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One third of Chinese exporters sell more than ninety percent of their production abroad. We argue that this distinctive pattern is attributable to the widespread use of subsidies that require firms to export the vast majority of their output. We study this type of subsidy in the context of a heterogeneous-firm model, and show that it is worse from a welfare standpoint than a regular export subsidy, partly because it increases protection of the domestic market. A counterfactual analysis suggests that eliminating these subsidies would result in a welfare gain for China comparable to that of halving its trade costs.

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"In certain zones, companies are apparently only allowed to locate when they enter obligations to export a certain minimum percentage amount of their production. [C]an China please explain how such practices are compatible with the obligations resulting from the accession protocol [?]"

Questions by the European Communities with regard to China's Transitional Review Mechanism on Subsidy Practices. World Trade Organization, September 21, 2004.

1 Introduction

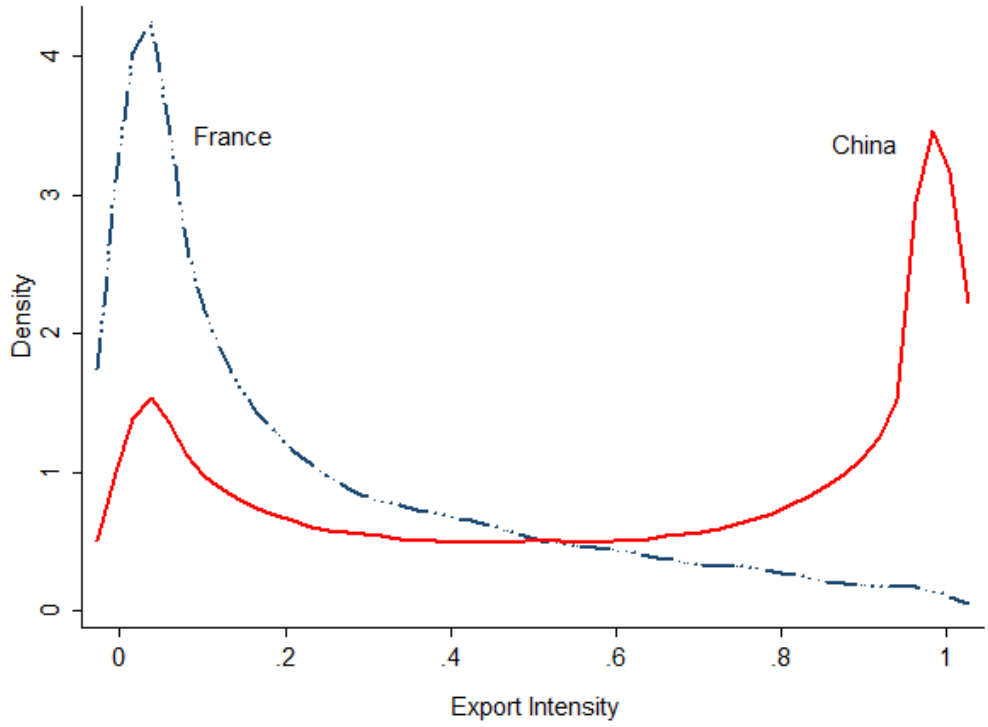
The exact nature of China's export subsidies has always been murky. The fact that China's trade regime features a wide range of policies that favor firms producing almost exclusively for the foreign market – which we refer to as "pure exporter subsidies" – is not widely appreciated. In recent discussions at the World Trade Organization (WTO), the European Communities questioned the case of the "Shanghai Foreign Investment Center", where firms *exporting the majority of their production* enjoy various preferential policies such as fiscal advantages, softer loans and priority access to infrastructure and land. The WTO document also mentions that firms *exporting more than 70 percent of their production* benefit from an exemption from local income tax and a reduction on their corporate income tax rate.[1] While the use of these types of subsidies is widespread across developing countries, China has implemented them on an incredibly large scale over the last three decades.[2]

We argue that this extensive use of pure exporter subsidies has resulted in an extraordinary number of manufacturing firms in China exporting all or almost all of their production. Figure 1 presents the distribution of Chinese and French manufacturing exporters in terms of their export intensity, i.e. the share of total sales accounted for by exports. Between 2000 and 2006, more than a third of Chinese manufacturing exporters sold 90 percent or more of their output abroad. In contrast, only 1.9 percent of French exporters display such high export intensity. Similarly, Bernard et al. (2003) report a corresponding figure of 0.7 percent for exporters in the United States.

[1] Questions by the European Communities with regard to China's Transitional Review Mechanism on Subsidies and Countervailing Measures, 30 September 2003 (references G/SCM/Q2/CHN/5 and G/SCM/Q2/CHN/7).

[2] Other examples include India's 100 percent export-oriented units, which enjoy no duties on imported capital goods and raw materials and are exempted of paying corporate income tax for their first 8 years of operation. Farole (2011, Table 3.5) documents minimum export share requirements, between 70 and 100 percent for firms enjoying similar advantages in special economic zones in Bangladesh, Dominican Republic, Honduras, Ghana, Kenya, Senegal and Tanzania.

Figure 1: Export Intensity Distribution for Chinese and French Manufacturing Exporters



The figure depicts the kernel density of export intensity, defined as the share of exports in total sales, for firms reporting a positive value of exports. Data for Chinese manufacturing exporters is for the period 2000-2006 and is described in detail in Section 4. Data on French exporters are from the Enquete Annuelle Entreprises, SESSI, for the year 2000.

In this paper, we provide the first formal analysis of the economic implications of pure-exporter subsidies. We propose a simple model in which heterogeneous firms may choose to operate as pure exporters, selling all their output abroad in return for an ad-valorem sales subsidy. This modeling approach seeks to encompass in a parsimonious way the myriad of policies favoring pure exporters, which are described in detail in Section 2. We use matched customs and balance sheet data for the period 2000-2006 to explore whether the mechanism highlighted in our model provides a suitable explanation for the large number of firms exporting all their output. By identifying firms that are more likely to benefit from pure-exporter subsidies, we find support for our model's predictions regarding the productivity and tax expenditure premia of pure exporters relative to other firms. We then investigate the welfare effects of China's unilateral use of a pure exporter subsidy in general equilibrium. To highlight the distinct features of this policy instrument, we compare its implications

with those produced by a standard ad-valorem export subsidy, i.e. one that is not conditional on a firm exporting all its output. We find the pure exporter subsidy to be more distorting and worse in welfare terms than the standard export subsidy. By reducing the number of varieties available to Chinese consumers, the former lessens competition in the domestic market and provides heightened protection for the least efficient, domestically-oriented firms.

Our starting point is a partial equilibrium model in which firms choose to operate in one of three different production regimes: domestic, regular or pure-exporter, based on their idiosyncratic productivity. In the absence of subsidies, the most productive firms self-select become regular exporters (i.e. selling both at home and abroad), intermediate-productivity firms serve only the domestic market and the least productive firms exit the market, as in Melitz (2003). We show that under these circumstances, a strictly positive subsidy is necessary to induce firms to become pure exporters. Moreover, we find that when pure exporters start to arise, they do so in the middle of the productivity distribution; more precisely, around the no-subsidy export productivity cutoff. As a result, pure exporters exhibit an intermediate level of productivity between that of domestic firms and that of regular exporters.

Although pure exporter subsidies are extremely difficult to observe in the data, we are able to identify three types of firms likely to receive preferential treatment conditional on exporting most of their production under the regulations effective between 2000 and 2006.[3] These are foreign-invested enterprises which benefit from a preferential treatment when exporting most of their production, establishments devoted to export processing activities, and firms located in Free Trade Zones. Altogether, these three types of firms account for 90 percent of the exporters in our data. Identifying pure exporters as firms exporting more than 90 percent of their output, we provide evidence of a higher prevalence of pure exporters within these three groups compared to the remaining group of firms.

In line with the predictions from our model, we find that pure exporters present a 35.9 percent productivity premium relative to domestic firms, but are 25.8 percent less productive than regular

[3]While China was required to notify the WTO of any subsidy under the provision of Article 1 of the Agreement on Subsidies and Countervailing Measures ahead of each year's Transitional Review Mechanism, it only submitted two notifications in 2006 and 2011 after joining the WTO in 2001. Both notifications were deemed to be highly incomplete, since they failed to state the level and annual amount spent in a large number of subsidies listed in the notification. Additionally, there was no acknowledgement of any subsidies granted at sub-national, provincial and local level in either notification. See "Request from the United States to China," October 11, 2011, reference G/SCM/Q2/CHN/42.

exporters. Additionally, we also show that pure exporters' corporate income tax, value-added tax and sales tax outlays (as a share of their value-added) are significantly lower than those of domestic firms and regular exporters. These differences hold despite the inclusion of a full set of prefecture-city specific effects, which capture the various advantages received by firms located in Free Trade Zones. By conducting a group-wise comparison among exporters, e.g. comparing pure and regular foreign-owned exporters, we also show that our results concerning the productivity and tax premia are not driven by the ownership or processing status of firms.

To investigate the economic implications of pure exporter subsidies, we embed our partial equilibrium framework into a two-country general equilibrium model and calibrate it to match key cross-sectional moments based on the firm-level data. We conduct a comparative statics exercise with respect to the total expenditure on export subsidies, and to highlight the distinct features of the pure exporter subsidy, we compare it to a regular export subsidy. For a given level of expenditure in export subsidies, our comparison reveals that a pure-exporter subsidy provides protection for domestic firms, whereas the standard export subsidy produces the opposite effect. By preventing pure exporters from selling in the domestic market, the number of varieties sold in China falls, driving up the domestic price index and lessening the degree of competition among firms in the Chinese market. This in turn reduces the productivity threshold necessary for Chinese firms to operate in the domestic market. A standard export subsidy on the other hand, allows exporters to expand at the expense of the domestic firms, inducing exit at the lower end of the productivity distribution.

A heavy reliance on encouraging exports while at the same time protecting the domestic market has been a cornerstone of China's transition into a market economy (Naughton, 2007). Since the late 1970s, China has been characterized by a dualistic trade regime in which a system of export-oriented enclaves coexist with a highly protected domestic economy; a situation that Feenstra (1998) described as "one country, two systems." Our paper shows how pure-exporter subsidies contribute to this strategy by boosting exports while simultaneously decreasing domestic competition and preventing the exit of the least productive firms. By hindering market selection, this trade policy can also be interpreted as a means through which to pursue what Lau et al. (2000) referred to as a "reform without losers," thus enabling the Chinese government to gain the support of agents who

would not otherwise support a full market liberalization.[4]

The successive appeals by the European Union, the United States and other member countries at the WTO has forced China to scrap several export support programs and preferential treatment for its exporters.[5] These developments naturally raise the question of what would be the consequences of eliminating pure-exporter subsidies. To address this issue, we conduct a counterfactual policy analysis in which we find that if China were to stop using pure-exporter subsidies it would experience a welfare gain of approximately 3 percent (in terms of an increase in real income). This is equivalent to the welfare improvement produced by halving bilateral transportation costs in a situation without pure exporter subsidies. Conversely, the rest of the World would experience a welfare reduction of 1.15 percent.

Our model can also be used to evaluate the welfare consequences of trade liberalization in the presence of pure exporter subsidies. In this scenario, the welfare gain due to a reduction in bilateral trade costs is counteracted by the distortion arising from a larger number of pure exporters operating in China. Following China's accession to the WTO we observe a substantial rise in the share of pure exporters, which increase from 30 to 40 percent of all manufacturing exporters between 2000 and 2006. In the context of our model, a 17 percent reduction in bilateral trade costs would result in a similar rise in pure exporters, implying a welfare loss of 0.75 percent in China and a welfare gain in the rest of the World of 1.44 percent relative to our calibrated benchmark equilibrium.

Our paper contributes to the growing body of research that quantifies the welfare and productivity gains resulting from China's reforms mandated by its accession to the WTO (Bajona and Chu, 2010; Khandelwal et al., Forthcoming). Bajona and Chu (2010) study the welfare implications of China's reduction of subsidies to its state-owned sector as required by its accession protocol. They find that decreasing the degree of dualism between the private and state-owned sector improves resource allocation, resulting in a 1.5 percent welfare gain. In a similar vein, Khandelwal et al. (Forthcoming) quantify the productivity gains arising from the removal of export licenses in the

[4]Another argument often used by policymakers to justify this policy is related to the existence of knowledge spillovers generated by the foreign multinationals. In the online appendix we provide some evidence suggesting that this might not be particularly important in the case of China.

[5]For instance, China modified its corporate tax law in January 2008, ending the preferential treatment of pure-exporting multinationals. The Famous Brands initiative, a large umbrella of export support programs which featured several subsidies contingent on export performance, was introduced in 2005, disputed at the WTO in 2008 and abandoned in 2009. The auto export base program introduced in 2009, has already been challenged in 2012 by the Obama Administration during the 2012 presidential election.

textiles and clothing sector. Their analysis reveals that a substantial share of this gain stems from eliminating the inefficient allocation of licenses by the central government.

China's becoming the workshop of the World and its implications for its trading partners have been recently studied by Lu (2010), Hsieh and Ossa (2011) and di Giovanni et al. (2012). These models emphasize the role of productivity differences across sectors in multi-country, multi-sector environments. Lu's calibration strategy is especially relevant for our work since it explicitly targets the share of Chinese firms exporting all their output. However, Lu's model hinges on the assumption that exporters (at least in some sectors) are less productive than domestic firms, while recent studies cast doubt on this assumption.[6] Additionally, Lu focuses on technological differences across sectors, whereas our paper emphasizes the role of trade policy in explaining the large number of pure exporters in China. Our analysis of pure-exporter subsidies is also related to the literature studying trade policy in a heterogeneous-firm environment (Chor, 2009; Demidova and Rodríguez-Clare, 2009; Felbermayr et al., 2012) as well as to the body of work investigating the welfare implications of export-processing zones and duty drawbacks (Hamada, 1974; Miyagiwa, 1986; Panagariya, 1992; Ianchovichina, 2007).[7]

The rest of the paper is organized as follows. Section 2 provides an overview of Chinese policies favoring pure exporters. Section 3 presents our partial equilibrium model and spells out the conditions under which pure-exporter firms arise. Section 4 describes the data used in our empirical analysis and shows how we take the predictions developed in Section 3 to the data. Section 5 presents our general equilibrium model of pure exporter subsidies. It also presents our comparative statics exercise comparing the pure exporter subsidy to a standard ad-valorem export subsidy and our counterfactual policy experiments. Section 6 concludes.

2 Overview of Policies Favoring Pure Exporters

In this section we provide a concise overview of different regulations, all of which aim to provide incentives for firms to export all or most of their output. Three major groups of policies favoring

[6] Measuring productivity by Total Factor Productivity instead of value-added per worker as Lu does, our empirical analysis as well the studies by Dai et al. (2011) and Ma et al. (2011) show that Chinese exporters are more productive than non-exporters.

[7] See Heid et al. (Forthcoming) for a recent contribution that quantifies the welfare impact of the rapid expansion of the *maquiladora* sector in Mexico in the presence of labor market frictions.

pure-exporters can be identified: the attraction of Foreign-Invested Enterprises (FIEs), the promotion of Processing Trade Enterprises (PTEs) and the establishments of Free-Trade Zones (FTZs). An online Appendix provides a translation of the specific legislations described below.

It is important to note that Free-Trade Zones and duty drawback schemes such as China's processing trade regime are not illegal per-se under the WTO agreements. However, if a measure such as lower fiscal liability, is offered for the sole purpose of exporting, and more specifically sets minimum export targets for companies such as the examples provided below, then it would violate Article 3 of the ASCM and the Trade-Related Investment Measures (TRIMs) Agreement.[8]

Foreign-Invested Enterprises

Aimed at attracting foreign investment, the 'twenty-two regulations' established in 1986 defined an 'export-oriented' firm as a manufacturing enterprise whose export volume accounts for 50 percent or above of its annual sales.[9] Foreign-Invested Enterprises (FIEs) with an export intensity exceeding such a threshold, benefit from preferential land-use policies, easier access to finance and exemptions from industrial and commercial consolidated tax. Until 2001, being an export-oriented firm was a requirement for foreign investments in China and FIEs had to specify their domestic sales ratio by contract.[10] Firms that did not comply with this requirement would face steep penalties. For instance, FIEs that did not meet the targets set for export-oriented enterprises within three years from the day when they began production were required to repay 60 percent of the tax refunded.[11] After China's accession to the WTO, the law of The People's Republic of China on Foreign Capital Enterprises revised in October 2000, lifted the requirement for FIEs to export the majority of their production. Nevertheless, financial incentives conditional on export-intensity have remained in use long after China entered the WTO.

The first paragraph of China's corporate income tax law, promulgated in 1991 and effective until 2008, stated that the 'establishment of enterprises with foreign investment which export all or the greater part of their production' should be encouraged.[12] The law stated that the standard

[8] We thank Petros Mavroidis and Luca Rubini for clarifying this point from a legal perspective.

[9] 'Enforcement of the Provisions of the State Council on Encouraging Foreign Investment', January 1, 1987.

[10] 'Circular of the Ministry of Foreign Trade and Economic Cooperation on Submission of Import and Export Plans for Enterprises with Foreign Investment', October 25, 2000.

[11] 'Corporate Income Tax Law of the People's Republic of China', 30 June 1991, Article 8.4.4.

[12] 'Corporate Income Tax Law of the People's Republic of China', 9 April 1991, Basic Regulations. 8.1.

Table 1: Corporate Income Tax Rate, 1991 to 2008

	National tax rate	Special Economic Zones	Coastal Development Zones	Yangtze and Pearl Economic Zones	Industrial Parks*
Export sales ratio					
			Foreign-Invested Enterprises		
Below 70%	30%	15%	24%	24%	15%
Over 70%	15%	10%	10%	10%	10%
			Production Enterprises		
Below 70%	30%	15%	15%	15%	15%
Over 70%	30%	10%	10%	10%	10%

* Industrial Parks includes "Economic and Technological Development Zones", "High-Technology Industrial Development Zones" and "Export Processing Zones."

corporate income tax rates for Chinese-owned firms operating in China was 30 percent, however FIEs exporting more than 70 percent of their production faced a lower income tax rate of just 15 percent. FIEs also enjoyed a preferential income tax rate of 15 percent if they were located in a Free Trade Zone (FTZ) (or 24 percent in a costal zone). In these specific locations FIEs exporting more than 70 percent of their production would see their income tax rate further reduced to 10 percent.[13] Table 1 presents the statutory corporate income tax rates for different types of firms between 1991 and 2008. As a result of several complaints by the European Union, the United States and Canada at the WTO, China substantially modified its corporate income tax legislation in January 2008. The new corporate tax rate of 25 percent applies equally to domestic and foreign companies. Moreover, the fiscal advantages conditional on a firm's export intensity have been eliminated. A five-year transition period has been established so that the new tax law will be fully operational after 2012.

The 1995 regulations 'Guiding the Direction of Foreign Investment' also incorporate restrictions on local sales for FIEs. For instance, all foreign investment projects are classified into one of four possible categories: encouraged, permitted, restricted and prohibited projects. Restricted projects must be examined and approved by the relevant authorities. However, restricted projects that export at least 70 percent of their total sales may be deemed as permitted.[14,15] This rule still

[13]'Corporate Income Tax Law of the People's Republic of China', 30 June 1991, Article 8.3.5.

[14]'Regulations for Guiding the Direction of Foreign Investment', June 7, 1995, Article 11.

[15]The first 10 listed products by the 1995 Catalogue for the Guidance of Foreign Investment Industries (in order of appearance) are: machinery, assemblage of movements of digital watches and finished watches, bikes, knitting

applies today, even though China has substantially revised the list of restricted products after joining the WTO. The 2002 regulation has introduced a new project category called 'all-for export projects', which includes all projects that export 100 percent of their production. Such projects are treated as encouraged projects automatically and therefore enjoy preferential treatment.[16] For instance, all-for export projects are entitled to a 20 percent refund of import duty and import value-added tax.[17]

Processing Trade Enterprises

China established the legal framework for processing trade in 1979 under which inputs and components needed for the production of goods for export were imported duty-free (Naughton, 1996). Since the early 1990s, assembling and processing has consistently accounted for approximately 50 percent of China's export volume. From a legal point of view, Processing Trade Enterprises (PTEs) are production enterprises or factories established by business enterprises but with independent accounting and their own business licence.

In practice, the strict administrative controls that characterize this export regime make it difficult for firms to combine it with ordinary trade. For instance, enterprises engaged in processing need to obtain a production capability certification as well as a processing trade approval certificate granted by government authorities. PTEs also face a strict control over their domestic sales. These enterprises are allowed to import inputs duty-free as long as they are not used for domestic consumption. If any output is sold in the domestic market, firms must promptly pay the tariffs and VAT on the imported materials. More importantly, they must obtain approval from both the provincial commerce authorities and customs for an import licence. Failing to do so translates into a penalty ranging from 30 to 100 percent of the declared value of the imported materials and parts.[18] As a consequence, the Hong Kong Trade Development Council (2009) reports that "most traditional processing trade factories are still export-oriented, the share of domestic sales of these

machines and electric appliances: washing machines, refrigerators, freezers, tins.

[16]'Regulations for Guiding the Direction of Foreign Investment', February 11, 2002.

[17]'General Administration of Customs and State Administration of Taxation', 4 September 2002.

[18]Hong Kong Trade Development Council (2003), 'Guide to Doing Business in China', Chapter on 'Processing-Trade'. Based on the circular concerning issuance of "Interim Measures on Administration of the Examination and Approval of Processing Trade" and "Interim Measures on Administration of the Examination and Approval of Domestic Sale of Bonded Materials and Parts Imported for Processing Trade", Ministry of Foreign Trade and Economic Cooperation (1999, WJMGF. No. 314 and No. 315).

factories is negligible." To enjoy autonomy in domestic sales, a processing trade enterprise has to change its registration and become a FIE, which requires it to temporarily stop their production for a customs auditing. The consulting company Li & Fung Group (2012) estimates that "production stoppage can take 9 to 12 months." Furthermore, the transformation from PTE to FIE "involves the work of more than 10 government departments" and might require a substantial tax repayment.

An additional advantage that PTEs enjoy is that they can import equipment provided by a foreign client to be used in processing duty-free. To obtain this benefit, the PTE has to be an independent factory devoted to export processing, in which case it exports 100 percent of its production. If the PTE does not count with a processing-oriented facility, it needs to specify in the terms of their processing trade contract that over 70 percent of its output must be exported.

Free Trade Zones

The third major element of China's trade policy providing incentives for pure exporters is the establishment of Free-Trade Zones (FTZs), externally-oriented enclaves designed to attract foreign investors by means of streamlined regulations, tax concessions, duty-free imports of materials and equipment used for exporting, among other allowances. Another crucial objective of the creation of FTZs was to use them as "laboratories" where market-oriented policies would be evaluated before their potential implementation in the rest of the economy. The Chinese government initially designated four counties in Guangdong and Fujian provinces as FTZs, called Special Economic Zones in 1979 as one of the components of Deng Xiaoping's package of economic reforms aimed at reintegrating China into the world economy. The following two decades would witness the establishment of a large number of FTZs in cities located primarily along the coastal regions, where a vast majority of China's export-oriented industrial production is still located today.

FTZs provide additional incentives for pure exporters over and above the policies described in previous sections. Foreign-Invested Enterprises (FIEs), Processing Trade Enterprises (PTEs) but also Chinese-owned enterprises are encouraged to locate in these zones, in which several available subsidies are granted conditional on firms satisfying certain export/sales ratio requirements. Notably, in all FTZs, such as the Special Economic Zones, Coastal Development Zones, Yangtze and Pearl River Delta Economic Zones as well as some smaller industrial parks,[19] where the corporate

[19]Industrial Parks includes "Economic and Technological Development Zones", "High-Technology Industrial De-

income tax rate is already set at 15 percent, enterprises exporting more than 70 percent of their production face a lower 10 percent corporate income tax rate, independently of their ownership structure or trade regime.[20]

Since FTZs compete fiercely among themselves to attract FIEs, they have introduced additional incentives aimed at export-oriented firms. For instance, Standard Chartered Bank (2007) reports the case of Shenzhen city, China's first special economic zone with a total area of 493 km^2, where firms that can prove they have paid all their value-added taxes on inputs and that export 100 percent of their production qualify for a 5 percent sales cash subsidy. The Shenzhen Special Economic Zone also reduces to half the "land use fee" charged on certified "enterprises-for-export". Similarly, most "Export Processing Zones" have strict requirements for firms' domestic sales ratio – usually 30 percent of the total volume of sales. The first 15 pilots of this new type of zone were set up in 2000, and their number has more than tripled in the last decade. The Chinese government seems keen to experiment with new strategies to encourage firms exporting most of their production.

3 A Simple Model of Pure-Exporter Subsidies

Consider a world with two countries, China (c) and the rest of the World (f). Consumer preferences are such that a producer of variety ω faces the following iso-elastic demand function in market i,

$$q(\omega) = A_i p(\omega)^{-\sigma}, \quad i \in \{c, f\}, \tag{1}$$

where $p(\omega)$ is the price of the variety ω, A_i is a measure of market size in country i and σ is the elasticity of substitution between varieties. Production is carried out by monopolistically-competitive firms using a linear technology with labor as the sole input,

$$q = \varphi l, \tag{2}$$

where φ is a firm-specific productivity index. Since each firm produces a unique variety, we can index firms by their productivity level φ.

velopment Zones" and "Export Processing Zones".

[20] 'Corporate Income Tax Law of the People's Republic of China', 16 September 1991, Article 5.

A Chinese firm can choose between three potential modes of operation: (i) produce for the domestic market alone, by paying a fixed cost f_d, (ii) become a regular exporter selling both domestically and abroad, by paying a fixed cost of exporting f_x in addition to the fixed cost of operating in the domestic market, f_d, and (iii) become a pure exporter, a firm that exports all its output, by paying the export fixed cost f_x and receiving an ad-valorem subsidy s on its sales. We assume that firms in the rest of the World can only operate domestically or as regular exporters. Since the focus of this section is to study under which conditions firms choose to become pure exporters, we focus on the problem faced by Chinese firms below.

Using equations (1) and (2), profit maximization yields the standard condition that a firm's output price is a constant markup over its marginal cost:

$$\begin{aligned} p_c(\varphi) &= \frac{\sigma}{\sigma-1}\frac{w_c}{\varphi}, \\ p_c^*(\varphi) &= \tau p_c(\varphi), \\ p_{cp}^*(\varphi) &= \frac{\tau}{1+s}p_c(\varphi), \end{aligned}$$

where w_c denotes the wage in China, $p_c(\varphi)$ the price charged by Chinese firms in the domestic market, $p_c^*(\varphi)$ the price charged by regular exporters in the foreign market and $p_{cp}^*(\varphi)$, the price charged by pure exporters. Both regular and pure exporters face an iceberg transportation cost $\tau \geq 1$ when selling their output abroad.

Let $k \in \{d, x, p\}$ index the three possible modes of production, domestic, regular and pure exporter respectively. Then the maximum level of profits that a firm with productivity φ using operation mode k can attain is given by,

$$\pi_c^k(\varphi, s) = \begin{cases} \kappa A_c(\varphi/w_c)^{\sigma-1} - f_d w_c, & \text{if } \ k = d, \\ \kappa[A_c + \tau^{1-\sigma}A_f](\varphi/w_c)^{\sigma-1} - (f_d + f_x)w_c, & \text{if } \ k = x, \\ \kappa(1+s)^{\sigma}\tau^{1-\sigma}A_f(\varphi/w_c)^{\sigma-1} - f_x w_c, & \text{if } \ k = p, \end{cases} \tag{3}$$

where $\kappa \equiv (\sigma-1)^{\sigma-1}\sigma^{-\sigma}$. Note that all fixed costs are denominated in units of labor.

In order for a Chinese firm with productivity φ to choose to operate under the pure-exporter regime $k = p$, we need that $\pi_c^p(\varphi, s) \geq \max\{\pi_c^d(\varphi), \pi_c^x(\varphi), 0\}$, or equivalently, that $\pi_c^p(\varphi, s) \geq \pi_c^d(\varphi)$,

$\pi_c^p(\varphi, s) \geq \pi_c^x(\varphi)$ and $\pi_c^p(\varphi, s) \geq 0$ hold altogether. We can characterize this set of conditions by making use of four different productivity cutoffs that define different combinations of productivity and subsidy rates (φ, s) under which a firm is indifferent between two different production modes.

We start with the two standard cutoffs φ^* and φ_x^* that identify domestic firms and regular exporters in the standard Melitz (2003) model in the absence of pure exporters,

$$\varphi^* = \left(\frac{w_c^\sigma f_d}{\kappa A_c}\right)^{\frac{1}{\sigma-1}}, \tag{4}$$

$$\varphi_x^* = \tau \left(\frac{w_c^\sigma f_x}{\kappa A_f}\right)^{\frac{1}{\sigma-1}}. \tag{5}$$

These two cutoffs are respectively, the productivity level above which a Chinese firm would find it profitable to produce for the domestic market alone $\{\varphi : \quad \pi_c^d(\varphi^*) = 0\}$, and the productivity level necessary for a firm to choose to become a regular exporter $\{\varphi : \quad \pi_c^x(\varphi_x^*) = 0\}$. In accordance with the stylized fact that exporters tend to be more productive than domestic firms, we assume that in a situation without pure-exporter subsidies, exporters are more productive than domestic firms in China, i.e. we assume that $(f_d/f_x) \leq [A_c/(\tau^{1-\sigma} A_f)]$, which results in $\varphi^* \leq \varphi_x^*$.

The assumption of selection-into-exporting for the most productive firms combined with the fact that demand functions in both markets are iso-elastic, imply that in order for pure-exporters to arise it is necessary that a strictly positive subsidy rate be offered. If $s = 0$, being a regular exporter would always dominate being a pure-exporter, since regular exporters would attain the same export profits as pure exporters without the need to sacrifice their domestic market. By the same reasoning, firms for which export revenues are not sufficient to cover the fixed cost of exporting f_x would prefer operating domestically than being pure exporters.

We now define two additional cutoffs that arise in the presence of a pure-exporter subsidy. For a given pure-exporter subsidy, s, define $\overline{\varphi}(s)$ as the productivity level at which a firm would be indifferent between being a regular or a pure exporter, i. e. $\overline{\varphi}(s) = \{\varphi : \pi_c^p(\overline{\varphi}, s) = \pi_x^c(\overline{\varphi})\}$. Thus, $\overline{\varphi}(s)$ is given by,

$$\overline{\varphi}(s) = \left(\frac{w_c^\sigma f_d}{\kappa(A_c - \tau^{1-\sigma} A_f[(1+s)^\sigma - 1])}\right)^{\frac{1}{\sigma-1}}. \tag{6}$$

Inspection of (6) reveals that $\overline{\varphi}(s)$ is strictly increasing in s, with $\overline{\varphi}(0) = \varphi^*$ and $\overline{\varphi}(s_1^{\max}) \to \infty$, with $s_1^{\max}$ defined below. In order for a firm to choose to operate as a pure rather than a regular

exporter, it must be the case that the subsidy it receives is greater than the profits it could earn in the domestic market. Thus, high productivity firms would require very high subsidy rates to be swayed towards operating as pure exporters.

Similarly, let $\underline{\varphi}(s)$ be the productivity level such that a firm would be indifferent between selling only in the domestic market and operating as a pure exporter. That is, $\underline{\varphi}(s)$ is defined implicitly by $\underline{\varphi}(s) = \{\varphi : \pi_c^p(\underline{\varphi}, s) = \pi_c^d(\underline{\varphi})\}$. This condition reads

$$\underline{\varphi}(s) = \left(\frac{w_c^\sigma (f_x - f_d)}{\kappa(\tau^{1-\sigma} A_f (1+s)^\sigma - A_c)} \right)^{\frac{1}{\sigma - 1}}. \tag{7}$$

Under the additional assumption that $f_x > f_d$, we can see that $\underline{\varphi}(s)$ is strictly decreasing in s whenever $s > s^{\min}$, with $s^{\min}$ defined below. Firms with productivity $\varphi \in (\varphi^*, \varphi_x^*)$ which would prefer to operate domestically in the absence of pure-exporter subsidies, would find it profitable to change their production mode if the additional revenue they receive because of the subsidy is greater than the difference in fixed costs, $f_x - f_d$. Therefore, domestic firms with relatively high productivity levels would require a lower subsidy to become pure-exporters. Figure 2 plots all the different cutoffs in $\{\varphi, s\}$-space.

Grouping together all cutoffs (4)-(7), we can see that pure-exporters arise when s is such that $\underline{\varphi}(s) \leq \overline{\varphi}(s)$. The minimum level of pure-exporter subsidy necessary for firms to choose the pure-exporter operation mode, $s^{\min}$, is given by,

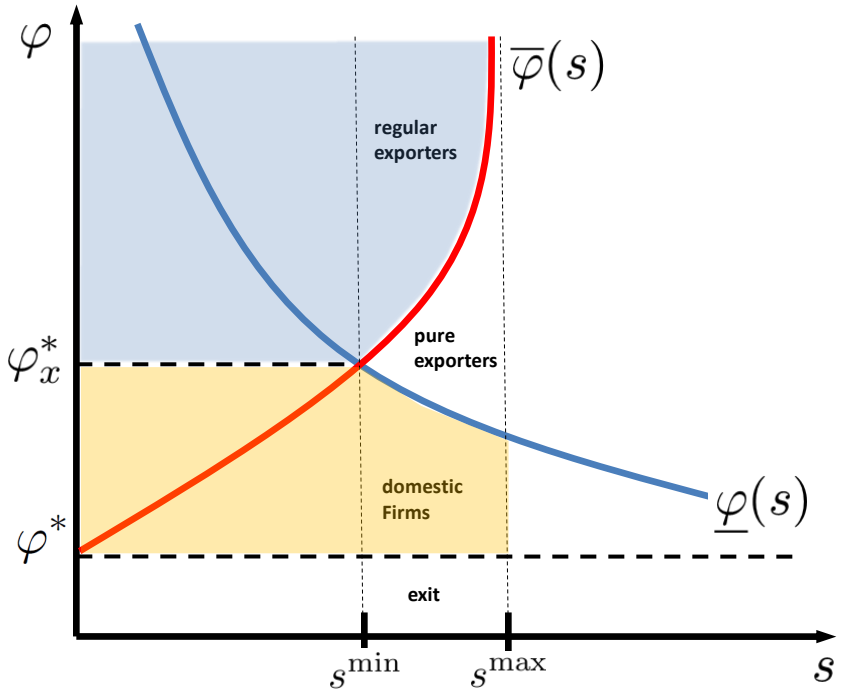
$$s^{\min} = \left(1 + \frac{A_c}{\tau^{1-\sigma} A_f} - \frac{f_d}{f_x} \right)^{\frac{1}{\sigma}} - 1 > 0, \tag{8}$$

moreover, Figure 2 shows that $\underline{\varphi}(s^{\min}) = \overline{\varphi}(s^{\min}) = \varphi_x^*$. Therefore, when $s \geq s^{\min}$, pure exporters start to arise around the no-subsidy export cutoff, φ_x^*. This implies that pure exporters would be more productive than domestic firms, but less productive than regular exporters.

As s increases, the share of active firms operating as pure exporters increases as well, at the expense of both domestic firms and regular exporters. In fact, if s were high enough, either domestic firms or regular exporters would disappear. As noted above, let $s_1^{\max}$ be the value of subsidy for which $\overline{\varphi}(s) \to \infty$, that is,

$$s_1^{\max} \equiv \left(1 + \frac{A_c}{\tau^{1-\sigma} A_f} \right)^{\frac{1}{\sigma}} - 1, \tag{9}$$

Figure 2: Choice of Mode of Operation with Pure Exporters



meaning that no firm would find it profitable to be a regular exporter. If on the other hand, it is the case that a very large pure-exporter subsidy stops firms from producing uniquely for the domestic market, we can define $s_2^{\max}$ as the subsidy value for which $\underline{\varphi}(s_2^{\max}) = \varphi^*$, i.e.

$$s_2^{\max} \equiv \left(\frac{f_x}{f_d} \frac{A_c}{\tau^{1-\sigma} A_f} \right)^{\frac{1}{\sigma}} - 1. \tag{10}$$

Since we are interested in a situation in which we observe all three types of firms, domestic firms together with pure and regular exporters, Proposition 1 summarizes the conditions under which we would observe such an outcome.

Proposition 1 *Assuming that* $(f_d/f_x) \leq [A_c/(\tau^{1-\sigma} A_f)]$ *and* $f_d < f_x$*, the three modes of production* $k \in \left\{d, p, x\right\}$ *coexist in the presence of a positive and sufficiently large pure-exporter subsidy* s*, such that* $s \in \left(s^{\min}, \min\left\{s_1^{\max}, s_2^{\max}\right\}\right)$*. Firms with productivity* $\varphi \in \left[\varphi^*, \underline{\varphi}(s)\right)$ *only operate domestically, firms with productivity levels* $\varphi \in \left[\underline{\varphi}(s), \overline{\varphi}(s)\right)$ *choose to operate as pure exporters, and firms with* $\varphi \geq \overline{\varphi}(s)$ *self-select into regular exporters.*

A reduction in the iceberg transportation cost, τ, increases the share of pure exporters for a given subsidy rate. Note that $s^{\min}$, the minimum subsidy necessary for the existence of pure exporters, is increasing in τ. Furthermore, $\overline{\varphi}$ rises and $\underline{\varphi}$ falls following a reduction in τ. Thus, the productivity range for which being a pure-exporter is the most profitable production mode for a Chinese firm widens as trade costs fall. A similar result follows if the relative size of the foreign market increases.

4 Data

Manufacturing Survey and Matched Customs Data

We make use of the annual survey of Chinese manufacturing firms compiled by the National Bureau of Statistics (NBS) for the years 2000 to 2006.[21] The dataset consists of state-owned enterprises and private firms with sales above five million Chinese Yuan and it contains detailed balance sheet information as well as firms' ownership status and total export sales. After cleaning up the data, our final sample consists of 1,100,600 firm-year observations with 386,185 different firms.[22]

For the purposes of our empirical analysis, we define a **pure exporter** as a firm exporting more than 90 percent of its production in a given year; a firm reporting a positive value of export sales with an export intensity below 90 percent is classified as a **regular exporter**, and a **domestic firm** is a firm that does not export at all in a given year. As can be seen in Columns 1 to 3 of Table 2, 105,543 observations are classified as pure exporter, accounting for 9.59 percent of our sample and 34.37 percent of all exporters.

As discussed in Section 2, policies favoring pure exporters are primarily targeted at three groups of firms: Foreign-invested Enterprises (FIEs), Processing Trade Enterprises (PTEs) and firms located in Free-Trade Zones (FTZs). Although the NBS data allows us to identify firms' ownership structure, it does not allow us to distinguish PTEs because the survey does not record the value of

[21] Previous studies using this dataset include Hsieh and Klenow (2009).

[22] To clean the data and rule out outliers we follow Brandt et al. (2012) and drop firms reporting less than 8 employees, or reporting missing or incoherent values for our key variables. We drop observations that report missing, null or negative values for total output, employment, intermediate inputs, fixed capital, value-added or if the ratios export/sales, value-added tax/value-added, output tax/output, income tax/value-added exceed one. We also exclude firms with the operating status recorded as 'inactive', 'bankrupt' or 'closed'. We also use the industry concordances suggested by Brandt et al. (2012) to insure a coherent and comparable classification over time. Finally, We also drop a small number of observations reporting zero exports in the manufacturing survey but showing positive export transactions in the custom data (presented below) in that particular year.

exports sold using different customs regimes. To obtain information about a firm's reliance on processing exports, we combine the NBS dataset with transaction-level customs data from the Chinese General Administration of Customs.[23] For each year, we follow Manova and Yu (2012) and match the two datasets using firms' names as a common variable, which results in approximately half of the observations reporting a positive value of exports in the NBS sample being matched with the customs records.[24] While both datasets use different firm identifiers, a firm's name is a reliable match variable since, by law, two firms cannot have the same name in the same administrative region. Table 2 provides descriptive statistics for the two samples. Although matching both datasets is a difficult task, it is reassuring that the share of pure exporters in the matched sample (Column 6) is almost identical to the one we find in the NBS data (Column 3).

Table 2: Summary Statistics

	Manufacturing Survey, 2000-2006			Matched Data, 2000-2006		
	Number of observations	Percentage among All firms	Percentage among Exporters only	Number of observations	Percentage among All firms	Percentage among Exporters only
Pure exporters	105,543	9.59	34.37	51,113	5.40	33.58
Regular exporters	201,563	18.31	65.63	101,104	10.69	66.42
Domestic firms	793,494	72.10		793,494	83.90	
Total	1,100,600	100	100	945,711	100	100

For each matched firm we calculate the average share of exports sold under the processing trade regime every year. We observe a strikingly bimodal distribution of firms' export processing share: 72.1 percent of firms use the processing regime for less than 10 percent of their exports, whereas 15.5 percent sell more than 90 percent of their exports under this regime. Hence, we define Processing Trade Enterprises (PTEs) as firms selling more than 90 percent of their exports through the processing trade regime. In our definition, PTEs encompass both firms that export all their output as well as firms selling domestically and using the processing regime to serve foreign markets. We then proceed to identify Foreign-Invested Enterprises (FIEs) as firms with a positive amount of foreign capital but that do not satisfy the criteria to be considered a PTE.

Although the NBS survey does not explicitly indicate whether a firm is located in a Free Trade

[23] See Manova and Zhang (2012) for a detailed description of this dataset.

[24] Details of the matching procedure are described in detail in the appendix of Wang and Yu (Forthcoming).

Zone (FTZs), it does provides information about its administrative area of location. We use this information to identify FTZs as prefecture-level cities promoted as Special Economic Zones, Coastal Development Zones as well as the Yangtze and Pearl River Delta Economic Zones.[25] Our definition of FTZs abstracts from smaller industrial parks such as "Economic and Technological Development Zones", "New and High-Tech Industrial Development Zones" and "Export Processing Zones", which also benefit from preferential treatment. Many of these have been located along the coast within prefecture-level cities already classified as a FTZ in our definition.[26] Appendix **??** provides the exact list of prefecture-cities included in our definition of FTZs.

Descriptive Statistics

Panel A of Table 3 presents the share of exporters across each category described above and also according to whether or not firms are located in a FTZ. The main message from Panel A is that approximately 90 percent of all Chinese manufacturing exporters face the possibility of receiving preferential treatment, conditional on exporting all or most of their production. The last column of the table reveals that 82.5 percent of exporters are located in a FTZ and thus can benefit from preferential treatment available to pure exporters. Panel B of Table 3 shows the percentage of pure exporters among all exporters across the different firm categories discussed above. It is also clear from Table 3 that a substantial share of PTEs and FIEs are pure exporters (51.6 and 33.7 percent of exporters in each group respectively). Finally, we observe that pure exporters, regardless of their ownership status or the customs regime used to sell their output, are more likely to be located within a FTZ.

[25]The Shanghai Economic area established in 1982 does not cover entirely the Shanghai prefecture, and notably does not include the city center of Shanghai. We make use of the firm postcode to exclude firms located in the city center from our definition of FTZ, i.e. postcode starting with '2000'.

[26]Using a "word search" on firms' addresses, Schminke and van Biesebroeck (2011) report 891 new firms established in "Economic and Technological Development Zones" between 1999 and 2005, and 47 percent of them were located either in the Yangtze or Pearl river Delta Economic zone, already accounted as a FTZ in our definition. Tracking firms located in an "Export Processing Zone" in our data is easier since the custom data provides a special coding identifying them. However, in 2006, only 166 firms can be classified as being located in any of these processing zones, and among them, 85 percent are located in a city which is already classified as a FTZ in our definition.

Table 3: Percentage of Exporters and Percentage of Pure Exporters by Firm Type and Location

Panel A: Percentage of Exporters

	PTE	FIE	Neither FIE nor PTE	Total
In a FTZ	22.63	35.79	24.08	82.51
Outside a FTZ	1.42	5.66	10.41	17.49
Total	24.06	41.45	34.49	100.00

Panel B: Percentage of Pure Exporters Among All Exporters

	PTE	FIE	Neither FIE nor PTE	All Exporters
In a FTZ	52.63	34.67	22.49	36.04
Outside a FTZ	35.56	27.85	16.85	21.93
All locations	51.62	33.74	20.79	33.58

Figure 3: Export Intensity Distribution by Firm Type and Location

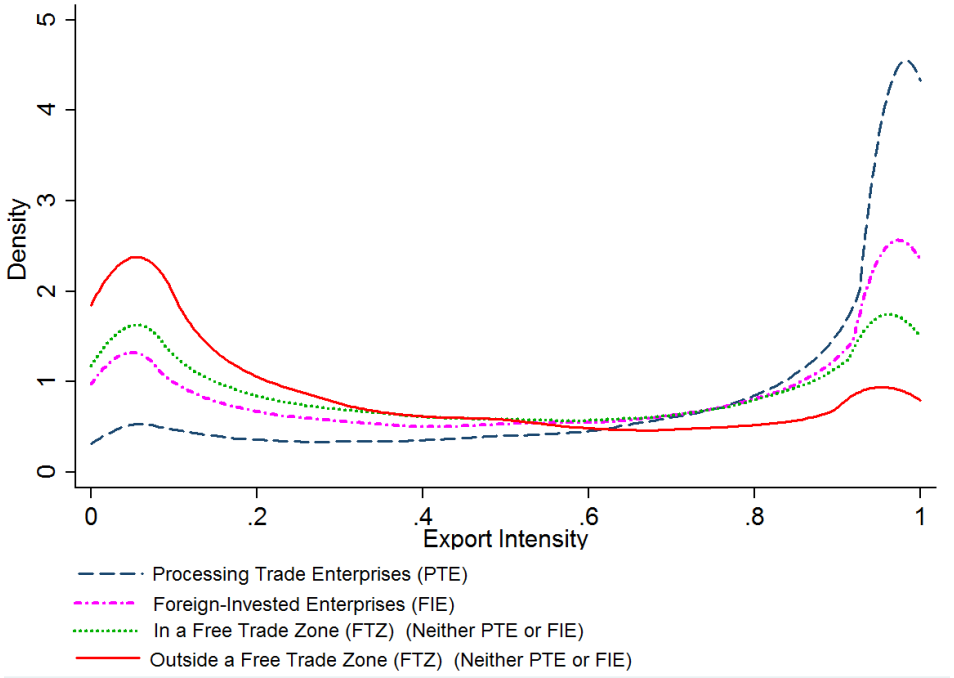


Figure 3 shows the distribution of export intensity across the four groups of firms described in Table 3. Pure exporters are more prevalent among PTEs, while FIEs and firms located in a FTZ display a greater degree of bimodality. The distribution of export intensity for the residual group of firms (i.e. exporters not located in a FTZ, which are neither PTEs nor FIEs) shows a majority

of firms selling a small share of their output abroad, the more common pattern documented for manufacturing firms in other countries. Nevertheless, Figure 3 still displays a small hump in the upper bound of the export-intensity distribution for this group of firms. One possible explanation is that our definition of FTZs focuses on major areas, therefore excluding small industrial parks, which might also provide preferential treatment for pure exporters.[27] Additionally, the laws and regulations that we consider in this paper exclude major sectoral and specific policies enacted at the local level, such as the Famous Brands initiative or the auto export base program.

Figure 4 presents the geographical distribution of FTZs and the distribution of the share of pure exporters among all exporting firms across prefecture-cities (by quartiles), where we have excluded locations with fewer than 42 observations to avoid inaccuracies. It can be clearly seen that pure-exporters are highly concentrated along coastal areas, the same places where FTZs have been established.

To provide a sense of the change in the prevalence of pure exporters since China's accession to the WTO in 2001, Table 4 compares the share of pure exporters among all exporters in 2000 and 2006. Column 1 shows a dramatic increase in the share of pure-exporters after China joined the WTO. Using our matched sample, Columns 2 to 5 of Table 4 show that the share of pure exporters has increased across the board for the four types of firms considered. It is interesting to see that being bound by the GATT/WTO rules disciplining the use of export subsidies has not reduced the prevalence of pure exporters in China. This pattern is, however, consistent with our model presented in Section 3, which suggests that trade liberalization (i.e. a reduction in the transport cost τ) would increase the prevalence of pure exporters.

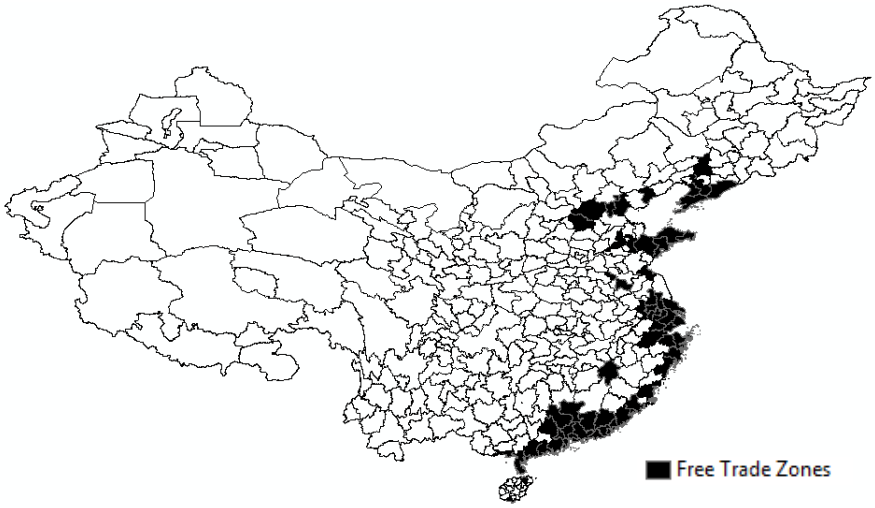
Table 4: Percentage of Pure Exporters Within the Group of Exporters, 2000 vs. 2006

	Manufacturing Survey	Matched Data			
Year	All Exporters	FIEs	PTEs	Neither FIEs nor PTEs	
				in a FTZ	outside a FTZ
2000	30.36	32.23	52.28	19.25	12.40
2006	40.59	38.57	57.55	26.13	20.97

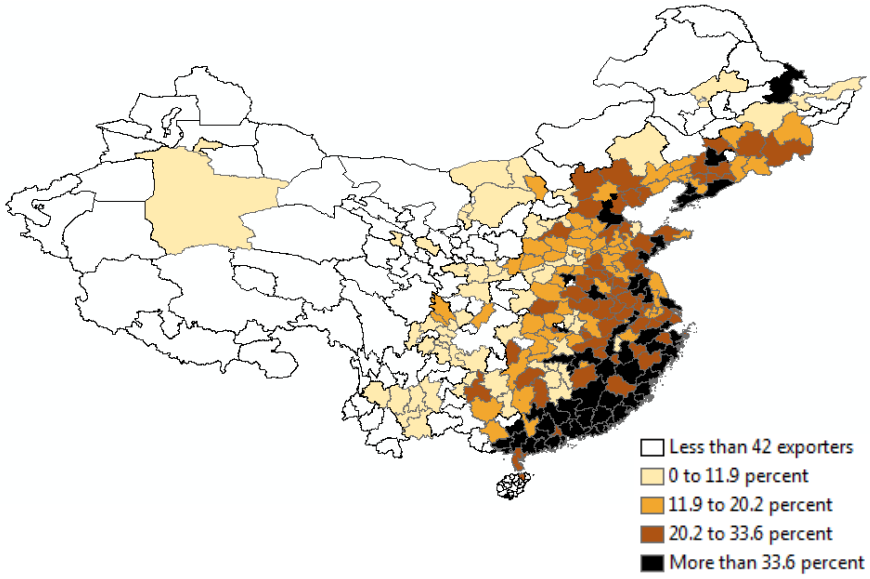
[27] Using a broader definition of Special Economic Zones, Wang (Forthcoming) identifies more than 80 percent of all Chinese prefecture-cities as FTZs in 2006.

Figure 4: Free Trade Zones and Share of Exporting Firms Classified as Pure Exporters

Free Trade Zones Established Between 1979 and 2000



Quartiles of the Share of Pure Exporters



A detailed description of the Free Trade Zones is included in Appendix **??**.

Firm-Level Evidence

Productivity

To evaluate our prediction that pure-exporters should exhibit an intermediate level of productivity greater than that of domestic firms but lower than that of regular exporters, we compute total factor productivity (TFP) for each firm over the period 2000 to 2006 and for each of the 27 (2-digit) sectors. We use the deflators computed by Brandt et al. (2012) to calculate real values for intermediate inputs, capital and output.[28] TFP, denoted φ_{it}, is estimated as the residual of a two-factor Cobb-Douglas production function: $Q_{it} = \lambda_0 + \lambda_K K_{it} + \lambda_L L_{it} + \varphi_{it} + \epsilon_{it}$, where Q_{it}, L_{it} and K_{it} denote firm i's value-added before taxes, labor and capital stock respectively (all in logs), and ϵ_{it} stands for measurement error in output. Real value added is obtained by subtracting the deflated value of intermediate inputs used in production from the firm's deflated output. As explained by Feenstra et al. (2011), due to the importance of processing trade in China it is preferable to estimate a valued-added than a gross output-based production function for Chinese firms. We calculate TFP using both OLS and the semiparametric methodology proposed by Levinsohn and Petrin (2003) (LP).

Using firms' productivity as a dependent variable, Columns 1-3 of Table 5 present estimates of the size and productivity premia of pure-exporters with respect to domestic firms and regular exporters using the NBS data. We cluster the standard errors at the firm level to take care of potential within-firm correlation over time. The upper panel of the Table uses domestic firms as the comparison group while in the lower panel we compare pure and regular exporters. The full set of prefecture-city fixed effects seeks to capture potential productivity differences arising from a firm's location in a FTZ, as well as differences in cities' skill endowments, which might affect firm-level productivity, see e.g. Cheng et al. (2012).

Column 1 of Table 5 shows that total sales of pure exporters are significantly higher than those of domestic producers but smaller than those of regular exporters (both differences are significant at 1 percent). Using the methodology proposed by Levinsohn and Petrin (2003), we find that pure exporters are 35.9 percent more productive than domestic firms but 25.8 percent less productive

[28] Nominal values of output and capital are deflated using two-digit sectoral price indexes. The deflators are obtained from the system of national accounts of the Chinese Bureau of Statistics. The 2-digit intermediate input deflators have been computed using both output deflators and the 2002 Chinese input-output.

Table 5: Pure Exporters' Productivity Premia Relative to Domestic Firms and Regular Exporters

		Manufacturing Survey			Matched Data		
		(1)	(2)	(3)	(4)	(5)	(6)
		log Sales	TFP LP	TFP OLS	log Sales	TFP LP	TFP OLS
		Comparison group:					
		All domestic firms			All domestic firms		
Pure exporter		0.467^a	0.307^a	0.011^b			
		(0.007)	(0.006)	(0.005)			
×	FIE				0.569^a	0.395^a	0.096^a
					(0.012)	(0.010)	(0.009)
×	PTE				0.972^a	0.602^a	-0.017
					(0.019)	(0.015)	(0.012)
×	Neither FIE				0.696^a	0.445^a	0.074^a
	or PTE				(0.016)	(0.013)	(0.011)
		Comparison group:					
		All regular exporters			Each type of regular exporter		
Pure exporter		-0.420^a	-0.299^a	-0.145^a			
		(0.008)	(0.006)	(0.005)			
×	FIE				-0.624^a	-0.448^a	-0.206^a
					(0.014)	(0.012)	(0.010)
×	PTE				-0.337^a	-0.286^a	-0.281^a
					(0.025)	(0.020)	(0.015)
×	Neither FIE				-0.197^a	-0.155^a	-0.044^a
	or PTE				(0.017)	(0.014)	(0.011)
Year fixed effects		✓	✓	✓	✓	✓	✓
Sector fixed effects		✓	✓	✓	✓	✓	✓
Prefecture-city fixed effects		✓	✓	✓	✓	✓	✓
# Obs		1,100,600	1,100,600	1,100,600	945,711	945,711	945,711
# firms		386,185	386,185	386,185	348,860	348,860	348,860
R^2		0.165	0.223	0.280	0.178	0.228	0.285

Robust standard error clustered at the firm level into brackets. ^{a}, ^{b} , ^{c} significantly different from 0 at 1%, 5% and 10% level, respectively.

than regular exporters.[29] Estimating productivity OLS results in the same productivity ranking, but substantially smaller productivity premia. Overall, our results provide support for our theoretical prediction that pure exporters show an intermediate level of productivity, greater than that of domestic firms but lower than that of regular exporters. All these results are also consistent with the findings of Lu et al. (2011), who use various other productivity estimation methods and a stricter definition of pure exporters, i.e. firms exporting exactly 100 percent of their output.

[29]We take exponents of the TFP coefficients in Column 2 of Table 5, to which we subtract one.

Moreover, our results imply that in line with the literature, e.g. Dai et al. (2011), Ma et al. (2011), Chinese exporters (pure or regular) are more productive than non-exporters.

Using our matched sample allows us to estimate the productivity premium of different types of pure exporters (namely FIEs and PTEs). Columns 4-6 of Table 5 present these results. The upper panel of the Table uses domestic firms as a control group, and shows that all three types of pure exporters are significantly more productive than domestic firms, with the exception of PTEs when productivity is estimated using OLS (Column 6).[30] In the lower panel we conduct a group-wise comparison between pure and regular exporters, i.e. we compare pure and regular exporters that are FIEs, pure and regular PTEs and so on. Our results show that for each type of firm regular exporters are significantly larger and more productive than pure exporters.

Firm-Level Taxes

The NBS survey provides information on the value of different taxes paid by firms as reported in their balance sheet. The three major taxes are on the firms' income, value-added tax and sales. Table 6 presents the difference in tax expenditure paid by pure exporters relative to other firms. As in the previous section, the upper panel of the table uses domestic firms as a control group, whereas the lower panel presents a group-wise comparison with regular exporters, controlling for sector, year and province-city-specific effects. The full set of prefecture-city fixed effects intends to capture any sort of preferential tax treatment common to all firms located in a FTZ. Additionally, standard errors are clustered at the firm-level. The dependent variables used in Columns 1-3 are respectively the income tax, value-added tax and sales tax outlay as a share of a firm's value-added.

The coefficients reported in Table 6 can be interpreted as the difference in the share of value-added devoted to the payment of each tax by pure exporters relative to the corresponding control group. Moreover, by adding the coefficients, we obtain the overall difference (in percentage points) of firms' value-added spent on taxes. Domestic firms dedicate on average an additional 5.08 percent ($\approx 0.68 + 3.32 + 1.08$) of their value-added to pay these taxes compared to pure exporters, while regular exporters spend 2.52 percent ($\approx 0.47 + 1.88 + 0.17$) more. Columns 4-6 present the difference

[30] Estimating TFP using Olley and Pakes (1996) methodology, Dai et al. (2011) find PTEs' productivity to be 4 percent lower than that of domestic firms at a 10 percent significance level. This difference becomes larger and significant at 1 percent when calculating TFP by OLS. One major difference with our estimation is that Dai et al. obtain their TFP measure from a gross output production function. As noted above, following Feenstra et al. (2011), we prefer to use a value-added production function.

in tax expenditure by the three different type of pure exporters, i.e. PTEs, FIEs and the residual group, compared to domestic firms and each type of regular exporter. Except when comparing the sales tax outlay of pure and regular exporters that are FIEs where the coefficient is insignificant, all the estimates indicate that pure exporters pay significantly less taxes than other firms.

Table 6: Pure Exporters' Tax Expenditure Premia Relative to Domestic Firms and Regular Exporters

		Comparison group: Domestic Firms					
		Manufacturing Survey			Matched Data		
		(1)	(2)	(3)	(4)	(5)	(6)
		Income tax	VAT	Sales tax	Income tax	VAT	Sales tax
		as share of value-added			as share of value-added		
		Comparison group:					
		All domestic firms			All domestic Firms		
Pure exporter		-0.687^a	-3.325^a	-1.082^a			
		(0.019)	(0.042)	(0.023)			
×	FIE				-1.110^a	-5.914^a	-2.095^a
					(0.036)	(0.080)	(0.033)
×	PTE				-1.092^a	-8.621^a	-2.023^a
					(0.034)	(0.072)	(0.032)
×	Neither FIE				-0.194^a	-3.239^a	-0.859^a
	or PTE				(0.052)	(0.102)	(0.050)
		Comparison group:					
		All regular exporters			Each type of regular exporter		
Pure Exporters		-0.471^a	-1.881^a	-0.171^a			
		(0.020)	(0.043)	(0.023)			
×	FIE				-0.460^a	-3.497^a	-0.049
					(0.041)	(0.088)	(0.039)
×	PTE				-0.330^a	-4.299^a	-0.236^a
					(0.047)	(0.103)	(0.043)
×	Neither FIE				-0.413^a	-0.501^a	-0.183^a
	or PTE				(0.056)	(0.107)	(0.054)
Year fixed effects		✓	✓	✓	✓	✓	✓
Sector fixed effects		✓	✓	✓	✓	✓	✓
Prefecture-city fixed effects		✓	✓	✓	✓	✓	✓
# Obs		1,100,600	1,100,600	1,100,600	945,711	945,711	945,711
# firms		386,185	386,185	386,185	348,860	348,860	348,860
R^2		0.060	0.103	0.120	0.061	0.122	0.118

Robust standard error clustered at the firm level into brackets. ^{a}, ^{b} , ^{c} significantly different from 0 at 1%, 5% and 10% level, respectively.

5 Economic Implications of Pure-Exporter Subsidies

In this section, we explore the general equilibrium consequences of using pure-exporter subsidies. To do so, we embed the partial equilibrium model presented in Section 3 into a two-country general equilibrium model in which China unilaterally provides a pure-exporter subsidy. In order to highlight the distinct features of the pure-exporter subsidy, we conduct a comparative statics exercise with respect to the level of expenditure in export subsidies, and compare our results to those produced by a standard ad-valorem export subsidy.

Pure Exporter Subsidies in General Equilibrium

We begin our presentation by providing the equilibrium conditions that close the model so that aggregate demand, wages, and the mass of firms operating in each country will be determined endogenously. Each country $i = c, f$, is inhabited by L_i identical consumers, each supplying one unit of labor inelastically. Preferences of the representative consumer in country i are given by,

$$\mathcal{U}_i = \left(\int_{\omega \in \Omega} q(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}}, \quad i \in \{c, f\}, \tag{11}$$

where Ω_i is the set of varieties available for consumption in country i, $q(\omega)$ is the quantity consumed of good ω and $\sigma > 1$ is the elasticity of substitution among varieties. The CES utility function (11) results in an iso-elastic demand function in country i for variety ω like the one considered in section 3,

$$q(\omega) = A_i p(\omega)^{-\sigma}, \quad \text{with} \quad A_i \equiv E_i P_i^{\sigma-1}, \tag{12}$$

where E_i and P_i denote aggregate expenditure and the ideal price index in country i respectively.

Firms need to incur an initial investment f_e to learn their idiosyncratic productivity, drawn from a Pareto distribution $G(\varphi) = 1 - \varphi^{-a}$, which is the same in both countries.[31] After observing their productivity realization, firms that decide to remain in the market choose their mode of operation $k \in \{d, p, x\}$, although the pure-exporter mode of operation is only available in China. We assume that every period firms exit the market with probability $\delta \in (0, 1)$. Therefore, the expected present discounted value of a Chinese firm with productivity φ operating under production mode k is

[31] All fixed costs in both countries are denominated in units of labor.

$v_c^k(\varphi) = \max_k\{\pi_c^k(\varphi)/\delta\}$, with $\pi_c^k(\varphi)$ as defined in Section 3, equation (3). Firms choose the mode of production that maximizes their expected present discounted value. Firms in country i will continue to enter the market until their expected present discounted value equals the entry cost,

$$\int v_i^k(\varphi) dG(\varphi) = f_e w_i, \quad i \in \{c, f\}.$$

Letting M_{ei} denote the mass of firms paying the entry cost in country i, and M_i the mass of operating firms, we can write the labor market clearing condition in country i as follows,[32]

$$M_i \left[\sum\nolimits_k \int l_i^k(\varphi) d\mu_i(\varphi) \right] + M_{ei} f_e = L_i, \quad i \in \{c, f\},$$

where $\mu_i(\varphi)$ is the ex-post distribution of operating firms across productivity levels in country i, and $l_i^k(\varphi)$ is the optimal labor demand for a firm with productivity φ using production mode k in country i.[33] Price indices in each country are given by

$$\begin{aligned} P_c &= \left[\int p_c(\varphi)^{1-\sigma} (M_c - M_c^p) d\mu_c(\varphi) + \int p_f^*(\varphi)^{1-\sigma} M_f^x d\mu_f(\varphi) \right]^{\frac{1}{1-\sigma}}, \\ P_f &= \left[\int p_f(\varphi)^{1-\sigma} M_f d\mu_f(\varphi) + \int p_c^*(\varphi)^{1-\sigma} M_c^x d\mu_c(\varphi) + \int p_{cp}^*(\varphi)^{1-\sigma} M_c^p d\mu_c(\varphi) \right]^{\frac{1}{1-\sigma}}, \end{aligned}$$

where M_i^k is the mass of operating firms using mode of operation k in country i.[34] Notice that the term $(M_c - M_c^p)$ that appears in the price index for China denotes the mass of domestically-produced varieties consumed in China, i.e. excluding the varieties produced by pure exporters. We assume that the Chinese government levies lump-sum taxes from households in order to finance the pure-exporter subsidy, and it runs a balanced budget:

$$T_c = \frac{s}{1+s} \left[\int r_c^p(\varphi) M_c^p d\mu_c(\varphi) \right],$$

where $r_c^p(\varphi)$ denotes the after-subsidy revenue earned by a pure exporter with productivity φ and

[32] Both variables are linked through the steady-state condition $p_{in,i} M_{ei} = \delta M_i$, where $p_{in,i}$ is the probability of successful entry in country i.

[33] Note that $l_i^k(\varphi)$ also includes the amount of labor used to pay fixed costs.

[34] Formally, $M_i^k \equiv M_i \int \mathbb{I}_i^k(\varphi) \mathrm{d}\mu_i(\varphi)$, where $\mathbb{I}_i^k(\varphi)$ is an indicator function that takes the value of 1 if a firm with productivity φ uses mode of operation k.

T_c is the aggregate tax collection in China.[35] Since free entry implies that aggregate income spent on entry costs, $M_{ei} f_e w_i$, is exactly compensated by aggregate profits, Π_i, aggregate expenditure in country i is given by $E_i = w_i L_i - T_i$. Finally, the trade balance condition reads,

$$\int r_c^x(\varphi) M_c^x d\mu_c(\varphi) + \frac{1}{1+s} \int r_c^p(\varphi) M_c^p d\mu_c(\varphi) = \int r_f^x(\varphi) M_f^x d\mu_f(\varphi).$$

Taking the wage in the rest of the world, w_f, as the numéraire, equilibrium in the model is characterized by a vector of endogenous variables $\Big(M_h, M_f, P_h, P_f, E_h, E_f, w_h\Big)$, such that the labor market clearing, free entry and aggregate expenditure equations are satisfied in both countries and the balanced trade condition holds.

Calibration

We solve the model presented above numerically, and use as our benchmark a scenario in which both countries are identical in terms of their size and the vector of parameters faced by firms and consumers. This means that if the pure-exporter subsidy s is small enough so that no firm chooses to be a pure exporter in China, all equilibrium variables would be the same in both countries.

We set the elasticity of substitution, σ, equal to 3, the same value used by Hsieh and Ossa (2011), which is close to the median of the estimates presented by Broda and Weinstein (2006) for 3 and 5-digit industries in the United States. We assume that firms in both countries draw their productivity from the same Pareto distribution with lower bound 1 and shape parameter a. Following Helpman et al. (2004), we obtain $a - (\sigma - 1)$ by regressing the log of the productivity rank (ordering Chinese firms according to their TFP) on the log of firms' productivity. Using the NBS dataset, we obtain a coefficient of 0.76. Given our assumption that $\sigma = 3$, it implies a value of $a = 2.76$.[36] Because the product of the sunk entry cost, f_e, and the probability of exiting, δ, simply re-scales the mass of operating firms, we follow Bernard et al. (2007) and set these parameters to 2 and 0.025 respectively. Country sizes, as noted above, are identical and normalized to 1.

This leaves us with four parameters left to be calibrated, namely, the fixed costs associated with domestic production and exporting, the iceberg transportation cost faced by exporters and

[35] Since we assume that the rest of the world is not conducting any trade policy, it is the case that $T_f = 0$.

[36] In all our simulations we approximate $G(\varphi)$ by a discrete distribution with 100,000 grid points.

the pure-exporter subsidy, $\left\{f_d, f_x, \tau, s\right\}$. We choose these parameters to match simultaneously four target moments calculated from the 2000-2006 NBS dataset: the average share of regular and pure exporters, the mean export intensity of regular exporters and the estimated productivity premium of pure exporters vis-à-vis domestic producers, which is presented in column (2) of Table 5.[37] Bajona and Chu (2010) follow a similar strategy whereby they jointly calibrate the productivity premium of private firms vis--vis state-owned enterprises and an interest rate subsidy obtained by the latter to match the relative size of these two sectors in the Chinese economy. Table 7 presents the parameters used to solve the model and the fit of the calibrated model is reported in Table 8.

Table 7: Simulation Parameters

Parameter	Description	Value
L_i	Country i's size, $i \in \{c, f\}$	1.00
σ	Elasticity of substitution	3.00
δ	Probability of exit shock	0.025
f_e	Entry cost	2.00
a	Pareto distribution shape parameter	2.76
$\mathbf{f_d}$	**Fixed cost of operation in the domestic market**	**0.352**
$\mathbf{f_x}$	**Fixed cost of exporting**	**0.635**
τ	**Iceberg transportation cost**	**1.204**
s	**Pure-exporter subsidy**	**0.274**

Parameters in bold are chosen to match the calibration targets presented in Table 8.

Table 8 shows that our model does a good job both in reproducing our imposed targets as well as in producing calibrated parameters of sensible magnitude. Our calibration results produce a value for the fixed cost of exporting relative to the fixed cost of domestic production of 1.8, placing it within the range of most other studies, (e.g. Demidova, 2008; Chor, 2009; Felbermayr et al., 2011), which find (f_x/f_d) to be between 1.7 and 2. Similarly, our calibrated transportation cost is very similar to the widely used value of 1.3 used by Ghironi and Melitz (2005), albeit slightly lower, due to the high export intensity prevalent among regular exporters in China.[38]

[37] We calculate the average productivity of firms using mode of production k in country i, $\widetilde{\varphi_i^k}$, in our model as in Melitz (2003), i.e. $\widetilde{\varphi_i^k} \equiv \left(\frac{1}{\int \mathbb{I}_i^k(\varphi) d\mu_i(\varphi)} \int \varphi^{\sigma-1} \mathbb{I}_i^k(\varphi) d\mu_i(\varphi)\right)^{\frac{1}{\sigma-1}}$.

[38] Other export subsidies, besides pure-exporter subsidies, might also contribute to the high export intensity displayed by regular exporters.

Table 8: Target Moments

Statistic	Data	Model
Share of regular exporting firms in China	0.179	0.200
Share of pure exporters in China	0.096	0.096
Export intensity of regular exporters in China	0.392	0.392
Productivity premia pure exporters relative to domestic firms	0.359	0.372

The first three moments are unconditional means for the period 2000-2006 calculated using the NBS dataset. The productivity premia of pure exporters with respect to domestic firms is given by $\exp(0.307) - 1$, where 0.307 is the estimated coefficient reported in the first row of column 2 in Table 5.

It is much harder to gauge the plausibility of the calibrated value for the pure-exporter subsidy rate since Chinese authorities did not provide the required subsidy rates or the annual amount budgeted for pure-exporter subsidies in either of their subsidy notifications to the WTO Committee on Subsidies and Countervailing Measures in 2006 and 2011. From a theoretical perspective, it is clear that in the absence of other instruments, the pure-exporter subsidy rate needs to be sufficiently large so as to induce firms to forego their entire domestic profits. Our estimates presented in Table 6 show that indeed, pure exporters pay significantly lower corporate, value-added and sales taxes (as a share of their value-added) than domestic firms and regular exporters. Although the estimated magnitude of this difference is substantially smaller than our calibrated subsidy rate, it only reflects a subset of all instruments used to provide incentives for pure exporters; moreover, this measure does not capture any instruments provided at the provincial and local level.

Our model parametrization implies an exports/GDP ratio in China of 33.9 percent, quite similar to the 27.4 percent average for the period 2000-2006 observed in the data and a total expenditure in export subsidies of 1.5 percent of GDP. The relative size of calibrated fixed costs results in pure exporters being half as productive as regular exporters whereas the productivity difference observed in the data is just 25 percent.[39]

Comparison Between Pure Exporter and Standard Export Subsidies

In order to compare the effect of a pure-exporter subsidy with a standard ad-valorem subsidy to export sales, we conduct a comparative statics exercise with respect to China's expenditure in

[39] $1 - \exp(-0.299)$, using the estimates presented in the fifth row of column (2) of Table 5.

export subsidies. Since the pure-exporter subsidy is only used when the subsidy rate s is above a threshold, the same level of expenditure in export subsidies results from a higher pure-exporter subsidy rate relative to the standard export subsidy. Specifically, our calibrated pure-exporter subsidy rate of 27.4 percent, which is received by 9.6 percent of all active firms results in the same aggregate subsidy expenditure as a standard export subsidy rate of 4.53 enjoyed by all exporters, which account for 29.6 percent of all active firms.

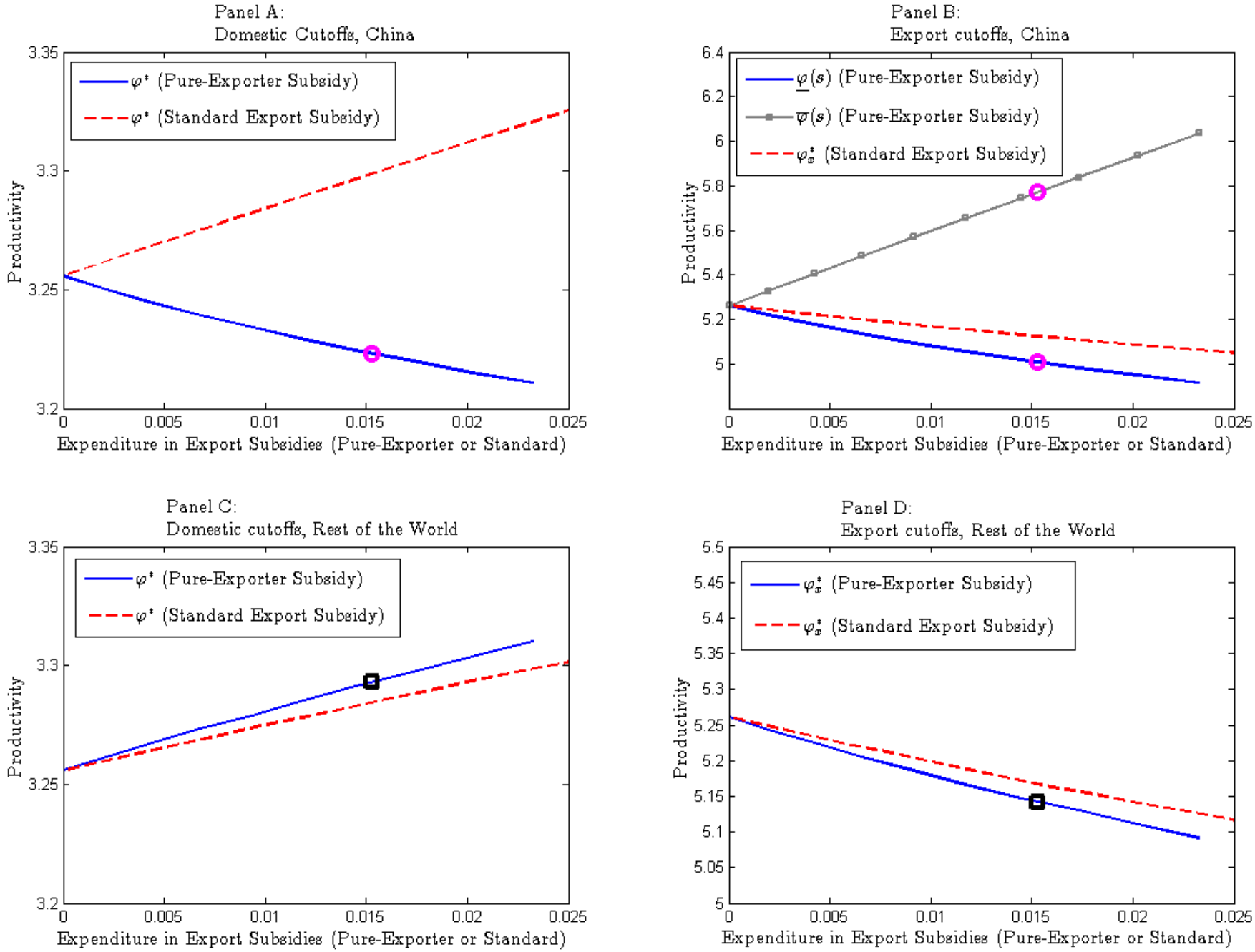
Figure 5 depicts the change in productivity cutoffs in China and the rest of the World in response to an increase in export subsidy expenditure in China. Solid lines are used to depict the variable of interest when a pure-exporter subsidy is in place while dashed lines are used in the case of a standard export subsidy. We start our analysis with Panel B of Figure 5, which shows how export cutoffs are affected in China. A higher pure-exporter subsidy increases the profitability of becoming a pure exporter, increasing $\overline{\varphi}(s)$ and decreasing $\underline{\varphi}(s)$, previously defined in equations (6) and (7). This creates a wedge around the no-subsidy export cutoff where pure exporters arise following the same mechanism described in Section 3. In the case of standard export subsidy, the export cutoff falls as the subsidy increases the profitability of exporting.[40] Both types of subsidies increase China's aggregate exports relative to the laissez-faire equilibrium, but aggregate exports are slightly larger when the pure-exporter subsidy is used.

Figure 5 shows that increasing the pure-exporter subsidy has the same qualitative effect on the domestic and export cutoffs in the rest of the World as what follows from a higher standard export subsidy. In both cases, Panel C reveals that tougher import competition driven by the rise in Chinese exports reduces the profitability of domestic producers in the rest of the World, forcing the least productive firms to exit and increasing the domestic production cutoff. A higher domestic cutoff increases average productivity abroad, and in turn decreases the export cutoff in the rest of the World and helps to restore balanced trade (see Panel D).

The most striking difference between the two types of subsidy can be seen in the response of φ^*, the cutoff characterizing the decision of whether to operate or not for Chinese firms, shown in Panel A of Figure 5. With a standard export subsidy, domestic firms in China face stronger competition both from Chinese and foreign exporters, which forces the least productive firms to

[40] A detailed analysis of standard export subsidies in the context of a heterogeneous-firm model of trade can be found in Demidova and Rodríguez-Clare (2009) and Felbermayr et al. (2012).

Figure 5: Comparative Statics - Productivity Cutoffs



A circle (square) denotes the equilibrium value for the variable of interest in China (rest of the World) using the calibrated parameters presented in Table 7 to solve the model.

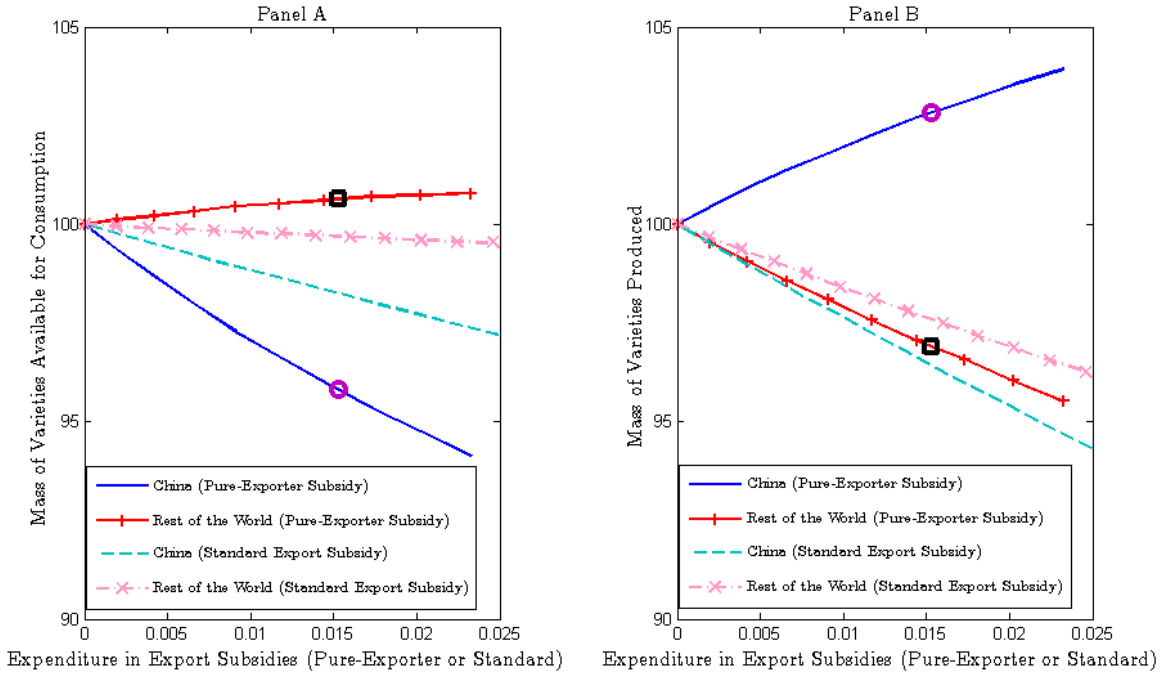
exit. This effect is manifest in a higher domestic cutoff. An increase in the pure-exporter subsidy expenditure, however, produces the opposite effect. Since operating in the pure-exporter regime requires firms to sell all their output in the foreign market alone, it follows that as the pure-exporter subsidy increases, a larger set of varieties produced by Chinese firms with productivity $\varphi \in [\underline{\varphi}(s), \overline{\varphi}(s)]$, becomes unavailable to Chinese consumers. As more Chinese firms become pure exporters, competition in the domestic market is relaxed, allowing the successful entry of less-productive firms. This implies that the domestic cutoff in China falls, in contrast to what happens when a standard export subsidy is used. Therefore, the pure-exporter subsidy allows China to increase its aggregate exports while at the same time providing heightened protection to its domestic firms.

Examining the mass of varieties consumed and produced in both countries also provides a clear contrast between the two types of subsidies. As Figure 6 shows, although the use of pure-exporter subsidies results in a greater number of varieties being manufactured in China (since more low-productivity firms are now operating in China), the mass of varieties available for consumption there falls. The opposite result occurs in the rest of the World. The standard export subsidy on the other hand, results in fewer varieties being produced and consumed in both countries, although the effect is stronger in China.

Similarly to the standard export subsidy, the pure-exporter subsidy has a negative effect on China's terms-of-trade.[41] The Chinese government subsidizes the consumption of Chinese goods by individuals abroad, while its own consumers buy relatively more expensive imported goods. The negative impact of the pure-exporter subsidy on terms-of-trade is stronger than when the standard export subsidy is in place, because the latter does not constrain the consumption basket of Chinese consumers. Moreover, since a larger share of China's exports is being conducted by pure exporters receiving a substantially higher subsidy rate, China's terms-of-trade deteriorate more with a pure-exporter subsidy than with a standard export subsidy.

[41] Demidova and Rodríguez-Clare (2009) show in a small economy environment with heterogeneous firms that a regular ad-valorem export subsidy has an ambiguous effect on the terms-of-trade.

Figure 6: Comparative Statics - Mass of Varieties Consumed and Produced



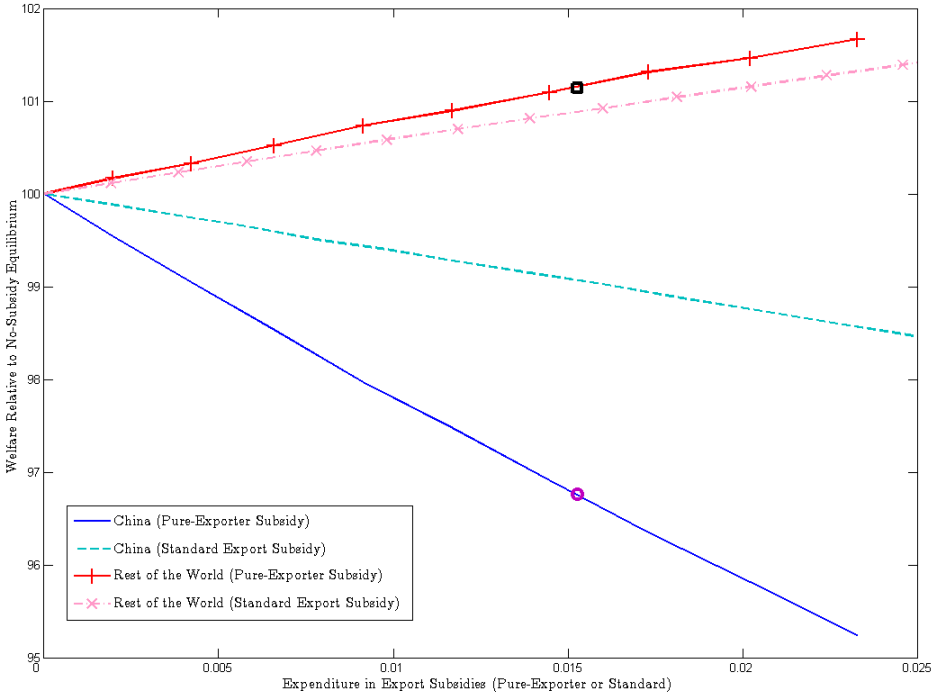
A circle (square) denotes the equilibrium value for the variable of interest in China (rest of the World) using the calibrated parameters presented in Table 7 to solve the model.

Welfare Effect of Eliminating Pure Exporter Subsidies

Our analysis shows that a pure-exporter subsidy reduces overall welfare in the enacting country. Moreover, for a given expenditure in export subsidies, the welfare loss produced by a pure-exporter subsidy is greater than that caused by a standard export subsidy. Conversely, welfare in the rest of the World improves more when China uses the pure-exporter subsidy (see Figure 7). In summary, Chinese consumers get the raw end of the deal from the use of pure-exporter subsidies. Their aggregate expenditure falls because they need to finance the subsidy, and additionally they experience worse terms-of-trade, lower consumption variety and higher prices due to the protection that the subsidy provides to low-productivity firms.

As scrutiny over China's trade policy intensifies, it is quite timely to quantify the welfare gains that would accrue to China if it were to stop using pure-exporter subsidies. Our calibrated model indicates that China's welfare would increase by 3.2 percent if pure-exporter subsidies were eliminated. To put this magnitude in context, this welfare gain is equivalent to the improvement

Figure 7: Comparative Statics - Welfare



A circle (square) denotes the equilibrium value for the variable of interest in China (rest of the World) using the calibrated parameters presented in Table 7 to solve the model.

produced by halving the calibrated bilateral iceberg transportation cost from 20 to 10 percent in a scenario without pure-exporter subsidies. From the perspective of the rest of the World, the elimination of pure-exporter subsidies would produce a welfare reduction of 1.14 percent.

Trade Liberalization with Pure Exporter Subsidies

We conduct a second exercise using our calibrated model which confirms the insight provided by our simple partial equilibrium model, that a reduction in the trade cost parameter τ increases the share of pure exporters. From Table 4 we see that on average, the share of pure exporters among all manufacturing exporters increased from 30 to 40 percent over our sample period. In the context of our calibrated model, a 17 percent bilateral reduction in trade costs would replicate the 10 percentage point rise in the share of pure exporters. Following this trade liberalization, China would experience a welfare loss of 0.75 percent while the rest of the World would enjoy a 1.44 percent welfare gain relative to our calibrated benchmark equilibrium.

6 Conclusion

China's transition to become the world's second largest trading economy over the last thirty years has been nothing but breathtaking, spurring great interest on the economic reforms that made this possible. In this paper, we document an important yet not widely appreciated element of China's trade policy whose economic implications have not been explored before, a heavy reliance on a wide range of policies favoring firms that export the vast majority of their output.

We study the economic implications of these pure exporter subsidies in the context of a heterogeneous-firm framework in which firms exporting all their output receive an ad-valorem sales subsidy. Using a rich dataset of Chinese manufacturing firms for the period 2000-2006 matched with export transactions data we provide empirical support for the predictions derived from our model. Our findings show that pure-exporters receive a preferential tax treatment compared to other firms, and also that they exhibit an intermediate level of productivity, greater than that of domestic firms but lower than that of firms that sell both at home and abroad.

Turning to the general equilibrium implications of pure exporter subsidies, we show that their use reduces welfare in China and is more deleterious than a standard ad-valorem export subsidy. Since the former induces a set of firms to sell only abroad, it lessens competition in the domestic market and provides heightened protection for low-productivity domestic firms. This feature might explain the popularity of similar policies such as the establishment of export-processing zones across a large number of developing countries.

A counterfactual policy analysis based in our calibrated model, indicates that China would experience an increase in real income of more than 3 percent if it were to completely eliminate its use of pure-exporter subsidies. This welfare gain is equivalent to that resulting from halving bilateral trade costs in an environment without pure-exporter subsidies. However, our analysis shows that conducting a trade liberalization reform while maintaining pure exporter subsidies would lead to a welfare loss in China by increasing the number of firms choosing to be pure exporters. A bilateral reduction in trade costs that is consistent with the observed increase in the share of pure exporters between 2000 and 2006 results in a welfare loss for China of 0.75 percent.

References

Bajona, C. and T. Chu (2010): "Reforming State Owned Enterprises in China: Effects of WTO Accession," *Review of Economic Dynamics*, 13, 800–823.

Bernard, A. B., J. Eaton, J. B. Jensen, and S. Kortum (2003): "Plants and Productivity in International Trade," *American Economic Review*, 93, 1268–1290.

Bernard, A. B., S. J. Redding, and P. K. Schott (2007): "Comparative Advantage and Heterogeneous Firms," *Review of Economic Studies*, 74, 31–66.

Brandt, L., J. van Biesebroeck, and Y. Zhang (2012): "Creative Accounting or Creative Destruction? Firm-level Productivity Growth in Chinese Manufacturing ?" *Journal of Development Economics*, 97, 339–351.

Broda, C. and D. E. Weinstein (2006): "Globalization and the Gains from Variety," *The Quarterly Journal of Economics*, 121, 541–585.

Cheng, W., J. Morrow, and K. Tacharoen (2012): "Productivity as if Space Mattered: An Application to Factor Markets Across China," Manuscript, London School of Economics.

Chor, D. (2009): "Subsidies for FDI: Implications From a Model with Heterogeneous Firms," *Journal of International Economics*, 78, 113–125.

Dai, M., M. Maitra, and M. Yu (2011): "Unexceptional Exporter Performance in China? The Role of Processing Trade," Manuscript, Columbia University.

Demidova, S. (2008): "Productivity Improvements And Falling Trade Costs: Boon Or Bane?" *International Economic Review*, 49, 1437–1462.

Demidova, S. and A. Rodríguez-Clare (2009): "Trade Policy Under Firm-level Heterogeneity in a Small Economy," *Journal of International Economics*, 78, 100–112.

di Giovanni, J., A. A. Levchenko, and J. Zhang (2012): "The Global Welfare Impact of China: Trade Integration and Technological Change," IMF Working Paper 12/79.

Farole, T. (2011): *Special Economic Zones in Africa: Comparing Performance and Learning from Global Experience*, Washinton DC: The World Bank.

Feenstra, R. C. (1998): "One Country, Two Systems: Implications of WTO Entry for China," Manuscript, University of California, Davis.

Feenstra, R. C., Z. Li, and M. Yu (2011): "Exports and Credit Constraints Under Incomplete Information: Theory and Evidence from China," NBER Working Papers 16940.

Felbermayr, G., B. Jung, and M. Larch (2012): "Optimal Tariffs, Retaliation and the Welfare Loss from Tariff Wars in the Melitz Model," *Journal of International Economics*, 89, 13–25.

Felbermayr, G., J. Prat, and H.-J. Schmerer (2011): "Globalization and Labor Market Outcomes: Wage Bargaining, Search Frictions, and Firm Heterogeneity," *Journal of Economic Theory*, 146, 39–73.

Ghironi, F. and M. J. Melitz (2005): "International Trade and Macroeconomic Dynamics with Heterogeneous Firms," *The Quarterly Journal of Economics*, 120, 865–915.

Hamada, K. (1974): "An Economic Analysis of the Duty Free Zone," *Journal of International Economics*, 4, 225–241.

Heid, B., M. Larch, and A. Riaño (Forthcoming): "The Rise of the Maquiladoras: A Mixed Blessing," *Review of Development Economics*.

Helpman, E., M. J. Melitz, and S. R. Yeaple (2004): "Export Versus FDI with Heterogeneous Firms," *American Economic Review*, 94, 300–316.

Hong Kong Trade Development Council (2003): *Guide to Doing Business in China*, HKTDC Business Edition, available at *www.hktdc.com*.

——— (2009): *Turning from Export Processing to Domestic Sales*, HKTDC Business Edition, available at *www.hktdc.com*.

Hsieh, C.-T. and P. J. Klenow (2009): "Misallocation and Manufacturing TFP in China and India," *The Quarterly Journal of Economics*, 124, 1403–1448.

Hsieh, C.-T. and R. Ossa (2011): "A Global View of Productivity Growth in China," NBER Working Papers 16778, National Bureau of Economic Research.

Ianchovichina, E. (2007): "Are Duty Drawbacks on Exports Worth the Hassle?" *Canadian Journal of Economics*, 40, 881–913.

Khandelwal, A. K., P. K. Schott, and S.-J. Wei (Forthcoming): "Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters," *American Economic Review*.

Lau, L. J., Y. Qian, and G. Roland (2000): "Reform without Losers: An Interpretation of China's Dual-Track Approach to Transition," *Journal of Political Economy*, 108, 120–143.

Levinsohn, J. and A. Petrin (2003): "Estimating Production Functions Using Inputs to Control for Unobservables," *Review of Economic Studies*, 70, 317–341.

Li & Fung Group (2012): *What do Expert Say? Ten Highlights of Chinas Commercial Sector, 2011-2012*, Li & Fung Research Centre, available at *www.funggroup.com*.

Lu, D. (2010): "Exceptional Exporter Performance? Evidence from Chinese Manufacturing Firms," Manuscript, University of Chicago.

Lu, J., Y. Lu, and Z. Tao (2011): "Pure Exporter: Theory and Evidence," MPRA Paper 29966, University Library of Munich, Germany.

Ma, Y., H. Tang, and Y. Zhang (2011): "Factor Intensity, Product Switching, and Productivity: Evidence from Chinese Exporters," Discussion Papers Series, Tufts University 0761.

Manova, K. and Z. Yu (2012): "Firms and Credit Constraints along the Value-Added Chain: Processing Trade in China," Manuscript, Stanford University.

Manova, K. and Z. Zhang (2012): "Export Prices Across Firms and Destinations," *The Quarterly Journal of Economics*, 127, 379–436.

Melitz, M. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Productivity," *Econometrica*, 71, 1695–1725.

Miyagiwa, K. F. (1986): "A Reconsideration of the Welfare Economics of a Free-trade Zone," *Journal of International Economics*, 21, 337–350.

Naughton, B. (1996): "China's Emergence and Prospects as a Trading Nation," *Brookings Papers on Economic Activity*, 27, 273–344.

——— (2007): *The Chinese Economy: Transitions and Growth*, Cambridge, MA: MIT Press.

Olley, G. S. and A. Pakes (1996): "The Dynamics of Productivity in the Telecommunications Equipment Industry," *Econometrica*, 64, 1263–1297.

Panagariya, A. (1992): "Input Tariffs, Duty Drawbacks, and Tariff Reforms," *Journal of International Economics*, 32, 131–147.

Schminke, A. and J. van Biesebroeck (2011): "Using Export Market Performance to Evaluate Regional Preferential Policies in China," Center for Economic Studies Discussion Paper 11.33, Katholieke Universiteit Leuven.

Standard Chartered Bank (2007): "On the Ground, China," Standard chartered research paper.

Wang, J. (Forthcoming): "The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities," *Journal of Development Economics*.

Wang, Z. and Z. Yu (Forthcoming): "Trading Partners, Traded Products, and Firm Performance: Evidence from China's Exporter-Importers," *The World Economy*.