalization (e.g. Amiti and Konings, 2007).

Section 2 describes the institutional context and historical details. Section 3 sketches our simple partial equilibrium model. Section 4 discusses the data and presents estimating equations. Section 5 presents our results including the importance of the extensive margin. Section 6 presents robustness checks. Section 7 discusses the effect of tariff reduction on the domestic content of China's exports. Section 8 concludes.

2 Stylized Facts/Context

2.1 Ordinary and Processing Trade

The vast majority of Chinese exports occur through either ordinary (O) or processing (P) trade, which combined represent more than 95 percent of Chinese exports between 2000 and 2006.[3] Established in 1979, China's processing regime confers substantial benefits on export processors, most importantly, the right to import duty-free raw materials, components, and capital equipment used in processing activity, and preferential tax treatment (Naughton, 1996). Processing firms are restricted in terms of their ability to sell on the domestic market.

[3]For a general discussion, see Naughton (1996). Within processing trade, there are two forms: import and assembly (IA) and pure assembly (PA), of which IA represents more than 75 percent. Both forms can import duty free, but are restricted in terms of their ability to sell to the domestic market. Because of these similarities, we combine these two organizational forms into a single form that we refer to as 'processing'. Differences between the two, including the right to source domestically, ownership of imported intermediates, and taxation as a legal entity, are the focus of a small but growing literature. For a discussion of some of these differences, see Feestra and Hanson (2005), Branstetter and Lardy (2008), and Fernandes and Tang (2012).

In contrast, firms engaged in ordinary trade must pay duties on their imports, but are free to sell on the domestic market. Exports in all organizational forms are subject to VAT rebates.[4]

In the aggregate, ordinary trade comprised 42.1 percent of total exports in 2000 and 45.3 percent in 2006, an increase of 3.2 percentage points, or 7.2 percent. At the 6-digit HS industry, however, trade was organized predominantly through ordinary trade. In 2000, the unweighted average share of ordinary exports was 67.6 percent and by 2006 rose to 75.1 percent, or an increase of 10.5 percent. The gap between the growth in ordinary's share at the aggregate and the industry level reflects the fact that the sectors experiencing the most rapid growth were heavily involved in processing. Figure 1 presents histograms of the share of exports organized through ordinary trade in HS industries in 2000 and 2006. Figure 2 shows percentage changes between 2000 and 2006 calculated using midpoint elasticities that are bound between [-2,2]. The bottom panel drops industries that were already completely organized through ordinary trade in 2000. The large mass in the distribution to the right of the origin reflects the general shift towards ordinary trade over this period.

A majority of firms–73 percent in 2003–export through a single organizational form. At the six-digit HS product level, 94.7 percent of all firms in 2003 did the same. Exports by firms exporting through multiple forms are larger than average, and in 2003 were the source of 68.8 of total exports. At the narrower six-digit HS product level however, exports by firms organizing through both processing and ordinary represented only 24.4 percent of total exports. Over time, the relative prevalence of multi-form firms has also been falling. As a share of firms exporting within a HS 6-digit level category, these firms declined from 7.2 percent of the total in 2000 to 5.3 percent in 2003, and 3.0 percent in 2006. Consequently, in our theoretical and empirical framework, we analyze the case in which each plant within a firm chooses a single form of trade for each product. Throughout this paper references to 'sector' or 'industry' refer to 1996 HS six-digit codes unless otherwise indicated.

[4]Processing firms that wish to set up an apparatus for domestic sales must establish a *segregated facility* whose operations do not receive processing's preferential treatment [based on interviews conducted in Guangdong (2005),(2006), and (2007)]. We discuss these multi-form firms below.

Figure 1: Share of Ordinary Trade (2000 & 2006)

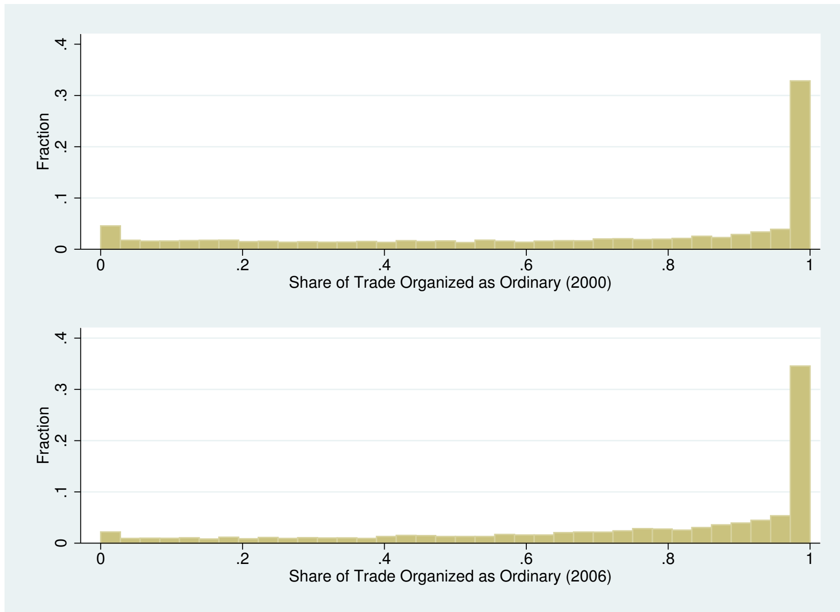
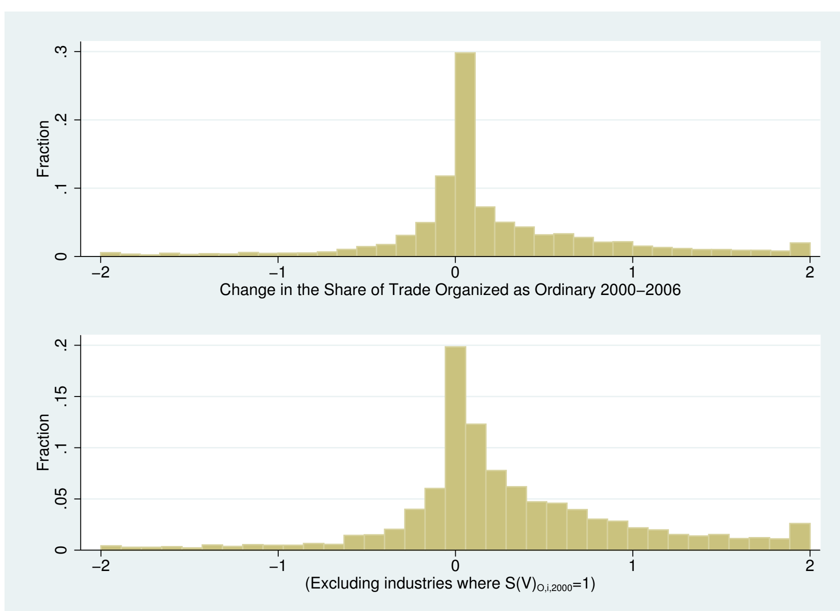


Figure 2: Change in the Share of Ordinary Trade (2000-2006)



2.2 Tariffs

In China, tariffs began to come down in the early 1990s as part of a broad set of external reforms culminating in WTO accession. Stated tariffs fell from an average of 43.2 percent in 1992 to 15.1 percent in 2001 and to 9.9 percent in 2007. This was accompanied by an equally sharp reduction in the dispersion in tariffs (Brandt, Van Biesebroeck, Wang, and Zhang, 2012). Viewed from the perspective of this fifteen year period, these cuts and the compression in tariffs reflect policymakers' objective of lower and more uniform tariffs. Because of this convergence, the initial level of protection in a sector is a very good predictor of the change between 1992 and 2007.[5]

More heterogeneity is observed for the period between 2000 and 2006, the focus of our analysis. However, tariff cuts occurring after 2001 were negotiated in the late 1990s as part of China's WTO accession.[6] Once these tariff cuts were negotiated, they were locked in, severing the link between tariff cuts and contemporaneous economic changes. As a result, concerns about possibly endogenous behavior of tariffs must have been based on expectations of their effects rather than the effects themselves.

To address concerns about the possible endogeneity of tariff liberalization and lacking a solid IV strategy, we use time series variation to purge time-invariant industry-province factors. We also condition on 2000 tariff levels to capture any preferential treatment a sector may have enjoyed in the years prior to WTO accession. The robustness section also evaluates numerous threats to the exogeneity of tariff cuts including pre-existing trends in input tariffs and ordinary trade shares, changes in output tariffs, and other key variables.

2.3 Domestic Absorption

Because of restrictions on domestic sales when production is organized through processing trade, firms in industries in which the domestic market is large relative to export demand have an incentive to organize through ordinary trade. We define domestic absorption to be

[5]A simple linear regression of the change between 1992 and 2007 on the level in 1992 has a slope of -0.84 and an R^2 of 0.96.

[6]Brandt, Van Biesebroeck, Wang, and Zhang (2012) discuss the institutional context of this round of tariff liberalization in detail.

the value of total sales of firms manufacturing in China less exports plus imports. Although China is often viewed as an 'export-driven' economy, exports represent less than twenty percent of gross manufacturing output, and domestic absorption exceeds exports in most industries. At the four-digit China Industrial Classification (CIC) level, domestic absorption in 2004–the only year for which we have all of the required data to do the calculations–was larger than export values in 86 percent of industries, and more than twice as large in 79 percent. The median difference between output and export value was 688 percent.

3 Theory

In this section, we sketch a simple partial equilibrium model in which entrepreneurs choose between organizing production into either ordinary or processing trade.[7] The model serves three purposes. First, it describes how input tariffs and domestic demand affect the distribution of exports within an industry between ordinary and processing. The key trade-off we highlight is that exporting through ordinary trade allows the same product to be sold on the domestic market but at the cost of tariffs on imported intermediate inputs while processing trade offers duty-free import of intermediate inputs but prohibits sale of the product on the domestic market. Second, the model delivers a closed-form expression for the share of ordinary trade at the industry level as a function of input tariffs and the ratio of domestic to world demand that motivates our empirical work. And third, it identifies potentially confounding factors possibly correlated with tariffs that may also influence trade form.

3.1 Demand

There are two markets: China and the World. Consumers in each market possess identical and homothetic Cobb-Douglas preferences over an exogenously fixed number of industries $i = 1, ..., I$. Within an industry, monopolistically competitive entrepreneurs each sell a single differentiated variety that can *either* be an ordinary *or* a processing good. We assume that

[7] We purposefully do explore the full general equilibrium of the model. This would require a model of how falling tariffs affect both global sourcing decisions and both product and factor market competition. Demidova and Rodriguez-Clare (2011) illustrate the difficulties in obtaining unambiguous analytical results in a full general equilibrium model of firm heterogeneity. See also, Defever and Riaño (2012).

the elasticity of substitution is the same across all varieties within an industry and equal to $\sigma > 1$.[8] We relax these assumptions in Appendix A and consider cases in which: 1. a single entrepreneur can produce both ordinary and processing goods within an industry; and 2. substitution possibilities between varieties within a single trade form are greater than between ordinary and processing varieties within the same industry.

Entrepreneurs producing the ordinary good can sell it exclusively in the domestic (China) market (D) or to both domestic (China) and overseas consumers (O). Entrepreneurs producing the processing good are legally prohibited from selling it domestically and can only sell it to world consumers (P). We refer to the choice of which good to produce and the market in which to sell it (D,O, or P) as the 'organization of production.' Conditional on exporting, we refer to an entrepreneur's choice of ordinary (O) versus processing (P) exports as the 'organization of trade.'

The price an entrepreneur receives for a good produced under organizational form j, (p_i^j), depends on their exogenous capability, (ϕ_f). Industry-specific demand shifters for domestic and World consumers are captured by D_i^C and D_i^W, respectively.[9] Thus, demand functions from selling domestically (D), selling domestically and exporting through ordinary trade (O), and only exporting through processing (P), respectively, are given by:

$$r_i^D(\phi_f) = \left(D_i^C\right)\left[p_i^D(\phi_f)\right]^{1-\sigma}$$
$$r_i^O(\phi_f) = \left(D_i^W + D_i^C\right)\left[p_i^O(\phi_f)\right]^{1-\sigma}, \quad \text{and}$$
$$r_i^P(\phi_f) = D_i^W\left[p_i^P(\phi_f)\right]^{1-\sigma}.$$

3.2 Inputs, Technology and Costs

There are two factors of production: an imported intermediate input M_M, and a domestically provided intermediate input M_D.[10] Input prices, p_M and p_D, are exogenously given,

[8] This implies, for example, that the elasticity of substitution between two shirts produced by processing firms is the same as the elasticity between shirts produced by an ordinary and processing firm.

[9] Specifically $D_i^W = (t_i\sigma/(\sigma-1))^{1-\sigma}\alpha_i \mathbf{P_i^W}^{\sigma-1} Y^W$ where t_i is any exogenous transport cost for exports to the World, α_i is the share of world income spent in industry i, $\mathbf{P_i^W}$ is the world CES price index for industry i and Y^W is world income. A domestic analog holds for D_i^C.

[10] We exclude primary factors of production such as labor and capital equipment from the formal model for parsimony. Their inclusion does not add additional insight however we control for such characteristics

and include transport costs. Imported intermediates used in goods for ordinary export or for goods sold domestically also face an ad valorem tariff set at the industry level τ_i. In addition, firms face a fixed cost of production f_i^j that differs by organizational form and industry. Following the literature, we assume that the fixed cost of production for domestic sales is smaller than for the fixed costs of exporting through either form (e.g. Bernard, Jensen, Redding, and Schott, 2007).

Leontief production functions combine the two intermediate inputs, M_D and M_M. As suggested by KWW (2012) and KT (2012), we allow for the possibility that the use of imported intermediate inputs differs by industries and organizational forms within an industry. Normalizing the use of the domestic intermediate to one, γ_i^O and γ_i^P represent the unit input requirements of the imported intermediate input in the production of the ordinary and processed goods, respectively, within industry i. Assuming that variable and fixed costs have the same factor intensities within an organizational form, the total cost functions associated with the three organizational forms are given by:[11]

$$TC^D(q_f, \phi_f, \tau_i p_m, p_D, f^D) = \left[p_D + \gamma_i^O \tau_i p_M\right] \left[\frac{q_f}{\phi_f} + f_i^D\right],$$

$$TC^O(q_f, \phi_f, \tau_i p_m, p_D, f^O) = \left[p_D + \gamma_i^O \tau_i p_M\right] \left[\frac{q_f}{\phi_f} + f_i^O\right],$$

and

$$TC^P(q_f, \phi_f, p_m, p_D, f^P) = \left[p_D + \gamma_i^P p_M\right] \left[\frac{q_f}{\phi_f} + f_i^P\right].$$

The total cost functions for domestic and ordinary trade firms (TC^D and TC^O) are similar in that both include tariffs τ_i on their imported intermediate inputs. Reflecting the preferential policies extended to processing activity, the total cost function for processing firms (TC^P) does not. The corresponding profit functions for domestic, ordinary, and processing organization are:

$$\pi_i^D(\phi_f) = \frac{D_i^C}{\sigma} \left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma} \phi_f^{\sigma-1} - \left[p_D + \gamma^O \tau_i p_M\right] f^D, \quad (1)$$

in our empirical analysis.

[11]Relaxing the assumption of identical factor intensities in fixed and variable costs is straightforward in a partial equilibrium setting but does not add any insight. In addition, all theoretical results generalize to the case in which the intermediate inputs are combined using a CES aggregator.

$$\pi_i^O(\phi_f) = \frac{\left(D_i^W + D_i^C\right)}{\sigma}\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\phi_f^{\sigma-1} - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O, \quad (2)$$

and

$$\pi_i^P(\phi_f) = \frac{D_i^W}{\sigma}\left[p_D + \gamma_i^P p_M\right]^{1-\sigma}\phi_f^{\sigma-1} - \left[p_D + \gamma_i^P p_M\right] f^P. \quad (3)$$

3.3 Sorting

Taking their capabilities as given, entrepreneurs in industry i chose the organization of production that maximizes profit and earn $v_i(\phi_f) = \max\left\{0, \pi_i^D(\phi_f), \pi_i^O(\phi_f), \pi_i^P(\phi_f)\right\}$.[12] Conditional on exporting, entrepreneurs sort into either ordinary or processing trade depending on whether $\pi_i^O(\phi_f) \lesseqgtr \pi_i^P(\phi_f)$. If $\pi_i^O(\phi_f) > \pi_i^P(\phi_f)$ $\forall \phi_f$, then a 'specialized equilibrium' holds in which all exporters sort into ordinary exports. Under the opposite inequality, only processing is chosen. The likelihood that we observe a specialized equilibrium with only ordinary (processing) exports is highest when input tariffs (τ_i) are low (high), and domestic absorption (D_i^C) is large (small).[13]

We now focus on the case of an interior solution in which there are strictly positive amounts of both ordinary and processing exports in an industry. We refer to this as a 'diversified equilibrium.' In this case all exporters for whom $\pi_i^O(\phi_f) > \pi_i^P(\phi_f)$ sort into ordinary trade and all for whom $\pi_i^O(\phi_f) < \pi_i^P(\phi_f)$ sort into processing. Any exporter for whom $\pi_i^O(\phi_f) = \pi_i^P(\phi_f)$ is indifferent between organizational forms. Setting equation (2) equal to (3), the capability of this marginal exporter is equal to:

$$\left(\phi_f^P\right)^{\sigma-1} \equiv \frac{\sigma\left[\left[p_D + \gamma_i^P p_M\right] f^P - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O\right]}{D_i^W\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} - \left(D_i^W + D_i^C\right)\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}}. \quad (4)$$

This expression will be strictly positive as long as the two inequalities below are of the same direction:

$$\left[\frac{p_D + \gamma_i^O \tau_i p_M}{p_D + \gamma_i^P p_M}\right]^{\sigma-1} \lesseqgtr 1 + \frac{D_i^C}{D_i^W}. \quad (5)$$

and

[12] The first argument allows for costless exit.

[13] This is seen formally by noting that total profits under ordinary trade (O) are increasing in domestic absorption and falling in input tariffs while processing exports depend on neither.

$$\left[\frac{p_D + \gamma_i^P p_M}{p_D + \gamma_i^O \tau_i p_M}\right] \frac{f^P}{f^O} \lesseqgtr 1. \tag{6}$$

When both inequalities are strictly greater than (>), the marginal profit with respect to capability and the fixed cost of exporting are greater for processing than for ordinary exports. If they are both strictly less than (<), then the marginal profit with respect to capability and the fixed cost of exporting are greater for ordinary trade than for processing.[14] Analogous to Melitz (2003) and Helpman, Melitz, and Yeaple (2004), the first case describes a setting in which the benefits of importing intermediate inputs duty free only compensate the most capable entrepreneurs for the fixed costs of processing and the loss of access to domestic consumers. In the second case, only for the most capable entrepreneurs do the returns to accessing the domestic market compensate for the higher fixed cost of ordinary exports and loss of duty free intermediate inputs.[15]

Figure 3 presents the first case described above along with the profit function from only selling domestically $[\pi_i^D(\phi_f)]$. Consistent with both a larger return to capability and greater fixed cost of processing, the processing profit function cuts the ordinary profit function from below. $\left(\phi^{P,1}\right)^{\sigma-1}$ denotes the level of capability for which an entrepreneur is indifferent between ordinary and processing. The capability at which entrepreneurs are indifferent between selling exclusively to the domestic economy and exporting through ordinary trade is noted by $\left(\phi^{O,1}\right)^{\sigma-1}$. The capability level at which entrepreneurs are indifferent between domestic sales alone and exit is represented by $(\phi^*)^{\sigma-1}$. The solid line depicts $v_i(\phi)$. In this case, the least capable entrepreneurs exit, the low intermediate capability entrepreneurs produce only for the domestic market, high intermediate capability entrepreneurs organize through ordinary trade, and the most capable entrepreneurs organize through processing. Appendix A derives these cutoffs explicitly.

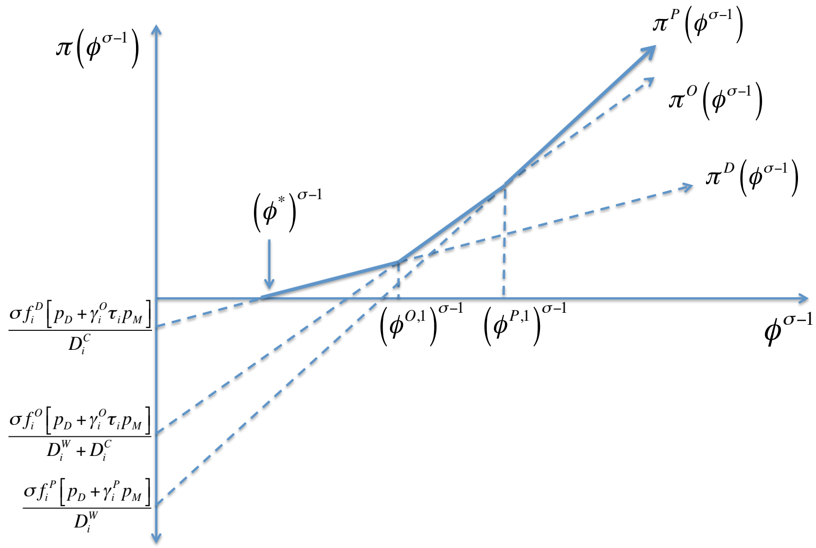
Figure 4 represents the second case in which ordinary trade offers a higher return to capability, but at a greater fixed cost.[16] In this case, the profit function for ordinary trade

[14]Both of these cases can be seen easily by examining the profit functions associated with each organizational form of production: equations (2) and (3).

[15]If there are no differences in fixed costs, all exporters choose the organizational form with greater marginal profit.

[16]Implicit in both figures depicting a diversified equilibrium is the assumption that the return to exporting

Figure 3: Higher Marginal Return to Processing Exports

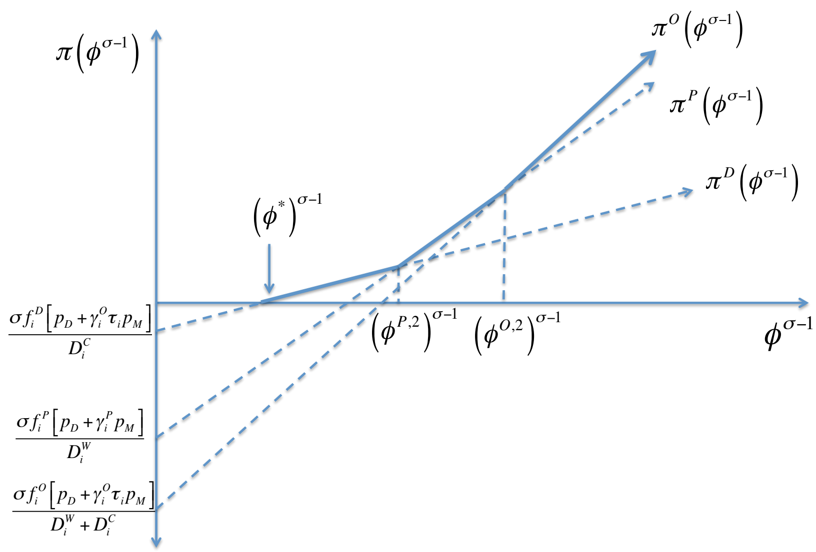


cuts that for processing from below. $\left(\phi^{P,2}\right)^{\sigma-1}$ denotes the level of capability for which an entrepreneur is indifferent between domestic sales and processing trade, while $\left(\phi^{O,2}\right)^{\sigma-1}$ is the critical cut-off between export processing and ordinary trade. The capability at which entrepreneurs are indifferent between only selling in the domestic market and exit is unchanged between the two figures. In the second case, the least capable entrepreneurs exit, low intermediate capability entrepreneurs produce only for the domestic market, high intermediate capability entrepreneurs organize through processing, and the most capable entrepreneurs organize through ordinary trade. Appendix A derives these cutoffs explicitly.

We remain agnostic as to which ordering of the inequalities is most likely to hold at the industry level. Either ordering can be rationalized, and is model-dependent. For example, if there are substantial fixed costs associated with R&D in processing activity and intermediate input tariffs are high, then Figure 3 is the empirically relevant case. Alternatively, if one believes that there are high fixed costs for ordinary trade associated with either capital investment or identifying export markets, and a high premium is also placed on the ability to access the domestic market, then Figure 4 is the empirically relevant case. As we show

in the 'low marginal return/low fixed cost' organizational form is sufficiently large that some firms choose to incur an additional fixed cost to engage in that form relative to selling domestically alone.

Figure 4: Higher Marginal Return to Ordinary Exports



below, in both cases the key finding that relative trade shares respond to changes in input tariffs and differences in domestic absorption across industries holds.

3.4 Diversified Equilibrium: Comparative Statics

Following Helpman, Melitz, and Yeaple (2004) and Chaney (2008), we assume that productivity follows a Pareto distribution with $\phi_{min,i}$ representing the minimum productivity draw in industry i, and $k > \sigma - 1$ the common shape parameter.[17] We define the (value) share of total exports that occur through ordinary trade in industry i as $S(V)_{O,i}$. Propositions 1 and 2 lay out the two important comparative static results:

Proposition 1. *Suppose that* $0 < S(V)_{O,i} < 1$*. If* τ_i *falls, then* $(\phi^{O,1})^{\sigma-1}$ *falls,* $(\phi^{P,1})^{\sigma-1}$ *rises in the case where ordinary trade is 'high return to capability/high fixed cost' and* $(\phi^{O,2})^{\sigma-1}$ *falls,* $(\phi^{P,2})^{\sigma-1}$ *rises in the case where processing trade is 'high return to capability/high fixed cost' . In both cases,* $S(V)_{O,i}$ *rises.*

Proof. See Appendix A. ∎

Proposition 2. *Suppose that* $0 < S(V)_{O,i} < 1$*. If* $\frac{D_i^C}{D_i^W}$ *rises, then* $S(V)_{O,i}$ *rises regardless of which organization of exporting is 'high return to capability/high fixed cost' .*

[17] This is a technical restriction that the right tail of firm productivity is sufficiently thin that industry revenue is finite.

Proof. See Appendix A. ∎

For the sorting depicted in Figure 3, lower input tariffs increase the marginal profit to exporting as marginal costs fall and profits rise for entrepreneurs that previously were not able to overcome the fixed cost of ordinary exports. Consequently, some entrepreneurs that previously only sold domestically now export the ordinary good as the minimum capability necessary for ordinary trade also falls $\left[\left(\pi^{O,1}\right)^{\sigma-1}\downarrow\right]$. In addition, some entrepreneurs that previously chose to organize through processing trade now switch into ordinary trade due to a falling cost advantage of processing trade. As a result, the minimum capability at which entrepreneurs organize through processing trade rises $\left[\left(\pi^{P,1}\right)^{\sigma-1}\uparrow\right]$. Combined with the positive effect of falling tariffs on export revenues of incumbent firms from ordinary exports, the share of exports organized through ordinary trade increases due to both extensive and intensive margin adjustments.

For the sorting depicted in Figure 4, lower input tariffs increase both the marginal return to exporting through ordinary trade and of selling domestically as marginal costs fall for entrepreneurs organizing through those two forms of production. Consequently, some entrepreneurs that previously chose to organize through processing trade now switch into ordinary trade due to a falling cost advantage of processing trade $\left[\left(\pi^{O,2}\right)^{\sigma-1}\downarrow\right]$ and some entrepreneurs that previously exported through processing choose to sell only on the domestic market $\left[\left(\pi^{P,2}\right)^{\sigma-1}\uparrow\right]$. Again, the share of exports organized through ordinary trade increases on both the extensive and intensive margins.

In both cases, a larger domestic market relative to international demand increases the attractiveness of organizing through ordinary trade, leading to an increase in the share of exports organized through ordinary trade. For simplicity, we have assumed that falling input tariffs do not affect domestic output product markets. However, we address the potential effect of output tariffs on the competitiveness of the domestic market and, therefore, organizational form in the robustness section. Equations (5) and (6) also identify sources of heterogeneity that might be correlated with the trade form. Specifically, any factor that affects the relative use of domestically and internationally-provided intermediate inputs (e.g. capital/skill intensity or use of differentiated inputs) can influence organizational decisions as captured by differences in γ_i^O and γ_i^P across industries. We control for these possibly confounding factors in our empirical analysis.

4 Data

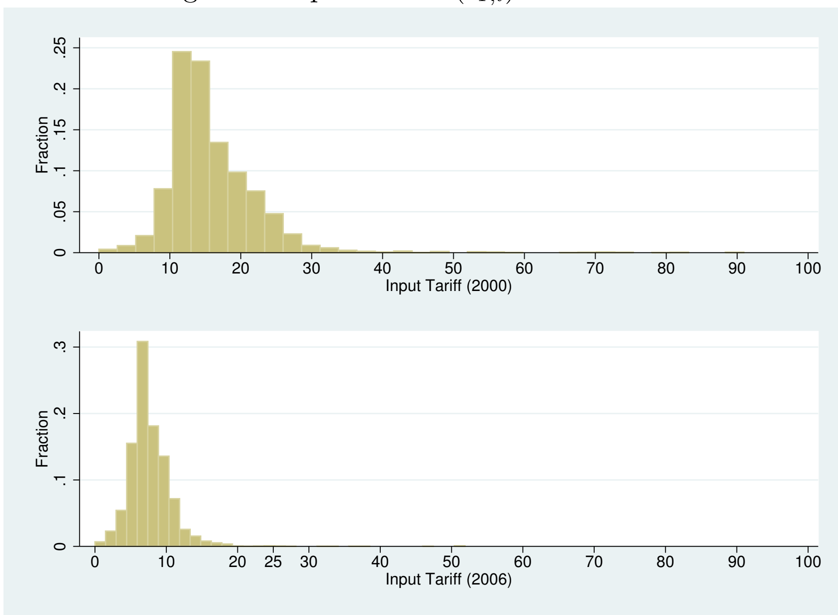
We use trade transaction data collected by the Customs Administration of China available for the years 2000-2006. These data provide firm-level information at the 8-digit HS level on the quantity and value of exports and imports, destination and source countries, whether goods are exported directly or through Hong Kong, organizational form (e.g. processing and ordinary trade), and ownership type (e.g. foreign- or Chinese-owned). To link data over time, we aggregate these data to the six-digit HS level.[18]

A key variable of interest in our analysis is input tariffs. Generally speaking, a firm's input tariff is a weighted average of tariffs applied to goods imported by the firm. An exporting industry's input tariff is then a weighted average of input tariffs over all firms in that industry. Calculating input tariffs at the industry level allows us to impute tariffs for exporting firms that might endogenously choose not to import.

We construct our industry measure in two steps. First, we construct firm-level import bundles in 2006. We use 2006 because the majority of tariff cuts had already occurred, thereby minimizing distortions on import demand. Using the 2006 import bundle and ad valorem tariffs in 2000-2006, we construct the average tariff that each firm would have faced in each year if it had imported the same bundle of goods. This provides us a time series of input tariffs for all firms importing in 2006. Second, using firm total imports in 2006 as constant weights, we then construct input tariffs at the exporting industry for all years. By construction, all of the variation in input tariffs comes from changes in the stated tariffs on goods that are imported and not from changes in the intensity with which these inputs are used. Appendix B describes the construction of the input tariffs in detail. Figure 5 presents histograms of the calculated input tariffs in 2000 and 2006. We observe a clear fall and

[18] A change in HS codes in 2002 requires us to link pre- and post-2002 codes. The only concordance that is available to us links six-digit 1996 HS codes to six-digit 2002 HS codes. Because only the first six digits of the HS classification are used across countries, we are unable to use the 10-digit concordance for US HS codes as set out by Pierce and Schott (2009). See the information contained at $http://www.international.gc.ca/canadexport/articles/120224a.aspx?view=d$ for more information.

Figure 5: Input Tariffs ($\tau_{I,i}$): 2000 & 2006



compression in input tariffs. The average ad valorem industry input tariff is 15.50 percent in 2000 and 7.40 percent in 2006.

Domestic absorption for industry i is total industry sales in the domestic (Chinese) market. By definition, it is equal to the sum of total sales of all firms in that industry producing in China minus exports plus imports. Manufacturing census data are only available for a single year for which we have Customs data, namely, 2004. Thus, we combine production data from the 2004 Chinese manufacturing census with data on imports and exports from the Customs data for the same year to construct a single cross-section for domestic absorption. As suggested by theory, we normalize domestic absorption by total exports to obtain a measure of domestic relative to world absorption D_i.

We also consider the effect of several industry-level variables identified by the model that may reflect differences in the prices of intermediate inputs sourced domestically versus internationally. Specifically, we include measures of the skilled-unskilled labor and capital-labor ratios in each industry. To avoid any bias associated with the endogeneity of firm input choice, we use U.S. measures of skill (the ratio of non-production to production workers) and capital (ratio of equipment to labor) intensity from the NBER manufacturing data base. We use the Chinese input-output matrix to capture both direct and indirect demand for skilled labor and capital intensive intermediate inputs. We also include the proportion of intermediate inputs that are differentiated ($Nunn_i$) from Nunn (2007).[19]

Table 1 presents summary statistics for all variables used in our primary regressions where observations are indexed by province p and industry i for reasons discussed below.

Table 1: Summary Statistics

variable	**Obs**	**Mean**	**Median**	**Std. Dev.**	**Min**	**25th pctile**	**75th pctile**	**Max**
$S(V)_{O,ip,2000}$	31062	0.839	1.000	0.323	0.000	0.949	1.000	1.000
$S(V)_{O,ip,2003}$	39372	0.875	1.000	0.280	0.000	0.996	1.000	1.000
$S(V)_{O,ip,2006}$	46742	0.892	1.000	0.254	0.000	0.998	1.000	1.000
$\%\Delta S(V)_{O,ip,2000}$	27613	0.115	0.000	0.665	-2.000	0.000	0.000	2.000
$\ln(S_i/U_i)$	53636	-0.928	-0.871	0.320	-2.574	-1.055	-0.712	-0.427
$\ln(K_i/L_i)$	53636	4.343	4.264	0.357	3.009	4.100	4.599	5.210
$Nunn_i$	53636	0.470	0.450	0.220	0.024	0.274	0.675	0.980
$\ln(D_i)$	53636	1.339	1.522	1.592	-3.612	0.287	2.263	11.028
$\tau_{I,i,2000}$	53128	15.924	14.713	5.187	0.509	12.410	18.960	73.967
$\tau_{I,i,2003}$	53128	9.225	8.494	3.545	0.155	6.897	11.206	55.239
$\tau_{I,i,2006}$	53128	7.752	7.289	2.819	0.153	6.138	9.221	51.879
$\Delta\tau_{I,i}$	53128	8.172	7.563	3.427	0.316	5.926	9.892	25.403

Ordinary trade is extremely common with the median industry-province observation organized exclusively through ordinary trade in all years.[20] In addition, the share of ordinary trade is increasing on average over time. The average percentage change over those sectors for which we observe trade in both 2000 and 2006 is 11.5 percent.[21] As illustrated in Figure 5, input tariffs fall by an average of 8.2 percentage points during this period.

[19] We thank Dan Trefler for making these three variables available to us.

[20] Ordinary trade is even more common in Table 1 than described in section 2. This is partially due to losing several industries not included in the NBER manufacturing database. It also reflects that processing is geographically concentrated, as a result of which the unweighted average share in ordinary at the industry-location level is higher it is at the industry.

[21] The number of observations on trade shares is less than that on tariffs and industry characteristics because exports in some cells are zero. Also, the average percentage change in Table 1 is not equal to the percentage change in the averages for two reasons: 1. the samples are different; and 2. the use of the non-linear midpoint elasticity operator.

4.1 Estimation Details

Our primary outcome of interest is the value share of exports organized through ordinary trade:

$$S(V)_{O,ipt} = \frac{V_{O,ipt}}{V_{O,ipt} + V_{P,ipt}}, \tag{7}$$

where $V_{O,ipt}$ and $V_{P,ipt}$ are export values organized through ordinary and processing trade, respectively, for industry i in province p in year t. We examine the organization of trade at this level for three reasons. First, industry-level analysis allows us to quantify the importance of the extensive margin's contribution to total changes. Second, ordinary trade firms are generally small. For this reason, average changes in ordinary trade at the firm level often differ from average changes at the industry level. And third, geographic heterogeneity (e.g. special economic zones) may play an important role in determining firms' choice of organizational form (Defever and Riaño, 2012).

In the cross section, we estimate equation (8) for each of the years $t \in \{2000, 2003, 2006\}$ where $\tau_{I,it}$ is the input tariff, $\mathbf{X}_{it}$ is a vector of explanatory variables, Φ_{pt} is a province-time fixed effect, and ϵ_{ipt} is an error term that is clustered at the industry level. Province fixed effects take into account provincial characteristics that might lead trade in some geographic locations to be more likely to organized into ordinary or processing trade.

$$S(V)_{O,ipt} = \beta_{I,t}\tau_{I,it} + \beta'_{X,t}\mathbf{X}_{it} + \Phi_{pt} + \epsilon_{ipt}. \tag{8}$$

We use Tobit estimators, where the range of the dependent variable is $[0, 1]$, to deal with the prevalence of industry-province observations that are organized exclusively through ordinary or processing. Because our variable is undefined if there are no exports, our panel is unbalanced.

In order to eliminate any time-invariant industry-province effects that might be correlated with tariffs, we also estimate the relationship using the proportional difference between 2000 and 2006. Our estimating equation is given by equation (9):

$$\%\Delta S(V)_{O,ip} = \beta_{\Delta I}\Delta\tau_{I,i} + \beta_{I,2000}\tau_{I,i,2000} + \beta'_{X}\mathbf{X}_{i} + \Phi_{p} + \epsilon_{\Delta,ip} \tag{9}$$

where standard errors are clustered at the industry level and variables are defined analogously to equation (8). Tariff levels in 2000 are included to help absorb unobserved heterogeneity related to any pre-WTO preferential treatment. We calculate proportional changes in trade shares using midpoint elasticities in order to avoid dropping sectors in which the initial share of ordinary trade is zero:

$$\%\Delta S(V)_{O,ip} = \frac{S(V)_{O,ip,2006} - S(V)_{O,ip,2000}}{0.5\left[S(V)_{O,ip,2006} + S(V)_{O,ip,2000}\right]}. \tag{10}$$

This gives a dependent variable defined over the range $[-2, 2]$.

5 Baseline Results

Columns (1)-(6) of Table 2 present estimation results of equation (8), while columns (7) and (8) are estimates for equation (9). All reported coefficients are Tobit marginal effects. Reductions in input tariffs between 2000 and 2006 are defined as positive. Column (8), which eliminates the effect of any time-invariant industry-province factors, is our preferred specification for estimating the effect of tariffs on trade forms.

In the individual cross-sections for 2000, 2003 and 2006, the coefficient on input tariffs is consistently negative and suggests that sectors with the lowest (highest) input tariffs have the highest (lowest) share of ordinary (processing) trade. The effect weakens considerably over time–possibly reflecting the loss in identifying variation as tariff differences between sectors narrow–and is smaller by about half with the inclusion of our measure of domestic absorption and industry characteristics. Consistent with our model, there is also robust positive correlation in each year between domestic absorption and the role of ordinary trade in exports. We do not want to push the causal interpretation too far because of the potential endogeneity of domestic absorption, but the estimated coefficient implies that a doubling in domestic absorption is associated with a 6.2 to 7.2 percent increase in the share of trade organized as ordinary.[22] In addition, the share of ordinary exports is positively correlated

[22] To translate these percent changes into percentage point changes, we use the initial share of ordinary exports of 0.421 from 2000 (see pg. 5), which implies that a doubling of domestic absorption increases the aggregate share of ordinary trade by 2.6 to 3 percentage points.

with sector skill-intensity, but negatively correlated with either capital intensity or the use of differentiated inputs. These correlations line up well with perceptions of processing activity in China concentrated in capital intensive sectors assembling differentiated inputs with the use of unskilled labor, e.g. the iPod.

Compared to the cross-sectional estimates, the time-series effects of tariffs are substantially larger and highly significant. A 10 percentage point input tariff cut increases the share of trade organized through ordinary trade by 13.0 percent. With input tariffs falling on average by 8.2 percent between 2000 and 2006, over 90 percent of the observed shift in the organization of trade at the industry level to ordinary over this period can be tied to input tariff cuts. Our estimates also suggest much smaller shifts between 2000 and 2006 to ordinary trade in industries in which domestic absorption and skill intensity were higher, and larger shifts in industries that were more capital intensive and used more highly differentiated inputs. In the case of domestic absorption, the robustness section will show that this simply reflects the fact that a large percentage of trade was already organized exclusively through ordinary in industries with high domestic absorption in 2000.

5.1 Extensive and Intensive Margins

There are a number of alternative margins through which the increase in ordinary trade may have occurred. We start by defining four types of firms at the industry i province p level:

1. Incumbents (I): firms with strictly positive exports in a given industry-province pair in both 2000 and 2006 ($V_{fip,2000} > 0$ & $V_{fip,2006} > 0$),
2. Exiting (E): firms with strictly positive exports in a given industry-province pair in 2000 but not in 2006 ($V_{fip,2000} > 0$ & $V_{fip,2006} = 0$),
3. New firms (N): firms that start to export between 2000 and 2006 ($V_{fip,2000} = 0 \ \ \forall i, p$ & $V_{fip,2006} > 0$), and
4. Switchers (S): Firms exporting in both 2000 and 2006, but in different industry-province pairs ($V_{fip,2000} = 0$ & $\exists j \neq i : V_{fjp,2000} > 0$ & $V_{fip,2006} > 0$).

Table 2: Baseline Estimation

	2000 (1)	2000 (2)	2003 (3)	2003 (4)	2006 (5)	2006 (6)	(00-06) (7)	(00-06) (8)
$\tau_{I,it}$	-0.016***	-0.0076***	-0.013***	-0.0028	-0.0077**	0.000099		
	(0.0025)	(0.0023)	(0.0031)	(0.0028)	(0.0032)	(0.0028)		
$\Delta\tau_{I,i}$							0.0071***	0.013***
							(0.0016)	(0.0031)
$\tau_{I,i,2000}$								-0.0066***
								(0.0021)
$\ln(D_i)$		0.067***		0.072***		0.062***		-0.010***
		(0.0074)		(0.0059)		(0.0051)		(0.0035)
$Nunn_i$		-0.80***		-0.72***		-0.51***		0.16***
		(0.0603)		(0.0541)		(0.0427)		(0.0294)
$\ln(S_i/U_i)$		0.44***		0.35***		0.21***		-0.17***
		(0.0498)		(0.0394)		(0.0325)		(0.0238)
$\ln(K_i/L_i)$		-0.18***		-0.19***		-0.068**		0.082***
		(0.0501)		(0.0410)		(0.0336)		(0.0236)
Observations	30,794	30,794	39,067	39,067	46,455	46,455	27,480	27,480
Left Censored	864	864	523	523	369	369	97	97
Non-Censored	7892	7892	9588	9588	11646	11646	26701	26701
Right Censored	22038	22038	28956	28956	34440	34440	682	682

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed effects. $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are marginal effects. The dependent variable is $S(V)_{O,ipt}$ in columns (1)-(6) and $\%\Delta S(V)_{O,ip}$ in columns 7 and 8.

Table 3: Decomposition

	$\%\Delta S(V)_{O,ip}$ Total (1)	$S(V)^N_{O,ip}$ New Firms (2)	$S(V)^S_{O,ip}$ Switchers (3)	$S(V)^{NE}_{O,ip}$ Net Exit (4)	$\%\Delta S(N)_{O,ip}$ Total (5)	$S(N)^N_{O,ip}$ New Firms (6)	$S(N)^S_{O,ip}$ Switchers (7)	$S(N)^{NE}_{O,ip}$ Net Exit (8)
$\Delta\tau_{I,i}$	0.013***	0.0068***	0.0040***	0.0016	0.0078***	0.0041***	0.0027***	0.00088
	(0.0031)	(0.0018)	(0.0012)	(0.0024)	(0.0017)	(0.0013)	(0.0009)	(0.0012)
$\tau_{I,i,2000}$	-0.0066***	-0.0046***	-0.0021**	0.00042	-0.0052***	-0.0041***	-0.0011*	0.00012
	(0.0021)	(0.0012)	(0.0008)	(0.0016)	(0.0013)	(0.0009)	(0.0006)	(0.0008)
$\ln(D_i)$	-0.010***	-0.0065***	0.0015	-0.0057**	-0.00011	-0.0073***	0.0045***	0.0025**
	(0.0035)	(0.0022)	(0.0015)	(0.0025)	(0.0021)	(0.0016)	(0.0011)	(0.0013)
$Nunn_i$	0.16***	0.067***	0.012	0.081***	0.10***	0.070***	-0.0086	0.040***
	(0.0294)	(0.0160)	(0.0115)	(0.0213)	(0.0183)	(0.0114)	(0.0085)	(0.0105)
$\ln(S_i/U_i)$	-0.17***	-0.042***	-0.052***	-0.066***	-0.10***	-0.034***	-0.024***	-0.043***
	(0.0238)	(0.0133)	(0.0094)	(0.0164)	(0.0154)	(0.0095)	(0.0069)	(0.0080)
$\ln(K_i/L_i)$	0.082***	0.068***	-0.016*	0.027*	0.057***	0.061***	-0.020***	0.014*
	(0.0236)	(0.0137)	(0.0090)	(0.0158)	(0.0151)	(0.0094)	(0.0065)	(0.0085)
Observations	27,480	27,480	27,480	27,480	27,480	27,480	27,480	27,480
Left Censored	97	0	0	97	97	0	0	97
Non-Censored	26701	27245	27446	27361	26701	27245	27446	27361
Right Censored	682	235	34	22	682	235	34	22

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province. fixed effects $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are marginal effects. The dependent variable is given at the top of each column.

We decompose the total change in the share of ordinary trade into the contribution from new firms, 'switchers', and a residual which combines the growth from the intensive margin adjustment of incumbents and exiting firms. Appendix C details this decomposition. Table 3 presents estimation results. Column (1) replicates column (8) of Table 2, and in columns (2)-(4), we report results using as our dependent variable the contribution of new exporters ($S(V)_{O,ip}^{N}$), 'switchers' ($S(V)_{O,ip}^{S}$), and finally, net exit to the overall change ($S(V)_{O,ip}^{NE}$), respectively. By construction, the sum of the effects of lower tariffs on these three sources equals the total effect given in column (1). In columns (5)-(8), we report results from a related analysis using the *share of the number of firms* organizing through ordinary trade, $\%\Delta S(N)_{O,ip}$.

For both the value of trade and the number of firms, entry accounts for the vast majority of the increase in the share of ordinary trade. Defined to include new firms and new products ('switchers'), entry accounts for 83 percent of the total change in the share of ordinary as measured by value and 87 percent as defined by the number of firms exporting at the industry-province level. New firms alone (columns 2 and 6) are responsible for 52 percent of the total change in the value share and 53 percent of the share in terms of the number of firms exporting at the industry-province level. Existing exporters adding products through ordinary trade in sectors experiencing tariff reductions for inputs also figure prominently. In terms of our model, falling input tariffs are helping an increasing number of domestic firms cover the fixed costs of exporting through ordinary trade.

5.2 Domestic and Foreign Firms

Domestic and foreign firms both play a prominent role in China's exports. In 2000, 53% (47%) of total exports was through foreign (domestic) firms. Of total exports by foreign firms, 13% was through ordinary trade in 2000, while 59% of total exports by domestic firms was through ordinary.[23] Table 4 provides results for the two types of firms separately.[24] If other policy changes implemented concurrently with the tariff cuts encouraged increased

[23]The unweighted average share of exports by foreign and domestic firms organized as ordinary was 68% and 96%, respectively.

[24]For domestic firms, the dependent variable is their ordinary exports as a share of their total exports. Shares for foreign firms are defined analogously.

entry by Chinese-owned relative to foreign-owned firms, the correlation between tariffs and ordinary trade shares might be spurious. In columns (1)-(3) and (5)-(7), we report estimates in levels for domestic and foreign firms, respectively, and in columns (4) and (8) provide time series results analogous to column (8) of Table 2.[25] In the cross-section, tariffs play a more prominent role in the case of domestic firms than foreign, while industry controls have nearly identical effects. In the time series, the marginal effect of tariff reductions on foreign firms is significantly larger than it is for domestic firms. The results in columns (4) and (8) suggest that a 10 percentage point fall in input tariffs leads to the share of ordinary trade increasing 4.2 percent for domestic firms and 27 percent for foreign firms. Given that the average changes in the share of domestic and foreign firms in ordinary trade were 7.6 percent and 40.5 percent, respectively, Table 4 suggests that falling input tariffs can explain 45 percent of the change within domestic firms and 55 percent of the change within foreign firms in the organization of trade. These magnitudes are less than the change in the share explained in the aggregate, reflecting the fact that falling input tariffs also affected the composition between domestic and foreign firms.[26]

5.3 Imports

A clear implication of the preceding analysis is that falling input tariffs should also increase the share of *imports* organized as ordinary trade. We examine this relationship in Table 5, where the dependent variable is now the share of imports organized through ordinary trade. Our tariff variable is the *reported* tariff on imports at the 6-digit level. All other right hand side variables are exactly as defined from Table 2. An obvious advantage of looking at this from the perspective of imports (rather than exports) is that we can use the tariff as directly reported, and do not have to worry about any biases possibly introduced by how we

[25]The samples for domestic and foreign firms (e.g. columns (1) and (5)) are each less than the total sample (e.g. column (1) of Table 2) because there are some industry-province cells in which only domestic firms or only foreign firms operate. The sum of the two samples is greater than the full sample because in some industry province cells we find both kinds of firms.

[26]Because the denominators of the dependent variables are not the same for the full sample, the sample for domestic firms, and the sample for foreign firms, this is not a formal decomposition but rather an illustration of 'within' effects.

Table 4: Domestic and Foreign Firms

	Domestic Firms				Foreign Firms			
	2000	2003	2006	(00-06)	2000	2003	2006	(00-06)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\tau_{I,it}$	-0.0072**	-0.010***	-0.012***		-0.0066***	-0.0023	0.0032	
	(0.0031)	(0.0031)	(0.0028)		(0.0025)	(0.0030)	(0.0032)	
$\Delta\tau_{I,i}$				0.0042**				0.027***
				(0.0020)				(0.0074)
$\tau_{I,i,2000}$				-0.0022				-0.011**
				(0.0015)				(0.0046)
$\ln(D_i)$	0.073***	0.081***	0.059***	-0.0073***	0.065***	0.070***	0.072***	-0.021**
	(0.0083)	(0.0066)	(0.0053)	(0.0025)	(0.0084)	(0.0067)	(0.0063)	(0.0094)
$Nunn_i$	-0.66***	-0.54***	-0.38***	0.085***	-0.73***	-0.88***	-0.68***	0.37***
	(0.0682)	(0.0606)	(0.0441)	(0.0210)	(0.0716)	(0.0613)	(0.0522)	(0.0824)
$\ln(S_i/U_i)$	0.63***	0.48***	0.30***	-0.091***	0.21***	0.21***	0.18***	-0.34***
	(0.0593)	(0.0426)	(0.0329)	(0.0173)	(0.0562)	(0.0481)	(0.0407)	(0.0643)
$\ln(K_i/L_i)$	-0.16***	-0.18***	-0.071**	0.022	-0.0034	-0.100**	-0.057	0.020
	(0.0582)	(0.0432)	(0.0340)	(0.0162)	(0.0549)	(0.0481)	(0.0407)	(0.0572)
Observations	28,726	37,228	44,626	25,374	12,545	17,261	22,696	10,828
Left Censored	473	260	159	46	1625	1295	1022	145
Non-Censored	4363	5039	6095	24955	5242	7052	9022	9486
Right Censored	23890	31929	38372	373	5678	8914	12652	1197

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed effects. $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are marginal effects. The dependent variable is $S(V)^{dom}_{O,ipt}$ in columns (1)-(3) and $\%\Delta S(V)^{dom}_{O,ip}$ in column 4. The dependent variable is $S(V)^{for}_{O,ipt}$ in columns (5)-(7) and $\%\Delta S(V)^{for}_{O,ip}$ in column 8.

Table 5: Imports

	2000 (1)	2000 (2)	2003 (3)	2003 (4)	2006 (5)	2006 (6)	(00-06) (7)	(00-06) (8)
$\tau_{O,it}$	-0.0096***	-0.0066***	-0.0062***	-0.0012	0.0050***	0.0065***		
	(0.0020)	(0.0016)	(0.0019)	(0.0019)	(0.0018)	(0.0018)		
$\Delta\tau_{O,i}$							0.015***	0.016***
							(0.0021)	(0.0022)
$\tau_{O,i,2000}$								-0.0043**
								(0.0017)
$\ln(D_i)$		0.083***		0.076***		0.072***		-0.049***
		(0.0092)		(0.0079)		(0.0074)		(0.0074)
$Nunn_i$		1.64***		1.35***		1.00***		-0.94***
		(0.067)		(0.056)		(0.052)		(0.060)
$\ln(S_i/U_i)$		0.49***		0.39***		0.38***		-0.49***
		(0.054)		(0.044)		(0.039)		(0.055)
$\ln(K_i/L_i)$		-0.057		-0.056		-0.13***		-0.023
		(0.046)		(0.040)		(0.036)		(0.047)
Observations	31,886	31,886	37,550	37,550	38,767	38,767	25,787	25,787
Left Censored	4914	4914	3550	3550	3246	3246	644	644
Non-Censored	11726	11726	14740	14740	16472	16472	22301	22301
Right Censored	15246	15246	19260	19260	19049	19049	2842	2842

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed effects. $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are marginal effects. The dependent variable is $S(V^M)_{O,ipt}$ in columns (1)-(6) and $\%\Delta S(V^M)_{O,ip}$ in columns 7 and 8 where V^M is the value of imports and $S(V^M)_{O,ipt}$ is defined analogously to equation 7.

construct our tariff measure. In both the cross-section and time series, the effect of lower tariffs on the share of imports coming through ordinary trade parallels the indirect link we found in our export regressions. The magnitude of the coefficients is also very similar.[27]

5.4 Heterogeneous Effects

We next explore the possibility of heterogeneous effects of lower input tariffs on exports and imports. Using the United Nations Broad Economic Classification (BEC) system, we classify goods into three basic categories: consumption goods, capital goods, and intermediate inputs, and include a set of interactions terms with our tariff measures. The omitted category in both sets of regressions is consumption goods.

Column 8 of Tables 9 and 10 in Appendix D shows that the effect of input tariff cuts

[27] The positive coefficient on input tariffs in columns (5) and (6) goes against both theory and all other results in the cross section. This is likely due to unobserved heterogeneity in the cross section as this anomaly disappears in the time series. This anomaly is also not robust to various robustness checks that are available upon request.

does not depend on the BEC of the exported good, but that the effect of lower tariffs is largest for imports of intermediate input goods. This suggests that for all three types of goods it is through the price of imported intermediate inputs that tariffs are influencing how trade is organized.

6 Robustness

Our results up to this point can be summarized as follows. First, lower input tariffs are responsible for 90 percent of the average increase in the share of ordinary trade. Second, the extensive margin of new and switching firms explains most of the observed effect. Third, our results hold equally for both domestic and foreign firms. This helps rule out the possibility that the link we find between tariffs and the organization of trade was the product of some other policy change that made entry by domestic firms into exporting activity easier. And fourth, we find corroborating support in importing behavior and in the differences in the link between trade organization and trade forms by BEC industries.

We examine the robustness of our results in a number of ways. First, we exclude firms commonly thought to be trading firms. Second, we further disaggregate the data by destination country, and include destination fixed effects. Third, we only examine industry-province observations for which we observe positive amounts of both ordinary and processing trade in 2000. Fourth, we look at pre-existing trends in both the share of ordinary trade and input tariffs. And fifth, we control for simultaneous changes in output tariffs which may be influencing firm choice through their effect on the competitiveness of the domestic market.

Over the period we examine, a significant (29% in 2000), albeit declining portion of China's trade was carried out through trading companies. Although we observe both ordinary and processing exports through trading companies, a potential concern is that for trade intermediated by trading companies, the mechanisms outlined in section 3 may be muted by other factors. Thus, as is common in the literature (e.g. Manova and Yu, 2013), column (1) of Table 6 excludes all firms identified to be trading firms.[28] The marginal effect

[28] This is done by looking for the Chinese characters for "trading company" in a firm's name.

of changes in input tariffs is 60 percent larger than in Table 2, consistent with the interpretation that the choice of non-trading firms was more sensitive to tariff levels. However, the average change in the share of ordinary trade among non-trading firms is also larger (0.20 compared to 0.12), leading to relatively similar magnitudes in the percentage of the shift to ordinary explained by tariff reductions.

Column (2) considers the role that destination country characteristics play in determining the organization of trade.[29] We redefine our dependent variable at the industry-province-destination country level, and run specifications with destination country fixed effects included. As before, input tariffs are calculated and standard errors are clustered at the HS six digit level. The size of our sample increases dramatically with our observations now indexed by industry-province-destination. Results are slightly stronger than before and of a similar magnitude.

Column (3) examines the subsample of cells for which there was a positive amount of both ordinary and processing exports in 2000. This serves two roles. First, it examines the effect of input tariff cuts on industry-locations that were not at corners, and potentially more room for choice between ordinary and processing. Second, it drops all province-industry cells that were already at 100 percent ordinary trade in 2000 and thus could not increase their share of ordinary trade.[30] As might be expected the effect of input tariff cuts is larger when we drop all industries that could not increase any more. More interestingly, the sign of domestic absorption is again positive, reflecting the intuitive result that industries with larger amounts of domestic absorption saw larger shifts into ordinary trade. This is due to the fact that many industries with large amounts of domestic absorption were already organized exclusively through ordinary trade in 2000 and the negative sign in column (8) of Table 2 reflects the fact that these industries had smaller changes because they could not increase further.

[29] Antras and Helpman (2004) suggest in the context of a model of global sourcing that partner-firm characteristics also have an effect on the endogenous boundary of the firm. Related, Feenstra and Hanson (2005) and Fernandes and Tang (2012) argue that the organization of trade can serve as a substitute for firm ownership.

[30] Of the cells that were entirely in ordinary in 2000, only 16.4 percent experienced a reduction between 2000 and 2006. Examining Figure 2, notice that the use of tobits in this context does not help since $\%\Delta S(V)_{O,ip}$=0 for these observations, which is in the middle of the distribution rather that at one of the corners.

Table 6: Robustness

	No Trading Co.	HS-Prov-Dest.	Interior in 2000	Trend $S(V)_{O,ip}$	Trend $\tau_{I,it}$	$\Delta\tau_{O,pi}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\tau_{I,i}$	0.021***	0.026***	0.027***		0.015***	0.0074**
	(0.0047)	(0.0048)	(0.0075)		(0.0032)	(0.0037)
$\Delta\tau_{I,i}^{2003-2006}$				0.020***		
				(0.0053)		
$\tau_{I,i,2000}$	-0.0084***	-0.0097***	-0.014***		-0.0097***	-0.0076***
	(0.0031)	(0.0031)	(0.005)		(0.0026)	(0.0025)
$\tau_{I,i,2003}$				-0.0019		
				(0.0016)		
$\%\Delta S(V)_{O,ip}^{2000-2003}$				-0.18***		
				(0.0108)		
$\Delta\tau_{I,i}^{1996-1999}$					0.0050**	
					(0.002)	
$\Delta\tau_{O,i}$						0.0034**
						(0.0016)
$\tau_{O,i,2000}$						0.0020*
						(0.0012)
$\ln(D_i)$	-0.015***	0.0049	0.028***	-0.0096***	-0.0080**	-0.0093***
	(0.0056)	(0.0056)	(0.0091)	(0.0027)	(0.0036)	(0.0035)
$Nunn_i$	0.28***	0.12***	0.081	0.13***	0.15***	0.14***
	(0.0459)	(0.041)	(0.0731)	(0.022)	(0.0293)	(0.0299)
$\ln(S_i/U_i)$	-0.21***	-0.054	-0.035	-0.078***	-0.16***	-0.15***
	(0.0362)	(0.034)	(0.0574)	(0.0177)	(0.0239)	(0.0238)
$\ln(K_i/L_i)$	0.074**	-0.018	0.011	0.050***	0.080***	0.078***
	(0.0358)	(0.029)	(0.0557)	(0.0179)	(0.0235)	(0.0234)
Observations	18,113	145,057	7,804	25,076	27,480	27,480
Left Censored	100	1995	39	71	97	97
Non-Censored	17064	131272	7765	24900	26701	26701
Right Censored	949	11790	0	105	682	682

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed effects. $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are Tobit marginal effects. The dependent variable is $\%\Delta S(V)_{O,ip}$ in columns (1),(3),(4),(5), (6) and $\%\Delta S(V)_{O,ipd}$ in column (2) where d indexes destination country.

Columns (4) and (5) examine the issue of pre-existing trends in the data, notably, in trade shares and tariffs. The concern is that pre-existing trends may be endogenously correlated with our tariff measures and thus biasing our results. We do not have data on the pre-2000 trends for the share of ordinary trade. However, in column (4), we run regressions for the change in the share of ordinary trade from 2003 to 2006, and include as an additional controls the change in ordinary's share from 2000 to 2003 and the level of protection in 2003. In Column (5), we include the change in input tariffs from 1996 to 1999 in our base regression to help absorb any unobserved heterogeneity.[31] Results in columns (4) and (5) are qualitatively unchanged from before, with slightly larger point estimates for the effect of the tariff changes with the inclusion of pre-existing trends in the share of ordinary.

Finally, column (6) includes output tariff cuts and their original level to control for the possibility that declining levels of protection might have been a countervailing force on firm choice to organize through ordinary. While the point estimate for input tariffs declines slightly, it is still large and significantly different from zero. The coefficient on the change in export tariffs is positive, which is opposite the sign we would expect if falling levels of protection led firms to organize through processing trade to avoid increasing product market competition from imports in domestic markets.

7 Implications for Domestic Factor Demand

KWW (2012) and KT (2012) argue that ordinary exports embody larger proportions of Chinese value added than do processing exports. Each estimates that the share of domestic value added in Chinese exports is 40-50 percentage points higher for ordinary than processing trade.[32] Consequently, our results suggest that falling input tariffs should influence the relative demand for Chinese factors of production by affecting the relative mix of ordinary and processing exports.

[31] We construct tariff measures for 1996-1999 the same way we did for later years, using as weights the 2006 consumption bundles.

[32] KWW (2012) estimate that between 2002 and 2007 the domestic content of ordinary trade was 86.8 percent of total value compared to 37.3 percent for processing. Using firm-level data, KT (2012) obtain estimates of 88 and 42 percent, respectively.

We obtain simple back-of-the-envelope calculations of the magnitude of these effects by combining estimates from KWW (2012) and KT (2012) of the differences in value added between the two trade forms, and our estimate from column (8) of Table 2 of the sensitivity of the share in ordinary to tariffs.[33] These estimates imply that the 8.2 percent input tariff cut contributes to a 2.0 (KT) and 2.2 (KWW) percentage point increase in DCR_i, respectively. With exports of over 900 billion USD in 2006, these estimates imply that changes in the composition of exports led to increased Chinese domestic value-added of between USD billion 19 to 21 for that year over a counterfactual in which input tariffs remained constant. Of course, considered over a longer period, these effects would have also been larger as a result of even larger reductions in tariffs, and thus larger changes in the role of ordinary trade.

In this section, we combine firm-level manufacturing data with our trade data to provide additional insight into the link between tariff cuts and domestic value-added, and to refine the estimates above. First, using *within-incumbent firm* variation, we find that a firm switching its exports from purely processing to purely ordinary is expected to increase its share of export value going to domestic factors of production by 9 percentage points. Second, using *within-industry* variation, we find that in an industry shifting from solely processing to solely ordinary exports domestic content rises by 30 percent, which is only slightly smaller than estimates implied by KWW (2012) and KT (2012). The 21 percentage point difference between incumbent firm and the industry adjustment is due to the inclusion of the extensive margin of adjustment in the industry level measure.

7.1 Estimating Domestic Content

Following KT (2012) and suppressing time subscripts, the value of exports of firm f in organizational form j, or V_f is given by the identity:

$$V_{f,j} = \pi_{f,j} + w_{f,j}L_{f,j} + r_{f,j}K_{f,j} + m^D_{f,j} + m^M_{f,j}.$$

[33]Note that $DCR_i = DCR_{O,i}S(V)_O + DCR_{P,i}(1 - S(V)_O)$ where DCR is the domestic content ratio as defined in equation (11) below. Thus, $\Delta DCR_i = (DCR_{O,i} - DCR_{P,i})\Delta S(V)_O$. The percentage change in ordinary's share is the product of the cut in tariffs times our estimate from Table 2.

where $\pi_{f,j}$ is profits, $w_{f,j}$ is the wage, $L_{f,j}$ is labor input, $r_{f,j}$ is the cost of capital, $K_{f,j}$ is the use of non-imported capital stock, $m^D_{f,j}$ is the value of intermediate inputs sourced domestically, and $m^M_{f,j}$ is the value of intermediate inputs and capital directly imported by the firm. Domestic content ($DC_{f,j}$) consists of the first four terms on the right hand side. Thus, domestic content ratio, ($DCR_{f,j}$), is equal to

$$DCR_{f,j} \equiv \frac{DC_{f,j}}{V_{f,j}} \tag{11}$$

where

$$DC_{f,j} \equiv V_{f,j} - m^M_{f,j}.$$

To calculate these values, we link our Customs data to firm-level data for 2000-2006 that are a product of annual surveys by the National Bureau of Statistics (NBS).[34]. Due to the structure of the firm-level data, analysis is at the four-digit Chinese Industrial Classification (CIC) level. For processing exports, calculating the term in equation (11) is straightforward as we observe values of both processing exports and imports from the Customs data. For ordinary trade, this is more difficult because we do not have information on how imports of intermediate inputs and capital should be allocated between domestic production and ordinary exports. Consequently, we use the proportionality assumption of KT (2012) and assume that ordinary imports are devoted to domestic sales and ordinary exports in the same proportion as (non-processing) sales are divided into domestic sales and ordinary exports. The latter is constructed by combining sales data from the NBS and trade data from the transactions data. DCR_f is then given by equation (12) where $V_{f,D}$ is the value of domestic sales:[35]

$$DCR_f = \frac{\sum_{j=O,P} DC_{f,j}}{\sum_{j=O,P} V_{f,j}} = \frac{V_{f,O} + V_{f,P} - \frac{V_{f,O}}{V_{f,O}+V_{f,D}} m^M_{f,O} - m^M_{f,P}}{V_{f,O} + V_{f,P}}. \tag{12}$$

Table 7 presents DCR_f and shares of ordinary trade ($S(V)_{O,f}$) for incumbents, 'switchers',

[34] This results in a sub-sample that covers 32 percent of the aggregate export value used in section 5 in 2000 and 37 percent in 2006. Appendix E re-estimates the baseline results of Table 2 using this sub-sample and finds that they continue to hold. Input tariffs are not recreated and are as used in Table 2

[35] Following KT (2012), we discount the domestic content by 10 percent in line with the calculations of KWW (2012) to account for indirect foreign content and also bottom-code the firm-level data at the 25^{th} percentile of DCR_f in a CIC industry.

Table 7: Average Domestic Content Ratios and the Share of Ordinary Trade

Variable	Year	Incumbents	Exiting	New	Switching
DCR_{fi}	2000	.639	.638	–	–
		(3,806)	(4,133)		
	2006	.777	–	.824	.763
		(3,806)		(35,247)	(2,252)
$S(V)_{O,fi}$	2000	.500	.563	–	–
		(3,806)	(4,133)		
	2006	.593	–	.800	.600
		(3,806)		(35,247)	(2,252)

Note: numbers in parentheses are firm counts.

new firms, and exiting firms as defined in section 5. Between 2000 and 2006, both DCR_f and $S(V)_{O,fi}$ increased appreciably for incumbent firms. Domestic content ratios and ordinary trade shares for new exporters were higher than for incumbents in 2006 while firms offering new products resembled incumbents in both dimensions.[36] This suggests that the substantial role of the extensive margin identified in Table 3 may have increased demand for domestic factors of production in China through a composition effect.

7.2 Firm Level Analysis

Using data on incumbent firms, we examine the relationship between trade form and domestic content using equation (13) where $\%\Delta S(V)_{O,fi}$ is the (midpoint elasticity) percentage change in $S(V)_{O,fi}$ between 2000 and 2006:[37]

$$\Delta DCR_{fi} = \beta_1 \%\Delta S(V)_{O,fi} + \beta_X' \mathbf{X}_{fi} + \Phi_i + \epsilon_{fi} \tag{13}$$

and

$$\Delta DCR_{fi} = DCR_{fi,2006} - DCR_{fi,2000}.$$

$\mathbf{X}_{fi}$ is a vector of firm-specific controls for 2000 and 2006 to control for both changes and initial conditions.[38] The inclusion of firm size assists in controlling for the fact that larger

[36] Consistent with the importance of the extensive margin documented of section 5, this subsample displays dramatic entry. Of 41,305 firms in the sample for 2006, only 3,806 were operating in 2000 in the same industry and only 2,252 were in operation in a different industry. New firms account for 35,247 (85.3 percent) of firms operating in 2006.

[37] This is a small sub-sample that covers 8.2 percent of total exports in 2000 and 2.4 percent in 2006.

[38] Specifically, we control for firm output (Y_{fit}), employment (L_{fit}), and capital stock (K_{fit})

firms may be more likely to cover the fixed costs of importing, and thereby have lower levels of domestic content. We also include CIC industry fixed effects (Φ_i) in some specifications to control for industry-specific trends.

Columns (1)-(4) of panel A of Table 8 present results for equation (13), while Panel B presents results from estimating equation (14), the reduced form relationship between input tariff cuts and domestic content ratios at the firm level.[39] This allows the change in input tariffs to work both through the organization of trade as well as other factors (e.g. changes in tariffs affecting the optimal input bundle). Because we are dealing with incumbent firms, we use the actual firm-level input tariff rather than the industry measure used in section 5:

$$\Delta DCR_{fi} = \beta_1 \Delta \tau_{I,f} + \beta_2 \tau_{I,f,2000} + \beta_X' \mathbf{X}_{fi} + \Phi_i + \mu_{fi}. \tag{14}$$

Column (4) of Table 8 suggests that a firm that goes from purely processing exports to purely ordinary exports ($\%\Delta S(V)_{O,fi} = 2$) sees its domestic content ratio rise by 9 percentage points. Panel B finds that a 10 percentage point input tariff cut correlates with a 2.7 percentage point increase in the domestic content ratio.[40]

7.3 Industry Level Evidence

Columns (5) and (6) of Panel A examine a similar relationship at the industry level that takes the extensive margin into account. We first estimate the equation

$$\Delta DCR_i = \beta_1 \% \Delta S(V)_{O,i} + \beta_X' \mathbf{X}_i + \epsilon_i \tag{15}$$

[39] We have experimented with an IV strategy using firm-level input tariff cuts as an instrument for the change in the organization of trade. We find evidence generally consistent with the results above with three caveats. First, while tariff cuts are a ‘significant’ predictor of changes in the organization of trade, this instrument is at the edge of what would be considered ‘strong’ with first stage F-statistics between 5 and 10 depending on the precise specification. Second, the strength of the instrument is very sensitive to how we measure changes in the organization of trade (e.g. first differences vs. proportional differences). Third, it is not obvious that tariff cuts satisfy the exclusion restriction that they only influence domestic content ratios through the organization of trade.

[40] Quantitatively, the latter effect is larger than would be expected if tariffs are only working through ordinary trade. Using our baseline results for the matched sample from Table 11 in appendix E, a 10 percentage point tariff cut increases the share of ordinary exports by 21 percent which would then be expected to increase the domestic content ratio by 0.945 percentage points (10∗0.021*0.009=0.00945).

Table 8: Shares of Ordinary Trade and Domestic Content Ratios

	Panel A					
	Incumbent Firm Analysis				Industry Analysis	
	(1)	(2)	(3)	(4)	(5)	(6)
$\%\Delta S(V)_{O,fi}$	0.054***	0.054***	0.045***	0.045***	0.15***	0.15***
	(0.0040)	(0.0040)	(0.0031)	(0.0032)	(0.0141)	(0.0151)
$\ln(Y_{i,2000})$		0.016***		0.00018		-0.0032
		(0.0059)		(0.0055)		(0.0196)
$\ln(Y_{i,2006})$		-0.026***		-0.015***		-0.014
		(0.0053)		(0.0052)		(0.0235)
$\ln(E_{fi,2000})$		-0.0051		-0.0036		-0.0074
		(0.0044)		(0.0044)		(0.0189)
$\ln(E_{fi,2006})$		0.022***		0.0080		0.017
		(0.0056)		(0.0060)		(0.0241)
$\ln(K_{fi,2000})$		0.0066		0.011**		-0.014
		(0.0054)		(0.0051)		(0.0194)
$\ln(K_{fi,2006})$		-0.0079		-0.00031		0.027
		(0.0060)		(0.0060)		(0.0254)
Industry FE	No	No	Yes	Yes	-	-
Observations	3,488	3,421	3,488	3,421	387	385
R-squared	0.07	0.08	0.34	0.34	0.29	0.31

	Panel B					
	Incumbent Firm Analysis				Industry Analysis	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\tau_{fi}$	0.0039***	0.0043***	0.0023*	0.0027**	-0.0018	-0.0020
	(0.0013)	(0.0013)	(0.0012)	(0.0012)	(0.0034)	(0.0034)
$\tau_{fi,2000}$	-0.0017*	-0.0025***	-0.0017**	-0.0019**	0.0015	0.0015
	(0.0009)	(0.0008)	(0.0007)	(0.0008)	(0.0027)	(0.0028)
$\ln(Y_{i,2000})$		0.014**		0.00029		0.032
		(0.0066)		(0.0065)		(0.0243)
$\ln(Y_{i,2006})$		-0.029***		-0.016**		-0.043
		(0.0061)		(0.0065)		(0.0302)
$\ln(E_{fi,2000})$		-0.0059		-0.0019		-0.016
		(0.0054)		(0.0053)		(0.0229)
$\ln(E_{fi,2006})$		0.023***		0.011		0.043
		(0.0068)		(0.0072)		(0.0302)
$\ln(K_{fi,2000})$		0.015**		0.016**		-0.028
		(0.0067)		(0.0068)		(0.0260)
$\ln(K_{fi,2006})$		-0.017**		-0.012		0.033
		(0.0072)		(0.0074)		(0.0330)
Industry FE	No	No	Yes	Yes	–	–
Observations	3,022	2,971	3,022	2,971	387	385
R-squared	0.00	0.02	0.33	0.33	0.00	0.04

For columns (1)-(4), the dependent variable is ΔDCR_{fi}. For columns (5)-(6), the dependent variable is ΔDCR_i. Independent variables for columns (5) and (6) are at the industry level. All estimations are OLS with robust standard errors in parentheses. $p < 0.01 :^{***}$.
$0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$.

at the industry level where all variables are industry analogs of variables in equation (13) and $\mathbf{X}_i$ includes similar variables as when estimating equation (13) but defined at the industry level.[41] If all firms entering or adding new products through ordinary trade take up the domestic content ratio of ordinary trade, the results of KT (2012) suggest a coefficient of 0.23 on $\%\Delta S(V)_{O,i}$.[42] Columns (5) and (6) of panel A report a coefficient of 0.15 which is smaller than that implied by the results of KWW (2012) and KT (2012) but larger than the effect for incumbent firms alone because of the importance of the extensive margin. Given the estimates from Table 2, this implies an average increase in DCR_i of 1.3 percentage points in response to the average tariff cut of 8.2 points, with approximately two-thirds of this effect due to the extensive margin. This implies an increase in payments to domestic factors of production of 12.6 billion USD between 2000 and 2006 due to changes in the composition of exports due to falling input tariffs.

For completeness, Panel B presents the reduced-form effect of lower input tariffs on DCR_i at the CIC industry level. Using the restricted sample and a necessarily narrower industrial classification, we calculate input tariffs calculated at the CIC industry level using an analogous procedure to the main specification. We cannot reject the null that there is no relationship between changes in input tariffs and ΔDCR_i at this level of aggregation. One explanation is a loss of identifying variation in our sample as we go from the six-digit HS level with over 3000 industries to the CIC level with less than 400 industries. In addition, the sub-sample constructed over firms in the matched manufacturing-Customs data in this section necessarily excludes a substantial amount of import (as well as export) data that was used in section 5, thereby reducing the amount of importing behavior with which we can construct industry level input tariffs.[43]

[41] Because we are only calculating this for exports, we are not double-counting domestic content as long exports are not re-imported for further production.

[42] They show that the domestic content ratio is 0.88-0.42=0.46 higher for ordinary trade with $\%\Delta S(V)_{O,fi}$=2 representing the switch from only processing to only ordinary trade exports.

[43] For the same reason in addition to those in footnote 39, we have been unable to pursue IV estimation in this section.

8 Conclusion

This paper finds that 90 percent of the average change from processing to ordinary exports for China between 2000 and 2006 can be explained by observed changes in input tariffs with the entry of new firms and introduction of new products playing dominant roles. In addition, we find suggestive evidence that the ability to access the domestic market is an important correlate of firms' organizational decisions. Finally, corroborating recent and independent research, we document that domestic value added per USD of exports is significantly and economically larger for ordinary exports than for processing in China. Our estimates imply that cuts in Chinese input tariffs between 2000 and 2006 led to an additional USD billion 13 to 21 more local domestic content in 2006 exports.

While the results in this paper that lower levels of protection for intermediate inputs can *increase* domestic factor demand may appear to be counter-intuitive, they are easily explained. Empirically, lower input tariffs in China promoted entry of new exporters with higher domestic content who were more likely to export through ordinary trade. In addition, falling input tariffs encouraged incumbent firms to increase their share of exports organized through ordinary trade, leading to higher shares of domestic value added through changes in export composition.

Assembly-intensive processing trade has played an important role in industrial upgrading and export-led development for many countries (Radelet and Sachs, 1997 and Radelet, 1999). It is a potentially important source of foreign exchange and allows access to foreign technology and know-how when domestic markets are protected. However, it also entails relatively lower demand for domestic factors of production as documented here and elsewhere. Empirical assessment of these trade-offs is an extremely fertile area of research both with regard to China and to development policy in general. Lastly, a better understanding of dynamic issues of whether processing in the initial stages of development stimulates later industrial upgrading is crucial for our understanding of export-led development.

References

[1] Amiti, Mary & Jozef Konings (2007) "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," *American Economic Review*, 97(5), 1611-1638

[2] Antràs, Pol, (2003) "Firms, Contracts, and Trade Structure," *Quarterly Journal of Economics*, 118(4), 1375-1418

[3] Antràs, Pol & Elhanan Helpman, (2004) "Global Sourcing," *Journal of Political Economy*, 112(3), 552-580

[4] Bernard, Andrew B. & J. Bradford Jensen & Stephen J. Redding & Peter K. Schott (2007) "Firms in International Trade," *Journal of Economic Perspectives*, 21(3), 105-130

[5] Bernard, Andrew B. & Stephen J. Redding & Peter K. Schott (2011) "Multiproduct Firms and Trade Liberalization," *Quarterly Journal of Economics*, 126(3), 1271-1318

[6] Brandt, Loren & Johannes Van Brieseboreock & Yifan Zhang (2012) "Creative Accounting or Creative Destruction: Firm Level Productivity Growth in Chinese Manufacturing," *Journal of Development Economics*, 97(2), 339-351

[7] Brandt, Loren & Johannes Van Brieseboreock & Luhang Wang & Yifan Zhang, (2012) "WTO Accession and Firm-level Productivity in Chinese Manufacturing," *working paper*, University of Toronto

[8] Branstetter, Lee & Nicholas R. Lardy, (2008) "China's Embrace of Globalization" in *China's Great Economic Transformation*, Edited by Loren Brandt and Thomas G. Rawski, Cambirdge University Press, New York, 633-683

[9] Chaney, Thomas (2008) "Distorted Gravity: the Intensive and Extensive Margins of International Trade," *American Economic Review*, 98(4), 1707-1721

[10] Demidova, Svetlana and Andres Rodriguez-Clare (2011) "The Simple Analytics of the Melitz Model in a Small Open Economy," *NBER Working Paper #17521*

[11] Defever, Fabrice & Ajejandro Riaño, (2012) "China's Pure Exporter Subsidies," *working paper*, University of Nottingham

[12] Eckel, Carsten & J. Peter Neary (2010) "Multi-Product Firms and Flexible Manufacturing in the Global Economy," *Review of Economic Studies*, 77(1), 188-217

[13] Feenstra, Robert C. & Gordon H. Hanson, (2005) " Ownership And Control Of Outsourcing To China: Estimating The Property-Rights Theory Of The Firm," *Quarterly Journal of Economics*, 120(2), 729-761

[14] Fernandes, Ana & Heiwei Tang (2012) "Determinants of vertical integration in export processing: Theory and evidence from China," *Journal of Development Economics*, 96(2), 396-414

[15] Helpman, Elhanan, Marc J. Melitz, and Stephen Yeaple (2004) "Export Versus FDI with Heterogeneous Firms, *American Economic Review*, 94(1), 300-316

[16] Kee, Hiau Looi and Heiwei Tang, (2012) "Domestic Value Added in Chinese Exports: Firm-level Evidence," *working paper*, Tufts University

[17] Koopman, Robert & Zhi Wang & Shang-Jin Wei (2011) "Estimating domestic content in exports when processing trade is pervasive," *Journal of Development Economics*, 96(2), 178-189

[18] Madini, Dorsati, (1999) "A Review of the Role and Impact of Export Processing Zones," *World Bank, Policy Research Working Paper #2238*

[19] Manova, Kalina & Zhihong Yu, (2013) "Firms and Credit Constraints along the Value Chain: Processing Trade in China,"*working paper*, Stanford University

[20] Mayer, Thierry & Marc J. Melitz & Gianmarco I.P. Ottaviano (2011) "Market Size, Competition, and the Product Mix of Exporters," *NBER Working Paper #16959*

[21] Melitz, Marc J. (2003) "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica* 71(6), 1695-1725

[22] Naughton, Barry (2012) "China's Emergence and Prospects as a Trading Nation," *Brookings Papers on Economic Activity* , Vol. 2, 273-344

[23] Nunn, Nathan, (2007) "Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade," *Quarterly Journal of Economics*, 122(2), 569-600

[24] Pierce, Justin R. and Peter K. Schott, (2009) "Concording U.S. Harmonized System Categories Over Time," *NBER Working Paper #14837*

[25] Radelet, Steven, (1999) "Manufactured Exports, Export Platforms, and Economic Growth," *Harvard Institute for International Development working paper*

[26] Radelet, Steven and Jeffrey Sachs (1997) "Asia's Reemergence," *Foreign Affairs*, 76(6), 44-59

[27] Yi, Kei-Mu, (2003) "Can Vertical Specialization Explain the Growth of World Trade?," *Journal of Political Economy*, 111(1), 52-102

A Theory Appendix

A.1 Cutoffs When $\left(\phi^P\right)^{\sigma-1} > \left(\phi^O\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$

We can solve for the level of $\phi^{\sigma-1}$ at which firms are indifferent between exit and selling domestically by solving for the level of $\phi^{\sigma-1}$ at which $\pi_i^D(\phi_f) = 0$:

$$(\phi^*)^{\sigma-1} = \frac{\sigma f^D}{D_i^C} \left[p_D + \tau_i \gamma_i^O p_M\right]^\sigma . \tag{16}$$

The capability level at which an entrepreneur is indifferent between only selling domestically and organizing exports through ordinary trade is obtained by solving for $\phi^{\sigma-1}$ such that $\pi^D(\phi_f) = \pi^O(\phi_f)$ using equations (1) and (2) :

$$\left(\phi^O\right)^{\sigma-1} = \frac{\sigma\left[f^O - f^D\right]\left[p_D + \gamma_i^O \tau_i p_M\right]^\sigma}{D_i^W}. \tag{17}$$

Similarly, setting $\pi^O(\phi_f) = \pi^P(\phi_f)$ using equations (2) and (3) delivers the level of capability at which an entrepreneur is indifferent between organizing through ordinary and processing:

$$\left(\phi^P\right)^{\sigma-1} = \frac{\sigma\left[\left[p_D + \gamma_i^P p_M\right] f^P - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O\right]}{\left[\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} D_i^W - \left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\left[D_i^W + D_i^C\right]\right]}. \tag{18}$$

A.2 Cutoffs When $\left(\phi^O\right)^{\sigma-1} > \left(\phi^P\right)^{\sigma-1} > \left(\phi^*\right)^{\sigma-1}$

The minimum level of productivity necessary to sell domestically is unchanged in this case and is still given by equation (16). Solving for the level of capability at which $\pi^D(\phi_f) = \pi^P(\phi_f)$ delivers the capability of the entrepreneur that is indifferent between domestic sales and processing

$$\left(\phi^P\right)^{\sigma-1} = \frac{\sigma\left[f^P\left[p_D + \gamma_i^P p_M\right] - f^D\left[p_D + \gamma_i^O \tau_i p_M\right]\right]}{D_i^W\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} - D_i^C\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}}. \tag{19}$$

Similarly, solving for the capability at which $\pi^O(\phi_f) = \pi^P(\phi_f)$ delivers the capability of the entrepreneur who is indifferent between ordinary and processing.

$$\left(\phi^O\right)^{\sigma-1} = \frac{\sigma\left[\left[p_D + \gamma_i^P p_M\right] f^P - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O\right]}{\left[\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} D_i^W - \left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\left[D_i^W + D_i^C\right]\right]}. \tag{20}$$

A.3 Industry Shares When $\left(\phi^P\right)^{\sigma-1} > \left(\phi^O\right)^{\sigma-1} > \left(\phi^*\right)^{\sigma-1}$

Under the previously stated assumptions, *export* revenue functions for ordinary and processing trade are:

$$r_i^{X,O}(\phi_f) = D_i^W\left[p_D + \tau_i \gamma_i^O p_M\right]^{1-\sigma}\phi_f^{\sigma-1} \quad \text{and} \quad r_i^{X,P}(\phi_f) = D_i^W\left[p_D + \gamma_i^P p_M\right]^{1-\sigma}\phi_f^{\sigma-1}.$$

Total exports accruing to processing and ordinary firms, respectively, in a given industry i then follow:

$$V_{P,i} = \int_{\phi^P}^{\infty} r_i^{X,P}(\phi_f) M_i^X f(\phi) d\phi \quad \text{and} \quad V_{O,i} = \int_{\phi^O}^{\phi^P} r_i^{X,O}(\phi_f) M_i^X f(\phi) d\phi.$$

where M_i^X is the total mass of exporters in industry i. Using the cut-offs from equations (17) and (18), integration using the Pareto distribution, and simplification, we obtain the following expressions showing that the value share of exports organized as ordinary in this diversified equilibrium is

$$S(V)_{O,i} \equiv \frac{\frac{V_{O,i}}{V_{P,i}}}{1+\frac{V_{O,i}}{V_{P,i}}} \tag{21}$$

where

$$\frac{V_{O,i}}{V_{P,i}} = \left[\frac{p_D+\gamma_i^O \tau_i p_M}{p_D+\gamma_i^P p_M}\right]^{(1-\sigma)} \left[\left(\frac{\phi^P}{\phi^O}\right)^{k+1-\sigma} - 1\right] \tag{22}$$

and

$$\left(\frac{\phi^P}{\phi^O}\right) = \left[\frac{f^O}{f^O-f^D} \frac{\left[\frac{p_D+\gamma_i^P p_M}{p_D+\gamma_i^O \tau_i p_M}\right]\frac{f^P}{f^O}-1}{\left[\frac{p_D+\gamma_i^P p_M}{p_D+\gamma_i^O \tau_i p_M}\right]^{1-\sigma} - (\frac{D_i^W}{D_i^C}+1)}\right]^{\frac{1}{\sigma-1}}. \tag{23}$$

This expression is strictly positive as long as inequalities (5) and (6) are of the same direction. Specifically, if the numerator is positive, fixed costs are larger for processing than for ordinary trade. If the denominator is also positive, the marginal return to capability for processing must be higher than for ordinary trade. If the numerator is negative, this indicates that fixed costs are higher for ordinary trade and, if the denominator is also negative, the marginal return to ordinary must also be greater than for processing.

A.4 Industry Shares When $\left(\phi^O\right)^{\sigma-1} > \left(\phi^P\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$

Using the same analysis, total exports accruing to processing and ordinary firms, respectively, in industry i are given by:

$$V_{P,i} = \int_{\phi^P}^{\phi^O} r_i^{X,P}(\phi_f) M_i^X f(\phi) d\phi \text{ and } V_{O,i} = \int_{\phi^O}^{\infty} r_i^{X,O}(\phi_f) M_i^X f(\phi) d\phi.$$

Using the cutoffs from equations (19) and (20), the value share of exports organized as ordinary in this diversified equilibrium is

$$S(V)_{O,i} \equiv \frac{\frac{V_{O,i}}{V_{P,i}}}{1+\frac{V_{O,i}}{V_{P,i}}} \tag{24}$$

where

$$\frac{V_{O,i}}{V_{P,i}} = \left[1+\frac{D_i^C}{D_i^W}\right] \left[\frac{p_D+\gamma_i^O \tau_i p_M}{p_D+\gamma_i^P p_M}\right]^{(1-\sigma)} \left[\frac{1}{\left(\frac{\phi^O}{\phi^P}\right)^{k+1-\sigma} - 1}\right]. \tag{25}$$

Analogous to the preceding case, this expression is strictly positive as long as inequalities (5) and (6) are of the same sign.

A.5 Proof of Proposition 1

Expressions (17), (18), (19), and (20) show that $\left(\phi^O\right)^{\sigma-1}$ falls and $\left(\phi^P\right)^{\sigma-1}$ rises as τ_i falls regardless of the ordering of ϕ^O and ϕ^P. Expressions (21)- (25) show that $S(V)_{O,i}$ increases as τ_i falls.

A.6 Proof of Proposition 2

Expressions (21)-(25) show that $S(V)_{O,i}$ increases as $\frac{D_i^C}{D_i^W}$ falls.

A.7 Extension: Multiple Organizational Forms within a Firm

In this extension, we relax the assumption that firms can only engage in one organizational form within a given industry i. Specifically, we assume that entrepreneurs can produce both the differentiated ordinary and processing goods using the technologies associated with these forms, but must incur an additional fixed cost f^B to do so. f^B is a reduced form exogenous parameter representing diseconomies of scope from managing two independent product lines. This is consistent with the fact that only the largest firms (in export volume) operate multiple organizational forms within a given product line and that product lines must be segregated physically for monitoring purposes. The elasticity of substitution between these varieties remains σ for simplicity.[44] The profit function for entrepreneurs producing both the ordinary and processing goods is:

$$\pi_i^B(\phi_f) = \left[\frac{D_i^W}{\sigma}\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} + \frac{D_i^W + D_i^C}{\sigma}\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\right]\phi_f^{\sigma-1} - \left[p_D + \gamma_i^P p_M\right] f^P - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O - f^B. \tag{26}$$

Our starting point is the 'diversified equilibrium' in which all four organizational forms appear. That is, there are a positive number of firms engaged exclusively in domestic sales alone, ordinary exports, processing exports, and both organizational forms. If $\left(\phi^P\right)^{\sigma-1} > \left(\phi^O\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$, then the minimum capability at which entrepreneurs export in both organizational forms is:

$$\left(\phi^{0,B}\right)^{\sigma-1} = \frac{\sigma\left[p_D + \gamma_i^O \tau_i p_M\right] f^O + \sigma f^B}{\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\left[D_i^W + D_i^C\right]}. \tag{27}$$

All other cutoffs are as before in this case. If $\left(\phi^O\right)^{\sigma-1} > \left(\phi^P\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$, then the minimum capability at which entrepreneurs export in both organizational forms is:

$$\left(\phi^{1,B}\right)^{\sigma-1} = \frac{\sigma\left[p_D + \gamma_i^P p_M\right] f^P + \sigma f^B}{\left[p_D + \gamma_i^P p_M\right]^{1-\sigma}\left[D_i^W\right]}. \tag{28}$$

Again, all other cut-offs are as before in this case. In the case for which $\left(\phi^P\right)^{\sigma-1} > \left(\phi^O\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$, it is easy to see that the mass of entrepreneurs exporting exclusively through processing falls in response to lower input tariffs due to both a higher minimum capability needed to export through processing [equation (18)] and a lower productivity necessary to export through both organizational forms [equation (27)]. As before, for a given entrepreneur that does not switch, ordinary exports increase due to lower marginal costs and processing exports are unchanged. Again, the share of ordinary trade increases on both the intensive and extensive margins.

[44] Adding an explicit treatment of multi-product firms is well beyond the scope of this paper. See Neary & Eckel (2010), Mayer, Melitz, & Ottaviano (2011), and Bernard, Redding, & Schott (2011) for full treatments of multi-product firms.

When $\left(\phi^O\right)^{\sigma-1} > \left(\phi^P\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$, similar results hold. The capability of the entrepreneur that is indifferent between ordinary exports and both organizational forms is unchanged [equation 28] as input tariffs fall. But as can be seen from equation (20) , the minimum capability to export through ordinary trade falls while the minimum productivity at which an entrepreneur enters processing exports rises [equation (19)]. Again, for a given firm, ordinary exports increase as input tariffs fall and processing exports are unchanged. Again, the share of ordinary trade increases in response to lower input tariffs on both in intensive and extensive margins. Cases in which only three organizational forms emerge are similar. For example, when exporters only export through processing or through both, equation (27) defines the marginal firm. As input tariffs fall, the minimum capability needed to export through both organizational forms falls [equation (27)] and the share of ordinary trade increases on both the intensive and extensive margins as illustrated above. When exporters only export through ordinary trade or both, the marginal firm is invariant to falling input tariffs [equation (28)] and all adjustment occurs on the intensive margin unless further assumptions are made on the structure of f^B.

A.8 Extension: Differential Substitutability Across/Within Organizational Forms

We now consider a case in which, within a given industry i, two varieties within a given organizational form are more substitutable than across organizational forms. Specifically, we assume that consumers possess a three-tier utility function in which preferences are Cobb-Douglas across industries i, CES across a ordinary and processing aggregate within an industry with an elasticity of substitution σ, and CES again across varieties within each of these industry-organizational form aggregates with an elasticity of substitution ϵ. We assume that $\epsilon > \sigma$, implying that varieties are more substitutable within an organizational form than across organizational forms. If $\epsilon = \sigma$, then all results collapse to the results in the main text. We assume that ordinary varieties are sold both in China and to World consumers whereas processing varieties are only sold to World consumers. D_i^W and D_i^C are as originally defined and $\mathbf{P^c_{j,i}}$ is the lower tier CES price index for market c in industry i for organizational form j. Given the partial equilibrium nature of the exercise, we assume that input tariffs in China have no effect on these price indexes; however, this emphasizes the importance of controlling for the effect of output tariffs on organizational form as we do in the robustness section (Section 6). Given these assumptions, the profit functions given in equations (1), (2), and (3) become

$$\pi_i^D(\phi_f) = \frac{\mathbf{P^C_{O,i}}^{\epsilon-\sigma} D_i^C}{\epsilon} \left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\epsilon} \phi_f^{\epsilon-1} - \left[p_D + \gamma^O \tau_i p_M\right] f^D, \tag{29}$$

$$\pi_i^O(\phi_f) = \frac{\left(D_i^W \mathbf{P^W_{O,i}}^{\epsilon-\sigma} + D_i^C \mathbf{P^C_{O,i}}^{\epsilon-\sigma}\right)}{\epsilon} \left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\epsilon} \phi_f^{\epsilon-1} - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O, \tag{30}$$

and

$$\pi_i^P(\phi_f) = \frac{D_i^W \mathbf{P^W_{P,i}}^{\epsilon-\sigma}}{\epsilon} \left[p_D + \gamma_i^P p_M\right]^{1-\epsilon} \phi_f^{\epsilon-1} - \left[p_D + \gamma_i^P p_M\right] f^P. \tag{31}$$

The export revenue functions become

$$r_i^{X,O}(\phi_f) = D_i^W \left(\mathbf{P^W_{i,O}}\right)^{\epsilon-\sigma} \left[p_D + \tau_i \gamma_i^O p_M\right]^{1-\epsilon} \phi_f^{\epsilon-1} \text{ and } r_i^{X,P}(\phi_f) = D_i^W \left(\mathbf{P^W_{i,P}}\right)^{\epsilon-\sigma} \left[p_D + \gamma_i^P p_M\right]^{1-\epsilon} \phi_f^{\epsilon-1}.$$

Using similar steps as before, the share of exports accruing to ordinary trade when $\left(\phi^P\right)^{\sigma-1} > \left(\phi^O\right)^{\sigma-1} > (\phi^*)^{\sigma-1}$ becomes

$$S(V)_{O,i} \equiv \frac{\frac{V_{O,i}}{V_{P,i}}}{1 + \frac{V_{O,i}}{V_{P,i}}} \tag{32}$$

where

$$\frac{V_{O,i}}{V_{P,i}} = \left[\frac{\mathbf{P^W_{i,O}}}{\mathbf{P^W_{i,P}}}\right]^{\epsilon-\sigma} \left[\frac{p_D + \gamma_i^O \tau_i p_M}{p_D + \gamma_i^P p_M}\right]^{(1-\epsilon)} \left[\left(\frac{\phi^P}{\phi^O}\right)^{k+1-\epsilon} - 1\right] \tag{33}$$

and

$$\left(\frac{\phi^P}{\phi^O}\right) = \left[\frac{f^O}{f^O - f^D} \frac{\left[\frac{p_D+\gamma_i^P p_M}{p_D+\gamma_i^O \tau_i p_M}\right] \frac{f^P}{f^O} - 1}{\frac{D_i^W \left(\mathbf{P^W_{i,P}}\right)^{\epsilon-\sigma}}{D_i^W \left(\mathbf{P^W_{i,O}}\right)^{\epsilon-\sigma}} \left[\frac{p_D+\gamma_i^P p_M}{p_D+\gamma_i^O \tau_i p_M}\right]^{1-\sigma} - \left[\frac{D_i^W \left(\mathbf{P^W_{i,O}}\right)^{\epsilon-\sigma} + D_i^C \left(\mathbf{P^C_{i,O}}\right)^{\epsilon-\sigma}}{D_i^W \left(\mathbf{P^W_{i,P}}\right)^{\epsilon-\sigma}}\right]}\right]^{\frac{1}{\epsilon-1}}. \tag{34}$$

Under the Pareto restriction $k > \epsilon - 1$, simple inspection of equation (34) shows that its numerator is falling and the denominator is rising in τ_i. Consequently, equation (33) and, therefore, (32) are also falling in τ_i. A similar extension can be derived for the case in which $\left(\phi^O\right)^{\epsilon-1} > \left(\phi^P\right)^{\epsilon-1}$. What is more interesting is that it is not the size of the domestic market relative to the world market *per se* that matters for the organization of trade but total world demand for ordinary goods relative to total world demand for the processing good. Recalling that the processing good can not be sold domestically by definition and to the degree to which domestic relative to world absorption can be used as a proxy for world demand for the ordinary good relative to the processing good, our results continue to hold. However, there is no reason to think that they will coincide exactly. We keep this as a caveat to our empirical work.

B Input Tariff Construction

Define firms f, 6-digit harmonized codes i, years t. Define $\mathscr{I}_f$ as the set of industries in which firm f imports in 2006. Tariffs are defined at the 6-digit harmonized code. Define the reported output tariff in industry i in year t as $\tau_{i,t}$. Denote firm f imports of good i in year t as M_{fit}. For each fi pair, define $\gamma_{fi,2006}$ as

$$\gamma_{fi,2006} = \frac{M_{fi,2006}}{\sum_{i' \in \mathscr{I}_f} M_{fi',2006}}$$

such that each γ_{fi} corresponds to the proportion of imports by firm f in industry i relative to total imports by firm f in 2006. These weights sum to 1 for a given firm in 2006. Using these weights, we construct the firm level input tariff in 2006 as

$$\tau_{f,2006} = \sum_{i' \in \mathscr{I}_f} \gamma_{fi',2006} \tau_{i',2006}.$$

Using the same weights, we construct the firm level input tariff in each year as

$$\tau_{f,t} = \sum_{i' \in \mathscr{I}_f} \gamma_{fi',2006} \tau_{i',t}. \tag{35}$$

For each year, we calculate firm level input tariffs for all firms operational in 2006 using these constant weights and time varying tariffs. Consequently, firm level tariffs vary across years only due to changes in tariffs and not changes in the weights. With these firm-year level tariffs in hand, we calculate industry-year level tariffs To start, for a given industry-year pair, we calculate the share of imports by firm f in 2006, $\beta_{fi,2006}$ as

$$\beta_{fi,2006} = \frac{M_{fi,2006}}{\sum_{f'} M_{f'i,2006}} \quad \text{where} \quad \sum_{f'} \beta_{f'i,2006} = 1. \tag{36}$$

The industry input tariff is calculated using equations (35) and (36):

$$\tau_{it} = \sum_{f} \beta_{fi,2006} \tau_{ft}.$$

Again, because all weights are constant, all variation over time comes from changes in tariffs and not from changes in the weights assigned to different firms within an industry. We have also performed all of the estimations in the paper using the average 2000-2006 import bundles for the above analysis with nearly unchanged results.

C Decomposition Classification

Representing the sets of incumbent, exiting, new, and 'switching' firms as $\mathcal{I}$, $\mathcal{E}$, $\mathcal{N}$, and, $\mathcal{S}$ respectively, we can express the total change in the share of ordinary trade as the sum of the contribution's of each of these types, or (10) as

$$\%\Delta S(V)_{O,ip} = \frac{\frac{\sum_{f\in\mathcal{N}} V_{O,ipf,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} + \frac{\sum_{f\in\mathcal{S}} V_{O,ipf,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} + \frac{\sum_{f\in\mathcal{I}} V_{O,ipf,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} - \frac{\sum_{f\in\mathcal{I}} V_{O,ipf,2000}}{V_{O,ip,2000}+V_{P,ip,2000}} - \frac{\sum_{f\in\mathcal{E}} V_{O,ipf,2000}}{V_{O,ip,2000}+V_{P,ip,2000}}}{0.5\left[\frac{V_{O,ip,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} + \frac{V_{O,ip,2000}}{V_{O,ip,2000}+V_{P,ip,2000}}\right]}$$

or

$$\%\Delta S(V)_{O,ip} = S(V)^{N}_{O,ip} + S(V)^{S}_{O,ip} + S(V)^{NE}_{O,ip}$$

where

$$S(V)^{N}_{O,ip} = \frac{\frac{\sum_{f\in\mathcal{N}} V_{O,ipf,2006}}{V_{O,ip,2006}+V_{P,ip,2006}}}{0.5\left[\frac{V_{O,ip,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} + \frac{V_{O,ip,2000}}{V_{O,ip,2000}+V_{P,ip,2000}}\right]},$$

$$S(V)^{S}_{O,ip} = \frac{\frac{\sum_{f\in\mathcal{S}} V_{O,ipf,2006}}{V_{O,ip,2006}+V_{P,ip,2006}}}{0.5\left[\frac{V_{O,ip,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} + \frac{V_{O,ip,2000}}{V_{O,ip,2000}+V_{P,ip,2000}}\right]},$$

$$S(V)^{NE}_{O,ip} = \frac{\frac{\sum_{f\in\mathcal{I}} V_{O,ipf,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} - \frac{\sum_{f\in\mathcal{I}} V_{O,ipf,2000}}{V_{O,ip,2000}+V_{P,ip,2000}} - \frac{\sum_{f\in\mathcal{E}} V_{O,ipf,2000}}{V_{O,ip,2000}+V_{P,ip,2000}}}{0.5\left[\frac{V_{O,ip,2006}}{V_{O,ip,2006}+V_{P,ip,2006}} + \frac{V_{O,ip,2000}}{V_{O,ip,2000}+V_{P,ip,2000}}\right]}.$$

D Evidence from BEC Classifications

Table 9: BEC of Exports

	2000	2000	2003	2003	2006	2006	(00-06)	(00-06)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\tau_{I,it}$	-0.0026	-0.014***	0.0054*	-0.026***	0.0082***	-0.019***		
	(0.0024)	(0.0036)	(0.0028)	(0.0043)	(0.0028)	(0.0042)		
$\Delta\tau_{I,i}$							0.0039**	0.013***
							(0.0017)	(0.0038)
$\tau_{I,i,2000}$								-0.0090***
								(0.0022)
$BEC_{K,i}$	0.34***	-0.12	0.31***	-0.31***	0.27***	-0.27***	-0.073***	-0.13***
	(0.0358)	(0.1336)	(0.0299)	(0.0947)	(0.0258)	(0.0721)	(0.0188)	(0.0477)
$BEC_{INT,i}$	0.16***	-0.092	0.17***	-0.31***	0.13***	-0.23***	-0.020	-0.065*
	(0.0266)	(0.0923)	(0.0233)	(0.0674)	(0.0207)	(0.0580)	(0.0147)	(0.0381)
$\tau_{I,it} * BEC_{K,i}$		0.028***		0.063***		0.069***		
		(0.0083)		(0.0104)		(0.0093)		
$\tau_{I,it} * BEC_{INT,i}$		0.014***		0.043***		0.040***		
		(0.0049)		(0.0059)		(0.0062)		
$\Delta\tau_{I,i} * BEC_{K,i}$								0.0044
								(0.0056)
$\Delta\tau_{I,i} * BEC_{INT,i}$								0.0027
								(0.0039)
$\ln(D_i)$	0.042***	0.045***	0.048***	0.054***	0.041***	0.044***	-0.0036	-0.0035
	(0.0075)	(0.0076)	(0.0063)	(0.0061)	(0.0055)	(0.0054)	(0.0038)	(0.0038)
$Nunn_i$	-0.82***	-0.82***	-0.72***	-0.69***	-0.56***	-0.54***	0.19***	0.18***
	(0.0678)	(0.0678)	(0.0623)	(0.0615)	(0.0494)	(0.0481)	(0.0340)	(0.0340)
$\ln(S_i/U_i)$	0.36***	0.36***	0.29***	0.31***	0.15***	0.17***	-0.13***	-0.15***
	(0.0489)	(0.0493)	(0.0390)	(0.0387)	(0.0322)	(0.0317)	(0.0234)	(0.0240)
$\ln(K_i/L_i)$	-0.13**	-0.12**	-0.14***	-0.14***	-0.030	-0.029	0.055**	0.068***
	(0.0497)	(0.0497)	(0.0408)	(0.0408)	(0.0334)	(0.0333)	(0.0236)	(0.0237)
Observations	30,774	30,774	39,032	39,032	46,397	46,397	27,461	27,461
Left Censored	863	863	519	519	369	369	97	97
Non-Censored	7884	7884	9584	9584	11633	11633	26683	26683
Right Censored	22027	22027	28929	28929	34395	34395	681	681

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed . effects $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are marginal effects. The dependent variable is $S(V)_{O,ipt}$ in columns (1)-(6) and $\%\Delta S(V)_{O,ip}$ in columns 7 and 8.

Table 10: BEC of Imports

	2000 (1)	2000 (2)	2003 (3)	2003 (4)	2006 (5)	2006 (6)	(00-06) (7)	(00-06) (8)
$\tau_{O,it}$	-0.013***	0.0089*	-0.0068***	0.0047	0.00037	0.0016		
	(0.0018)	(0.0046)	(0.0022)	(0.0053)	(0.0019)	(0.0042)		
$\Delta\tau_{O,i}$							0.015***	-0.0010
							(0.0023)	(0.0027)
$\tau_{O,I,2000}$							0.00021	-0.00062
							-0.002	-0.0022
$BEC_{K,i}$	0.071	0.39***	0.063	0.071	0.0053	-0.058	0.11***	0.027
	(0.052)	(0.14)	(0.043)	(0.11)	(0.039)	(0.088)	(0.036)	(0.042)
$BEC_{INT,i}$	-0.61***	0.076	-0.50***	-0.25**	-0.48***	-0.44***	0.27***	0.021
	(0.044)	(0.12)	(0.037)	(0.096)	(0.031)	(0.069)	(0.037)	(0.044)
$\tau_{O,it} * BEC_{K,i}$		-0.0066		0.010		0.0089		
		(0.0072)		(0.0082)		(0.0072)		
$\tau_{O,it} * BEC_{INT,i}$		-0.031***		-0.017***		-0.0035		
		(0.0053)		(0.0060)		(0.0048)		
$\Delta\tau_{O,i} * BEC_{K,i}$								0.00048
								(0.0033)
$\Delta\tau_{O,i} * BEC_{INT,i}$								0.027***
								(0.0035)
$Nunn_i$	0.92***	0.91***	0.76***	0.75***	0.48***	0.49***	-0.73***	-0.71***
	(0.070)	(0.069)	(0.060)	(0.060)	(0.057)	(0.057)	(0.068)	(0.068)
$\ln(S_i/U_i)$	0.41***	0.36***	0.34***	0.32***	0.34***	0.34***	-0.47***	-0.44***
	(0.051)	(0.050)	(0.041)	(0.041)	(0.037)	(0.037)	(0.055)	(0.054)
$\ln(K_i/L_i)$	0.011	0.020	0.012	0.011	-0.063*	-0.063*	-0.038	-0.039
	(0.044)	(0.042)	(0.039)	(0.038)	(0.036)	(0.036)	(0.048)	(0.048)
$\ln(D_i)$	0.078***	0.063***	0.073***	0.070***	0.071***	0.071***	-0.052***	-0.043***
	(0.0090)	(0.0089)	(0.0077)	(0.0077)	(0.0073)	(0.0073)	(0.0076)	(0.0074)
Observations	31,808	31,808	37,475	37,475	38,676	38,676	25,732	25,732
Left Censored	4907	4907	3545	3545	3241	3241	644	644
Non-Censored	11725	11725	14736	14736	16466	16466	22248	22248
Right Censored	15176	15176	19194	19194	18969	18969	2840	2840

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed . effects $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are marginal effects. The dependent variable is $S(V)_{O,ipt}$ in columns (1)-(6) and $\%\Delta S(V)_{O,ip}$ in columns 7 and 8.

E Replication of Baseline Results Using Matched Sample

Table 11: Replication of Baseline Estimation with Matched Sample

	2000 (1)	2000 (2)	2003 (3)	2003 (4)	2006 (5)	2006 (6)	(00-06) (7)	(00-06) (8)
$\tau_{I,it}$	-0.014***	-0.0074**	-0.014***	-0.0046	-0.010***	-0.00046		
	(0.0034)	(0.0030)	(0.0039)	(0.0032)	(0.0040)	(0.0032)		
$\Delta\tau_{I,i}$							0.022***	0.030***
							(0.0044)	(0.0072)
$\tau_{I,i,2000}$								-0.011**
								(0.0048)
$\ln(D_i)$		0.068***		0.086***		0.080***		-0.021**
		(0.0103)		(0.0077)		(0.0067)		(0.0092)
$Nunn_i$		-0.72***		-0.84***		-0.57***		0.37***
		(0.0845)		(0.0655)		(0.0524)		(0.0783)
$\ln(S_i/U_i)$		0.25***		0.29***		0.25***		-0.19***
		(0.0672)		(0.0523)		(0.0412)		(0.0618)
$\ln(K_i/L_i)$		-0.016		-0.15***		-0.056		0.0026
		(0.0668)		(0.0530)		(0.0419)		(0.0572)
Observations	11,525	11,525	17,450	17,450	24,242	24,242	9,833	9,833
Left Censored	1208	1208	956	956	867	867	126	126
Non-Censored	4092	4092	5893	5893	8275	8275	8798	8798
Right Censored	6225	6225	10601	10601	15100	15100	909	909

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province level fixed effects. $p < 0.01 :^{***}, 0.01 \leq p < 0.05 :^{**}, 0.05 \leq p < 0.10 :^{*}$. All reported regression coefficients are Tobit marginal effects. The dependent variable is $S(V)_{O,ipt}$ in columns (1)-(6) and $\%\Delta S(V)_{O,ip}$ in columns 7 and 8.