The University of Nottingham

research paper series

China and the World Economy

Research Paper 2017/01

China's Dual Export Sector

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GEP

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January 10, 2017

Abstract

China has transitioned from being an almost autarkic economy to become the world's largest exporter in less than three decades. Given this unique transformation, this paper investigates if the key stylized facts that characterize the behavior of firms' exports around the world, can also describe China's experience after joining the World Trade Organization. We find that, consistent with received wisdom, relatively few Chinese firms engage in exporting, and those doing so, are on average, larger and more productive than their domestic counterparts. However, unlike other large and developed countries, a substantial share of Chinese exporters sell the majority of their output abroad. In fact, the distribution of Chinese exporters according to their export intensity —the share of their revenues accounted for by exports— is strikingly bimodal. In contrast to recent work that has focused on the technological factors that explain the prevalence of high-intensity exporters, we instead concentrate on the role played by China's heterodox trade policy regime in promoting pure exporters. Our empirical analysis suggests that trade policy has played an instrumental role in fostering a dual export sector. Notably, nine out of ten manufacturing exporters in China are eligible to enjoy fiscal incentives contingent on export performance.

Keywords: China; Firm-level exports; Export Intensity; Free Trade Zones; Export Processing Regimes; China.

JEL classification: F12, F13, O47.

*We thank Ben Zissimos and Arye Hillman as well as participants at the CESifo Venice Summer Institute Workshop on "The World Trade Organization and Economic Development" held at Venice International University in July 2015. All remaining errors are our own.

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1 Introduction

Over the last two decades, international trade theory has increasingly shifted its focus towards understanding individual firms' decision to serve foreign markets, following, most notably, the seminal work by Melitz (2003). This paradigm change has been facilitated by the parallel emergence of a robust set of stylized facts which point at a substantial degree of heterogeneity across firms in terms of size and productivity within narrowly-defined industries and according to their export status. More specifically, researchers have established three key empirical regularities that hold across a wide range of countries and time periods (Bernard et al., 2007; Melitz and Redding, 2014):

(i) Relatively few firms engage in exporting.

(ii) Exporters tend to be larger and more productive than firms that only sell domestically, and,

(iii) The vast majority of exporting firms sell only a small share of their output abroad.

In this chapter we ask whether these stylized facts also reflect the patterns observed in China's manufacturing sector after joining the World Trade Organization (WTO) in 2001. We believe that this is a fruitful question to pose for two reasons. Firstly, China has transitioned from being a quasi-autarkic economy in the late 1970s to become the world's largest exporter in little less than three decades, while at the same time maintaining distinctive traits of a centrally-planned economy (Naughton, 1996, 2007; Xu, 2011). Thus, it is not straightforward to expect its exporters to share the same traits as their counterparts operating in the U.S., France and other market-oriented economies for which the aforementioned stylized facts have been established.

Secondly, China is widely recognized for having followed an unconventional and heterodox approach to trade opening — placing a strong emphasis on encouraging exports while at the same time protecting its domestic market (Naughton, 1996; Feenstra, 1998; Rodrik, 2010, 2014). Throughout its integration into the world economy, China has implemented a wide range of policy measures that have sought to facilitate its interaction with the rest of the world, while minimizing disruptions to its socialist economy. This mixture of policy objectives has led Feenstra (1998) to aptly characterize China's trade policy regime as "one country, two systems": a large collection of export-oriented enclaves co-existing within a highly protected economy. Prominent examples of policy measures

with these characteristics include Free Trade Zones (FTZ)[1] (World Bank, 2008; Wang, 2013), the export processing duty drawback scheme (Feenstra and Hanson, 2005; Ianchovichina, 2007), and a broad-range of tax concessions and subsidies featuring export share requirements, i.e. fiscal incentives conditioned on the recipient firm exporting more than a certain stated share of its output (Defever and Riaño, 2015a, 2017). Since these policies have been shown to distort the market selection mechanism that lies at the heart of the observed performance premium of exporting firms (Chor, 2009; Demidova and Rodríguez-Clare, 2009; Defever and Riaño, 2017), and given the unprecedented scale of their implementation in China over the last three decades, it is only natural to wonder about how similar Chinese exporters are to their peers elsewhere.

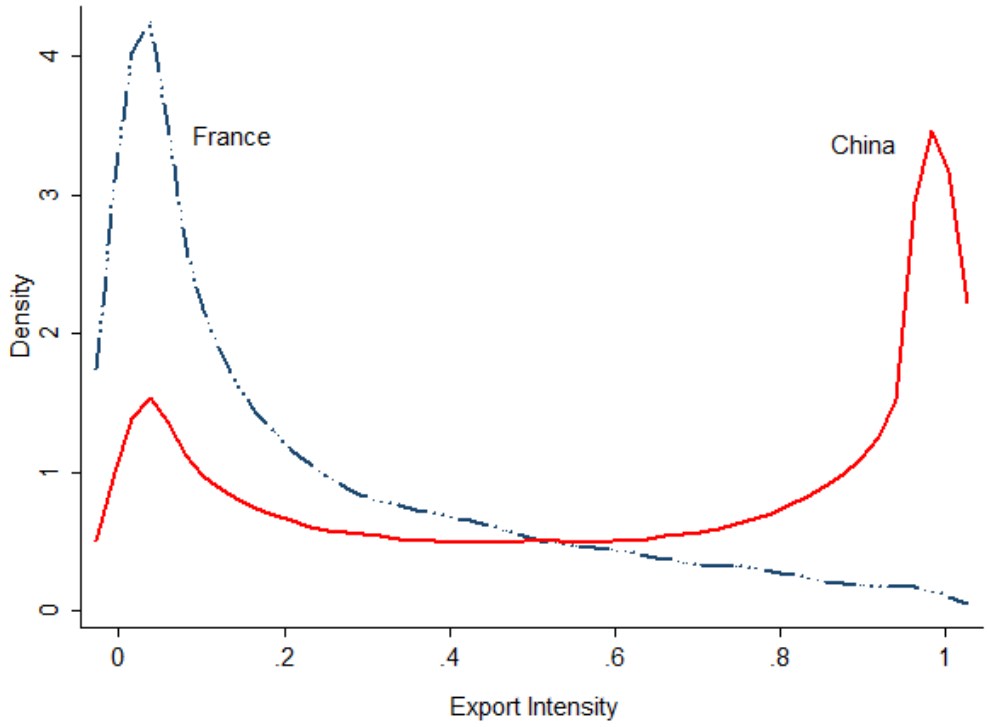
At first pass, our analysis suggests that exporters in China are not so different from exporters elsewhere. Only 28 percent of the firm-year observations in our data —which is a census of relatively large firms, and is therefore likely to overestimate the share of exporting firms— report positive export sales. Furthermore, exporters' total shipments are, on average, more than twice as big as those of domestic firms and are also significantly more productive than the latter.

The most striking difference that we observe among Chinese manufacturing exporters against the backdrop of the stylized facts outlined above, is the existence of a large number of exporters that sell almost all their output abroad. To be more precise, between 2000 and 2006, more than a third of Chinese manufacturing exporters sold 90 percent or more of their output in foreign markets. In contrast, only 1.9 percent of French exporters and 0.7 percent of U.S. exporters display such high export intensity (Bernard et al., 2003). Figure 1 vividly illustrates this point by comparing the distribution of export intensity, i.e. the share of total sales accounted for by exports, for Chinese manufacturing exporters during our period of study with the equivalent distribution for French exporters in 2000.

Two major groups of exporters can therefore be identified in China, 'pure exporters' (by which we mean firms that export more than 90 percent of their output), and 'regular exporters', which sell most of their output domestically. Our empirical analysis reveals that these two types of exporters differ significantly from one another across several dimensions. Firstly, although both pure and regular exporters are more productive than firms that only operate domestically, we find that pure

[1]Throughout the chapter we use the term Free Trade Zone to encompass special economic zones and other geographically-defined areas of export promotion.

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 3. Data on French exporters are from the Enquete Annuelle Entreprises, SESSI, for the year 2000.

exporters are significantly less productive than regular ones —a result which is at odds with the workhorse models of international trade with heterogeneous firms— all of which predict a positive correlation between firms' export intensity and productivity. We also find that pure exporters are less likely to undertake R&D expenditures and spend a smaller share of their value added in taxes than both domestic firms and regular exporters. Despite these differences, pure exporters are not confined to a narrow set of industries, and are in fact ubiquitous within China's manufacturing sector.

Although Defever and Riaño (2015b) have shown that countries in which exporters selling most of their output domestically coexist with a pure exporters are more common than initially thought, one of our objectives in this chapter is to investigate the extent to which China's trade policy regime has contributed towards the remarkable degree of duality observed in its export sector. To

do so, we combine firm-level data with customs transaction information to identify three types of firms, which, based on the typology developed by Defever and Riaño (2017), have been consistently targeted to receive incentives conditioned on them exporting the majority of their output. These firms are foreign-owned enterprises, firms located in free trade zones and firms exporting via the export processing regime.[2]

Our empirical analysis suggests that China's trade policies have played an instrumental role in fostering a dual export sector. Notably, nine out of ten manufacturing exporters in China are eligible to enjoy incentives contingent on export performance. Pure exporters are substantially more prevalent among the group of firms that are eligible to benefit from these policy measures. However, we show that pure exporters are also not confined to the export processing regime; a substantial number of them are foreign-owned firms not engaged in processing as well as privately-owned Chinese firms located in free trade zones. Lastly, we find that pure exporters pay on average 2.52 percent less taxes (as a share of their value-added) than regular exporters. This result crucially holds even within each group of exporters, i.e. processing trade enterprises, foreign-owned firms not specialized in processing and domestically-owned exporters.

Related Literature. The previous literature studying the prevalence of high-intensity exporters in China has focused on the technological differences between pure and regular exporters —e.g. in terms of the magnitude of foreign market access costs faced by each type of exporter and their factor usage intensity (Lu, 2010; Dai et al., 2016; Lu et al., 2014). In this chapter we emphasize instead the role played by the heterodox trade policy regime in promoting pure exporters. We also contribute to the extensive body of work seeking to establish robust empirical regularities regarding the export behavior of firms, exemplified by the summaries by Bernard et al. (2007) and Melitz and Redding (2014), which we hope will inform future theoretical work regarding the effects of trade policy on firm-level outcomes.

The rest of the chapter is organized as follows. Section 2 provides an overview of the trade policies implemented in China that have fostered the development of its dual export sector. This section also discusses potential reasons for their persistent use. Section 3 describes the data we

[2]Export processing is a legal arrangement between a foreign partner and a local producer, where all or part of the intermediate inputs are imported, and the finished product is re-exported after processing or assembly by enterprises within the mainland.

utilize. Section 4 presents our empirical findings, and Section 5 concludes.

2 China's Heterodox Trade Opening

Since China's trade liberalization reforms have been amply described in several sources (Naughton, 1996; Lardy, 2002; Naughton, 2007; Branstetter and Lardy, 2008), our objective in this section is to highlight the key economic policy elements that have fostered dualism in China's export sector. Since, as we argue below, the initial objectives of policies fostering export dualism was quite rapidly achieved, we speculate about the potential reasons that could rationalize their use long after China joined the WTO.

The death of Mao Zedong in 1976 marked a watershed moment in which the Chinese Communist Party (CCP) began its transition away from a command economy after the disastrous consequences of the Great Leap Forward (see Li and Yang, 2005). The party's ideology was reoriented to emphasize economic development as the foundation for both socialism and the political monopoly of CCP (Xu, 2011).

The process of market reform relied on the establishment of a dual-track system in which the centrally-planned economy coexisted with a market mechanism Lau et al. (2000). This approach was pursued more intensively in areas such as international trade that were perceived to be least embedded in the socialist economy. Naughton (2007) notes that the main objective of this development strategy was not necessarily to reduce distortions but rather to experiment with reforms in a controlled environment. Doing so allowed policymakers to contain problems more easily and to undertake the necessary adjustments before rolling out policies at the provincial and national level. Additionally, Xu (2011) argues that this setup also facilitated the implementation of schemes aimed at compensating interest groups opposing the reforms.

The creation of special economic zones in 1978, the establishment in 1986 of a separate corporate tax regime for foreign-invested enterprises, which provided tax breaks conditioned on a 50 percent export share requirement, and the institution of the processing trade regime in 1987, all conform to the general pattern outlined above. These three policy measures provided incentives for firms to export the majority of their output, and as a consequence helped in shielding state-owned enterprises from import competition, as shown by Defever and Riaño (2017). Of course, export

subsidies foster exports and import competition may increase to balance trade. However, subsidies associated with export requirements force firms that expand on the export market to also contract their domestic sales, which decreases domestic competition. By attracting multinational affiliates and compelling them to export all of their production, China has protected its low-productivity domestic companies from competition while simultaneously boosting exports. The Promotion of processing trade enterprises and the establishment of FTZ are geared towards the same objective.

The reforms targeting pure exporters were initially implemented with the narrow objective of increasing and diversifying China's sources of foreign exchange —a goal which was very quickly achieved by the early 1990s (Naughton, 2007). Why then, has the use of incentives targeted towards firms exporting the majority of their output persisted so long after the early phases of transition? After all, it is well known that export promotion is not a desirable objective per se; as Krugman (1993) notes, exports are essentially just an input to acquire imports. Moreover, a large body of work has shown that policies that incentivize firms to export all their output can only be considered second-best policies from a welfare perspective in the presence of other distortions such as externalities, imperfect competition or unemployment (Hamada, 1974; Miyagiwa, 1986; Davidson et al., 1985; Rodrik, 1987). Similarly, Defever and Riaño (2017) show from a quantitative perspective, that imposing export share requirements on export subsidies exacerbates their distortions relative to standard, unconditional subsidies.

Since all models listed above are set up in a static environment, they are not well suited to speak to the dynamic consequences of China's export promotion efforts. It is plausible that the policies targeted at pure exporters played a significant role in the rapid industrialization process observed in China, helping to ease the reallocation of labor from agriculture towards manufacturing, although to the best of our knowledge, this hypothesis has not yet been formalized or quantified. Thus, static distortions in terms-of-trade or within-industry market shares could in principle be compensated by dynamic gains in physical capital and knowledge accumulation (Young, 2003). A related advantage associated with maintaining tight control over its domestic market, is that it allowed Chinese policymakers to successfully trade market access in exchange for technology transfers from foreign multinationals, as noted by Holmes et al. (2015).

A second potential explanation for the continuing promotion of pure exporters —from a political economy perspective— relies on the regionally decentralized authoritarian nature of Chinese poli-

cymaking (Xu, 2011). Local governments in China have enjoyed substantial autonomy in the design and implementation of rules and legislation affecting the export sector, grounded in the principle of reform experimentation described above. As the number of free trade zones expanded dramatically following their initial success,[3] an intense regional competition developed among local officials for bureaucratic promotion based on performance rankings in which exports and FDI growth featured prominently (Li and Zhou, 2005; Xu, 2011). Branstetter and Feenstra (2002) however, have shown that besides the promotion of international trade and foreign investment, local governments also placed significant importance on the performance of state-owned enterprises. Estimating a variant of Grossman and Helpman's (1994) seminal paper on protection for sale, extended to account for FDI and government ownership of domestic firms, Branstetter and Feenstra (2002) find that provincial governments in China assign a weight to consumer welfare of one-seventh to one-quarter of the weight applied to the output of domestic firms in their political objective function. This result is all the more striking since protection-for-sale models estimated across a wide range of countries usually imply that the weight assigned to consumer welfare in policymakers' objective function is substantially larger than that given to interest groups (Gawande and Krishna, 2003). Defever and Riaño (2017) show that subsidies with export requirements foster aggregate exports, but unlike unconditional export subsidies, they also increase the profitability of firms operating only in the domestic market. As noted above, these two effects have a direct impact on key performance indicators affecting the career progression of local officials. Maintaining the profitability of domestic producers is consistent both with the well-documented gradualist approach to transition followed by Chinese authorities (McMillan and Naughton, 1992), as well as with a desire to implement "reforms without losers" as suggested by Lau et al. (2000).

A third plausible motivation could be attributed to 'strategic trade policy' objectives. The aggressive subsidization of pure exporters by China can be viewed as a means to increase its market share in international markets at the expense of its competitors, as illustrated by the seminal work by Brander and Spencer (1985). The fact that over the last decade China has been the most targeted country in terms of temporary trade barriers such as anti-dumping and countervailing duty measures attests to the popularity of this view across the world (Bown, 2011). Rodrik (2013) argues that China has become the leading perpetrator of modern mercantilism. In his view, Chinese

[3]See Wang (2013) for a detailed account of the evolution of special economic zones.

policymakers do not consider —as most economic models show— that the main source of gains from trade arise from the increased possibility of imported consumption. Instead, China has actively subsidized exports, perhaps at the expense of their own consumers, with the objective of supporting domestic production and employment.

Rodrik (2014) aptly summarizes the combination of export promotion and domestic protection elements underlying the Chinese approach to trade opening thus:

> Rather than liberalize its trade regime in the standard way, which would have decimated the country's inefficient state enterprises, China allowed firms in special economic zones to operate under near-free-trade rules while maintaining trade restrictions elsewhere until the late 1990s. This enabled China to insert itself in the world economy while protecting employment and rents in the state sector. The Chinese Communist Party was strengthened and enriched, rather than weakened, as a result.

Although incentives targeted at pure exporters are one of the most important instruments of industrial policy deployed across developing countries —in no small part due to the perception of their success in China— their potential to foster economic development has been less convincing (Rodrik, 2004; World Bank, 2008; Farole and Akinci, 2011). The encouragement of a dual export sector through the provision of subsidies conditioned on export performance limits the creation of productive linkages with the local economy, curtails the extent of potential knowledge spillovers and can even harm the local economy, as shown by Rodríguez-Clare (1996).

3 Data

Our first data source is the annual survey of Chinese manufacturing firms compiled by the National Bureau of Statistics (NBS) for the years 2000 to 2006. This dataset includes both state-owned enterprises and private firms with sales above five million Chinese Yuan and contains detailed balance sheet information as well as firms' ownership status and total export sales.

In order to clean the data we follow Brandt et al. (2012) and drop firms reporting less than 8 employees, or reporting missing or incoherent values for our key variables of interest. We drop observations that report missing, null or negative values for total output, employment, intermediate inputs, fixed capital, value-added or if the export/sales, value-added tax/value-added, output

tax/output, income tax/value-added ratios exceed one. We also exclude firms with operating status recorded as "inactive", "bankrupt" or "closed". Lastly, we drop a small number of observations in which firms report no exports in the manufacturing survey but for which we observe export transactions in the custom data (discussed below) in that particular year. After applying these filters, our final sample consists of 1,100,600 firm-year observations with 386,185 different firms. Our sample represents approximately 95 percent of China's industrial output and 98 percent of its manufacturing exports.

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.

4 Empirical Analysis

Are exporters a minority in China? In a nutshell, yes. Table 1 presents a first cut at the manufacturing survey data. Column (2) reveals that only 28 percent of firm-year observations feature positive export flows. Since ours is a survey of large firms, it is likely that the share of exporters among the universe of Chinese manufacturing firms is even lower. Column (3) shows that, conditional on exporting, more than a third of firms fall in the pure exporter category. This share is substantially higher than what has been previously documented in the U.S., France and Colombia —three countries that have figured prominently in the empirical literature on the decision to export at the firm-level (Bernard and Jensen, 1999; Bernard et al., 2003; Arkolakis, 2010; Eaton et al., 2011; Roberts and Tybout, 1997)— in none of which the share of pure exporters (among exporting firms) exceeds 8 percent.

Díaz de Astarloa et al. (2013) document the existence of a large number of "born-to-export" firms in the apparel sector in Bangladesh, and argue that they could arise due to a lack of domestic demand for the specific products they manufacture. This explanation does not suit the Chinese case because, (as shown below), pure exporters in China are prevalent across a wide range of manufacturing industries, and second, because domestic absorption in China exceeds exports in most manufacturing industries (Brandt and Morrow, 2013).

Table 1: Summary Statistics - Manufacturing Survey, 2000-2006

	Manufacturing Survey, 2000-2006		
	Number of observations	Percentage among All firms	Percentage among Exporters
	(1)	(2)	(3)
Pure exporters	105,543	9.59	34.37
Regular exporters	201,563	18.31	65.63
Domestic firms	793,494	72.10	
Total	1,100,600	100	100

Are exporters more productive than domestic firms? In order to answer this question, we first estimate 2-digit sector-specific production functions for the firms in the NBS survey over the period 2000-2006. Total factor productivity (TFP) is computed as the difference between a firm's observed and predicted output. We next regress our TFP measure on an export status dummy in order to estimate export performance premia following Bernard and Jensen (1999) and Bernard et al. (2007), including year, 4-digit sector and prefecture-city fixed effects. The latter are included 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, as shown by Cheng et al. (2012).

Total factor productivity for firm i in year t, denoted by φ_{it}, is estimated as the residual of the following two-factor Cobb-Douglas production function:

$$Q_{it} = \lambda_0 + \lambda_K K_{it} + \lambda_L L_{it} + \varphi_{it} + \epsilon_{it}, \tag{1}$$

where Q_{it}, L_{it} and K_{it} denote firm i's value-added before taxes, labor and capital stock respectively (all in logarithms), and ϵ_{it} stands for measurement error in output; λ_0 is a constant term and λ_L and λ_K are the elasticities of output with respect to labor and capital respectively. We use the deflators computed by Brandt et al. (2012) to calculate real values for intermediate inputs, capital and output.[4] Real value added is obtained by subtracting the deflated value of intermediate inputs used in production from the firm's deflated output. As Feenstra et al. (2014) note, it is preferable

[4]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.

to estimate a valued-added rather than a gross output production function in the case of China, due to the importance of processing trade. The production functions represented by equation (1) are estimated both by OLS and using the semi-parametric method proposed by Levinsohn and Petrin (2003) (LP). We cluster the standard errors at the firm level to account for any potential within-firm correlation over time.

Table 2: Exporters' Productivity Premium

	(1) log Sales	(2) TFP LP	(3) TFP OLS	(4) log Sales	(5) TFP LP	(6) TFP OLS
	Comparison group: All domestic firms					
Exporter	0.824^a	0.563^a	0.151^a			
	(0.005)	(0.004)	(0.003)			
• Pure exporters				0.575^a	0.383^a	0.073^a
				(0.007)	(0.006)	(0.005)
• Regular exporters				0.917^a	0.631^a	0.181^a
				(0.006)	(0.005)	(0.004)
Year fixed effects	✓	✓	✓	✓	✓	✓
Sector fixed effects	✓	✓	✓	✓	✓	✓
Prefecture-city fixed effects	✓	✓	✓	✓	✓	✓
# Obs	1,100,600	1,100,600	1,100,600	1,100,600	1,100,600	1,100,600
# firms	386,185	386,185	386,185	386,185	386,185	386,185
R^2	0.217	0.265	0.313	0.221	0.268	0.314

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

The first three columns of Table 2 reveal that Chinese exporters are indeed larger and more productive than domestic firms —just as their counterparts in other countries. More precisely, Chinese exporters are 128 percent larger in terms of sales and 76 percent more productive (using the LP estimator) than firms selling solely at home, with both differences being significant at the 1 percent confidence level.[5] Using the OLS-based TFP measure yields the same productivity ranking, although the magnitude of the productivity premium is lower. These results are in line with previous findings by Dai et al. (2016), Ma et al. (2014) and Feenstra et al. (2014).

In columns (4)-(6), we present estimated performance premia —again, relative to domestic firms— for regular and pure exporters separately. We find that both types of exporter are larger and more productive than domestic firms. However, and more interestingly, we find that regular ex-

[5] $\exp(0.824) - 1 \approx 1.28$ and $\exp(0.563) - 1 \approx 0.76$ respectively.

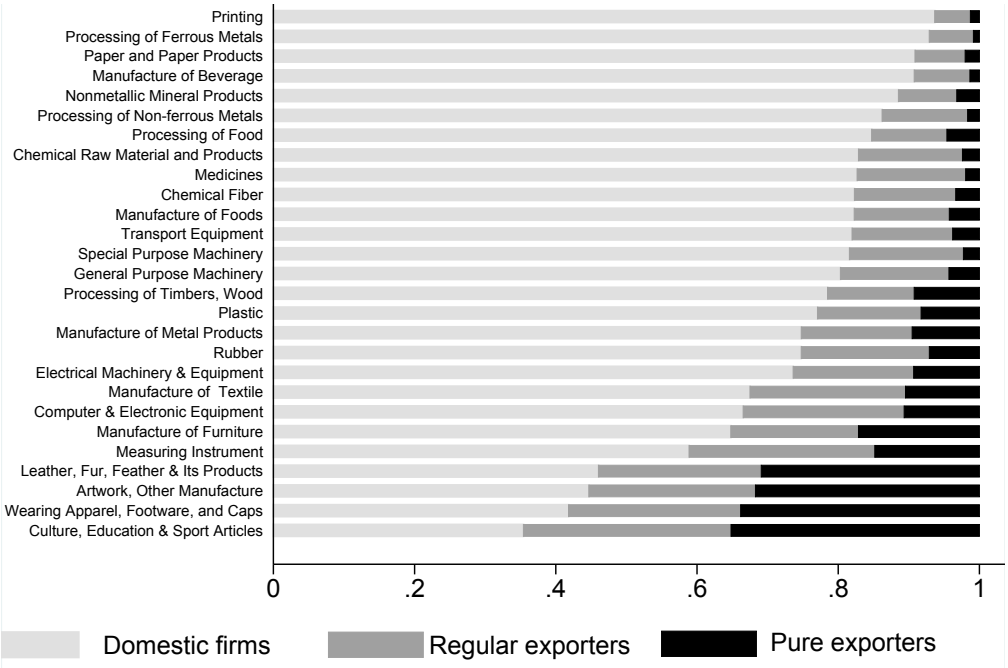
porters are significantly larger and more productive than firms selling all their output abroad. This result is at odds with most workhorse models of international trade with heterogeneous firms such as Melitz (2003) (with more than two countries), Melitz and Ottaviano (2008), Arkolakis (2010), and Eaton et al. (2011), all of which predict a positive correlation between a firm's productivity and its export intensity.[6]

Lu et al. (2014) show that adding a fixed cost to access both the domestic and foreign market (over and above the fixed cost associated with setting up a production facility) to a partial equilibrium version of the Melitz (2003) model generates pure exporters that are less productive than regular ones, as long as the foreign market is larger than the domestic one. Another possibility is that the majority of pure exporters are engaged in processing activities, which are in turn associated with low fixed costs (Manova and Yu, 2016), e.g. if these firms do not engage in product design, marketing or R&D or have lower search costs to find foreign buyers. While the two mechanisms outlined above emphasize differences in 'technology' between regular and pure exporters, lower fixed costs of servicing export markets can also be the result of incentives subject to export share requirements, as noted by Defever and Riaño (2017). In this case, pure exporters enjoy advantages such as provision of utilities at below-market rates or priority access to infrastructure and land, which reduce the fixed cost of exporting relative to that faced by firms that choose to sell a substantial share of their output domestically. Relatively less productive firms select themselves to operate as pure exporters instead of regular exporters, in order to save on fixed costs.

Is the prevalence of pure exporters due to inter-industry differences? It is plausible that the figures reported in Table 1 are the result of a composition effect related to significant inter-industry heterogeneity in market access costs. The standard Melitz (2003) model assumes that the fixed cost of servicing the foreign country —relative to the market's effective size— is higher than the corresponding cost of selling domestically. The implications following from this assumption are that the most productive firms select themselves into exporting and that all exporters sell some of their output domestically; in other words, it precludes the existence of pure exporters. Lu (2010) shows that in a multi-sector extension of the Melitz model, the sign of the selection

[6] All exporting firms allocate the same share of their total sales to the export market in the Melitz (2003) model with two countries. With three or more countries, the most productive firms sell to more destinations and therefore exhibit a higher export intensity than firms selling in fewer markets.

Figure 2: Distribution of Firm Types across 2-digit Industries



condition can be reversed in the comparative advantage sector. Under these circumstances, the least productive firms in the comparative advantage sector export all their output, while the most productive sell both domestically and abroad. Conversely, domestic firms and regular exporters coexist in the comparative disadvantage sector. If this is the case, we would expect to see pure exporters disproportionably concentrated in certain sectors while being absent in others.

The data does not support this hypothesis. Figure 2 shows that pure exporters are not confined to a narrow set of industries; they coexist with regular exporters and domestic firms across all 2-digit industries covered in the NBS dataset.[7] Pure exporters are less frequently observed in sectors such as printing, processing of ferrous metals and paper and are most prevalent in the manufacture of textiles, apparel and sporting goods as well as in the production of electronics and electrical machinery.

Identifying firms eligible to receive support subject to exporting the majority of their output. As noted in Section 2, a key element of China's heterodox trade regime has been to

[7]Redoing Figure 2 at the 4-digit level of aggregation yields the same conclusion.

actively incentivize firms that sell the majority of their output abroad. As documented in more detail by Defever and Riaño (2017), policies favoring pure exporters have primarily targeted three groups of firms: Foreign Invested Enterprises (FIEs), Processing Trade Enterprises (PTEs) and firms located in Free Trade Zones (FTZs).

Although the NBS data provide information on firms' ownership status (with a further breakdown, based on whether a firm's capital originates from Hong Kong, Macau or Taiwan or other sources), it does not allow us to directly distinguish PTEs, because the survey does not record the value of exports sold through different customs regimes. To obtain information about a firm's reliance on processing exports, we merge the NBS dataset with a transaction-level customs dataset from the Chinese General Administration of Customs. We follow Manova and Yu (2016) and match the two datasets using firms' names as a common variable. While each uses a different identifier, firms' names are a reliable matching variable since, by law, two firms cannot have the same name in the same administrative region. Table 3 provides summary statistics for the merged sample. We are able to successfully match approximately half of the observations reporting a positive value of export sales in the NBS sample with their respective customs records. Nevertheless, it is reassuring that the share of pure exporters in the matched sample (Column 3 of Table 3) is almost identical to the one we find using the NBS data (Column 3 of Table 1).

Table 3: Summary Statistics - Matched Data, 2000-2006

	Matched Data, 2000-2006		
	Number of observations	Percentage among All firms	Exporters
	(1)	(2)	(3)
Pure exporters	51,113	5.40	33.58
Regular exporters	101,104	10.69	66.42
Domestic firms	793,494	83.90	
Total	945,711	100	100

We calculate the average share of exports sold under the processing trade regime in every year for each firm in the matched sample. The distribution of firms' export processing share is strikingly bimodal: 72.1 percent of firms use the processing regime for less than 10 percent of their exports, while 15.5 percent sell more than 90 percent of their exports under this regime. Therefore, we

define **Processing Trade Enterprises (PTEs)** as firms selling more than 90 percent of their exports through the processing trade regime. It is important to highlight the fact that based on this 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 state whether a firm is located in a Free Trade Zone or not, it does record firms' administrative area of location. We use this information to identify **firms operating in a Free Trade Zone (FTZ)** as producers located in prefecture-level cities promoted as Special Economic Zones, Coastal Development Zones as well as the Yangtze and Pearl River Delta Economic Zones. Our definition of FTZ excludes smaller industrial parks such as "Economic and Technological Development Zones", "New and High-Tech Industrial Development Zones" and "Export Processing Zones", in which firms also enjoy preferential treatment. Many of these are located along the coast within prefecture-level cities already classified as a FTZ in our definition.[8] Appendix A provides the exact list of prefecture-cities included in our definition of FTZs.

Prevalence of different firm types. Panel A of Table 4 presents the share of exporters across each category described above (FIE, PTE, neither) and also according to firms' location in a FTZ. The main message from Panel A is that approximately 90 percent of Chinese manufacturing exporters are potentially eligible to receive preferential treatment, conditional on exporting the majority of their output. Panel B shows the percentage of pure exporters among exporters across different firm groups. Pure exporters are highly concentrated among FIEs and PTEs, accounting for approximately a half and third of all exporters in these categories respectively. Table 4 also shows that pure exporters, regardless of their ownership status or the customs regime used to sell their output, are more likely to be located in a FTZ.

[8] 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 customs data provide a special code identifying them. However, in 2006, only 166 firms can be classified as being located in any of these processing zones, 85 percent of which are located in a city already classified as a FTZ.

Table 4: 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

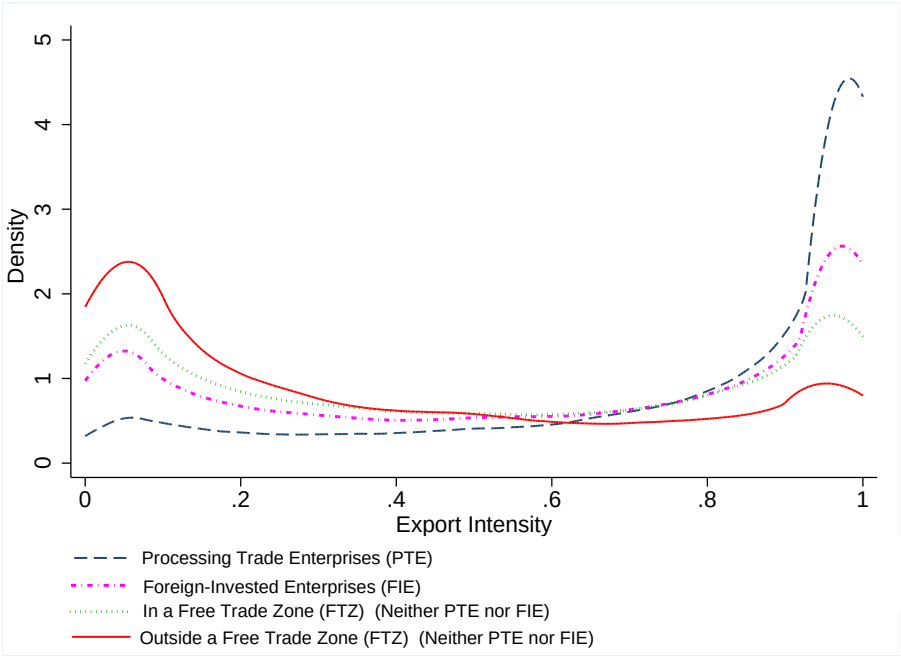


Figure 3 presents the distribution of export intensity across the four groups of exporters described in Table 4. Pure exporters are significantly more prevalent among PTEs, whereas the distribution of export intensity for FIEs and firms located in a FTZ appears more bimodal. Interestingly, more than a third of PTEs sell 30% or more of their output domestically. This challenges

the commonly held view that firms engaged in processing activities are fully specialized in production for exporting (Brandt and Morrow, 2013). 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— although, there is still a discernible hump in the upper bound of the export intensity distribution for this group of firms. This could be due to the fact that our definition of FTZ excludes small industrial parks, which also provide preferential treatment for pure exporters, or because our firm grouping does not capture policies benefitting pure exporters 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). 25% of the prefectures have 33.6% or more of their exporters that can be classified as pure exporters.[9] It can be clearly seen that pure exporters are highly concentrated along coastal areas, the same places where FTZs have been established. Unlike the traditional definition of a free trade zone, which stresses the fact that they usually are small, fenced-in geographically-delimited areas (World Bank, 2008), the scale of FTZ in China is unprecedentedly massive. FTZ often encompass entire prefectures, and in fact, as shown in Figure 4, cover a substantial fraction of China's eastern seaboard.

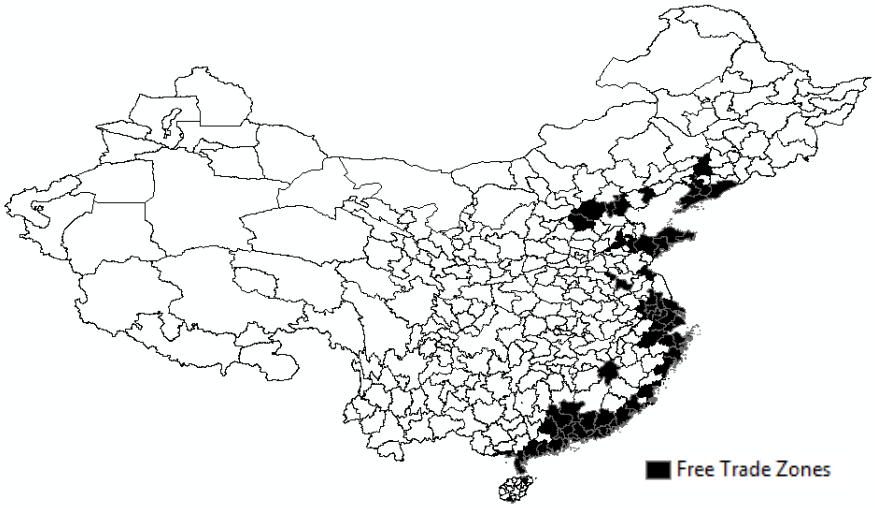
Foreign affiliates from Hong Kong, Macau and Taiwan. Foreign direct investment (FDI) has played an instrumental role in China's integration into the world economy. A notable characteristic of FDI inflows into China, as Branstetter and Foley (2010) point out, is that a substantial share of them originates from Hong Kong, Macau or Taiwan (HKMT). Anecdotal evidence suggests that an important share of HKMT-originated capital flows are the result of "round-tripping" (Prasad and Wei, 2007), i.e. Chinese investors creating shell companies in HKMT to operate production facilities located in mainland China in order to enjoy preferential tax treatment as foreign investment, which is also often conditioned on export performance (Defever and Riaño, 2017).

Using the information available in the NBS data regarding firms' ownership, we now explore

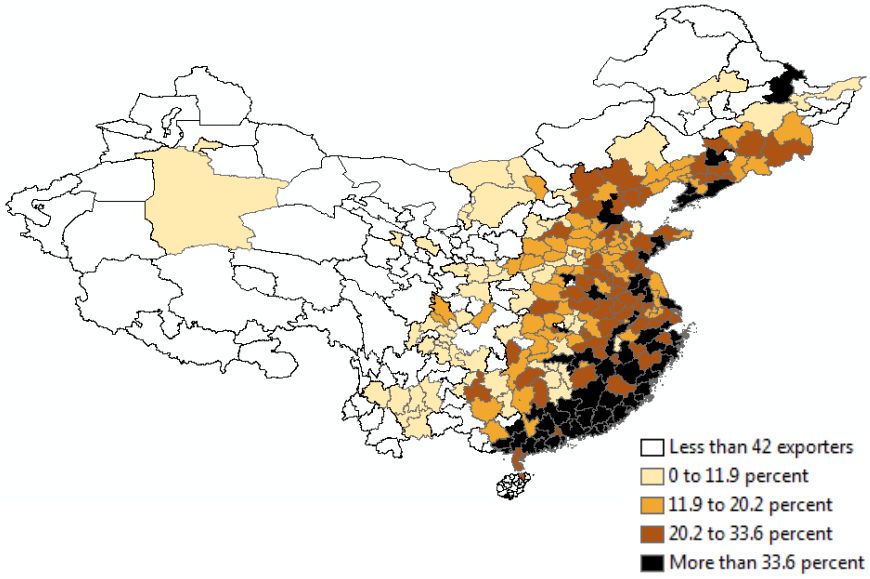
[9]Locations with fewer than 42 observations have been excluded in order to avoid inaccuracies.

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 A.

Table 5: Percentage of firms with capital originating in Hong Kong, Macau or Taiwan by firm-type

	Manufacturing Survey	Matched Data			
	All exporters	FIEs	PTEs	Neither FIEs or PTEs in a FTZ	Neither FIEs or PTEs outside a FTZ
Non-HKMT foreign affiliate	11.37	23.97	28.56		
Non-HKMT foreign JV	11.24	32.54	16.08		
HKMT foreign affiliates	12.25	20.30	33.43		
HKMT foreign JV	10.01	23.19	16.31		
State Owned Enterprises	6.77		1.29	8.55	26.38
Chinese Private firms	48.37		4.33	91.45	73.62
	100.00	100.00	100.00	100.00	100.00

the role of HKMT foreign firms in China's export sector. The first column of Table 5 shows that foreign-owned firms are extremely important in China's export sector, accounting for slightly less than half of exporters. To provide a reference point, Rodrigue (2008) finds that foreign-owned firms account for only 19 percent of Indonesian exporters. FIEs are evenly distributed between wholly-owned foreign affiliates and joint ventures and also across the sources of origin of their capital. Columns (2)-(4), which are based on our matched sample, show first that PTE are overwhelmingly foreign-owned (only 5 percent of them are domestically owned), and second, that approximately half of all PTEs and 44 percent of FIEs not specialized in processing activities are owned by HKMT-based investors. These figures provide suggestive evidence of the importance of round-tripping and its close association with incentives conditioned on export performance.

A recurring argument put forward by policy-makers to rationalize the use of incentives to attract foreign-owned firms is that their activity generates knowledge spillovers that can be appropriated by domestic firms through technology transfer, imitation of best practices, worker flows and access to new markets (Keller, 2004). Inasmuch as HKMT-based FDI flows are targeted towards export-oriented activities with the objective of enjoying tax incentives, the potential for FDI spillovers for Chinese firms appears quite limited, as shown by Agarwal et al. (2014). Table 6 presents the percentage of observations reporting a positive value of R&D in the NBS survey. Column 1 shows that the proportion of pure exporters reporting a positive level of expenditure in R&D is three times smaller than that among regular exporters. Similarly, large differences in the share of firms reporting any R&D expenditure can also be identified in the matched data for all firm categories

presented in Columns (2)-(5). Regulations such as the 2002 *Provisions on Guiding Foreign Direct Investment* for example, can help in explaining the stark differences in R&D activity between pure and regular exporters, since they provide preferential treatment to foreign enterprises which are *either* technology-intensive *or* export the majority of their production. As a result, foreign-investors seeking access to the Chinese market might choose to invest in R&D in order to qualify as technologically-intensive firms, whereas pure exporters would tend to concentrate on labor-intensive activities.

Table 6: Percentage of Observations Featuring Positive Expenditure in R&D

Year	Manufacturing Survey	Matched Data			
	All exporters	FIEs	PTEs	Neither FIEs or PTEs in a FTZ	Neither FIEs or PTEs outside a FTZ
Pure exporters	6.99	7.35	7.40	11.71	14.04
Regular exporters	20.78	17.07	15.92	26.99	36.26

Firm-level tax outlays. Defever and Riaño (2017) document a wide variety of policy measures utilized in China (even after joining the WTO), providing incentives to firms under the condition that they export the majority of their output. Although it is extremely difficult to obtain systematic information indicating which firms receive these incentives and how big they are, we can investigate if pure exporters pay less taxes than domestic firms and regular exporters. To do so, we use the information provided by the NBS survey regarding firms' income, value-added and sales tax outlays as reported in their balance sheet.

Table 7 presents the tax outlay premia of pure exporters vis-à-vis other firms. The upper panel of the table uses domestic firms as a reference group, while the lower one presents a group-wise comparison with regular exporters. The latter compares, for instance, pure exporters that rely primarily on the processing customs regime to export with PTE firms that sell less than 90 percent of their output abroad in terms of their share of value-added devoted to each specific tax. Just as in the productivity premia regressions, we include year, 4-digit sector and province-city-specific fixed effects and cluster standard errors at the firm-level. The dependent variables used in the regressions reported 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.

Table 7: 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 exporter		-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.

The coefficients reported in Table 7 can be interpreted as the difference in the share of value-added devoted to the payment of each type of tax by pure exporters relative to the corresponding control group defined above. By adding the coefficients, we obtain the overall difference (in percentage points) of firms' value-added spent on taxes. Domestic firms devote, 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 in tax expenditure for each of the three groups of pure exporters, i.e. PTEs, FIEs and the residual group, compared to domestic firms and regular exporters of each type. All the estimates, except the one comparing the sales tax outlay of pure and regular exporters that are FIEs, indicate that pure exporters pay significantly less taxes than other firms.

5 Concluding Remarks: Dualism Here to Stay?

China's transition to become the world's largest exporter over the last thirty years has been nothing short of spectacular, spurring great interest on the economic reforms that made it possible. In this chapter we have shown that China's heterodox approach towards trade opening combining strong incentives for export promotion with domestic protection, has resulted in a starkly dual export sector.

In this chapter we have shown that although Chinese exporters resemble their counterparts elsewhere —namely in terms of being a minority among manufacturing firms and being larger and more productive— economic policies favoring firms exporting the majority of their output have engendered a rather unique degree of dualism among them. Using a rich data of Chinese manufacturing firms for the period 2000-2006 matched with customs transaction data, we have shown that the vast majority of Chinese exporters belong to one of two groups: regular exporters, firms that sell most of their output domestically, and pure exporters, producers that sell almost exclusively abroad. A large share of pure exporters are engaged in processing activities, i.e. assembling imported inputs into final goods to be sold in foreign markets, but many of them also export through the ordinary trade customs regime. Pure exporters are primarily located in close proximity to the eastern seaboard in prefectures with free trade zones and are also likely to be foreign owned. When compared to regular exporters, pure exporters tend to be significantly smaller and less productive, are less likely to engage in R&D activities, and crucially, devote a smaller share of their value added to tax payments.

Incentives contingent on export performance have remained a prominent element of China's trade policy regime, even after becoming a member of the WTO in 2001. For instance, tax con-

cessions granted by the central government to foreign-invested enterprises conditioned on them exporting more than 70 percent of their output were maintained until 2008, despite several complaints voiced by WTO members during China's annual Transitional Review Mechanism (TRM). At the same time, while China was required to disclose any subsidy programs in place on a yearly basis under the provision of Article 1 of the Agreement on Subsidies and Countervailing Measures (ASCM), it ended up submitting just two notifications in 2006 and 2011 when the TRM ended. 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 (Haley and Haley, 2013). Additionally, subsidies granted at sub-national, provincial and local levels were not acknowledged in either notification.[10] Similarly, the 'Famous Brands' initiative —a large umbrella of export support programs which featured several subsidies contingent on export performance— was introduced in 2005, and was only abandoned in 2009 after being challenged by the U.S. and the EU at the WTO one year before.

The persistence of export promotion policies and their protectionist implications after China's successful integration into the global economy, brings to mind Matoo and Subramanian's (2011) allegorical portrayal of China and its trade policy as Penelope, Ulysses' wife, unraveling by night the shroud she wove by day to keep her suitors at bay. As member countries maintain pressure on China to abide by WTO rules, one natural question to ask is whether the dual nature of China's export sector will endure. In this respect, Defever and Riaño (2015a) find, using data from the World Bank Enterprise Survey available for 2002 and 2013, that the importance of pure exporters in China has declined significantly over the last decade. These results suggest that China's trade policy might have shifted focus away from the active promotion of firms exporting the majority of their output, thereby reducing the extent of dualism in its export sector.

Understanding the potential impact of ending policies that incentivize pure exporters is crucial for a large number of developing economies that rely on subsides with export requirements. Crucially, 19 developing countries had been exempted from complying with the Agreement on Subsidies and Countervailing Measures (ASCM) by the WTO until December 31st 2015.[11] Defever

[10] See "Request from the United States to China," October 11, 2011, reference G/SCM/Q2/CHN/42.

[11] See: General Council decision of July 31, 2007 WT/L/691. The beneficiaries of this extension are Antigua and Barbuda, Barbados, Belize, Costa Rica, Dominica, Dominican Republic, El Salvador, Fiji, Grenada, Guatemala, Jamaica, Jordan, Mauritius, Panama, Papua New Guinea, St. Kitts and Nevis, St. Lucia, Saint Vincent and the Grenadines, and Uruguay. The notification also lists the subsidy programs that need to be reformed.

et al. (2016) have shown, however, that efforts to make free trade zones compliant with the subsidy disciplines of the WTO by removing explicit export performance requirements —specifically in the Dominican Republic— have not been very successful in reducing the extent of duality of the export sector.

References

Agarwal, N., C. Milner, and A. Riaño (2014): "Credit constraints and spillovers from foreign firms in China," *Journal of Banking & Finance*, 48, 261–275.

Arkolakis, C. (2010): "Market Penetration Costs and the New Consumers Margin in International Trade," *Journal of Political Economy*, 118, 1151 – 1199.

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. and J. B. Jensen (1999): "Exceptional exporter performance: cause, effect, or both?" *Journal of International Economics*, 47, 1–25.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott (2007): "Firms in International Trade," *Journal of Economic Perspectives*, 21, 105–130.

Bown, C. P. (2011): "Taking Stock of Antidumping, Safeguards and Countervailing Duties, 19902009," *The World Economy*, 34, 1955–1998.

Brander, J. A. and B. J. Spencer (1985): "Export subsidies and international market share rivalry," *Journal of International Economics*, 18, 83–100.

Brandt, L. and P. M. Morrow (2013): "Tariffs and the Organization of Trade in China," Manuscript, University of Toronto.

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.

Branstetter, L. G. and R. C. Feenstra (2002): "Trade and Foreign Direct Investment in China: a Political Economy Approach," *Journal of International Economics*, 58, 335–358.

Branstetter, L. G. and C. F. Foley (2010): "Facts and Fallacies about U.S. FDI in China," in *China's Growing Role in World Trade*, ed. by R. C. Feenstra and S.-J. Wei, National Bureau of Economic Research, 513–539.

Branstetter, L. G. and N. R. Lardy (2008): "China's Embrace of Globalization," in *China's Great Economic Transformation*, ed. by L. Brandt and T. G. Rawski, Cambridge: Cambridge University Press.

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 (2016): "Unexceptional Exporter Performance in China? The Role of Processing Trade," *Journal of Development Economics*, 121, 177–189.

Davidson, C., S. J. Matusz, and M. E. Kreinin (1985): "Analysis of Performance Standards for Direct Foreign Investments," *Canadian Journal of Economics*, 18, 876–90.

Defever, F., J.-D. Reyes, A. Riaño, and M. E. Sánchez-Martín (2016): "Does the Elimination of Export Requirements in Special Economic Zones affect their Export Performance? Evidence from the Dominican Republic," World Bank Policy Research Working Paper 7874.

Defever, F. and A. Riaño (2015a): "Gone for Good? Subsidies with Export Share Requirements in China: 2002-2013," *World Bank Economic Review Papers & Proceedings*, 29, S125–S144.

——— (2015b): "Twin Peaks," Manuscript, University of Nottingham.

——— (2017): "Subsidies with export share requirements in China," *Journal of Development Economics*, 126, 33–51.

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

Díaz de Astarloa, B., J. Eaton, K. Krishna, B. Y. Aw-Roberts, A. Rodríguez-Clare, and J. Tybout (2013): "Born-to-Export Firms: Understanding Export Growth in Bangladesh," International Growth Centre Working Paper.

Eaton, J., S. Kortum, and F. Kramarz (2011): "An Anatomy of International Trade: Evidence From French Firms," *Econometrica*, 79, 1453–1498.

Farole, T. and G. Akinci (2011): *Special Economic Zones: Progress, Emerging Challenges and Future Directions*, Washington 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. and G. H. Hanson (2005): "Ownership and Control in Outsourcing to China: Estimating the Property-Rights Theory of the Firm," *The Quarterly Journal of Economics*, 120, 729–761.

Feenstra, R. C., Z. Li, and M. Yu (2014): "Exports and Credit Constraints under Incomplete Information: Theory and Evidence from China," *The Review of Economics and Statistics*, 96, 729–744.

Gawande, K. and P. Krishna (2003): "The Political Economy of Trade Policy: Empirical Approaches," in *Handbook of International Trade*, ed. by J. Harrigan and E. K. Choi, Oxford: Basil Blackwell.

Grossman, G. M. and E. Helpman (1994): "Protection for Sale," *American Economic Review*, 84, 833–50.

Haley, U. C. V. and G. T. Haley (2013): *Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy*, Oxford: Oxford University Press.

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

Holmes, T. J., E. R. McGrattan, and E. C. Prescott (2015): "Quid Pro Quo: Technology Capital Transfers for Market Access in China," *Review of Economic Studies*, 82, 1154–1193.

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

Keller, W. (2004): "International Technology Diffusion," *Journal of Economic Literature*, 42, 752–782.

Krugman, P. R. (1993): "What Do Undergrads Need to Know about Trade?" *American Economic Review*, 83, 23–26.

Lardy, N. R. (2002): *Integrating China into the Global Economy*, Washington, DC: Brookings Institution Press.

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, H. and L.-A. Zhou (2005): "Political Turnover and Economic Performance: The Incentive Role of Personnel Control in China," *Journal of Public Economics*, 89, 1743–1762.

Li, W. and D. T. Yang (2005): "The Great Leap Forward: Anatomy of a Central Planning Disaster," *Journal of Political Economy*, 113, 840–877.

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

Lu, J., Y. Lu, and Z. Tao (2014): "Pure Exporter: Theory and Evidence from China," *The World Economy*, 37, 1219–1236.

Ma, Y., H. Tang, and Y. Zhang (2014): "Factor Intensity, Product Switching, and Productivity: Evidence from Chinese Exporters," *Journal of International Economics*, 92, 349–362.

Manova, K. and Z. Yu (2016): "How firms export: Processing vs. ordinary trade with financial frictions," *Journal of International Economics*, 100, 120–137.

Matoo, A. and A. Subramanian (2011): "China and the World Trading System," Policy Research Working Paper 5897, World Bank.

McMillan, J. and B. Naughton (1992): "How to Reform a Planned Economy: Lessons from China," *Oxford Review of Economic Policy*, 8, 130–43.

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

Melitz, M. J. and G. I. P. Ottaviano (2008): "Market Size, Trade, and Productivity," *Review of Economic Studies*, 75, 295–316.

Melitz, M. J. and S. J. Redding (2014): "Heterogeneous Firms and Trade," in *Handbook of International Economics*, ed. by E. Helpman, K. Rogoff, and G. Gopinath, Elsevier, vol. 4 of *Handbook of International Economics*, 1 – 54.

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.

Prasad, E. and S.-J. Wei (2007): "The Chinese Approach to Capital Inflows: Patterns and Possible Explanations," in *Capital Controls and Capital Flows in Emerging Economies: Policies, Practices and Consequences*, ed. by S. Edwards, Chicago, IL: Chicago University Press.

Roberts, M. J. and J. R. Tybout (1997): "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs," *The American Economic Review*, 87, 545–564.

Rodrigue, J. (2008): "Foreign Direct Investment, Exports and Aggregate Productivity," Manuscript, Queen's University.

Rodríguez-Clare, A. (1996): "Multinationals, Linkages, and Economic Development," *American Economic Review*, 86, 852–873.

Rodrik, D. (1987): "The Economics of Export-Performance Requirements," *The Quarterly Journal of Economics*, 102, 633–50.

——— (2004): "Industrial Policy for the Twenty-First Century," CEPR Discussion Paper 4767.

——— (2010): "Making Room for China in the World Economy," *American Economic Review*, 100, 89–93.

——— (2013): "The New Mercantilist Challenge," Project syndicate column, January 9, 2013.

——— (2014): "When Ideas Trump Interests: Preferences, Worldviews, and Policy Innovations," *Journal of Economic Perspectives*, 28, 189–208.

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.

Wang, J. (2013): "The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities," *Journal of Development Economics*, 101, 133–147.

World Bank (2008): *Special Economic Zones: Performance, Lessons Learned and Implications for Zone Development*, Washington, DC: The World Bank Group.

Xu, C. (2011): "The Fundamental Institutions of China's Reforms and Development," *Journal of Economic Literature*, 49, 1076–1151.

Young, A. (2003): "Gold into Base Metals: Productivity Growth in the People's Republic of China during the Reform Period," *Journal of Political Economy*, 111, 1220–1261.

Appendix

A List of Free Trade Zones

A.1 Special Economic Zones

Special Economic Zones include the six prefectures: Haikou, Sanya, Shantou Shi, Shenzhen, Xiamen, Zhuhai and the entire province of Hainan.

A.2 Coastal Development Zones

Coastal Development Zones include the Shanghai Economic area established in 1982. This zone 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".

Coastal Development Zones also include the prefecture-cities of Anshan, Baoding, Beihai, Dalian, Dandong, Fuzhou, Guangzhou, Jinan, Langfang, Lianyungang, Nantong, Ningbo, Qingdao, Qinhuangdao, Quanzhou, Shenyang, Shijiazhuang, Tianjin, Weifang, Wenzhou, Weihai, Yantai, Yingkou, Zhanjiang, Zhangzhou, Zibo.

A.3 Yangtze River Delta Economic Zone

Yangtze River Delta Economic Zone includes cities located in the Yangtze River Delta but also some cities located outside the area due to mutual economic development. In 1982, the Chinese government set up the Shanghai Economic Area. Besides Shanghai, 4 cities in Jiangsu (Changzhou, Nantong, Suzhou, Wuxi) and 5 cities in Zhejiang (Hangzhou, Huzhou, Jiaxing, Ningbo, Shaoxing) were included. In 1992, a 14-city cooperative joint meeting was launched. Besides the previous 10 cities, the members included Nanjing, Yangzhou and Zhenjiang in Jiangsu, and Zhoushan in Zhejiang. In 1998, Taizhou became a new member.

A.4 Pearl River Delta Economic Zone

The boundaries of the Pearl River Delta as an economic zone differ from those associated with the geographic boundaries of the delta. In 1985, the State Council designated the Pearl River Delta as an open economic zone. It contained three Special Economic Zones that were established earlier: Shantou, Shenzhen and Zhuhai. Other leading cities in the open zone are: Dongguan, Foshan, Guangzhou, Huizhou, Jiangmen and Zhongshan. 'Peripheral' cities that were declared open cities include: Chaozhou, Heyuan, Jieyang, Maoming, Meizhou, Qingyuan, Shanwei, Shaoguan, Yangjiang, Zhanjiang and Zhaoqing.