Tariffs and the Organization of Trade in China*

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March 26, 2014

Abstract

This paper examines the impact of China's falling import tariffs on the organization of its 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 a majority of the increase in the share of exports occurring through ordinary trade, much of which occurs on the extensive margin. The choice of trade is tied to a lesser degree to the size of the domestic market, which processing firms cannot access. Consistent with the literature, we document that the domestic content share of ordinary exports is 40 percentage points higher than for processing. As a result of falling tariffs, our estimates imply that the demand for Chinese factors of production *increased* by approximately US $39 billion in 2006 (1.6% of Chinese GDP).

Keywords: China, Processing Trade, Domestic Content, Tariffs

JEL classification: F14, F15, F16

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*Email: brandt@chass.utoronto.ca and peter.morrow@utoronto.ca. We thank Dwayne Benjamin, Bernardo Blum, Meredith Crowley, Kunal Dasgupta, Gilles Duranton, Gordon Hanson, Pravin Krishna, Nick Li, Heiwai Tang, Daniel Trefler, and seminar participants at Baylor University, Duke University, Johns Hopkins University School for Advanced International Studies, McMaster University, the MWIEG Spring 2013 meeting, and the University of Toronto for helpful comments and suggestions. Jeff Chan, Lei Kang, and Luhang Wang provided excellent research assistance. All usual disclaimers apply.

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 commensurately. Recent scholarship suggests that the composition of trade matters for China and its trading partners. Koopman, Wang, and Wei (KWW, 2012) and Kee and Tang (KT, 2012) find that ordinary exports embody more than twice as much domestic value added per USD as do processing exports. Recent work by Jarreau and Poncet (2012), and Yu (2013) also indicates that ordinary trade entails substantially more upgrading and has larger spillovers on the local economy than does processing.

In this paper we examine the causal determinants of this transition to ordinary trade. Ordinary and processing trade in China differ most prominently in terms of tariff treatment and the ability of firms to sell on the domestic market. Firms involved in 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, lower tariffs should have eroded some of the policy advantages processing exports enjoyed relative to ordinary trade. The rapid growth of the domestic market relative to global export demand might have reinforced the shift in the composition of Chinas exports.

[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]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).

Utilizing 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 conservatively suggest that more than half of the average change in the organization of trade at the six-digit HS industry level over this six-year period can be explained by input tariff cuts. Especially important are the contribution of foreign firms, and the role of the extensive margin, notably, the entry of new Chinese and foreign exporters that organize through ordinary trade, and the addition of new product lines under ordinary trade by existing firms. Our findings complement other recent work emphasizing the importance of entry to the dynamism in China's manufacturing sector (e.g Brandt, Van Briesebrock, and Zhang, 2012 and Brandt, Van Biesebroeck, Wang, and Zhang, 2012). We also find that the organization of trade is tied to the size of the domestic market. However, this effect is quantitatively small.

We corroborate our finding for exports through a similar analysis of the organization of imports. Our results linking trade form with tariffs are strongest for the imports of intermediate inputs, in contrast to exports where the impact of falling input tariffs on trade organization is pervasive across all types of goods, e.g. intermediates, consumer goods, and capital goods. This finding 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.

We next examine the link between falling tariffs, trade forms and domestic content. KWW (2012) and KT (2012) both document the significantly higher domestic content of ordinary trade compared to processing. Our results on the relationship between tariffs and trade form suggest possibly significant increases in domestic content through this link. However, there are alternate channels through which lower tariffs might have affected domestic content: tariffs will affect the use of imported versus domestically-sourced intermediates within each trade form, as well as the role of foreign versus Chinese firms, which often differ in their use of imported intermediates. As a result, falling tariffs could be associated with either an increase or decrease in domestic content. Indeed, an important motivation at the outset for the high tariffs was to maintain high levels of domestic content.

To address this question, we draw on a sample of manufacturing firms that that we can directly link to Chinese Customs data for the period between 2000 and 2006. For these firms, we document that domestic content of ordinary exports is approximately 40 percentage points higher than it is for processing, consistent with earlier estimates by KWW (2012) and KT (2012). Through an analysis of the relationship between changes in input tariffs and changes in the demand for Chinese factors of production, we find that a 10 percentage point fall in input tariffs results in an increase in the domestic content of exports of 1.2 to 6.0 percentage points. Quantitatively, however, the magnitude of this effect is modest: our results imply an increase in the demand for Chinese factors of production in 2006 of US $39 billion (nominal) on total exports of over US $900 billion which is equal to 1.6% of Chinese GDP.

To motivate our empirical work, we sketch out a simple partial equilibrium model of firm organizational choice following 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 make it easier for 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 based 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

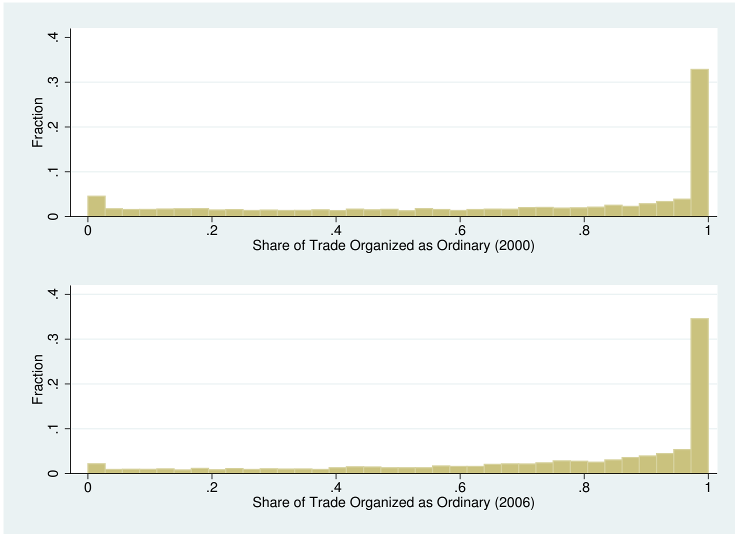
The vast majority of Chinese exports occur through either ordinary (O) or processing (P) trade, which combined represent more than 95 percent of Chinese exports between 2000 and 2006.[3] Established in 1979, China's processing regime confers substantial benefits on export processors, most importantly, 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 not allowed to use these inputs in production for sales on the domestic market, and in fact must set up segregated production facilities to sell domestically (Interviews, 2005, 2006 and 2007.)[4] In contrast, firms engaged in ordinary trade must pay duties on their imports, but are free to sell on the domestic market. Consequently, firms in industries in which the domestic market is large relative to export demand have an incentive to organize through ordinary trade. Exports in all organizational forms are subject to VAT rebates.

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

[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).

[4]Segregated facilities helped to reduce the 'leakage' of tariff-free intermediates into the local economy. We discuss these multi-form firms below.

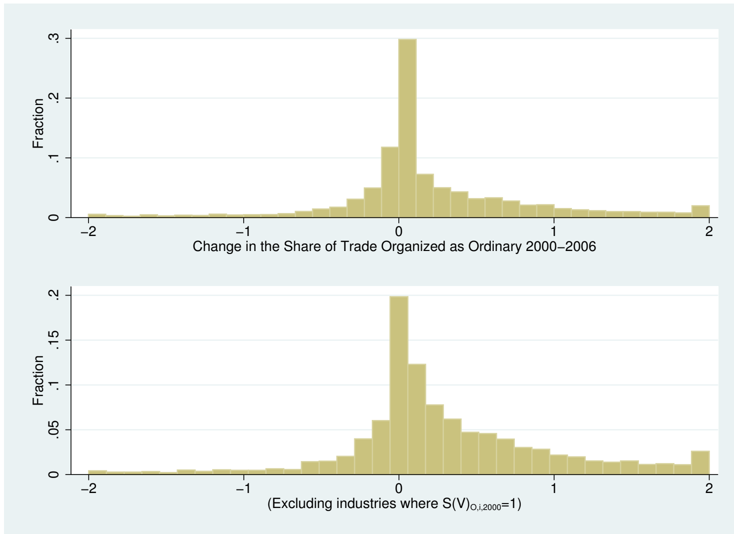
Figure 1: Share of Ordinary Trade (2000 & 2006)



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 of Figure 2 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, 94.8 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 33.2 percent of total exports. Over time, the relative prevalence of multi-form firms has also been falling. As a share of all firms exporting within a HS 6-digit level category, these firms declined from 7.6 percent of the total in 2000 to 5.2 percent in 2003, and 3.2 percent in 2006. Consequently, in our theoretical and empirical framework, we analyze the case in which each plant chooses a single form of trade for each product. Throughout this paper references to 'sector' or

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



'industry' refer to 1996 HS six-digit codes unless otherwise indicated.

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.

Tariff cuts occurring after 2001 were negotiated in the late 1990s as part of China's WTO accession.[5] 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

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

a solid IV strategy, we use time series variation to remove time-invariant industry-province factors. In some regressions, 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

We define domestic absorption to be the value of total sales of firms manufacturing in China less exports plus imports. This is our measure of domestic market size. 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 for the median industry in 2004 was 8 times larger than exports, and was greater than exports in 87 percent of all industries.

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.[6] 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

[6] We purposefully do not explore the full general equilibrium of the model. This would require a model of how falling tariffs affect both global sourcing decisions and 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).

of domestic to world demand that motivates our empirical work. And third, it identifies potentially confounding factors 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 the elasticity of substitution is the same across all varieties within an industry and equal to $\sigma > 1$.[7] 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.[8] 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:

[7] 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.

[8] 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.

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

3.2 Inputs, Technology and Costs

There are two factors of production: an imported intermediate input M_M, and a domestically supplied intermediate input M_D.[9] Input prices, p_M and p_D, are exogenously given, 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.[10] 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]

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

[9] 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 capital and skill intensity in our empirical analysis.

[10] All propositions that follow extend easily to the case of CES production functions in which changes in tariffs are allowed to affect the relative mix of domestic versus foreign provided inputs for ordinary exports. We examine the empirical implications of this assumption in section 7.

[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.

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

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:

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

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

and

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

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

[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.

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:

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

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

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

and

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

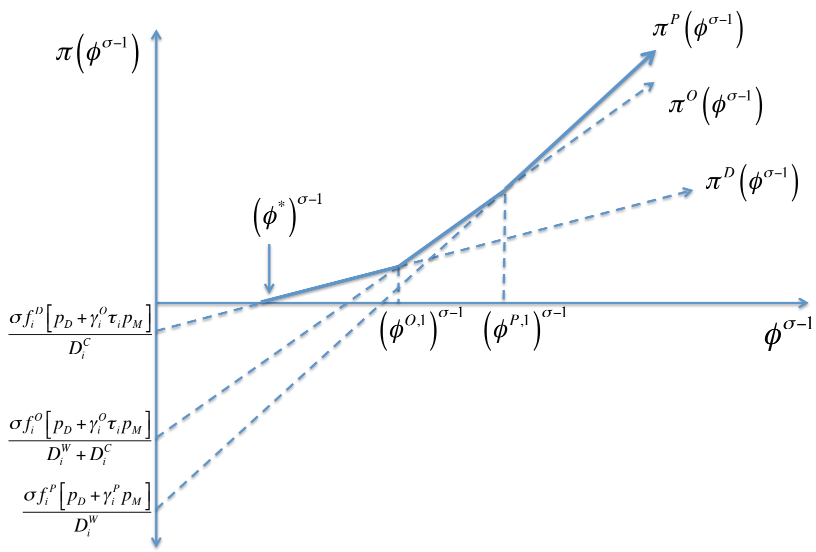
When both inequalities are strictly greater than (>), the marginal profit with respect to capability and the fixed cost of exporting are greater for processing than for ordinary exports. If they are both strictly less than (<), then the marginal profit with respect to capability and the fixed cost of exporting are greater for ordinary trade than for processing.[14] Analogous to 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

[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.

Figure 3: Higher Marginal Return to Processing Exports

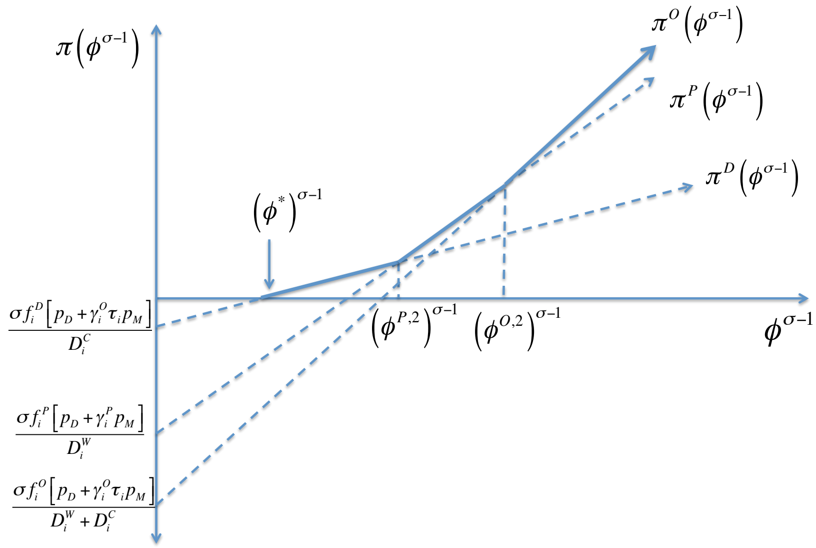


fixed cost of processing, the processing profit function cuts the ordinary profit function from below. $\left(\phi^{P,1}\right)^{\sigma-1}$ denotes the level of capability for which an entrepreneur is indifferent between ordinary and processing. The capability at which entrepreneurs are indifferent between 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 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

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



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 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* $\left(\phi^{O,1}\right)^{\sigma-1}$ *falls,* $\left(\phi^{P,1}\right)^{\sigma-1}$ *rises in the case where ordinary trade is 'high return to capability/high fixed cost' and* $\left(\phi^{O,2}\right)^{\sigma-1}$ *falls,* $\left(\phi^{P,2}\right)^{\sigma-1}$ *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' .*

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 ordinary exporters, 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,

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

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 assume 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

[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.tradecommissioner.gc.ca/eng/canadexport/document.jsp?did* = 139565 for more information.

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.[19] 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 export industry input tariffs for all years.[20] 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 compression in input tariffs with the average input tariff falling from 15.5 percent to 7.4 percent between 2000 and 2006.

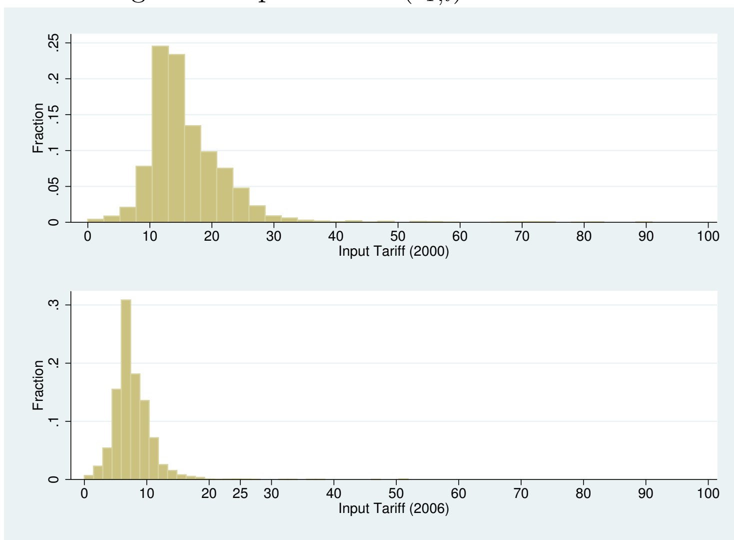
Domestic absorption for industry i is total industry sales in the domestic (Chinese) market. By definition, it is equal to the sum of total sales of all firms in that industry producing in China minus exports plus imports. The manufacturing census data that are required to calculate this variable are only available for 1995, 2004, and 2008. In our cross sectional analysis, we use data on domestic absorption for 2004 for all years and, in the time series, we use differences between 1995 and 2008. As suggested by theory, we normalize domestic absorption by total exports to obtain a measure of domestic relative to world absorption, D_i.

In some specifications, we also include the initial input tariff level in 2000. This serves

[19] In the robustness section of the paper, we examine the sensitivity of our results to using an alternative input tariff measure that uses the Chinese input-output matrix to weight industry-level tariffs estimated at the four-digit CIC (Chinese Industrial Classification) level. In general, all of our results are robust to using this alternative input tariff measure.

[20] Similar results hold using time-invariant 2000-2006 average weights, as well as weights based on imports in 2000.

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



two purposes. First, it controls for pre-WTO levels of protection in an industry. Second, it allows for a more flexible functional form in which the effect of an input tariff cut may depend on its initial level (e.g. the effect of a 10 percentage point tariff cut from an initial tariff of 10 percent may be different from the same cut from an initial level of 50 percent).

We also consider the effect of several industry-level variables identified by the model that may reflect differences factor requirements or the prices of intermediate inputs sourced domestically versus internationally. Specifically, we include measures of the skilled labor and capital intensity 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.[21] 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).[22] Finally, we use provincial fixed effects that control for factors that might make some geographic locations more likely to be organized into ordinary or processing trade. Table 1 presents

[21] The use of capital intensity also captures the importance of credit constraints as discussed by Manova and Yu (2013).

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

summary statistics for all variables used in our primary regressions where observations are indexed by province p and industry i.

Ordinary trade is extremely common with the median industry-province observation organized exclusively through ordinary trade in all years.[23] 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 10.5 percent.[24] As illustrated in Figure 5, input tariffs fall by an average of 8.2 percentage points during this period.

Table 1: Summary Statistics

variable	**Obs**	**Mean**	**Median**	**Std. Dev.**	**Min**	**25th pctile**	**75th pctile**	**Max**
$S(V)_{O,ip,2000}$	32,014	0.846	1.000	0.316	0.000	0.971	1.000	1.000
$S(V)_{O,ip,2003}$	40,068	0.879	1.000	0.277	0.000	1.000	1.000	1.000
$S(V)_{O,ip,2006}$	47,355	0.895	1.000	0.252	0.000	0.999	1.000	1.000
$\%\Delta S(V)_{O,ip}$	28,377	0.105	0.000	0.654	-2.000	0.000	0.000	2.000
$\ln(S_i/U_i)$	54,454	-0.926	-0.871	0.311	-2.574	-1.055	-0.712	-0.427
$\ln(K_i/L_i)$	54,454	4.351	4.262	0.351	3.009	4.100	4.604	5.210
$Nunn_i$	54,454	0.466	0.450	0.219	0.024	0.274	0.669	0.980
$\ln(D_i)$	54,454	1.588	1.748	1.315	-6.150	0.744	2.442	6.228
$\Delta\ln(D_i)$	54,454	0.257	0.086	1.343	-4.249	-0.479	0.667	10.131
$\tau_{I,i,2000}$	53,979	15.922	14.635	5.316	0.414	12.403	18.988	73.967
$\tau_{I,i,2003}$	53,979	9.196	8.410	3.626	0.155	6.877	11.129	57.000
$\tau_{I,i,2006}$	53,979	7.720	7.263	2.901	0.153	6.109	9.164	57.000

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

[23] Ordinary trade is 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. Processing is also geographically concentrated, as a result of which the unweighted average share in ordinary at the industry-location level is higher than it is at the industry level.

[24] 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.

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:

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

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. Our variable is undefined if there are no exports, and so 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):

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

where standard errors are clustered at the industry level and variables are defined analogously to equation (8).[25] 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:

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

[25]Results are robust to clustering at the Chinese industrial classification (CIC) level as well as two-way clustering at the HS-province level as described by Cameron, Gelbach, and Miller (2008).

Table 2: Baseline Estimation

	2000 (1)	2000 (2)	2003 (3)	2003 (4)	2006 (5)	2006 (6)	(00-06) (7)	(00-06) (8)
$\Delta\tau_{I,i}$	-0.014***	-0.0063***	-0.011***	-0.0015	-0.0071**	0.00086		
	(0.0024)	(0.0023)	(0.0030)	(0.0027)	(0.0031)	(0.0027)		
$\Delta\tau_{I,i}$							-0.0049***	-0.014***
							(0.0016)	(0.0031)
$\tau_{I,i,2000}$								-0.0094***
								(0.0022)
$\ln(D_i)$		0.064***		0.075***		0.065***		
		(0.0082)		(0.0069)		(0.0059)		
$\Delta\ln(D_i)$								0.021***
								(0.0044)
$Nunn_i$		-0.81***		-0.72***		-0.52***		0.13***
		(0.0598)		(0.0538)		(0.0431)		(0.0288)
$\ln(S_i/U_i)$		0.45***		0.35***		0.21***		-0.16***
		(0.0517)		(0.0411)		(0.0338)		(0.0241)
$\ln(K_i/L_i)$		-0.17***		-0.17***		-0.051		0.073***
		(0.0513)		(0.0419)		(0.0344)		(0.0230)
Obs.	31,768	31,768	39,798	39,798	47,058	47,058	28,240	28,240
Left Cens.	841	841	512	512	365	365	100	100
Non-Cens.	7,885	7,885	9,548	9,548	11,651	11,651	27,476	27,476
Right Cens.	23,042	23,042	29,738	29,738	35,042	35,042	664	664

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.

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.[26] Reductions in input tariffs between 2000 and 2006 are defined as negative. 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

[26]Because tobit estimation often provides larger point estimates than OLS, we have also run these regressions using the latter. While the cross-sectional point estimates are larger using Tobit than OLS, the preferred time series results are similar, consistent with relatively few censored values in the time series but many in the cross section. Running the same regressions as in columns 7 and 8 of table 2 using OLS, the point estimates are -0.0049 and -0.0134, respectively, with both significantly different from zero at $p < 0.01$.

is consistently negative and suggests that sectors with the lowest (highest) input tariffs have the highest (lowest) share of ordinary trade. The effect weakens considerably over time–possibly reflecting a loss in identifying variation as tariff differences between sectors narrow–and is smaller with the inclusion of our measure of domestic absorption and industry characteristics. Consistent with our model, there is also a robust positive correlation in each year between domestic absorption and the role of ordinary trade in exports. In addition, the share of ordinary exports is positively correlated 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. Using the results from columns (7) and (8), a 10 percentage point input tariff cut increases the share of trade organized through ordinary trade by between 4.9 and 14 percent. With input tariffs falling on average by 8.2 percent between 2000 and 2006 and an average change in the share of ordinary trade of 10.5 percent, our results imply that between 38 and 109 percent of the observed change in the organization of trade at the industry level is constant with falling input tariffs. The effect of higher domestic absorption is also significantly different from zero, but quantitatively the effect is small. Using the average change in $\ln(D_i)$ of 0.257 from Table 1, the increase in domestic absorption only predicts a 0.5 percent increase in the share of ordinary trade.[27] Our estimates also suggest smaller shifts between 2000 and 2006 to ordinary trade in industries in which skill intensity was higher, and larger shifts in industries that were more capital intensive and used more highly differentiated inputs. We address possible issues of endogeneity in both input tariff cuts and domestic absorption in section 6.

It is also clear from our theory that falling input tariffs should increase the share of *imports* organized as ordinary trade. We examine this relationship in Table 3, where the dependent variable is the share of imports organized through ordinary trade. Our tariff variable is the *reported* tariff on imports at the 6-digit HS level. An obvious advantage of

[27] The fact that this is based on the average change between 1995 and 2008 suggests smaller effects for the 2000-2006 period.

Table 3: Imports

	2000	2000	2003	2003	2006	2006	(00-06)	(00-06)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\tau_{O,it}$	-0.0086***	-0.0065***	-0.0051***	-0.0017	0.0044**	0.0050***		
	(0.0019)	(0.0016)	(0.0018)	(0.0019)	(0.0017)	(0.0018)		
$\Delta\tau_{O,pi}$							-0.014***	-0.015***
							(0.0020)	(0.0023)
$\tau_{O,i,2000}$								-0.0034*
								(0.0019)
$\ln(D_i)$		0.054***		0.046***		0.046***		
		(0.0097)		(0.0083)		(0.0077)		
$\Delta\ln(D_i)$								0.0035
								(0.0105)
$Nunn_i$		1.61***		1.32***		0.98***		-0.92***
		(0.0671)		(0.0563)		(0.0524)		(0.0620)
$\ln(S_i/U_i)$		0.45***		0.34***		0.33***		-0.47***
		(0.0580)		(0.0458)		(0.0406)		(0.0623)
$\ln(K_i/L_i)$		-0.0014		-0.0049		-0.068*		-0.10**
		(0.0477)		(0.0414)		(0.0372)		(0.0477)
Obs.	33,189	33,189	39,262	39,262	40,578	40,578	26,871	25,738
Left Cens.	5,112	5,112	3,723	3,723	3,421	3,421	672	647
Non-Cens.	12,235	12,235	15,402	15,402	17,241	17,241	23,216	22,217
Right Cens.	15,842	15,842	20,137	20,137	19,916	19,916	2,983	2,874

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.

this exercise is that we can use the tariff as directly reported, and do not have to worry about any biases possibly introduced by how we construct our tariff measure. In both the cross-section and time series, we find that lower tariffs are correlated with a higher share of imports organized through ordinary trade and that these effects are of a similar magnitude as for exports.[28] The effects of domestic market size are similar although smaller and estimated with less precision in the time series.

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

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

Table 4: Decomposition

	$\%\Delta S(V)_{O,ip}$ Total (1)	$S(V)^{N}_{O,ip}$ New Firms (2)	$S(V)^{S}_{O,ip}$ Switchers (3)	$S(V)^{IE}_{O,ip}$ IE (4)	$\%\Delta S(N)_{O,ip}$ Total (5)	$S(N)^{N}_{O,ip}$ New Firms (6)	$S(N)^{S}_{O,ip}$ Switchers (7)	$S(N)^{IE}_{O,ip}$ IE (8)
$\Delta\tau_{I,i}$	-0.014***	-0.0067***	-0.0026**	-0.0042	-0.0079***	-0.0032**	-0.0014	-0.0033**
	(0.0031)	(0.0020)	(0.0012)	(0.0026)	(0.0016)	(0.0016)	(0.0009)	(0.0015)
$\tau_{I,i,2000}$	-0.0094***	-0.0052***	-0.0014*	-0.0024	-0.0062***	-0.0038***	-0.00064	-0.0017*
	(0.0022)	(0.0012)	(0.0008)	(0.0017)	(0.0012)	(0.0009)	(0.0006)	(0.0009)
$\Delta \ln (D_i)$	0.021***	0.0087***	-0.0066***	0.019***	0.0073***	0.0020	-0.0054***	0.011***
	(0.0044)	(0.0024)	(0.0016)	(0.0031)	(0.0025)	(0.0018)	(0.0012)	(0.0017)
$Nunn_i$	0.13***	0.054***	0.014	0.061***	0.080***	0.061***	-0.0037	0.022**
	(0.0288)	(0.0159)	(0.0112)	(0.0209)	(0.0174)	(0.0113)	(0.0082)	(0.0101)
$\ln (S_i/U_i)$	-0.16***	-0.027**	-0.067***	-0.057***	-0.10***	-0.024**	-0.037***	-0.040***
	(0.0241)	(0.0136)	(0.0098)	(0.0168)	(0.0152)	(0.0097)	(0.0070)	(0.0085)
$\ln (K_i/L_i)$	0.073***	0.053***	-0.0088	0.024	0.057***	0.050***	-0.012*	0.018**
	(0.0230)	(0.0134)	(0.0089)	(0.0157)	(0.0148)	(0.0093)	(0.0063)	(0.0088)
Obs.	28,240	28,240	28,240	28,240	28,240	28,240	28,240	28,240
Left Cens.	100	0	0	100	100	0	0	100
Non-Cens.	27,476	28,018	28,206	28,119	27,476	28,018	28,206	28,119
Right Cens.	664	222	34	21	664	222	34	21

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.

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 ($V_{fip,2000} = 0$ & $\exists j \neq i : V_{fjp,2000} > 0$ & $V_{fip,2006} > 0$).

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 4 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 ($S(V)^{N}_{O,ip}$), 'switchers' ($S(V)^{S}_{O,ip}$), and finally, incumbents plus exiters to the overall change

$(S(V)^{IE}_{O,ip})$, 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 majority of the increase in the share of ordinary trade. Defined to include new firms and new products ('switchers'), entry accounts for 66 percent of the total change in the share of ordinary as measured by value and 58 percent as defined by the number of firms exporting at the industry-province level. New firms alone (columns 2 and 6) are responsible for 48 percent of the total change in the value share and 41 percent of the share in terms of the number of firms exporting at the industry-province level. In terms of our model, falling input tariffs are helping an increasing number of 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.[29] Table 5 provides results for the two types of firms separately.[30] This is potentially important for two reasons. First, if other policy changes implemented concurrently with the tariff cuts encouraged increased entry by Chinese-owned relative to foreign-owned firms, the correlation between tariffs and ordinary trade shares might be spurious. An example of such a policy is the universal extension of direct trading rights in 2004 to domestically-owned firms, rights which foreign-owned firms already possessed.[31] Second, because of differences between domestic and foreign firms in the use of imported intermediates within each trade form, the effects of tariffs on their choices will matter for

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

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

[31]See Bai, Krishna, and Ma (2013) for more details.

Table 5: 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)
$\tau_{I,it}$	-0.0059*	-0.0090***	-0.011***		-0.0050**	-0.00063	0.0044	
	(0.0030)	(0.0030)	(0.0028)		(0.0025)	(0.0029)	(0.0031)	
$\Delta\tau_{I,i}$				-0.0057***				-0.030***
				(0.0021)				(0.0075)
$\tau_{I,i,2000}$				-0.0042***				-0.016***
				(0.0015)				(0.0046)
$\ln(D_i)$	0.079***	0.092***	0.066***		0.069***	0.070***	0.076***	
	(0.0090)	(0.0075)	(0.0059)		(0.0096)	(0.0084)	(0.0075)	
$\Delta\ln(D_i)$				0.016***				0.037***
				(0.0031)				(0.0103)
$Nunn_i$	-0.67***	-0.54***	-0.39***	0.072***	-0.74***	-0.90***	-0.70***	0.34***
	(0.0675)	(0.0599)	(0.0443)	(0.0202)	(0.0714)	(0.0622)	(0.0526)	(0.0791)
$\ln(S_i/U_i)$	0.64***	0.49***	0.29***	-0.075***	0.21***	0.21***	0.19***	-0.30***
	(0.0619)	(0.0448)	(0.0345)	(0.0174)	(0.0587)	(0.0502)	(0.0427)	(0.0661)
$\ln(K_i/L_i)$	-0.14**	-0.15***	-0.042	0.014	0.024	-0.086*	-0.041	-0.024
	(0.0601)	(0.0444)	(0.0348)	(0.0158)	(0.0569)	(0.0497)	(0.0421)	(0.0571)
Obs.	29,716	38,007	45,273	26,152	12,685	17,338	22,859	10,922
Left Cens.	465	262	156	45	1,606	1,275	1,021	144
Non-Cens.	4,363	5,032	6,116	25,744	5,199	6,983	8,998	9,587
Right Cens.	24,888	32,713	39,001	363	5,880	9,080	12,840	1,191

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 $\%\Delta S(V)^{for}_{O,ip}$ column 8.

the relationship between tariffs and domestic content. 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.[32]

In the cross-section, tariffs play a more prominent role in the case of domestic firms than foreign, while industry controls have similar effects. In the time series, the marginal effect of tariff reductions on foreign firms is significantly larger than it is for domestic firms highlighting the importance of foreign firms in industry-level dynamics. 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 5.7 percent for domestic firms and 30 percent for foreign

[32]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.

firms. Given that the average changes in the share of domestic and foreign firms in ordinary trade were 7.0 percent and 40.2 percent, respectively, Table 5 suggests that falling input tariffs can explain 66 percent of the change within domestic firms and 60 percent of the change within foreign firms in the organization of trade.[33]

5.3 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 negative effect of input tariff cuts is pervasive across BEC classifications for *exported* goods, but that the effect of lower tariffs is only negative 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 a substantial share of the average increase in the share of ordinary trade. Second, the extensive margin of new and switching firms explains much of the observed effect. Third, our results hold for both domestic and foreign firms but emphasize the importance of the latter. Fourth, we find corroborating support in importing behavior and in the differences in the link between tariffs and trade forms by BEC industries.

We examine the robustness of our results in a number of ways. First, we show that our results are robust to a more common measure of the input tariff constructed using the Chinese input-output matrix. Second, we exclude firms commonly thought to be trading firms.

[33]Because of differences in the denominators of the dependent variables for the full sample, the sample of domestic firms, and the sample of foreign firms, this is not a formal decomposition and is only illustrative of the 'within' effects.

Third, we further disaggregate the data by destination country, and include destination fixed effects. Fourth, we only examine industry-province observations for which we observe positive amounts of both ordinary and processing trade in 2000. Fifth, we look at pre-existing trends in both the share of ordinary trade and input tariffs. Sixth, we control for simultaneous changes in output tariffs which may be influencing firm choice through their effect on the competitiveness of the domestic market. Finally, we pursue an IV strategy to assess the possible endogeneity of domestic absorption.

Our baseline results utilize an input tariff constructed on the basis of the actual baskets of goods that are imported and the tariffs to which they are subjected. In column (1), we show that our results are robust to a more commonly used measure of the input tariff that applies the Chinese input-output matrix to industry level tariffs. More generally, all of our results are robust to this alternate construction. In some cases, however, standard errors are slightly larger, reflecting the fact that higher level of aggregation of the input-output matrix results in less variation in our tariff measure.[34]

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 (2) of Table 6 excludes all firms identified to be trading firms.[35] The marginal effect of changes in input tariffs is 71 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 (0.21 compared to 0.07), leading to relatively similar magnitudes in the percentage of the shift to ordinary explained by tariff reductions.

Column (3) considers the role that destination country characteristics play in determining the organization of trade.[36] We redefine our dependent variable at the industry-

[34]This alternate input tariff is constructed at the Chinese Industrial Classification (CIC) level, each of which contains 6-8 6-digit HS codes.

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

[36]Antras and Helpman (2004) suggest in the context of a model of global sourcing that partner-firm

Table 6: Robustness

	IO τ_I (1)	No Trading Co. (2)	HS-Prov-Dest (3)	Interior in 2000 (4)	Trend $S(V)_{O,ip}$ (5)	Trend $\tau_{I,it}$ (6)	$\Delta\tau_{O,pi}$ (7)	IV- $\Delta\ln(D_i)$ (8)
$\Delta\tau_{I,i}^{IO}$	-0.025**							
	(0.0105)							
$\Delta\tau_{I,i}$		-0.024***	-0.029***	-0.026***		-0.015***	-0.0074*	-0.015***
		(0.0048)	(0.0051)	(0.0079)		(0.0032)	(0.0038)	(0.0032)
$\Delta\tau_{I,i}^{2003-2006}$					-0.027***			
					(0.0068)			
$\tau_{I,i,2000}^{IO}$	-0.052***							
	(0.0190)							
$\tau_{I,i,2000}$		-0.013***	-0.012***	-0.018***		-0.011***	-0.0085***	-0.010***
		(0.0031)	(0.0034)	(0.0052)		(0.0024)	(0.0025)	(0.0022)
$\tau_{I,I,2002}$					-0.0046***			
					(0.0015)			
$\%\Delta S(V)_{O,ip}^{2000-2002}$					-0.097***			
					(0.0112)			
$\Delta\tau_{I,i}^{1996-1999}$						-0.0023		
						(0.0021)		
$\Delta\tau_{O,i}$							-0.0042**	
							(0.0017)	
$\tau_{O,i,2000}$							0.00026	
							(0.0014)	
$\Delta\ln(D_i)$	0.017	0.030***	0.0014	-0.010	0.019***	0.020***	0.022***	0.026***
	(0.0103)	(0.0067)	(0.0056)	(0.0094)	(0.0034)	(0.0046)	(0.0045)	(0.0053)
$Nunn_i$	0.10**	0.24***	0.077*	0.028	0.11***	0.13***	0.12***	0.13***
	(0.0459)	(0.0451)	(0.0421)	(0.0754)	(0.0227)	(0.0288)	(0.0287)	(0.0288)
$\ln(S_i/U_i)$	-0.16***	-0.20***	-0.072**	-0.12*	-0.048**	-0.16***	-0.15***	-0.15***
	(0.0442)	(0.0374)	(0.0355)	(0.0639)	(0.0195)	(0.0241)	(0.0241)	(0.0246)
$\ln(K_i/L_i)$	0.092**	0.058	-0.0010	0.084	0.033*	0.073***	0.071***	0.071***
	(0.0412)	(0.0352)	(0.0291)	(0.0561)	(0.0185)	(0.0230)	(0.0229)	(0.0231)
Obs.	28,377	18,582	162,794	7,794	24,247	28,240	28,240	28,240
Left Cens.	100	103	2,466	35	52	100	100	100
Non-Cens.	27,611	17,553	147,122	7,759	24,061	27,476	27,476	27,476
Right Cens.	666	926	13,206	0	134	664	664	664

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed effects. $p < 0.01 :^{***}, 0.01 \le p < 0.05 :^{**}, 0.05 \le p < 0.10 :^{*}$. All reported regression coefficients are Tobit marginal effects. The dependent variable is $\%\Delta S(V)_{O,ip}$ in columns (1),(2),(4),(5), (6), (7), (8) and $\%\Delta S(V)_{O,ipd}$ in column (3) where d indexes destination country.

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 but of a similar magnitude.

Column (4) examines the subsample of cells for which there was a strictly 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 had 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.[37] As might be expected, the effect of input tariff cuts is larger when we drop all industries that could not increase any more.

Columns (5) and (6) 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 (5), we run regressions for the change in the share of ordinary trade from 2003 to 2006, and include as additional controls the change in ordinary's share from 2000 to 2002 and the level of protection in 2003. In column (6), we include the change in input tariffs from 1996 to 1999 in our base regression to help absorb any unobserved heterogeneity.[38] Results in columns (5) and (6) are qualitatively unchanged from before, with slightly larger point estimates.

Column (7) 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

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.

[37] 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.

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

is still large and significantly different from zero. The coefficient on the change in output 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.[39]

Finally, column (8) addresses the fact that domestic absorption is an endogenously determined outcome especially considering the normalization by total exports. Our endogenous variable is the ratio of domestic absorption to total chinese exports ($\frac{Q_i+M_i-X_i}{X_i}$). We instrument for this by replacing the denominator with total world exports (excluding China) to the world ($X_{i,ins}$) such that we instrument $\frac{Q_i+M_i-X_i}{X_i}$ with $\frac{Q_i+M_i-X_i}{X_{i,ins}}$. The instrument is strong with a first stage F-statistic of 242 when the data are collapsed to the CIC level at which the variables are calculated. The IV estimate is only marginally different from the OLS estimate.[40]

7 Implications for Domestic Factor Demand

KWW (2012) and KT (2012) argue that ordinary exports embody a larger proportion of Chinese value added than do processing exports. Each estimates that the share of domestic value added in Chinese exports ('domestic content') is 40-50 percentage points higher for ordinary than processing trade.[41] Consequently, our results imply that falling input tariffs should influence the relative demand for Chinese factors of production within an industry by affecting the relative mix of ordinary and processing exports. However, lower levels of protection might induce important countervailing forces that could *reduce* the share of value accruing to domestic factors. For example, reductions in the level of protection that lower the price of imported relative to domestically-provided intermediate inputs should lead firms and industries to substitute away from domestic factors. In addition, the composition of exports between domestic and foreign firms might also be altered, inducing changes in

[39]This result is consistent with Yu (2013), however, if lower levels of protection induce technological upgrading, and thus rising shares of exports by ordinary firms.

[40]We do not replace X_i with $X_{i,ins}$ in the numerator because it results in negative values that are then missing when logs are taken.

[41]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.

Table 7: Average Firm-level Domestic Content Ratios (DCR)

Year	Total	Ord.	Proc.	Ord. (Dom.)	Proc. (Dom.)	Ord. (For.)	Proc. (For.)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2000	0.649	0.851	0.418	0.874	0.554	0.838	0.415
	(331)	(327)	(292)	(269)	(158)	(306)	(290)
2006	0.781	0.872	0.478	0.887	0.510	0.860	0.476
	(352)	(327)	(292)	(268)	(231)	(311)	(299)

Note: Numbers in parentheses are industry counts.

overall domestic content depending on differences in the use of domestic factors by these two types of firms. This section rigorously assesses this potentially ambiguous effect.

7.1 Estimating Domestic Content

Following KT (2012), we start by calculating the 'domestic content ratio' (DCR) for each industry, which represents the share of export revenue going to domestic factors of production. To do so, we link the Customs data for 2000-2006 to firm-level data that are a product of annual surveys by the National Bureau of Statistics (NBS).[42] Appendix E discusses the construction of this variable in detail. A value of one for DCR implies that all export revenue accrues to domestic factors of production, while a value of zero implies that all export revenue goes to foreign factors.[43] These calculations are at the four-digit Chinese Industrial Classification (CIC) level as each firm in the NBS data is assigned to a single CIC industry. Since each 4-digit CIC code generally maps into multiple 6-digit HS codes, our results below combine changes in domestic content within a single HS code with that coming from changes across HS codes within a given CIC code.

Column (1) of Table 7 shows that on average, across CIC industries, domestic content increased from 64.9% to 78.1% between 2000 and 2006. This parallels the increase in ordinary trade over the same time span. Columns (2) and (3) provide the same estimates

[42]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 F re-estimates the baseline results of Table 2 using this sub-sample and finds that they continue to hold.

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

where DCR is calculated for ordinary and processing shipments separately. Consistent with KWW (2012) and KT (2012), domestic content is approximately 40 percentage points higher for ordinary trade than processing in both 2000 and 2006. Columns (4) and (5) perform the same exercise separately for domestic firms and find similar patterns. As expected, calculations based on domestic firms separately generally show higher domestic content ratios than when based on foreign firms (columns 6 and 7).

Table 7 also shows that between 2000 and 2006 the domestic content ratio increased very little for ordinary shipments and actually declined slightly for processing shipments for domestic firms. However, the latter number should be viewed with caution as the number of industries in which domestic firms were involved in processing exports increased dramatically between 2000 and 2006. Column (7) shows that the largest increase in DCR was for foreign firms engaged in processing.

In sum, while there are not likely to be large increases in DCR within ordinary trade, these data confirm that there are potentially large effects from compositional shifts out of processing and into ordinary trade and across domestic and foreign firms within each trade form.

7.2 Industry Level Evidence

We now explicitly examine the link between lower input tariffs and domestic content. While we might expect lower input tariffs to increase domestic content through the reorganization of trade, it is possible that these same cuts induced movement towards foreign factors of production through other channels.

Analogously to section 5, we conduct our analysis at the CIC industry-province level so as to account for geographic heterogeneity. With slight abuse of notation, CIC industries are indexed i and provinces are indexed p. Our primary estimating equation is:

$$\Delta DCR_{ip} = \beta_1 \Delta \tau_{I,i} + \beta_X' \mathbf{X}_i + \Phi_p + \mu_{ip}. \tag{11}$$

Industry-level input tariffs are calculated at the industry as described in 5 but at the

CIC as opposed to the HS level. The vector $\mathbf{X}_i$ contains the same control variables as in section 5. We continue to include province fixed effects and cluster the standard errors at the CIC industry level. Again, all results are robust to using an input tariff calculated using the input-output matrix.

It is important to note that we do not pursue an instrumental variables strategy in which we regress domestic content on the endogenous share of ordinary trade, instrumenting for the latter with tariff cuts. Tariff cuts are unlikely to meet the exclusion restriction that tariff cuts only influence domestic content ratios through the organization of trade. In fact, the exercise is explicitly designed to allow other channels to determine how tariff cuts affect domestic content.

Table 8: Input Tariff Cuts and Domestic Content Ratios

	ΔDCR_{ip}	ΔDCR_{ip}	ΔDCR_{ip}^{dom}	ΔDCR_{ip}^{for}
	(1)	(2)	(3)	(4)
$\Delta\tau_{I,i}$	-0.0012	-0.0060*	-0.0020	-0.0040
	(0.0015)	(0.0033)	(0.0080)	(0.0077)
$\tau_{I,i,2000}$		-0.0036**	-0.0027	-0.00090
		(0.0018)	(0.0055)	(0.0054)
$\Delta\ln(D_i)$		-0.0017	0.029	-0.031
		(0.0096)	(0.0222)	(0.0239)
$Nunn_i$		0.083	-0.100	0.18
		(0.0578)	(0.1063)	(0.1120)
$\ln(S_i/U_i)$		-0.041	-0.016	-0.025
		(0.0531)	(0.0850)	(0.0843)
$\ln(K_i/L_i)$		0.0073	-0.014	0.021
		(0.0643)	(0.0830)	(0.0800)
$\Delta\ln(D_i)$		-0.0017	0.029	-0.031
		(0.0096)	(0.0222)	(0.0239)
Observations	1,959	1,959	1,959	1,959
R-squared	0.07	0.08	0.03	0.05

All regressions include province fixed effects. The dependent variable is ΔDCR_{ip} in columns (1)-(2). The dependent variable in column (3) is the contribution from domestic firms. The dependent variable in column (4) is the contribution from foreign firms. All estimations are OLS with robust standard errors clustered by HS-6 in parentheses. $p < 0.01 :^{***}$, $0.01 \leq p < 0.05 :^{**}$, $0.05 \leq p < 0.10 :^{*}$.

Table 8 presents our main results. Column (1) finds that a 10 percentage point input tariff cut causes a (imprecisely estimated) 1.2 percentage point increase in the domestic content ratio, consistent with the results in section 5 and higher measured DCR in ordinary relative to processing trade. Adding additional controls in column (2) increases this responsiveness to an increase of 6.0 percentage points. The average change in input tariffs at the CIC level is 7.21 percentage points which is slightly smaller than at the HS level. This suggests that, in the average industry, a falling input tariff induced an increase in the domestic content ratio of approximately 4.3 (0.0060*7.21) percentage points.

Using the properties of OLS, columns (3)-(4) decompose the total effect of column (2) into that attributable to domestic (column 3) and foreign (column 4) firms. Consistent with the larger absolute movements for foreign firms documented in section 5, we find that 2/3 of the overall change in domestic content ratios is due to foreign firms.[44]

To assess the economic magnitude of this effect, recall that domestic factor's share of the value of exports would have been 4.3 percentage points *lower* if these cuts had not been exacted. With exports of over US $900 billion, this implies that lower input tariffs resulted in US $38.7 billion more in payment to Chinese factors of production in 2006. This is equal to approximately 1.6% of China's GDP in 1996. While this change is large in absolute value, it is much smaller relative to the total value of Chinese exports and the domestic value added in Chinese manufacturing sector in general.

8 Conclusion

This paper finds that a majority of the average change from processing to ordinary exports for China between 2000 and 2006 can be explained by observed reductions in input tariffs, with the entry of new firms and introduction of new products playing dominant roles. The value of accessing the domestic market has a much smaller quantitative influence on firms' organizational decisions. Falling tariffs also contributed to a modest rise in the domestic value added of Chinese exports in 2006 of US $38.7 billion.

The finding that lower levels of protection for intermediate inputs did not cause domestic factor demand to fall may appear to be counter-intuitive. Empirically, lower input tariffs in China promoted entry of new exporters with higher domestic content who were

[44]Results using Tobit estimators are nearly identical.

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 marginally higher shares of domestic value added through changes in export composition. Increases through these channels more than offset any substitution effects occuring within trade forms.

Assembly-intensive processing trade has played a strategic 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 foreign technology and know-how when domestic markets are protected. However, processing trade also entails relatively lower demand for domestic factors of production as documented here and elsewhere. Empirical assessment of these trade-offs is an important area of research with regard to China and to development policy in general. The dynamic implications of processing trade for the pace of industrial upgrading is also crucial for our understanding of export-led development.

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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 $\pi_i^D(\phi_f) = 0$:

$$(\phi^*)^{\sigma-1} = \frac{\sigma f^D}{D_i^C} \left[p_D + \tau_i \gamma_i^O p_M\right]^\sigma . \tag{12}$$

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) :

$$\left(\phi^O\right)^{\sigma-1} = \frac{\sigma\left[f^O - f^D\right]\left[p_D + \gamma_i^O \tau_i p_M\right]^\sigma}{D_i^W}. \tag{13}$$

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:

$$\left(\phi^P\right)^{\sigma-1} = \frac{\sigma\left[\left[p_D + \gamma_i^P p_M\right] f^P - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O\right]}{\left[\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} D_i^W - \left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\left[D_i^W + D_i^C\right]\right]}. \tag{14}$$

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 (12). Solving for the level of capability at which $\pi^D\left(\phi_f\right) = \pi^P\left(\phi_f\right)$ delivers the capability of the entrepreneur that is indifferent between domestic sales and processing

$$\left(\phi^P\right)^{\sigma-1} = \frac{\sigma\left[f^P\left[p_D + \gamma_i^P p_M\right] - f^D\left[p_D + \gamma_i^O \tau_i p_M\right]\right]}{D_i^W\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} - D_i^C\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}}. \tag{15}$$

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

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

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:

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

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

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

where M_i^X is the total mass of exporters in industry i. Using the cut-offs from equations (13) and (14), 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:

$$S(V)_{O,i} \equiv \frac{\frac{V_{O,i}}{V_{P,i}}}{1 + \frac{V_{O,i}}{V_{P,i}}} \tag{17}$$

where

$$\frac{V_{O,i}}{V_{P,i}} = \left[\frac{p_D + \gamma_i^O \tau_i p_M}{p_D + \gamma_i^P p_M}\right]^{(1-\sigma)}\left[\left(\frac{\phi^P}{\phi^O}\right)^{k+1-\sigma} - 1\right] \tag{18}$$

and

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

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:

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

Using the cutoffs from equations (15) and (16), the value share of exports organized as ordinary in this diversified equilibrium is

$$S(V)_{O,i} \equiv \frac{\frac{V_{O,i}}{V_{P,i}}}{1 + \frac{V_{O,i}}{V_{P,i}}} \tag{20}$$

where

$$\frac{V_{O,i}}{V_{P,i}} = \left[1 + \frac{D_i^C}{D_i^W}\right] \left[\frac{p_D + \gamma_i^O \tau_i p_M}{p_D + \gamma_i^P p_M}\right]^{(1-\sigma)} \left[\frac{1}{\left(\frac{\phi^O}{\phi^P}\right)^{k+1-\sigma} - 1}\right]. \tag{21}$$

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 (13), (14), (15), and (16) 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 (17)- (21) show that $S(V)_{O,i}$ increases as τ_i falls.

A.6 Proof of Proposition 2

Expressions (17)-(21) 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 cost 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.[45] The profit function for entrepreneurs producing both the ordinary and processing goods is:

$$\pi_i^B(\phi_f) = \left[\frac{D_i^W}{\sigma}\left[p_D + \gamma_i^P p_M\right]^{1-\sigma} + \frac{D_i^W + D_i^C}{\sigma}\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\right]\phi_f^{\sigma-1} - \left[p_D + \gamma_i^P p_M\right] f^P - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O - f^B. \tag{22}$$

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:

$$\left(\phi^{0,B}\right)^{\sigma-1} = \frac{\sigma\left[p_D + \gamma_i^O \tau_i p_M\right] f^O + \sigma f^B}{\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\sigma}\left[D_i^W + D_i^C\right]}. \tag{23}$$

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:

$$\left(\phi^{1,B}\right)^{\sigma-1} = \frac{\sigma\left[p_D + \gamma_i^P p_M\right] f^P + \sigma f^B}{\left[p_D + \gamma_i^P p_M\right]^{1-\sigma}\left[D_i^W\right]}. \tag{24}$$

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 (14)] and a lower productivity necessary to export through both organizational forms [equation (23)]. 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.

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 24] as input tariffs fall. But as can be seen from equation (16) , the minimum capability to export through ordinary trade falls while the minimum productivity at which an entrepreneur enters processing exports rises [equation (15)]. 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 (23) defines the marginal firm. As input tariffs fall, the minimum capability needed to export through both organizational forms falls [equation (23)] 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

[45] Adding an explicit treatment of multi-product firms is 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.

falling input tariffs [equation (24)] 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

$$\pi_i^D(\phi_f) = \frac{\mathbf{P^C_{O,i}}^{\epsilon-\sigma} D_i^C}{\epsilon}\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\epsilon}\phi_f^{\epsilon-1} - \left[p_D + \gamma^O \tau_i p_M\right] f^D, \tag{25}$$

$$\pi_i^O(\phi_f) = \frac{\left(D_i^W \mathbf{P^W_{O,i}}^{\epsilon-\sigma} + D_i^C \mathbf{P^C_{O,i}}^{\epsilon-\sigma}\right)}{\epsilon}\left[p_D + \gamma_i^O \tau_i p_M\right]^{1-\epsilon}\phi_f^{\epsilon-1} - \left[p_D + \gamma_i^O \tau_i p_M\right] f^O, \tag{26}$$

and

$$\pi_i^P(\phi_f) = \frac{D_i^W \mathbf{P^W_{P,i}}^{\epsilon-\sigma}}{\epsilon}\left[p_D + \gamma_i^P p_M\right]^{1-\epsilon}\phi_f^{\epsilon-1} - \left[p_D + \gamma_i^P p_M\right] f^P. \tag{27}$$

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:

$$S(V)_{O,i} \equiv \frac{\frac{V_{O,i}}{V_{P,i}}}{1 + \frac{V_{O,i}}{V_{P,i}}} \tag{28}$$

where

$$\frac{V_{O,i}}{V_{P,i}} = \left[\frac{\mathbf{P^W_{i,O}}}{\mathbf{P^W_{i,P}}}\right]^{\epsilon-\sigma}\left[\frac{p_D + \gamma_i^O \tau_i p_M}{p_D + \gamma_i^P p_M}\right]^{(1-\epsilon)}\left[\left(\frac{\phi^P}{\phi^O}\right)^{k+1-\epsilon} - 1\right] \tag{29}$$

and

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

Under the Pareto restriction $k > \epsilon - 1$, simple inspection of equation (30) shows that its numerator is falling and the denominator is rising in τ_i. Consequently, equation (29) and, therefore, (28) 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

$$\tau_{f,t} = \sum_{i' \in \mathscr{I}_f} \gamma_{fi',2006}\tau_{i',t}. \tag{31}$$

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

$$\beta_{fi,2006} = \frac{M_{fi,2006}}{\sum_{f'} M_{f'i,2006}} \quad \text{where} \quad \sum_{f'} \beta_{f'i,2006} = 1. \tag{32}$$

The industry input tariff is calculated using equations (31) and (32):

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

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

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

where

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

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

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

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)
$\tau_{I,it}$		-0.0097**	0.0064**	-0.020***	0.0083***	-0.015***		
	(0.0024)	(0.0041)	(0.0028)	(0.0051)	(0.0027)	(0.0047)		
$\Delta\tau_{I,i}$							-0.014***	-0.0090**
							(0.0031)	(0.0042)
$\tau_{I,i,2000}$							-0.010***	-0.010***
							(0.0022)	(0.0022)
$BEC_{K,i}$	0.36***	-0.0069	0.32***	-0.21**	0.28***	-0.19**	-0.054***	-0.12**
	(0.0356)	(0.1375)	(0.0300)	(0.1004)	(0.0260)	(0.0759)	(0.0199)	(0.0492)
$BEC_{INT,i}$	0.17***	-0.038	0.17***	-0.24***	0.13***	-0.19***	-0.016	-0.082**
	(0.0268)	(0.0994)	(0.0236)	(0.0740)	(0.0209)	(0.0605)	(0.0155)	(0.0394)
$BEC_{K,i} * \tau_{I,it}$		0.022***		0.054***		0.059***		
		(0.0085)		(0.0109)		(0.0098)		
$BEC_{INT,i} * \tau_{I,it}$		0.011**		0.038***		0.036***		
		(0.0053)		(0.0065)		(0.0064)		
$BEC_{K,i} * \Delta\tau_{I,i}$								-0.0069
								(0.0060)
$BEC_{INT,i} * \Delta\tau_{I,i}$								-0.0070*
								(0.0041)
$\ln(D_i)$	0.038***	0.040***	0.051***	0.054***	0.044***	0.046***		
	(0.0088)	(0.0088)	(0.0076)	(0.0074)	(0.0064)	(0.0064)		
$\Delta\ln(D_i)$							0.016***	0.017***
							(0.0049)	(0.0050)
$Nunn_i$	-0.82***	-0.82***	-0.72***	-0.69***	-0.56***	-0.55***	0.15***	0.15***
	(0.0666)	(0.0666)	(0.0615)	(0.0608)	(0.0494)	(0.0483)	(0.0333)	(0.0333)
$\ln(S_i/U_i)$	0.36***	0.37***	0.29***	0.30***	0.15***	0.16***	-0.15***	-0.15***
	(0.0509)	(0.0512)	(0.0406)	(0.0403)	(0.0333)	(0.0331)	(0.0242)	(0.0242)
$\ln(K_i/L_i)$	-0.11**	-0.11**	-0.12***	-0.12***	-0.013	-0.010	0.069***	0.069***
	(0.0511)	(0.0512)	(0.0417)	(0.0418)	(0.0342)	(0.0343)	(0.0232)	(0.0231)
Obs.	31,747	31,747	39,761	39,761	46,998	46,998	28,221	28,221
Left Cens.	840	840	509	509	365	365	100	100
Non-Cens.	7,877	7,877	9,543	9,543	11,638	11,638	27,458	27,458
Right Cens.	23,030	23,030	29,709	29,709	34,995	34,995	663	663

Standard errors in parentheses are clustered at the six-digit HS level. All regressions include province fixed . effects $p < 0.01 :^{***}, 0.01 \le p < 0.05 :^{**}, 0.05 \le p < 0.10 :^{*}$. 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	2000	2003	2003	2006	2006	(00-06)	(00-06)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\tau_{O,it}$	-0.013***	0.0072*	-0.0076***	0.0031	-0.0011	-0.00047	0.0010	
	(0.0018)	(0.0039)	(0.0021)	(0.0046)	(0.0019)	(0.0036)	(0.0021)	
$\Delta\tau_{O,i}$							-0.014***	0.0035
							(0.0023)	(0.0027)
$\tau_{O,i,2000}$								3.3e-06
								(0.0023)
$BEC_{K,i}$	0.074	0.36***	0.060	0.049	0.013	-0.071	0.072*	-0.0046
	(0.0494)	(0.1313)	(0.0421)	(0.1038)	(0.0383)	(0.0809)	(0.0369)	(0.0413)
$BEC_{INT,i}$	-0.63***	0.037	-0.52***	-0.27***	-0.48***	-0.45***	0.27***	-0.0020
	(0.0427)	(0.1074)	(0.0358)	(0.0876)	(0.0304)	(0.0627)	(0.0379)	(0.0445)
$BEC_{K,i} * \tau_{O,it}$		-0.0050		0.012		0.011		
		(0.0065)		(0.0076)		(0.0068)		
$BEC_{INT,i} * \tau_{O,it}$		-0.030***		-0.017***		-0.0032		
		(0.0047)		(0.0055)		(0.0043)		
$BEC_{K,i} * \Delta\tau_{O,i}$								-0.00041
								(0.0029)
$BEC_{INT,i} * \Delta\tau_{O,i}$								-0.030***
								(0.0034)
$\ln(D_i)$	0.066***	0.053***	0.057***	0.055***	0.058***	0.057***		
	(0.0095)	(0.0093)	(0.0082)	(0.0082)	(0.0076)	(0.0076)		
$\Delta\ln(D_i)$							0.0094	0.014
							-0.0111	-0.0109
$Nunn_i$	0.88***	0.88***	0.72***	0.72***	0.45***	0.46***	-0.67***	-0.66***
	(0.0690)	(0.0682)	(0.0597)	(0.0598)	(0.0566)	(0.0568)	(0.0696)	(0.0699)
$\ln(S_i/U_i)$	0.38***	0.33***	0.29***	0.28***	0.30***	0.29***	-0.44***	-0.41***
	(0.0536)	(0.0527)	(0.0433)	(0.0434)	(0.0393)	(0.0395)	(0.0617)	(0.0603)
$\ln(K_i/L_i)$	0.055	0.065	0.053	0.053	-0.013	-0.013	-0.12***	-0.11**
	(0.0449)	(0.0432)	(0.0396)	(0.0390)	(0.0363)	(0.0363)	(0.0481)	(0.0480)
Obs.	33,111	33,111	39,185	39,185	40,486	40,486	25,683	25,683
Left Cens.	5,105	5,105	3,717	3,717	3,415	3,415	647	647
Non-Cens.	12,234	12,234	15,397	15,397	17,235	17,235	22,164	22,164
Right Cens.	15,772	15,772	20,071	20,071	19,836	19,836	2,872	2,872

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 Construction of Domestic Content Ratios

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:

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

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

$$DCR_{f,j} \equiv \frac{DC_{f,j}}{V_{f,j}} \quad \text{where} \quad DC_{f,j} \equiv V_{f,j} - m^{M}_{f,j}. \tag{33}$$

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). For processing exports, calculating the term in equation (33) 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 (34) where $V_{f,D}$ is the value of domestic sales:

$$DCR_f = \frac{\sum_{j=O,P} DC_{f,j}}{\sum_{j=O,P} V_{f,j}} = \frac{V_{f,O} + V_{f,P} - \frac{V_{f,O}}{V_{f,O}+V_{f,D}} m^{M}_{f,O} - m^{M}_{f,P}}{V_{f,O} + V_{f,P}}. \tag{34}$$

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.

F 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)
$\tau_{I,it}$	-0.015***	-0.0094***	-0.018***	-0.0084***	-0.012***	-0.0030		
	(0.0028)	(0.0024)	(0.0034)	(0.0028)	(0.0034)	(0.0027)		
$\Delta\tau_{I,i}$							-0.020***	-0.028***
							(0.0037)	(0.0066)
$\tau_{I,i,2000}$								-0.011**
								(0.0044)
$\ln(D_i)$		0.066***		0.090***		0.078***		
		(0.0122)		(0.0094)		(0.0078)		
$\Delta\ln(D_i)$								0.048***
								(0.0101)
$Nunn_i$		-0.69***		-0.84***		-0.60***		0.32***
		(0.0854)		(0.0662)		(0.0531)		(0.0784)
$\ln(S_i/U_i)$		0.21***		0.26***		0.24***		-0.13*
		(0.0713)		(0.0559)		(0.0436)		(0.0657)
$\ln(K_i/L_i)$		0.022		-0.13**		-0.036		-0.060
		(0.0695)		(0.0563)		(0.0443)		(0.0593)
Obs.	11,070	11,070	16,830	16,830	23,412	23,412	9,472	9,472
Left Cens.	1150	1150	919	919	840	840	123	123
Non-Cens.	3907	3907	5655	5655	7992	7992	8473	8473
Right Cens.	6013	6013	10256	10256	14580	14580	876	876

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.