Trade Liberalisation and Chinese Firm's Exports: Sourcing from Indonesia

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1 Introduction

How much can a country expand its exports? It could either export more in terms of the quantity of goods (intensive margins), more in terms of the variety of goods (extensive margins) or move to a higher quality of goods (Hummels & Klenow, 2005). The conventional trade theorem predicts that a country will export goods that use its abundant factor intensively. In the North–South trade framework, this implies that developed countries will export capital-intensive goods, while developing countries will export labour-intensive goods. However, as tariffs decline, trade grows not only between countries with different levels of intensity of factors of production, but also between countries with similar levels. Furthermore, as suggested by Bernard et al. (2003), the increase of North–South trade generates more trade between developing countries as countries in different developing stages engage in different stages of global value chains.

Previous research introduced how trade liberalisation, mostly in terms of tariff rates reductions, increases exports and domestic economy. An important related research question is how sourcing from other economies, especially developing countries (refer to 'the South'), affects exports of a large trading country (Feng et al., 2016). Today, China is the largest exporter and the second largest importing country in the world. Sourcing from other economies, particularly from the South, is crucial not only for China's exports, but also the Chinese economy.

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W. Tian and M. Yu, *Input Trade Liberalization in China*, Contributions to Economics,
https://doi.org/10.1007/978-981-99-7599-0_8

Indonesia, as the largest countries in South-east Asia, grouped as the Association of South and East Asian Nation (ASEAN) in terms of economic size, plays an increasing role of shaping China's imports from the South. Today, Indonesia is one of the China's most important sourcing South countries in East Asia. Motivated by such stylised facts, we hence choose Indonesia as a representative the South to investigate the impacts of import source on China's exports.

ASEAN indeed has surpassed the United States and the European Unions to become China's largest trading partners since 2019. Since the ASEAN-China Free Trade Area launched in 2010, tariff rates have been reduced resulting in increases in trade significantly. Taking the two largest developing countries in the ASEAN-China trade bloc, according to National Bureau of Statistics of China, China and Indonesia, as an example, exports from China to Indonesia increased 13-fold, from US $2.8 billion in 2000 to around US $45.0 billion in 2019, and exports from Indonesia to China increased 16 times from 2000 to 19, rising from US $1.7 billion to around US $33.5 billion, over the same period. To fully capture the impacts of trade liberalisation and fit with related empirical literature, we consider the following three dimensions of trade liberalisation: (a) home (i.e., China) tariff rate cuts in final products, such as textiles and garments; (b) tariff rate cuts of a foreign destination country (e.g., the United States); and (c) China's tariff rate cuts on its intermediate inputs imported from Indonesia (e.g., cotton). The first two types of tariffs are bilateral trade liberalisation on final goods. The last type is trade liberalisation on intermediate inputs, as noted in Goldberg et al. (2010) and Topalova and Khandelwal (2011).

The main findings of this paper are threefold. First, Chinese manufacturing firms with a significant import share from Indonesia perform better in terms of productivity, export value, number of employees and sales, and they are more likely to engage in processing exports. Second, all aspects of trade liberalisation foster firm export value, and the impact is stronger for firms with more import from Indonesia. Last, we investigate how trade liberalisation affects export and import scopes differently for firms with a different extent of imports from Indonesia. The empirical study shows that trade liberalisation (tariff rate reductions) on inputs increases both import and export scopes. The impacts on import scopes are more pronounced for firms with higher import shares from Indonesia.

Our paper contributes to the literature in two ways. First, we find that tariff reductions on inputs increase exports through tougher import competition. The main value added of our work is that the magnitude is *uneven* across firms with different import intensity. Firms with higher import shares from Indonesia tend to have increased exports. Second, we find that South–South trade liberalisation, proxied by China's tariff rate reductions on inputs sourcing from Indonesia, increases both import and export scopes. The results suggest that trade liberalisation can change import and export structures in developing countries.

The existing literature on this issue generally works on a multi-product firm framework. It is assessed that firms will reduce product scopes in response to trade liberalisation (Arkolakis & Muendler, 2011; Baldwin & Gu, 2009; Bernard et al., 2011; Dhingra, 2013; Eckel & Neary, 2010; Feenstra & Ma, 2008). Qiu and Zhou (2013)

even argue that firms may increase product scopes in response to increased product-specific fixed costs. Furthermore, Mayer et al. (2014) assert that under one-sided trade liberalisation, firms will reduce product scopes, and thus, production will be concentrated in a core competitive product. Recently, Qiu and Yu (2020) show that home market liberalisation increases domestic competition and consequently leads to firm product scope reductions. On the one hand, foreign market liberalisation increases foreign market competition; on the other hand, lower tariff rates will enable exporters more profitable. The net effects depend on firm managerial efficiencies.

Empirically, Dhingra (2013) uses Thailand data to show that the one-side tariff cuts from 2003 to 06, firms in general exported less and increased product varieties, while exporting firms decreased product scopes. Iacovone and Javorcik (2010) also found that Mexican firms decided to have product churning in response to more liberalised foreign markets. Likewise, Goldberg et al. (2010) assess that Indian firms introduced more product varieties when tariff rates reduced between 1989 and 2003. By using Chinese data, Qiu and Yu (2020) show that, parallel to productive efficiency, which is usually measured by total factor productivity (TFP), managerial efficiency is an important factor in determining the extent to which firms adjust their export product scopes. Trade liberalisation at multilateral levels, however, does not necessarily increase product scopes. Study results by Baldwin and Gu (2009), Bernard et al. (2011), and Berthou and Fontagne (2013) on the impacts of multilateral trade liberalisation on product scopes, are inconclusive.

Different from the literature, our paper pays more attention on the impacts of trade liberalisation between South and North (i.e., China and high-income countries) trade, and between South and South (China and ASEAN countries) trade. Specifically, we study the three types of tariff rate reductions related to Chinese firms and how they change China's trade with Indonesia. We use the generated firm-level input tariffs to measure the tariff rates between China and the South, and the constructed industry-level output tariff rate and foreign tariff rate reductions as a measurement of trade liberalisation between China and the North.

The rest of the paper is organised as follows. Section 2 introduces the details of data and data sources. Section 3 presents econometric specifications and reports empirical findings. Section 4 concludes.

2 Data and Measurement

This paper uses three disaggregated data sets: Chinese firm-level production data are from Annual Survey Manufacturing data, China's trade data are from Customs data at the HS 8-digit level, and tariff rate data are from the HS 8-digit level tariff data. Our data set is constructed by merging these three data sets with China's customs data (China's imports from Indonesia by product).

2.1 Chinese Firm-Level Production Data

The sample is derived from a rich firm-level panel data set that covers 162,885 firms in 2000 and 301,961 firms in 2006. The data are collected and maintained by China's National Bureau of Statistics in an Annual Survey of Manufacturing Enterprises that provide important economic variables, including three major accounting statements (i.e., balance sheets, profit and loss accounts, and cash flow statements). In brief, the data set covers two types of manufacturing firms—all state-owned enterprises (SOEs) and non-SOEs whose annual sales exceed CNY5 million (equivalent to US $714,000). The data set also includes more than 100 financial variables listed in the main accounting statements of these firms.

Although the data set contains rich information, some samples are still noisy and therefore could be misleading, largely because of some firms' misreporting. Following Feenstra et al. (2014), we clean the sample and omit outliers by using the following criteria: first, observations with missing key financial variables (such as total assets, net value of fixed assets, sales and gross value of the firm's output productivity) are excluded; and second, we drop firms with fewer than eight workers since they fall under a different legal regime, as mentioned in Brandt et al. (2012).

We remove observations according to the basic rules of the generally accepted accounting principles if any of the following are true: (a) liquid assets are greater than total assets, (b) total fixed assets are greater than total assets, (c) the net value of fixed assets is greater than total assets, (d) the firm's identification number is missing, or (e) an invalid established time exists (e.g., the opening month is later than December or earlier than January). After applying such stringent filters to guarantee the quality of the production data, the filtered firm data are reduced by about 50% for each year.

To ensure the preciseness of the estimates, we exclude some trading companies from the sample in all estimates. In particular, we exclude firms with names including any Chinese characters for their trading company or importing and exporting company from the sample.

2.2 Chinese Trade Data

The Chinese trade data we use are at the most disaggregated product-level trade transaction obtained from China's General Administration of Customs. The data provide information on each firm's product list, including trading price, quantity and value at the HS 8-digit level. The most important feature of the data is they include not only import and export data, but also the breakdown of the data into several specific types of processing trade, such as processing with assembly and processing with inputs. At the most disaggregated HS 8-digit level, ~ 35% of the 18,599,507 transaction-level observations are ordinary trade, and 65% refer to processing trade. Similar proportions are obtained when measuring by trade volume: around 43% of trade volume comprises ordinary trade. Processing with inputs accounts for around

30%, whereas processing with assembly only is around 10%. The remaining 17% represents other types of processing trade, aside from assembly and processing with inputs.

Last, to estimate firms' TFP, we merge Manufacturing Firm and Customs data. The detailed approach has been introduced in Tian and Yu (2012). In particular, we use the Chinese firm's name–year, zip code and the last 7-digit of the telephone number to merge the two data sets. As discussed in Yu (2015), our merged data skew towards larger trading firms as the matched sample has more exports, more sales and even larger number of employees.

2.3 Measurement of Firm-Level Tariffs

The measurement of average intermediate input tariffs faced by a single firm is constructed in Yu (2015). Since processing imports are duty-free in China, we construct a firm-specific input tariff index based on its non-processing imports (O), as follows:

$$FIT_{it} = kO \in \sum \frac{m^k_{i,initial\_year}}{\sum_{k \in M} m^k_{i,initial\_year}} \tau^k_t,$$

where $m^k_{i,initial\_year}$ is firm i's imports of product k in the first year the firm appears in the sample. M is the set of the firm's total imports. The set of processing imports does not appear because processing imports are duty-free. Since imports are negatively affected by tariffs, the imports of products with prohibitive tariffs would be zero; thus, if the import weight is measured in the current period, the measure of firm's tariff rates would generate a downward bias. Following Topalova and Khandelwal (2011), we use the import weight for each product at the firm's first year in the sample, which is time-invariant weights to avoid such endogeneity.

We measure the output tariffs and tariffs charged by third countries (so called foreign tariffs) at 2-digit Chinese industry classification (CIC) level, according to Amiti and Konings (2007), by averaging the tariffs of HS 6-digit industries within each 2-digit CIC industry code. Particularly, to measure the output tariffs, we use the CIC 2-digit level to concord with HS 6-digit tariff level (i.e., the most disaggregated level of tariff rates). The reason of using CIC 2-digit level tariff rates, rather than HS tariff rates, is to match and identify with firm-level data. Namely, for each particular firm, we are able to find its corresponding CIC 2-digit industry and then assign the matched tariffs.[1] Last, to make the comparisons consistent, we measure the foreign tariff rates using CIC system to be consistent with output tariff rates.

[1] By contrast, a measure output tariffs using the HS system is not ideal since some firms may not export/import, and accordingly, we cannot capture the related firm's "competition effects" embodied in the output tariffs. We appreciate a referee for pointing this out.

China is the largest developing country in terms of output and contributes the largest share to the world trade, so to study the impacts of trade liberalisation between the South and the North, we choose trade liberalisation between China and the rest of the world as a sample. We use the generated firm-level input tariff rates to measure the tariff rates between China and the South, and the constructed industry-level output tariff rates and foreign tariff rate reductions to measure trade liberalisation between China and the North. This is because trade between China and other developing countries are mostly intermediate inputs or raw materials, whereas trade between China and developed countries are largely final goods. This proxy will not generate much bias to our study, although we do not distinguish whether the partner is a developed or developing country, and both country groups are important trading partners of China.[2] First, as most of China's trading partners are members of the World Trade Organization, the same level of tariff rates applied to all WTO member countries (most favoured nation, MFN). Second, the weight used in the industry-output tariff rates and foreign tariff rates is constructed according to the domestic input–output table that is irrelevant to the trading partner.

3 Empirical Findings

Before examining the nexus between trade liberalisation and Chinese firm's exports, we will show the importance of Indonesia for China's trade. Table 1 shows performance of overall exporters and exporters with import shares from Indonesia (i.e., imports from Indonesia as a proportion of their total imports). By comparing all Chinese exporting firms, those exporting firms with a significant import share from Indonesia tend to perform better in terms of export value, number of employees and sales. In particular, of the total 70,369 Chinese exporting firms during 2000–06, 1387 exporting firms had more than a 5% import share from Indonesia and 995 firms had more than a 10% import share from Indonesia. Although firms with significant imports from Indonesia perform better than those without, this does not imply that the larger the import share from Indonesia, the better the firm's performance will be. For example, Chinese firms with more than 10% import share from Indonesia apparently export less to other countries than those with more than a 5% import share, suggesting that firm performance has no simple linear relationships with its import shares from Indonesia.

Table 2 presents the summary statistics of key variables used in the estimates. We report a simple average of CIC 2-digit industry-level output import tariff rates and external tariff rates imposed by China's trading partners. The external tariff rates tend to be lower than China's output tariff rates, as China's major trading partners are developed countries that tend to have lower import tariff rates partly due to the World Trade Organization's discipline and partly due to their commitments in

[2] According to *China International Trade Report* (2015) issued by the Minister of Commerce, trade between China and Developed Countries is around 60% of the total China's trade with the world.

Table 1 Overall exporters and exporters with import shares from Indonesia

Variable	All exporting firms		> 5% import share from Indonesia		> 10% import share from Indonesia	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Log exports	9.664	1.694	10.515	1.683	10.466	1.72
Log number of employees	5.456	1.167	5.876	1.249	5.853	1.283
Log sales	10.802	1.337	11.504	1.564	11.465	1.584
Number of firms	70,369			1387	995	

Note Chinese exporters reported in this table are large-sized exporting firms, obtained by matching Chinese firm-level data and customs data from 2000 to 06
Source Authors' calculations

regional trade agreements. We measure China's input tariff rates at the firm level to capture the feature of zero import tariff rates of processing imports. It is important to stress that China's firm-level input tariff rates are much lower than output tariff rates (see Yu, 2015 for a detailed discussion). To this end, we also construct the dummy of processing indicator and find that around 27% of firms are processing importers. We also report firm's export and import scopes by product (at the HS 8-digit level) reported in China's Customs data. On average, Chinese firms' exports around 7 products to, and imports more than 21 products from, the rest of the world.

Table 2 Statistics summary of key variables

Variable	All exporters		> 5% import shares from Indonesia		> 10% import shares from Indonesia	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Exports	9.664	1.694	10.515	1.683	10.466	1.72
Home output tariffs (industry-level)	11.71	0.056	11.8	0.058	11.74	0.057
Foreign industry tariffs	9.6	0.048	10.13	0.05	10.02	0.049
Home input tariffs (firm-level)	2.554	4.255	1.536	3.135	1.561	3.256
Firm TFP (Olley–Pakes)	1.072	0.668	1.196	0.863	1.202	0.862
Foreign indicator	0.569	0.495	0.774	0.419	0.763	0.426
SOE indicator	0.021	0.142	0.013	0.113	0.013	0.114
Log labour	5.456	1.167	5.876	1.249	5.853	1.283
Processing indicator	0.271	0.445	0.513	0.5	0.49	0.5
Export scope	7.421	10.99	8.64	11.127	8.254	10.855
Import scope	20.595	37.301	26.358	41.646	23.819	39.358

Source Authors' calculations

Table 2 also shows that firm's productivity increases from 1.07 for all Chinese exporters to 1.19 for Chinese exporters with more than a 5% import share from Indonesia and 1.20 for those with more than a 10% import share from Indonesia, suggesting that the higher import shares from Indonesia, the higher firm's productivity will be. It is important to emphasise that the share of 'processing' (indicated by processing indicator) is higher for firms with higher import shares from Indonesia than that of the average exporting firms. The firms with more than a 5% import share from Indonesia have 50% more processing activities, compared to 27% of the average of all Chinese exporting firms.

3.1 Trade Liberalisation and Firm's Exports

In this section, we examine the impacts of trade liberalisation on domestic firm's export intensive margin. We estimate three types of liberalisation—home input tariff reductions, home output tariff reductions and foreign output tariff reductions—on firm's export value.

Table 3 presents the estimation results of the impacts of trade liberalisation on domestic firms' exports, Chinese firms' exports. Columns (1) and (2) include Chinese exporters with more than a 10% import share from Indonesia, whereas Columns (3) and (4) include those firms with more than a 5% import share. Columns (5) and (6) include firms with positive, but less than a 5% import share from Indonesia. The last two columns include firms with zero imports from Indonesia, but positive China's imports from other sourcing countries.

We consider the following empirical specification:

$$\begin{aligned}\log \exp_{ijt} = {} & \beta_0 + \beta_1 TFP_{ijt} + \beta_2 OT_{jt} + \beta_3 IT_{ijt} \\ & + \beta_4 ET_{jt} + \theta X_{it} + \delta_i + \delta_t + \varepsilon_{it}\end{aligned}$$

where $\log \exp_{ijt}$ is log export of firm i in industry j, TFP_{ijt} is total factor productivity, OT_{jt} is China's output tariff rate of industry j, IT_{ijt} is China's input import tariff rate faced by firm i, and ET_{jt} is foreign country tariff rates of industry j at year t. X_{it} is a vector of control variables, including firm's size, ownership type (state-owned enterprises (SOE), multinational firm and other variables) and trade mode (processing or ordinary trade). Firm-specific fixed-effects δ_i capture all time-invariant factors, such as firm location; and year-specific fixed-effects δ_t govern all time-variant factors, such as RMB depreciation or appreciation.

First, the coefficients of firm productivity are positive and significant in all estimates, indicating that firms with high productivity tend to export more. More importantly, the magnitude of firm's TFP increases with import shares from Indonesia, suggesting that the impacts of TFP on firm's exports *seem to* be more pronounced for firms with more imports from large developing countries, like Indonesia. The economic rationale is clear: as Chinese firms' import more intermediate inputs or

Table 3 Trade liberalisation on firm's exports, by import share

Log firm exports	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Import shares from Indonesia	> 10%		> 5%		< 5%		< 5% (zero imports from Indonesia included)	
Home output tariffs (industry-level)	− 3.199** (− 2.33)	− 3.657*** (− 2.72)	− 2.616** (− 2.27)	− 3.105** (− 2.72)	− 2.979*** (− 3.15)	− 2.979*** (− 3.15)	− 1.288*** (− 4.98)	− 1.418*** (− 5.50)
Foreign tariffs (industry-level)	− 2.239* (− 1.67)	− 2.440* (− 1.86)	− 2.672** (− 2.39)	− 2.816** (− 2.55)	− 3.601*** (− 4.27)	− 3.600*** (− 4.27)	0.199 (0.81)	0.024 (0.10)
Home input tariffs (firm-level)	− 0.036** (− 2.08)	0.021 (1.01)	− 0.040** (− 2.65)	0.014 (0.77)	− 0.082*** (− 5.89)	− 0.028 (− 0.50)	− 0.042*** (− 15.59)	− 0.008** (− 2.10)
Home input tariffs × import intensity		− 0.165*** (− 4.94)		− 0.130*** (− 4.66)		− 0.057 (− 1.00)		− 0.064*** (− 13.70)
Firm TFP (Olley–Pakes)	0.122 (1.62)	0.180** (2.42)	0.064 (0.98)	0.100 (1.54)	0.024 (0.45)	0.025 (0.47)	0.050*** (2.82)	0.063*** (3.55)
Foreign indicator	0.045 (0.33)	0.154 (1.14)	0.211* (1.78)	0.255** (2.17)	0.364*** (3.34)	0.372** (3.41)	0.227*** (9.89)	0.258*** (11.23)
SOE indicator	0.883 (− 1.15)	0.852 (1.13)	0.96 (1.45)	0.961 (1.48)	0.213 (0.46)	0.228 (0.49)	− 0.851*** (− 9.30)	− 0.821*** (− 9.01)
Log firm labour	0.913*** (19.29)	0.907*** (19.60)	0.895*** (21.39)	0.896*** (21.72)	0.928*** (31.86)	0.928*** (31.83)	0.783*** (86.19)	0.783*** (86.64)
Processing indicator	0.368*** (2.78)	0.272** (2.07)	0.287** (2.57)	0.222** (2.00)	− 0.118 (− 1.45)	− 0.115 (− 1.41)	− 0.012 (− 0.49)	− 0.006 (− 0.23)
R^2	0.46	0.49	0.43	0.45	0.49	0.49	0.29	0.3
Observations	743	743	1008	1008	1630	1630	29,699	29,699

Notes Numbers in parentheses are robust t-value, with *, **, *** denoting the level of significance at 10%, 5%, 1%. Firm-specific fixed effects and year-specific fixed effects are included in all regressions

Source Authors' calculations

raw materials from Indonesia, they are more likely to engage in processing trade (as confirmed in Table 2) and, hence, export more. With more available imported intermediate goods, firms are able to optimise the use of the combination of domestic inputs and imported inputs, as suggested by Halpern et al. (2015).

Second, trade liberalisation significantly boost exports. This holds for all aspects of trade liberalisation, including output tariff and input tariff rate reductions as well as foreign tariff rate reductions. Input trade liberalisation enable domestic firms to save costs in intermediate inputs and thus earn more profit. Likewise, lower trading partners' tariff rates enable firms to gain easier access to foreign markets and thus can export more. By contrast, the role of output trade liberalisation is different: output tariff reductions suggest tough import competition effects from international markets, and thus, only efficient firms who will able to survive in the markets. As efficient firms tend to be growing larger and to export more, we see negative coefficients of output tariffs.

Third, SOEs and larger firms tend to export more. Similarly, processing firms also tend to export more. Yet, it may be insufficient to claim that the differences between estimated coefficients across odd columns in Table 3 are due to the differences in import intensity from Indonesia, because many other factors such as the differences in capital stock and share of foreign investment may also affect the estimation results.[3] Indeed, to make specifications with different import intensities comparable, we have adopted a common set of control variables in all regressions of Table 3. To be precise, we run new regressions by interacting input tariffs with import intensity, given Chinese input tariffs directly affect China's imports, as shown in the even columns of Table 3.

The estimated results in Table 3 Columns (2), (4) and (6) clearly show that, with the interaction of input tariffs with import intensity from Indonesia, both output tariff rate reductions and foreign tariff rate reductions increase China's exports. Such findings are exactly consistent with the corresponding regressions, ignoring the interaction terms of tariffs as shown in Columns (1), (3) and (5). More importantly, as shown in Columns (2), (4) and (6), the coefficients of firm input tariffs interacted with Indonesian import intensity are negative and statistically significant (except insignificant in Column (6)), suggesting that the magnitude of input trade liberalisation is more pronounced for firms with more import sourcing from Indonesia. This finding indeed is reinforced in the last column of Table 3, in which all importing firms sourcing from all other countries, except Indonesia, are included in the regression. The impacts of input trade liberalisation on Chinese firm's exports are more pronounced for firms with more import sourcing.

[3] We thank a referee for pointing this out.

3.2 Trade Liberalisation and Export Scope

In this section, we estimate trade liberalisation on domestic firm's export extensive margin. In particular, we focus on the change in export and import scopes. Referring to Qiu and Yu (2020), we define a firm's export scope as the total number of product lines at the HS 8-digit level exported by a Chinese manufacturing firm.[4]

The empirical specification is as follows:

$$es_{ijt} = \beta_0 + \beta_1 TFP_{ijt} + \beta_2 OT_{jt} + \beta_3 IT_{jt} + \beta_4 ET_{jt} + \theta X_{it} + \delta_i + \delta_t + \varepsilon_{it}$$

where es_{ijt} is an export product scope of firm i in industry j in year t.

Table 4 presents the count-data estimates of the impacts of trade liberalisation on domestic firm's export scopes. Columns (1)–(3) include a sample of Chinese exporters with more than a 10% import share from Indonesia and Columns (4)–(6) cover firms with more than a 5% import share from Indonesia.

We start from Poisson estimates, in which 'the mean of export scopes' is presumed to equal its variance. The Poisson estimates in Table 4 Column (1) suggest that both domestic output tariff and foreign tariff rate reductions decrease firm's export scopes. In addition, reductions in firm-level input tariff will decrease firm's export scopes. Such findings are consistent with the findings of Qiu and Yu (2020) that cover the whole sample of Chinese exporters. The economic rationale of the positive coefficient of domestic output tariff reductions is straightforward. Lower output tariffs lead to tougher import competition, which in turn makes firms focus on their competitive products. At first glance, however, the positive coefficient of foreign output tariffs is counter-intuitive. This is because the trade-off between positive and negative shocks raised by a trading partner's tariff reductions (as discussed carefully in Lim et al., 2019). On the one hand, foreign markets induce exporting firms to expand their product lines, as generally they offer higher prices (resulting in higher profits). On the other hand, foreign markets are also much more competitive than domestic markets, due to entrance and logistics costs, so firms will also have an incentive to reduce their product scopes to avoid internal cannibalisation. As presented in Qiu and Yu (2020), once the negative competition impacts dominate the positive ones, export scopes fall.

With careful assessment, the assumption that 'the mean of the export scopes' equals its variance seems too strong. Instead, we adopt negative binomial estimates in Table 4 Column (2) for Chinese exporters with more than a 10% import share from Indonesia and those in Column (5) with more than a 5% import share from Indonesia. The negative binomial estimates are more credible here, as they allow the sample to exhibit a pattern of over-dispersion. We keep in mind that there may be a concern that a number of key macroeconomic indicators may fluctuate, such as Yuan appreciation during the sample period, particularly after 2005, can affect firms' export scopes. In addition, other unspecified factors, such as firms' managerial efficiency,

[4] Detailed calculations of firm-product year-level export and import scopes can also be found in Ing et al. (2018).

Table 4 Count-data estimates of trade liberalisation on firm's export scope

Regression: export scope	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Econometric method	Poisson	Negative binomial		Poisson	Negative binomial		Poisson	Negative binomial	
Import share from Indonesia	> 10%			> 5%			< 5%		
Home output tariffs	0.724*** (4.75)	1.100** (2.57)	0.942** (2.36)	1.102*** (9.05)	1.347*** (3.79)	0.871*** (2.71)	1.363*** (13.09)	1.050*** (3.81)	0.473** (2.10)
Foreign tariffs (industry-level)	5.078*** (21.68)	4.189*** (6.97)	1.709*** (3.05)	4.472*** (23.17)	3.848*** (7.60)	1.782*** (3.78)	1.041*** (8.40)	1.433*** (3.56)	1.589*** (4.53)
Home input tariffs (firm-level)	− 0.006 (− 1.64)	− 0.007 (− 0.85)	0.004 (0.45)	− 0.016*** (− 4.87)	− 0.013* (− 1.90)	− 0.001 (− 0.13)	− 0.006*** (− 2.80)	− 0.011 (− 1.63)	− 0.033*** (− 4.06)
Firm TFP (Olley–Pakes)	0.353 + 0** (14.31)	0.425*** (5.53)	0.226*** (2.96)	0.324*** (15.37)	0.397*** (6.02)	0.233*** (3.84)	0.485*** (37.78)	0.623*** (11.54)	0.191*** (4.42)
Foreign indicator	− 0.200*** (− 7.73)	− 0.114 (− 1.55)	− 0.047 (− 0.56)	− 0.128*** (− 5.78)	− 0.067 (− 1.05)	− 0.036 (− 0.49)	− 0.493*** (− 33.16)	− 0.548*** (− 8.46)	− 0.006 (− 0.09)
SOE indicator	0.093 (1.20)	− 0.043 (− 0.17)	0.138 (0.42)	− 0.071 (− 1.02)	− 0.138 (− 0.64)	− 0.046 (− 0.16)	− 0.709*** (− 9.86)	− 0.779*** (− 3.47)	− 0.023 (− 0.10)
Log firm labour	0.187*** (20.87)	0.187*** (8.06)	0.202*** (7.11)	0.222*** (28.75)	0.222*** (10.92)	0.201 *** (8.02)	0.223*** (51.21)	0.259*** (16.66)	0.251*** (14.33)
Processing indicator	− 0.259*** (− 10.82)	− 0.27*** (− 4.50)	− 0.12*** (− 2.63)	− 0.14*** (− 7.40)	− 0.17*** (− 3.41)	− 0.10*** (− 2.65)	− 0.197*** (− 16.29)	− 0.184*** (− 430)	− 0.124*** (− 3.91)
Year-specific fixed effects	No	No	Yes	No	No	Yes	No	No	Yes
Firm-specific fixed effects	No	No	Yes	No	No	Yes	No	No	Yes
Observations	948	948	948	1323	1323	1323	2123	2261	2261

Note Numbers in parentheses are robust t-value, with *, **, *** denoting the significance level at 10%, 5%, 1%
Source Authors' calculations

as introduced in Qiu and Yu (2020), may also affect firms' extensive margin. We thus control for firm-specific fixed effects and year-specific fixed effects in Columns (3) and (6). It turns out that the negative binomial estimation results in Columns (2) and (3) and (5) and (6) are qualitatively identical to their counterparts in Columns (1) and (4) with Poisson estimates. Thus, our estimates are insensitive to different empirical specifications.

In addition, the negative sign of foreign indicator suggests that multinational companies based in China have less export scopes. Such a finding is consistent with the fact that processing firms also have less export scopes, as processing firms generally are subsidiaries of multinational companies, as documented in Dai et al. (2016).

Last, we also observe that larger firms, proxied by number of employees, have relatively more export scopes than average-sized firms. Interestingly, compared to non-processing firms (i.e., ordinary firms), processing firms seem to have less export scopes. Findings in Tables 3 and 4 show that processing firms have relatively higher value of exports, and the implication is clear: processing exporters tend reduce varieties of their traded products and focus on their core competitive products.

3.3 Trade Liberalisation and Import Scope

In this section, we present the impacts of trade liberalisation on import scopes. Table 5 Columns (1) and (4) are Poisson estimates, and the rest are negative Binomial estimates. Columns (1)–(3) are estimates for Chinese exporters with more than a 10% import share from Indonesia, while Columns (4)–(6) represent firms with more than a 5% import share.

Table 5 illustrates that foreign tariff reductions will increase firms' import scopes, due to stimulated foreign demand and a larger access to foreign markets. We also find that home output tariff reduction increases firm import scopes. The implication is straightforward: with tougher import competition, firms tend to import more foreign (Indonesia's) input varieties to promote firm productivity. Strikingly enough, home input tariff reductions are found to decrease firms' import scopes. This finding is very counter-intuitive. We suspect that the results may be due to the sample restriction, as the sample in our previous estimates only covers firms with a certain percentage of import sourcing from Indonesia. We therefore include all samples sourced from Indonesia in Table 6 and allow the three types of tariff liberalisation—home input tariff reductions, home output tariff reductions and foreign output tariff reductions—to interact with import shares from Indonesia. Although the coefficients of firm's own input tariffs are still positive, as shown in Table 7. Poisson estimates of Column (1) and negative binominal estimates of Column (2), their interaction terms with import shares from Indonesia turn to be negative and statistically significant.

To fully understand the whole picture of the impacts of tariff rate reductions on Chinese firms' import scopes, it is worthwhile to also examine the impacts of imports from countries, other than Indonesia, on Chinese firms' import scopes. Therefore, we

Table 5 Count-data estimates of trade liberalisation on firm's import scope

Regression: import scope	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Econometric method	Poisson	Negative binomial		Poisson	Negative binomial		Poisson	Negative binomial	
Import share from Indonesia	> 10%			> 5%			< 5%		
Home output tariffs	− 0.073 (− 0.49)	− 1.419*** (− 13.96)	− 0.601*** (− 5.98)	− 0.977*** (− 8.10)	− 1.183*** (− 14.87)	− 1.038** (− 2.52)	− 1.526*** (− 23.04)	0.109*** (3.03)	0.109 (0.44)
Foreign tariffs (industry-level)	− 2.214*** (− 13.57)	− 1.164**** (− 7.79)	− 0.439*** (− 3.45)	− 2.415*** (− 18.30)	− 1.469*** (− 12.32)	− 0.135 (− 0.24)	− 2.638*** (− 42.63)	− 3.367*** (− 60.42)	− 2.762*** (− 7.70)
Home input tariffs (firm-level)	0.014*** (7.41)	0.023*** (12.20)	0.019*** (10.28)	0.022*** (13.92)	0.029*** (18.86)	0.046*** (3.92)	0.030*** (34.94)	0.034*** (39.51)	0.056*** (6.98)
Firm TFP (Olley–Pakes)	0.260*** (16.36)	0.271*** (17.43)	0.192*** (11.70)	0.340*** (26.06)	0.346*** (27.68)	0.540*** (7.67)	0.452*** (71.08)	0.482*** (78.44)	0.624*** (13.46)
Foreign indicator	1.221*** (54.47)	1.249*** (55.68)	1.143*** (46.68)	1.168*** (63.41)	1.224*** (65.98)	1.116*** (16.19)	0.971*** (87.49)	0.932*** (87.63)	0.802*** (14.66)
SOE indicator	− 0.846*** (− 8.66)	− 0.865*** (− 10.33)	− 0.932*** (− 7.93)	− 0.860*** (− 10.33)	− 0.810*** (− 11.50)	− 0.727*** (− 2.92)	0.481*** (12.78)	0.369*** (9.87)	0.464** (2.38)
Log firm labour	0.497*** (94.06)	0.473*** (93.53)	0.475*** (78.49)	0.468*** (107.16)	0.454*** (107.85)	0.455*** (20.67)	0.418*** (202.28)	0.419*** (214.05)	0.385*** (30.09)
Processing indicator	− 0.108*** (− 7.31)	− 0.128*** (− 8.93)	− 0.096*** (− 9.13)	− 0.074*** (− 6.18)	− 0.097*** (− 8.42)	− 0.067 (− 1.14)	− 0.232*** (− 40.84)	− 0.220*** (− 40.01)	− 0.195*** (− 5.22)
Year-specific fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific fixed effects	No	No	No	No	No	No	No	No	No
Observations	948	948	948	1323	1323	1323	2123	2261	2261

Note Numbers in parentheses are robust t-value, with, *, **, *** denoting the level of significance 10%, 5%, 1%

Table 6 Estimates of trade liberalisation on import and export scope

Variables	(1)	(2)	(3)	(4)	(5)
	Import scope				Export scope
	Poisson	Negative binomial	Negative binomial	Negative binomial	Negative binomial
Home output tariffs	− 0.625*** (− 6.32)	− 0.584 (− 1.04)	− 0.693*** (− 3.73)	0.100 (0.62)	− 0.291** (− 1.99)
Foreign tariffs (industry-level)	− 0.028 (− 0.25)	0.460 (0.74)	− 0.371 (− 1.47)	− 0.149 (− 1.12)	− 0.004 (− 0.03)
Home input tariffs (firm-level)	0.035*** (33.95)	0.080*** (8.90)	− 0.011*** (− 5.84)	− 0.012*** (− 6.90)	− 0.008*** (− 6.41)
Home output tariffs × import share from Indonesia	− 6.155***	− 4.477***	1.544	0.786	0.925
	(− 11.93)	(− 2.95)	0.8	0.59	0.72
Foreign tariffs × import share from Indonesia	− 8.498***	− 7.745***	− 3.642*	0.671	1.386
	(− 15.18)	(− 4.83)	(− 1.85)	0.47	0.95
Home input tariffs × import share from Indonesia	− 0.107***	− 0.165***	0.071*	− 0.018	− 0.024
	(− 14.80)	(− 6.25)	− 1.96	(− 0.57)	(− 0.88)
Firm TFP (Olley–Pakes)	0.061*** (14.12)	0.094*** (3.75)	0.242*** (19.40)	0.025** (2.87)	0.020** = (2.17)
Foreign indicator	0.958*** (88.83)	0.932*** (19.85)	1.282*** (90.14)	0.331*** (8.16)	0.191*** (4.75)
SOE indicator	0.212*** (4.45)	0.325 (1.45)	− 0.073 (− 1.37)	− 0.137 (− 1.64)	− 0.030 (− 0.47)
Log firm labour	0.404*** (174.20)	0.387*** (28.28)	0.388*** (75.21)	0.110*** (9.31)	0.090*** (7.34)
Processing indicator	− 0.206*** (− 33.35)	− 0.109*** (− 3.04)	0.222*** (16.28)	0.067*** (6.77)	− 0.045*** (− 4.83)
Observations	2638	2638	32,337	19,103	19,103
Industry-specific fixed effects	Yes	Yes	Yes	No	No
Firm-specific fixed effects	No	No	No	Yes	Yes
Year-specific fixed effects	Yes	Yes	Yes	Yes	Yes
Zero imports from Indonesia included	No	No	Yes	Yes	Yes

Note Numbers in parentheses are robust *t*-value, with *, **, *** denoting the level of significance at 10%, 5%, 1%

Source Authors' calculations

Table 7 Estimates of trade liberalization on firm productivity

Import shares from Indonesia regress and firm TFP (system-GMM)	> 10%		> 5%	
	(1)	(2)	(3)	(4)
Home output tariffs (industry-level)	− 1.177*** (− 4.76)	− 0.666** (− 2.08)	− 1.343*** (− 6.46)	− 0.925*** (− 3.42)
Foreign tariffs (industry-level)	− 0.770*** (− 2.70)	− 1.089*** (− 3.17)	− 0.768*** (− 3.24)	− 1.034*** (− 3.57)
Home input tariffs (firm-level)	0.237 (0.71)	0.412 (0.95)	0.249 (0.83)	0.329 (0.84)
Foreign indicator	0.138 (0.70)	0.357** (2.22)	0.064 (0.43)	0.209 (1.63)
SOE indicator	− 0.002 (− 0.05)	0.028 (0.76)	0.016 (0.60)	0.038 (1.20)
Log firm labour	0.067*** (6.92)	0.067*** (5.61)	0.069*** (8.27)	0.063*** (5.94)
Processing indicator	− 0.092*** (− 3.61)	− 0.087*** (− 2.62)	− 0.085*** (− 3.89)	− 0.084*** (− 2.98)
Year-specific fixed effects	No	Yes	No	Yes
Firm-specific fixed effects	No	Yes	No	Yes
R^2	0.15	0.21	0.15	0.19
Observations	828	828	1156	1156

Note Numbers in parentheses are robust t-value, with *, **, *** denoting the level of significance at 10%, 5%, 1%
Source Authors' calculations

include all Chinese importing firms in Column (3).[5] The results show both own term and interacted terms of home input tariffs are negative. By adding more parsimonious firm-specific fixed effects in Column (4), the coefficient of own input tariffs is still negative, whereas its coefficient interacted with import shares is positive. Since the import shares from Indonesia are only around 2%, the entire effects of input trade liberalisation on firms' imports turn out to be negative. Just for a comparison, Table 6 Column (5) includes the impacts of trade liberalisation on firms' export scopes. The results are consistent with the abovementioned findings.

The estimation results presented in Tables 5 and 6 jointly suggest that trade liberalisation affects trade differently in terms of extensive margins. Input trade liberalisation will increase firms' import scopes for firms with a significant sourcing shares from Indonesia. Such a finding is more pronounced when import shares from Indonesia increase. In addition, input trade liberalisation also indirectly increases firms' export scopes, largely due to the prevalence of processing trade in China.

[5] The number of total firms in Column (3) is of course significantly much higher compared to those in Columns (1) and (2).

3.4 More Robustness Checks

Thus far we use the augmented Olley–Pakes TFP to measure firm productivity. Although such measured TFP has many advantages compared to other alternative measures of productivity, we acknowledge that it has two main disadvantages. First, the Olley–Pakes TFP assumes that firms adjust capital inputs, when facing an exogenous shock. However, this may not happen in China, as China is a labour-abundant country, and hence, firms find it easier to adjust labour than capital. Second, the Olley–Pakes TFP does not allow output to have any serial correlations, which are likely to occur. For these reasons, the system-general method of moments (GMM) TFP measure seems an ideal complementary measure, as it has enough flexibility to allow for possible serial autocorrelations. We hence use the system-GMM TFP to check whether our results will remain robust even when using other measures of TFP. Table 7 shows these comparisons.

Following Yu (2015), we now discuss whether trade liberalisation boosts productivity of Chinese exporting firms with a significant import share from Indonesia. Once again, we consider firms with 10% and 5% import shares from Indonesia, respectively. As in other studies, we find that both output trade liberalisation and external trade liberalisation boost firm productivity. However, we do not find that input trade liberalisation raises firm productivity. The impacts of home input trade liberalisation on firm productivity are insignificant. Such findings are robust, even when we control for year-specific fixed effects and firm-specific fixed effects in Column (2) of Table 7 for firms with a 10% import share from Indonesia and in Column (4) for those firms with a 5% corresponding import share.

This raises a concern over the previous estimates of the effects of trade liberalisation on firm productivity. One may worry that our estimates above may contain an estimation bias. To address this concern, following Feenstra et al. (2014), we distinguish between Ex-Ante TFP and Ex-Post TFP measures.

The conventional measures of TFP, including our above measures—both Olley–Pakes and system-GMM—are a Solow residual that includes both unspecified factors and production productivity. In this way, the measured TFP correlates with the error terms. To avoid such a shortcoming and to be closer with the spirit of Melitz (2003) that emphasises more on Ex-Ante random draw of firm productivity, we trail Feenstra et al. (2014) and Qiu and Yu (2020) to construct an Ex-Ante TFP.

Table 8 reports the estimation results using the Ex-Ante TFP measure. Column (1) is firms' export volume, Columns (2) and (3) are export scopes, and Column (4) is import scope. Estimates in Column (1) show that all types of trade liberalisation boost firms' exports, which make good economic senses. Meanwhile, all estimates on export and import scopes are consistent with estimates with Ex-Post firm productivity presented in Tables 5 and 6. Thus, our main findings are robust, even when using different measures of TFP.

Table 8 Estimates of trade liberalisation with Ex-Ante firm productivity

Regress and import shares from Indonesia	Log exports	Export scope		Import scope
	> 5%	> 5%	> 10%	> 5%
	(1)	(2)	(3)	(4)
Home output tariffs (industry-level)	− 0.708	0.682*	0.826*	− 1.218***
	(− 0.78)	1.89	1.95	(− 2.86)
Foreign tariffs (industry-level)	− 1.936**	2.806***	4.164***	0.734
	(− 2.36)	5.3	6.97	1.16
Home input tariffs (firm-level)	− 0.059***	− 0.002	− 0.005	0.063***
	(− 3.24)	(− 0.23)	(− 0.64)	− 5.36
Firm TFP (Olley–Pakes)	− 0.064	0.749***	0.666***	0.025
	(− 0.49)	9.16	6.89	0.27
Foreign indicator	0.280***	− 0.035	− 0.115	1.134***
	2.82	(− 0.57)	(− 1.58)	16.22
SOE indicator	0.304	0.052	0.061	− 0.512**
	0.83	0.26	0.25	(− 2.04)
Log firm labour	0.893***	0.247***	0.236***	0.471***
	28.39	12.65	10.05	20.61
Processing indicator	0.258***	− 0.171***	− 0.281******	− 0.056
	3.26	(− 3.38)	(− 4.60)	(− 0.95)
Year-specific fixed effects	No	Yes	Yes	Yes
Firm-specific fixed effects	No	Yes	Yes	Yes
Observations	1192	1324	949	1324

Note Numbers in parentheses are robust t-value, with *, **, *** denoting the level of significance at 10%, 5%, 1%
Source Authors' calculations

3.5 Dealing with Possible Endogeneity

One last possible concern is that firm-level output tariffs and foreign tariffs are highly correlated with firm exports. It is not clear whether the impacts of tariff liberalisation on the export volume, because the causality can be reversed. This concern may be more relevant for countries with strong special interest groups (Grossman & Helpman, 1994). However, the endogeneity caused by this reverse causality will not cause any serious bias in our estimations, given that we use the industry-level output and foreign output tariffs in our paper. A single firm's exports cannot economically significantly affect the average industry-level tariff rates that the firm locates. Also, labour unions or other special interest groups in China are impotent to affect China's tariff and trade policies. Still, for the sake of avoiding this possible endogeneity, we adopt a measure of firm-level previous year (output and foreign) tariffs as robustness checks.

Table 9 picks up this task, examining the impacts of tariff reductions on firm exports by using a one-year period lag of home firm-level tariffs and foreign output tariffs. The impacts of trade liberalisation on firm export scopes (i.e., intensive margins) shown in Table 9 Columns (1)–(3) with the coefficients of home firm-level tariff and foreign output tariffs are, overall, still negatively significant. In particular, the coefficients of home firm-level output tariffs are insensitive to the use of one-period lag output tariffs. We also see similar findings of the one-period lag external tariffs, though its coefficient in Column (1) with Indonesia's import shares higher than 10% is statistically insignificant. In conclusion, the coefficients of input tariffs are still negative and statistically significant in all cases.

Table 9 Lagged impacts of tariff reductions on exports

Import shares from Indonesia	Exports			
	> 10%	> 5%	< 5%	< 5% (zero imports from Indonesia included)
	(1)	(2)	(3)	(4)
Home industrial output tariffs (1-period lag)	− 4.086*	− 2.23	− 6.734***	− 1.260***
	(− 1.74)	(− 1.11)	(− 3.33)	(− 3.55)
Foreign industrial output tariffs (1-period lag)	− 0.88	− 3.664*	− 2.443	0.091
	(− 0.36)	(− 1.84)	(− 1.40)	0.26
Home firm-level input tariffs (1-period lag)	− 0.133***	− 0.144***	− 0.061**	− 0.025***
	(− 3.09)	(− 3.69)	(− 2.05)	(− 7.00)
Firm TFP (Olley–Pakes)	0.327***	0.297***	0.145	0.054*
	(2.67)	(2.95)	(1.23)	(1.95)
Foreign indicator	0.306 (1.25)	0.260 (1.25)	0.536** (2.06)	0.186*** (5.73)
SOE indicator	1.142 (1.04)	1.251 (1.17)	0.681 (0.74)	− 1.005*** (− 9.04)
Log firm labour	0.774*** (10.87)	0.819*** (13.74)	1.031*** (16.68)	0.733*** (53.30)
Processing indicator	0.189 (0.86)	0.466** (2.47)	− 0.049 (− 0.28)	0.066* (1.79)
Observations	202	280	356	11,260
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R^2	0.58	0.6	0.57	0.29

Note Numbers in parentheses are robust *t*-value, with *, **, *** denoting the level of significance at 10%, 5%, 1%

Source Authors' calculations

4 Conclusions

In this paper, we examine how trade liberalisation affects the performance of Chinese manufacturing firms via sourcing from the South. In particular, we use both Chinese firm-level production and transaction-level trade data to examine the impacts of three types of tariff reductions—input tariff reductions, output tariff reductions and foreign output tariff reductions—on firm export, firm productivity, and firm export and import scopes for firms with significant import shares from Indonesia, the largest South country in the ASEAN bloc.

Our findings assert that trade liberalisation, particularly, home input tariff and foreign output tariff rate reductions, significantly raises home firm exports. The impacts are, overall, more pronounced for firms with higher import shares from Indonesia. Chinese firms with a higher import shares from Indonesia perform better in productivity, export and sales, and they are more likely to engage in processing exports. In addition, input trade liberalisation boosts not only firm's import scopes but also firm's export scopes for firms, with a significant sourcing shares from Indonesia. Such a finding is more pronounced as firm's import shares from Indonesia increase.

Last, our findings also have rich policy implications: first, if deeper integration between South and South can increase trade flows, governments in the developing countries should provide more trade facilitation to enable deeper and wider coverage of trade integration; second and equally important, we find that trade liberalisation from the sourcing countries can boost firm productivity and raise firms' exports. Thus, it would be a prudent strategy for countries to encourage sourcing from other developing and competitive countries by cut their home input tariffs, phase out unjustified non-tariff barriers and improve transparency of non-tariff measures.

Acknowledgements We thank comments and suggestions from three anonymous referees, Zhiyuan Li, Zhihong Yu and conference participants from ERIA. Tian and Yu thank China's Natural Science Foundation (No. 71503043, 71625007) and China's Social Science Foundation (No. 16AZD003, 20ZDA050) for financial supports.

Funding National Natural Science Foundation of China, Grant/Award Number: 71503043.

References

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review, 97*(5), 1611–1638. https://doi.org/10.1257/aer.97.5.1611

Arkolakis, C., & Muendler, M.-A. (2011). *The extensive margin of exporting products: A firm-level analysis* [NBER Working Paper No. 17991].

Baldwin, J., & Gu, W. (2009). The impact of trade on plant scale, production-run length and diversification. In T. Dunne, J. B. Jensen, & M. J. Roberts (Eds.), *Producer dynamics: New evidence from micro data.* University of Chicago Press.

Bernard, A., Eaton, J., Jensen, J. B., & Kortum, S. (2003). Plants and productivity in international trade. *American Economic Review, 93*, 1268–1290. https://doi.org/10.1257/000282803769206296

Bernard, A., Redding, S. J., & Schott, P. K. (2011). Multiple-product firms and trade liberalization. *Quarterly Journal of Economics, 126*(1), 70–97.

Berthou, A., & Fontagne, L. (2013). How do multi-product exporters react to a change in trade costs? *Scandinavian Journal of Economics, 115*(2), 326–353. https://doi.org/10.1111/sjoe.12006

Brandt, L., Van Bieseboreck, J., & Zhang, Y. (2012). Creative accounting or creative destruction? Firm level productivity growth in Chinese manufacturing. *Journal of Development Economics, 97*(02), 339–351. https://doi.org/10.1016/j.jdeveco.2011.02.002

Dai, M., Maitra, M., & Yu, M. (2016). Unexceptional exporter performance in China? Role of processing trade. *Journal of Development Economics, 121*, 177–189.

Dhingra, S. (2013). Trading away wide brands for cheap brands. *American Economic Review, 103*(6), 2554–2584. https://doi.org/10.1257/aer.103.6.2554

Eckel, C., & Neary, J. P. (2010). Multi-product firms and flexible manufacturing in the global economy. *Review of Economic Studies, 77*, 188–217. https://doi.org/10.1111/j.1467-937X.2009.00573.x

Feenstra, R., Li, Z., & Yu, M. (2014). Exports and credit constraints under incomplete information: Theory and application to China. *Review of Economics and Statistics, 96*(4), 729–744.

Feenstra, R., & Ma, H. (2008). Optimal choice of product scope for multiproduct firms under monopolistic competition. In E. Helpman, D. Marin, & T. Verdier (Eds.), *The organization of firms in a global economy* (pp. 173–199). Harvard University Press.

Feng, L., Li, Z., & Swenson, D. (2016). The connection between imported intermediate inputs and exports: Evidence from Chinese firms. *Journal of International Economics, 101*, 86–101. https://doi.org/10.1016/j.jinteco.2016.03.004

Goldberg, P., Khandelwal, A., Pavcnik, N., & Topalova, P. (2010). Imported intermediate inputs and domestic product growth: Evidence from India. *Quarterly Journal of Economics, 125*(4), 1727–1767. https://doi.org/10.1162/qjec.2010.125.4.1727

Grossman, G. M., & Helpman, E. (1994). Protection for sale. *American Economic Review, 84*, 833–850.

Halpern, I., Koren, M., & Szeidl, A. (2015). Imported inputs and productivity. *American Economic Review, 105*(12), 3660–3703. https://doi.org/10.1257/aer.20150443

Hummels, D., & Klenow, P. L. (2005). The variety and quality of a nation's exports. *American Economic Review, 95*(3), 704–723. https://doi.org/10.1257/0002828054201396

Iacovone, L., & Javorcik, B. S. (2010). *Getting ready: Preparation for exporting*. Manuscript.

Ing, L. Y., Miaojie, Y. U., & Zhang, R. (2018). The evolution of export quality: China and Indonesia. In L. Y. Ing & M. Yu (Eds.), *World trade evolution: Growth, productivity, and employment* (pp. 261–302). Taylor & Francis.

Lim, K., Trefler, D., & Miaojie, Y. U. (2019). *Trade and innovation: The role of scale and competition*. Peking University.

Mayer, T., Melitz, M., & Ottaviano, G. (2014). Market size, competition, and the product mix of exporters. *American Economic Review, 104*(2), 495–536.

Melitz, M. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695–1725.

Qiu, L. D., & Yu, M. (2020). Export scope, managerial efficiency, and trade liberalization: Evidence from Chinese firms. *Journal of Economics and Behavior Organization, 177*, 71–90.

Qiu, L. D., & Zhou, W. (2013). Multiproduct firms and scope adjustment in globalization. *Journal of International Economics, 91*, 142–153.

Tian, W., & Yu, M. (2012). China's processing trade: A firm-level analysis. In H. Mcmay & L. Song (Eds.), *Rebalancing and sustaining growth in China* (pp. 111–148). Australian National University E-Press.

Topalova, P., & Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of India. *Review of Economics and Statistics, 93*(3), 995–1009.
Yu, M. (2015). Processing trade, tariff reductions and firm productivity: Evidence from Chinese firms. *Economic Journal, 125*, 943–988. https://doi.org/10.1111/ecoj.12127