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Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

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Abstract

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JEL Classification: F10, F13, F14

Keywords: trade policy, Lobbying, global value chains

Anna Maria Mayda - amm223@georgetown.edu
Georgetown University and CEPR

Rodney D Ludema - ludemar@georgetown.edu
Georgetown University

Zhi Yu - yuzhi@rmbs.ruc.edu.cn
Renmin University of China

Miaojie Yu - mjyu@ccer.pku.edu.cn
Peking University

The political economy of protection in GVCs: Evidence from Chinese micro data*

Rodney D. Ludema†, Anna Maria Mayda¶, Zhi Yu§ and Miaojie Yu‡

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Abstract: This paper explores the political economy of import protection in a setting where imports may contain a country's own domestic value added (DVA) via domestically-produced inputs that get exported and used in foreign downstream production. We show that import-competing producers and their domestic input suppliers are generally allies in favor of protection, but this alliance weakens as DVA increases, because a home tariff on finished goods decreases foreign demand for home inputs. Empirically, we examine detailed discriminatory trade policies of 23 countries toward China and use Chinese transaction-level processing trade data to construct a measure of DVA. We also measure input customization. We find that both upstream and downstream political organization increase downstream protection, but the effect of the former is smaller when DVA as a share of final imports from China is larger. Tariffs on products containing inputs that are neither customized nor politically organized appear to be unaffected by the DVA share.
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†Georgetown University, Department of Economics and School of Foreign Service, Shanghai Institute of International Finance and Economics and CESIfo. 37th and O Streets, Washington, DC 20057, U.S.A. E-mail Addresses: ludemar@georgetown.edu.

¶Georgetown University, Department of Economics and School of Foreign Service, and CEPR, 37th and O Streets, Washington, DC 20057, U.S.A. E-mail Addresses: ludemar@georgetown.edu (Ludema), amm223@georgetown.edu.

§Corresponding author: Renmin University of China, School of Business, 59 Zhong Guan Cun Street, Beijing 100872, China. E-mail Address: yuzhi@rmbs.ruc.edu.cn.

‡Peking University, National School of Development, China Center for Economic Research (CCER), Beijing 100871, China. E-mail Address: mjyu@ccer.pku.edu.cn.

1 Introduction

By any measure, global value chains (GVCs) have become an important feature of the international trade landscape. To what extent do GVCs reshape the political calculus of trade policy? This paper studies the influence of upstream and downstream domestic producers on the level of protection against downstream imports. Consider the classic GVC example of the iPhone. Chinese processing firms import components, such as CPUs, chips and cameras mainly from the U.S., Japan, and South Korea, respectively, and then export finished iPhones to the entire world. While producers of competing devices in these countries would naturally favor protection, how do the component suppliers influence their governments' trade policy toward iPhones?

Most of the existing literature on trade politics in a GVC context focuses on protection against imported inputs. Studies such as Gawande, Krishna, and Olarreaga (2012) and Ludema, Mayda and Mishra (2018) show that such protection is shaped by direct political competition between domestic input producers seeking protection and downstream firms preferring cheaper inputs.[1] Conceptually, this is a straightforward extension of standard political calculus (e.g., Grossman and Helpman, 1994) to the case of politically organized consumers.

Protection against downstream imports in a GVC context is more complicated. A groundbreaking paper by Blanchard, Bown and Johnson (2016), henceforth BBJ, argues that GVCs dampen a country's terms-of-trade motive for protection, because "tariffs push down the prices that foreign producers receive, which hurts upstream domestic producers who supply value added to foreign producers." They show that the optimal tariff is decreasing in a country's domestic value added relative to its imports (the DVA share) and find support for this relationship in the data.[2]

Our paper explores endogenous downstream protection with a focus on input cus-

[1] For example, domestic device producers might challenge domestic chip makers over chip tariffs.

[2] The paper also analyzes the impact on the optimal tariff of foreign value added contained in domestic production, which we do not investigate here.

tomization and political organization. We begin with a framework where a government has a terms-of-trade motive for imposing a tariff on finished imports, but domestic input producers supply inputs to both import-competing producers and foreign producers of the finished good. The imposition of the tariff exerts two opposing forces on input markets, hence on input prices: it increases input demand from import-competing producers at home and decreases it from foreign producers abroad. This has two main theoretical implications. First, we show that whether the DVA share dampens the terms-of-trade motive for protection or not depends on the degree to which input suppliers customize their inputs to different markets. If inputs are fully customized, such that domestic and exported input prices can move in opposite directions, as assumed in BBJ, then indeed the DVA share dampens the terms-of-trade motive because the downstream tariff lowers the price of exported inputs. However, if inputs are homogeneous, such that domestic and exported input prices move in tandem, then a tariff-induced boost in home input demand could drive up the price of exported inputs, thus enhancing the terms-of-trade motive for downstream protection.

Second, whether a politically organized domestic input industry would pressure the government for a higher or lower tariff on the finished good depends on the above price effects and on how much of the industry's revenue is derived from exports. We show that political organization of domestic input suppliers always increases the politically optimal downstream tariff at low levels of the DVA share. Thus, import-competing producers and their domestic input suppliers are allies in favor of protection for small DVA share values. However, this alliance may weaken as the DVA share increases, because domestic input suppliers are increasingly harmed by the tariff as their reliance on export revenue grows.

To examine these hypotheses empirically, we consider the trade policies of 23 countries toward China. In particular, we focus on China-specific preferential tariffs and anti-dumping filings, which specifically apply to China and vary over time. The advantage of focusing on China is that we can measure the value of each country's exports of intermediate inputs sold to Chinese firms that export finished goods back to the same countries at the 6-digit HS product level, which is the level at which internationally comparable tariff data are kept. In contrast, value-added trade data based on existing inter-country input-output (ICIO) tables are far more aggregated (e.g., the OECD-WTO TiVA database has only 16 manufacturing sectors). To construct our measure, we use Chinese transaction-level trade data from 2000 to 2006. The dataset allows us to match imports and exports for each Chinese firm by product, country (destination of exports or source of imports), and time. We restrict our attention to processing transactions, specifically "processing with imports," which involve duty-free imports by Chinese firms and subsequent export of the resulting output (Feenstra and Hanson 2005).[3] This gives a very disaggregate, direct measure of the input-output relationships relevant to our analysis.[4]

In addition, we measure political organization of both upstream and downstream industries by importing country and we construct indicators of the customization of inputs. For the former, we follow Ludema and Mayda (2013) and proxy political organization with the presence of industry trade associations. The data come from the World Guide to Trade Associations (1995), which identifies trade associations by country and subject for 185 countries and several hundred subjects, about 300 of which correspond to goods that we concord to the 4-digit HS classification. For customization, we follow Nunn (2007) in classifying inputs that are neither sold on an exchange nor reference priced, according to Rauch (1999), as customized, and we use our disaggregated input-output data to compute the share of customized inputs imported from each country and embodied in each Chinese product. For robustness checks, we also use alternative measures of input customization, such as the quality ladder index by Khandelwal and a measure of dispersion of unit values by 6-digit HS product code and country.

OLS regressions reveal a weak negative association between the value share of domestic

[3]We include ordinary trade, as well, in the denominator of our measure of the DVA share, for the reasons explained in detail in the Data Section.

[4]One limitation of our China-centric very granular approach, however, is that we can only compute a country's *direct* domestic value added in imports from China. Using data from the OECD-WTO TiVA database, in robustness checks we account for domestic value added passed through third countries and for foreign value added in the country's intermediate exports.

exports relative to a country's imports from China (the DVA share)[5] and its tariffs on those imports. Given that the denominator of the DVA share is the value of imports being taxed, OLS may be be biased toward zero. This is confirmed by IV estimates which are larger in magnitude and more significant than the OLS ones. As an instrument for the DVA share, we use distance-adjusted shipping rates, drawn from U.S. Merchandise Import data. In particular we exploit exogenous country-level variation driven by distance and product-level variation in transport costs of a country, the United States, which is not included in the tariff regressions sample.[6] The IV estimates imply that a one standard deviation increase in the DVA share decreases the preferential tariff by 2.4 percentage points and decreases the likelihood of an AD filing by 4.7 percentage points (in our most demanding specifications which control for product (HS6)-year, country-year and industry (HS2)-country fixed effects). These regressions broadly confirm the main result of BBJ for the case of China. Consistent with the theoretical predictions, we also find that the negative effect of the DVA share on protection is primarily in sectors with customized inputs. For products containing inputs that are not customized, the DVA share has an insignificant impact on trade barriers in most specifications. Delving deeper, we find that both upstream and downstream political organizations increase protection, but the effect of the former is smaller when the DVA share is larger. Tariffs on products containing inputs that are neither customized nor politically organized appear to be unaffected by the DVA share.

The remainder of the paper is organized as follows. Section 2 briefly reviews the literature. Section 3 presents the model. Section 4 describes the data. Sections 5 and 6 present the baseline and extended empirical models, respectively, and discuss the results. Section 7 describes various robustness checks and Section 8 concludes.

[5] This is a slight abuse of terminology as we really mean *direct* DVA share as discussed in the previous footnote.

[6] The United States is part of the anti-dumping-duty sample but in a robustness check we show that the IV results are robust when we exclude it.

2 Literature

The literature on the political economy of trade policy is voluminous (see Gawande and Krishna 2003, or McLaren 2016, for surveys), but it has only recently begun to focus on upstream-downstream supply relationships. Papers along these lines can be grouped into two categories.

The first category examines political competition between upstream-downstream suppliers over protection against imported intermediates. This includes Cadot, de Melo, and Olarreaga (2004), Gawande, Krishna, and Olarreaga (2012) and Ludema, Mayda and Mishra (2018).[7] The focus on upstream tariffs in these papers follows from two assumptions that are common in the political economy literature: that goods (including intermediates) are homogenous and that the country imposing the tariffs is small.[8] Together these assumptions pin the domestic price of the intermediate input to the fixed world price, such that tariffs on downstream products cannot affect upstream prices. Hence, upstream producers have no interest in downstream tariffs.

The second category studies trade policy with endogenous world input prices. Antras and Staiger (2012) explore the role of trade agreements in a model where customized input prices are determined through bilateral bargaining over incomplete contracts, rather than market clearing. They show that a hold-up problem arises causing an inefficiently low volume of input trade, which shallow trade agreements, like the WTO, can only partially address. The emphasis on contracting over customized inputs is in line with the broader offshoring literature, including Antras and Helpman (2004) and the empirical studies of Feenstra and Hanson (2005), Levchenko (2007), Nunn (2007), and Nunn and Trefler (2008).

The closest paper to the present study is BBJ. They consider a specific-factors model in which inputs are produced with destination-specific capital. This allows inputs to be

[7]Gawande and Bandyopadhyay (2000) and McCalman (2004) include intermediate tariffs in a GH model but treat them as exogenous.

[8]Ludema, Mayda and Mishra (2018) do not explicitly make these assumptions. Rather, their focus on upstream tariffs comes from the data, as input tariffs are the subject of the U.S. tariff suspensions program.

customized by country but with prices still determined by market clearing. BBJ's main point, that home supply of inputs dampens the terms-of-trade motive for a tariff on final goods, does not rely on special interest politics. Nevertheless, they include political weights on profits in their model, which produces an interesting result: the strength of the dampening effect increases with the political clout of the domestic input suppliers. This interaction between the political-economy and terms-of-trade motives for protection is unusual in the literature;[9] however, BBJ do not explore it empirically, as it requires data on political organization. It is one of the key channels we explore.

Related work includes Blanchard (2007, 2010), Blanchard and Matschke (2015) and Jensen, Quinn and Weymouth (2015), which show how cross-border capital ownership affects the motives for trade policy. Blanchard and Matschke (2015) find that a 10% increase in exports to the U.S. by the foreign affiliate of a U.S. multinational is associated with a 4 percentage point increase in the likelihood of preferential duty-free access. Jensen, Quinn and Weymouth (2015) find that among larger US multinationals, the likelihood of an AD filing is negatively associated with increases in intrafirm trade.

Finally, our empirical work requires addressing two key measurement issues, previously addressed in the literature. First, empirical studies following Grossman and Helpman (1994) have sought to measure political organization. Studies of U.S. protection measure political organization based on campaign contributions by political action committees (e.g., Goldberg and Maggi, 1999; Gawande and Bandyopadhyay, 2000) or lobbying expenditures (e.g., Bombardini and Trebbi, 2009; Ludema, Mayda and Mishra, 2018), which do not exist in any internationally comparable form. Studies of Turkey, by Mitra, Thomakos, and Ulubasoglu (2002) and Limao and Tovar (2011), and of India, by Bown and Tovar (2011), use trade association presence at the industry level to proxy for political organization. Following Ludema and Mayda (2013), we extend this latter approach to many countries.

Second, we are interested in a country's domestic value-added relative to its imports

[9]The classic treatment of political economy with terms-of-trade effects is Grossman and Helpman (1995), which finds the two motives to be additively separable.

from China. This relates to an extensive literature measuring trade in value-added (e.g., Hummels, Ishii, and Yi, 2001; Johnson and Noguera, 2012; Koopman, Wang, and Wei, 2014; Los, Timmer, and de Vries, 2015). Following Koopman, Wang and Wei (2012) and Kee and Tang (2016), our paper focuses for the most part on processing trade in the measurement of value added.

Other papers on the characteristics of processing trade in China include Yu (2015), Dai, Madhura and Yu (2016). However, none of these studies look at how processing trade impacts trade policy, as we do in this paper.

3 The Model

To motivate our empirical analysis, we consider a model of vertical specialization consisting of N countries and an arbitrarily large set of goods, I. One of the goods, z, is a freely traded numeraire produced in all countries from labor alone, with unit productivity, thus fixing the wage at one in each country. Production of each non-numeraire good i involves two stages: intermediate and final. Intermediate suppliers produce intermediate good x^i, which is used exclusively by firms producing final good y^i.[10] Associated with each good is a country pair. One member of the pair is the "source" (or home) country, denoted H^i, which produces and exports the intermediate to the other member, the "processor" (or foreign) country, denoted F^i.[11] Both members of the pair produce the final good, but the processor is assumed to have comparative advantage in y^i, and thus it exports the final good to all countries, including the source, in addition to supplying its own consumers.

Although the assumption that production sharing occurs within country pairs is special, relaxing it would have little effect on our theoretical results. For example, we could interpret the processor to be a collection of countries instead of a single country. This would require

[10] Nothing would be lost by assuming x^i and y^i to be vectors instead of scalars.

[11] In this model, intermediates go directly from the source to the processor. We do not consider the possibility of value added from the source traveling to the processor through third countries, as in a "snake" type GVC (Baldwin and Venables, 2013). We address this possibility in the empirical section.

no change in the theory.[12] Another extension would be to allow the source to be a collection of countries. In this case, a final-good tariff imposed by one source would affect intermediate demand facing all sources, which is more complicated but not qualitatively different.

All countries consume all final goods in quantities large enough to affect world prices. The utility function of country c is given by, $U_c = \sum_{i \in I} u^i_c(D^i_c) + D^z_c$, where u^i_c is increasing and strictly concave and D^i_c and D^z_c denote the consumption levels of final good i and z, respectively. The price of final good i in country c is p^i_c, which is related to the world price p^{*i} according to $p^i_c = p^{*i}\tau^i_c$, where $\tau^i_c \geq 1$ is the tariff on final good i by country c, measured as one plus the ad valorem tariff rate. We assume free trade in intermediates.[13]

In our description of production, we focus on a generic non-numeraire good, and thus we drop the good superscript for notational simplicity. Production takes place under perfect competition and constant returns to scale. The final good is produced from labor, final-sector-specific capital k, and the intermediate input. The intermediate is produced from labor, intermediate-sector-specific capital h, and a destination-specific factor ϕ. This last factor can be thought as the sales engineers, designers or marketers, who connect with a specific customer and customize the intermediate input to that customer's needs. While it is not necessary that customization alter the physical characteristics of the input, we assume that each unit requires some services of this factor, which affects the unit cost.[14]

[12] As an empirical matter, however, one would need for data for each country on its DVA share of imports from each processor, whereas we have disaggregated data only from one (major) processor, China. To mitigate this problem in the empirics, we consider China-specific tariffs. This is completely theory-consistent as long as imports of the same product from different processors are poor substitutes for one another (which is another way of interpreting our model). Otherwise, if a source country imports a highly substitutable final good from two different processors, then a discriminatory tariff on one processor would cause the other processor to export more and increase its demand for the intermediate. This effect would parallel the increase in domestic demand for the intermediate that occurs in the source itself. Thus, it is just another channel reinforcing a key effect already in our model.

[13] While it would be straightforward to include transport costs on intermediate trade, they play no useful role in the theory. However, we will consider intermediate transport costs in the empirics to help with identification.

[14] In some settings, destination-specific design or marketing may be a fixed cost that does not affect the marginal cost of supplying the destination. Scale economies of this kind, while realistic, would be incompatible with our assumption of perfect competition. While our model could comfortably accommodate imperfect competition among intermediate suppliers, the incentive to impose tariffs on final goods would depend not just on terms-of-trade effects but also on markups and trade volumes. Again this may be realistic, but our purpose here to explore the BBJ terms-of-trade dampening effect, and thus we wish to

For country H, let k_H, h_H and ϕ_{Hc} be endowments of final capital, intermediate capital and sales engineers specific to $c \in \{H, F\}$, respectively. Country F's final capital endowment is k_F.

The quantity of the final good produced in country $c \in \{H, F\}$ is determined by the Cobb-Douglas production function,

$$y_c = k_c^\gamma \tilde{x}_c^\delta \left(l_c^y\right)^{1-\gamma-\delta} \tag{1}$$

where $\delta, \gamma < 1$. Variables $\tilde{x}_c$, and l_c^y are the inputs of intermediates and labor, respectively, and δ is the cost share of intermediates in final production. In equilibrium, intermediate demand $\tilde{x}_c$, is equal to x_{Hc}, the quantity of the intermediate sales from H to c. The latter is produced by the Cobb-Douglas production function,

$$x_{Hc} = \phi_{Hc}^{\alpha\beta} h_{Hc}^{(1-\alpha)\beta} \left(l_{Hc}^x\right)^{1-\beta} \tag{2}$$

where h_{Hc} is the amount of h_H allocated to output destined for c, and we require $h_{HH}+h_{HF} = h_H$.

The parameter α captures the destination-specific factor intensity of intermediate input production. This intensity will have an important effect on the terms-of-trade motive for a tariff. If $\alpha = 1$, intermediate input prices are determined solely by the prices of the destination-specific factors and are thus independent across destinations. This is the special case considered by BBJ. It implies that a tariff on a final good will always drive down the price of the corresponding intermediate in the foreign market, because the latter depends on foreign (but not domestic) input demand. We refer to this as the case of complete customization. If $\alpha = 0$, intermediate prices are determined by the price of the sector-specific (but not destination-specific) factor h and are thus the same across destinations. In this case, the impact of a tariff on the price of the intermediate is the same across countries and depends

retain perfect competition and constant returns to scale as in BBJ.

on the tariff's effect on global intermediate demand. We call this the homogenous case.

3.1 Equilibrium

Profit maximization by producers of x in country H results in an intermediate supply schedule to country $c \in \{H, F\}$ of,

$$x_{Hc} = b\left(q_c\right)^{\frac{1-\alpha\beta}{\alpha\beta}} \Phi_H^{-\frac{1-\alpha}{\alpha\beta}} \phi_{Hc} h_H^{1-\alpha} \tag{3}$$

where q_c is the price of the intermediate destined for c, $\Phi_H = \left(\sum_{k\in\{H,F\}} \left(q_k\right)^{1/\alpha\beta} \phi_{Hk}\right)^{\alpha\beta}$, and $b \equiv (1-\beta)^{\frac{(1-\beta)}{\beta}}$. The term Φ_H is a CES average of intermediate prices, weighted by the destination-specific endowments of H. It captures the extent to which prices in one market affect supply to other. This term drops out in the case of complete customization.

Intermediate demand by producers of y in country c is found by setting the value marginal product of x equal to the price of the intermediate q_c, resulting in,

$$\tilde{x}_c = a\left(p_c\right)^{\frac{1}{\gamma}} \left(q_c\right)^{-\frac{\gamma+\delta}{\gamma}} k_c \tag{4}$$

where $a \equiv \delta^{\frac{\gamma+\delta}{\gamma}} \left(1-\gamma-\delta\right)^{\frac{1-(\gamma+\delta)}{\gamma}}$.

Equating (3) and (4) and solving for q_c gives a closed-form solution for the price of any intermediate produced in H and sold in $c \in \{H, F\}$ in terms of the world price of the final good, tariffs and endowments:

$$q_c = p^{*\eta} A_H \omega_{Hc}^{\alpha} \left(\sum_{k\in\{H,F\}} \omega_{Hk}^{\frac{1}{\beta}} \phi_{Hk}\right)^{(1-\alpha)\gamma\eta} \tag{5}$$

where

$$\omega_{HH} = \left(\frac{k_H}{\phi_{HH}} \tau_H^{\frac{1}{\gamma}}\right)^{\frac{\beta\gamma}{\gamma+\delta\alpha\beta}} \quad \text{and} \quad \omega_{HF} = \left(\frac{k_F}{\phi_{HF}}\right)^{\frac{\beta\gamma}{\gamma+\delta\alpha\beta}} \tag{6}$$

and $A_H = \left(\frac{a}{bh_H^{1-\alpha}}\right)^{\gamma\eta}$ and $\eta \equiv \frac{\beta}{\gamma+\delta\beta}$. Intuitively, the intermediate price for destination c is increasing in the world price, the final-good tariff and the final-good capital endowment of c; it is decreasing in the intermediate factor endowments of the source country H.

Supply of the final good can be expressed as a function of intermediate and final prices,

$$y_H(p_H, q_H) = a\delta^{-1} p_H^{\frac{1-\gamma}{\gamma}} (q_H)^{-\frac{\delta}{\gamma}} k_H \tag{7}$$

$$y_F(p^*, q_F) = a\delta^{-1} p^{*\frac{1-\gamma}{\gamma}} (q_F)^{-\frac{\delta}{\gamma}} k_F \tag{8}$$

Final-good market clearing equates total supply with demand from all countries:

$$y_H(p_H, q_H) + y_F(p^*, q_F) = \sum_{c=0}^{N} D_c(p^*\tau_c) \tag{9}$$

Equations (5) - (9) complete the description of the equilibrium.

3.2 Comparative Statics

It is instructive to consider the effects of final-goods prices on the intermediate prices in the two producing countries H and F. Applying hat calculus to (5), and using $\hat{\tau}_H = \hat{p}_H - \hat{p}^*$, gives:

$$\hat{q}_H = \eta\left[\hat{p}_H - s_F(1-\tilde{\alpha})(\hat{p}_H - \hat{p}^*)\right] \tag{10}$$

$$\hat{q}_F = \eta\left[\hat{p}^* + s_H(1-\tilde{\alpha})(\hat{p}_H - \hat{p}^*)\right] \tag{11}$$

where $\tilde{\alpha} \equiv \alpha\frac{\gamma+\delta\beta}{\gamma+\delta\alpha\beta} \in [0,1]$ captures the degree of customization. Recalling that η is the partial elasticity of the intermediate price with respect to the world price in (5), we see that intermediate price changes depend on η and on a weighted-average of final price changes in the two countries. The weights depend on $\tilde{\alpha}$, the domestic share of world expenditure on the intermediate, s_H, and $s_F = 1 - s_H$. The domestic share is given by,

$$s_H \equiv \frac{q_H x_{HH}}{q_H x_{HH} + q_F x_{HF}} = \frac{\omega_{HH}^{1/\beta}\phi_{HH}}{\omega_{HH}^{1/\beta}\phi_{HH} + \omega_{HF}^{1/\beta}\phi_{HF}}$$

which is independent of prices.

When customization is complete, $\tilde{\alpha} = 1$, (10) and (11) imply that intermediate price changes depend only on own-country final-good price changes. As a tariff imposed by country H should cause the domestic price of the final good to increase, and the world price to decrease, the intermediate prices follow this same pattern. The intermediate price in H increases, while in F it decreases, in line with the shifts in input demand accompanying the increase in source final production and decrease in processor final production caused by the tariff. The key implication it that, while the tariff improves the source country's terms-of-trade in the final-good, it worsens its terms-of-trade in the intermediate good. Thus, we should expect the country's terms-of-trade motive for a tariff to be dampened by the presence of intermediate trade, in line with BBJ.

If the intermediate is homogenous, $\tilde{\alpha} = 0$, there is a single intermediate price, and (10) and (11) become,

$$\hat{q}_H = \hat{q}_F = \eta \left(s_F \hat{p}^* + s_H \hat{p}_H \right) \tag{12}$$

Thus, the intermediate price either increases or decreases in response to a tariff, depending on the intermediate spending shares and the final-good price changes. As a tariff increase would cause $\hat{p}_H > 0$, a high enough s_H would cause the price of the intermediate to increase as well, in which case the source country's terms-of-trade motive for a tariff would be actually intensified by the presence of intermediate trade.

It turns out that the condition for this to happen is complex, because the final-good price responses to a tariff depend on trade elasticities, which may themselves be functions of s_H. Specifically, letting $\mu_H > 0$ and $\xi_H^* > 0$ denote the final-good import demand and export supply elasticities facing the source country (which are derived in the Appendix), the following proposition clarifies the point:

Lemma 1 : An increase in the source's tariff on a final good increases the export price of the corresponding intermediate good, if and only if,

$$\frac{\hat{q}_F}{\hat{p}^*} = \eta \left[1 - s_H \left(1 - \tilde{\alpha}\right) \left(\frac{\xi_H^* + \mu_H}{\mu_H} \right) \right] < 0 \tag{13}$$

Moreover, this condition is satisfied for $\tilde{\alpha} = 0$, if and only if,

$$\epsilon_H \Delta_H < s_H \left[\frac{s_F \left(\tau_H - 1\right)}{\tau_H s_F + s_H} \left(\frac{1-\gamma}{\gamma} \right) + \sum_{c=1}^{N} \epsilon_c \Delta_c \right] \tag{14}$$

where $\epsilon_c > 0$ and $\Delta_c \in (0,1)$ denote country c's demand elasticity and share of world consumption, respectively. (Proof in Appendix).

One implication of Lemma 1 is that if the degree of customization is high enough, then (13) cannot hold, in which case vertical specialization must dampen the terms-of-trade motive. The second implication is that under homogeneous intermediate inputs, whether or not we should expect dampening or intensification of the terms-of-trade motive depends on a collection of parameters. For any positive tariff and $s_H \in (0,1)$, condition (14) holds, if γ and/or ϵ_H are sufficiently low. This would give rise to a relatively inelastic import demand schedule, such that the bulk of a tariff effect is in the form of a higher domestic price, which is enough to increase $\hat{q}_F$. Thus, intensification of the terms-of-trade motive is a theoretical possibility.

3.3 The Optimal Tariff

Before adding political economy considerations, we first consider the relationship between the DVA share of imports and the optimal tariff of a welfare-maximizing government. This is so as to isolate the terms of trade elements. Quasi-linear utility allows us to consider welfare on a good-by-good basis. For any final good, source country welfare can be written as the sum of final consumer surplus v_H, factor income (both intermediate and final) and tariff revenue derived from that good:[15]

$$W_H = v_H(p_H) + \pi_H(p_H, q_H) + \pi_H^I(q_H, q_H) + (p_H - p^*)\, M_H \tag{15}$$

where $\pi_H(p_H, q_H) = p_H y_H - q_H x_{HH} - l_H^y$ is the income of final capital k_H, $\pi_H^I(q_H, q_F) = q_H x_{HH} + q_F x_{HF} - l_H^x$ is that of the intermediate specific factors h_H, ϕ_{HH} and ϕ_{HF}, and M_H denotes imports.[16] Note that, because welfare depends only on the sum, and not the distribution, of factor incomes, the value of domestic intermediate supply $q_H x_{HH}$ cancels out of welfare, as it amounts to a transfer between domestic factors.

Differentiating (15) with respect to τ and simplifying gives,

$$\frac{dW_H}{d\tau_H} = (p_H - p^*)\, \frac{dM_H}{dp_H}\frac{dp_H}{d\tau_H} - M_H \frac{dp^*}{d\tau_H} + x_{HF}\frac{dq_F}{d\tau_H} \tag{16}$$

Equation (16) highlights the main factors at work. The first term on the right-hand side is the standard dead-weight loss from the tariff. The second and third terms are terms-of-trade effects for final and intermediate goods, respectively. To the extent that the tariff lowers the foreign price of the final good, it increases H's welfare in proportion to final imports. Moreover, if the tariff impacts the price of exported inputs, it changes H's welfare in proportion to the quantity of intermediate exports.

Final-good market-clearing requires that $-\mu_H \hat{p}_H = \xi_H^* \hat{p}^*$. Substituting this condition into (16) produces the optimal tariff:

$$\tau_H^o - 1 = \frac{1}{\xi_H^*}\left(1 - \frac{q_F x_{HF}}{p^* M_H} \cdot \theta^*\right) \tag{17}$$

where $\theta^* \equiv \hat{q}_F / \hat{p}^*$ is the ratio of the input to output percentage price changes abroad, or the ratio of terms of trade changes, as given by equation (13).

From (17), we see that the optimal tariff depends on the inverse export supply elasticity

[15] Welfare of a non-source importer would the same but without the factor income.
[16] Labor income is a constant and thus suppressed

$\frac{1}{\xi^*}$, as in the standard optimal tariff formula. This would be the optimal tariff of a non-source importing country. For a source country, however, the optimal tariff also depends on the value of source exports of inputs relative to the value of its final imports $\frac{q_F x_{HF}}{p^* M_H}$, or the DVA share, which determines the relative importance of the two terms-of-trade effects. Finally, it depends on θ^*. If $\theta^* > 0$, the tariff *worsens* the H's intermediate terms of trade, thus dampening the traditional terms of trade motive for a tariff. In this case, the DVA share has a *negative* impact on the optimal tariff of the final good. If $\theta^* < 0$, the tariff *improves* the source country's intermediate terms of trade, and the DVA share has a *positive* impact on the optimal tariff of the final good.

Combining these observations with Lemma 1 gives the following proposition:

Proposition 1 (Direct Effect of the DVA Share) The optimal tariff τ_H^o is decreasing in the DVA share for sufficiently high input customization. It is increasing in the DVA share if the input is homogeneous and (14) holds.

As an empirical matter, we do not have the requisite data to check condition (14). Among other things, we lack data on s_H. However, we will attempt to measure input customization, and Proposition 1 suggests that dampening should be clearly evident, in the form of a negative relationship between the tariff and DVA share, under high customization but not necessarily under low customization.

A corollary of Proposition 1 is that products with more customized inputs have lower optimal tariffs, other things equal. This could rationalize the finding of Antras and Staiger (2012) that countries acceding to the WTO tend to make smaller concessions on products that have higher input customization as measured by Nunn (2007). Perhaps accession countries make smaller cuts *ex post* on such products, because they have smaller terms-of-trade motives *ex ante*.[17]

[17] It could also be that WTO negotiations are more problematic in sectors with customized inputs because of contracting frictions, as Antras and Staiger (2012) argue.

3.4 Political Influence

Next we introduce political economy considerations into the optimal tariff calculation. We assume the source government wishes to maximize,

$$\Omega_H = W_H + \lambda_H \pi_H(p_H, q_H) + \lambda_H^I \pi_H^I(q_H, q_F) \tag{18}$$

That is, the government's payoff is a weighted sum of welfare, downstream domestic profits and upstream domestic profits. The weights λ and λ^I represent the political clout of importing-competing and input-supplying specific factors, respectively. These weights may be due to lobbying as in Grossman and Helpman (1994), though they are consistent with a variety of political economy models (Baldwin 1987; Helpman 1997).

Note that λ and λ^I are assumed to be sector specific, consistent with the format of our data on political organization, but not destination specific. This is not to ignore that different destination-specific factors may have different trade policy preferences; rather, the assumption is that their preferences are aggregated with the same weight. We need not take a stand on how this aggregation occurs. It could be that all firms within the intermediate sector own the same mix of destination-specific factors, in which case aggregation takes place within the firm, but all firms share the same policy preference when organizing into a lobby. Alternatively, it could be that the intermediate lobby itself aggregates the divergent preferences, perhaps using lump-sum transfers to reach consensus. Or we could even allow destination-specific factors to form competing lobbies, as long as they are equally effective in influencing the government. The point is that only the total profit of the sector matters to the government, not its within-sector allocation.[18]

[18] Our assumption of sector-specific political weights differs from the destination-specific political weights found in BBJ. They essentially assume that upstream firms supplying the foreign downstream industry have a different political weight, call it λ_{HF}^I, than upstream firms supplying the domestic downstream industry, λ_{HH}^I, and the latter's weight is equal to that of the domestic downstream industry, $\lambda_{HH}^I = \lambda_H$. As is clear from equation (18), setting $\lambda_{HH}^I = \lambda_H$ would cause value of domestic intermediate supply $q_H x_{HH}$ to cancel out of the government objective function as it does in the pure welfare case. In other words, tariff-induced changes in the distribution of domestic profits between upstream and downstream suppliers would play no role in shaping tariff policy. In our framework, the distribution of domestic profits is crucial.

Differentiating (18) with respect to the tariff gives,

$$\frac{d\Omega_H}{d\tau_H} = \frac{dW_H}{d\tau_H} + \lambda_H \left(y_H \frac{dp_H}{d\tau_H} - x_{HH} \frac{dq_H}{d\tau_H} \right) + \lambda_H^I \left(x_{HH} \frac{dq_H}{d\tau_H} + x_{HF} \frac{dq_F}{d\tau_H} \right) \tag{19}$$

From (19) we see that political influence of producers affects the government's marginal benefit from a tariff through two channels. The weight λ_H increases it according to the tariff's impact on value added of final producers: the tariff increases domestic revenue $y_H \frac{dp_H}{d\tau_H} > 0$ but may also change payments to input suppliers, $x_{HH} \frac{dq_H}{d\tau_H}$. The effect of λ_H^I depends on the tariff's impact on payments received by input suppliers at source $x_{HH} \frac{dq_H}{d\tau_H}$ and abroad $x_{HF} \frac{dq_F}{d\tau_H}$. Thus, our predictions about the impact of producer political influence depends once again on how the tariff affects input prices.

Setting (19) to zero and solving (see Appendix) gives the politically optimal tariff:

$$\tau_H^{po} = \frac{1 + \frac{1}{\xi_H^*} \left[1 - \frac{q_F x_{HF}}{p^* M_H} \left(\theta^* + \eta \lambda_H^I - (\eta - \theta^*) \lambda_H \right) \right]}{1 - \frac{y_H}{\mu_H M_H} \left[\lambda_H (1 - \delta\eta) + \lambda_H^I \delta\eta \right]} \tag{20}$$

To understand the role of political influence in (20), it is helpful to consider it in two steps. First, consider the case of complete customization, such that $\theta^* = \eta$ and the final term in the numerator of (20) drops out. The remaining political-economy term in the numerator $-\eta\lambda_H^I$ captures the impact of the tariff on intermediate producers via the price of exported intermediates, which is proportional to the DVA share. In the denominator is the term, $\frac{y_H}{\mu_H M_H} \left[\lambda_H (1 - \delta\eta) + \lambda_H^I \delta\eta \right]$, which captures the political impact of the tariff via domestic prices. It bears a striking resemblance to the optimal tariff in Grossman and Helpman (1994) but for the term in brackets, which depends on how a higher domestic final price affects the distribution of profits between final and intermediate suppliers. This distribution depends on the value share of intermediates in domestic production $\frac{q_H x_{HH}}{p_H y_H} = \delta$ and the partial elasticity η. Note that $\delta\eta < 1$, i.e., both final and intermediate suppliers share in the benefit of protection of the domestic market.

Next, consider the effect of reducing the degree of customization. As intermediate prices are now interdependent, the effect of the tariff on intermediate prices in both markets is mitigated: there is a smaller increase in the intermediate price in the home market and a smaller decrease in the foreign market. It turns out that, with identical technologies in the two countries, the effect of this mitigation on the total profit of the intermediate sector nets out to zero. Thus, the degree of customization does not alter the effect of intermediate political influence on the government's tariff choice, $-\eta\lambda_H^I$. The mitigation of the domestic input price does, however, work to the benefit of the domestic final-good producers. This effect is captured by $(\eta - \theta^*)\,\lambda_H$.

Compared to the welfare-maximizing tariff, we see that the political influence of producers affects both the *level* of the optimal tariff and its *responsiveness* to domestic value added in imports. These effects are described in the next two propositions.

Proposition 2 (Political Allies) If the DVA share is sufficiently small, the politically optimal tariff τ_H^{po} is increasing in the political weight of both input suppliers λ_H^I and final-good producers λ_H.

Proposition 3 (Divergent DVA Interests) An increase in the DVA share decreases the politically optimal tariff τ_H^{po} in proportion to λ_H^I and increases it in proportion to λ_H, unless customization is complete (in which case the latter effect is zero).

According to Proposition 2, if GVCs are unimportant, the political interests of domestic final-goods producers and their domestic input suppliers are allied in favor of import protection. Proposition 3 implies that as the DVA share increases, organized input suppliers generate less protection, as their profits are increasingly derived from exports that are negatively affected by the final tariff, while organized final-good producers generate more protection, unless inputs are completely customized.

3.5 Approximation

As we move to the empirical section of the paper, it will be useful to work with a linear approximation of the politically optimal tariff equation (20). Note that a non-source country has $q_F x_{cF}/p^* M_c = 0$ and $y_c/\mu_c M_c = 0$, and thus τ_c^{po} becomes just the welfare-maximizing tariff, $\tau_c^o - 1 = 1/\xi_c^*$. The average tariff of non-source countries across all products is thus $\bar{\tau}_{ns}^o - 1 = 1/\bar{\xi}_{ns}^*$. Taking a first-order approximation of (20) around the point $1/\xi_H^* = 1/\bar{\xi}_{ns}^*$, $q_F x_{HF}/p^* M_H = 0$, and $y_H/\mu_H M_H = 0$ gives

$$\tau_H^{po} - 1 = \frac{1}{\xi_H^*} - \left(\bar{\tau}_{ns}^o - 1\right) \frac{q_F x_{HF}}{p^* M_H} \left(\theta^* + \eta \lambda_H^I - \left(\eta - \theta^*\right) \lambda_H\right) + \frac{\bar{\tau}_{ns}^o y_H}{\mu_H M_H} \left[\lambda_H \left(1 - \delta\eta\right) + \lambda_H^I \delta\eta\right] \tag{21}$$

As with any approximation, its accuracy suffers for source countries far away from the approximation point. It will be most accurate when the DVA share is low, import penetration is high and export supply elasticity is near the non-source mean.[19] The main advantages of (21) are twofold. First, it has a straightforward interpretation in terms of counterfactuals: for each product, the first term on the right-hand side is the tariff that the source country would choose if it were a non-source country; the remaining terms measure how far the average non-source country would deviate from its optimal tariff if it were the source country. The second advantage is empirical: the first term can be captured by a collection of fixed effects, while the average marginal effects of DVA can be estimated with data on DVA shares, political organization of intermediate and final sectors, and input customization (to capture θ^*).[20]

[19] There is no theoretical reason that source countries and non-sources should have different mean export supply elasticities. In fact, with complete customization, variation in export supply elasticities across products and countries depends only on differences in consumer preferences. See Appendix for the derivation.

[20] BBJ take the same empirical approach of using fixed effects to absorb any level effects due to heterogeneity in export supply elasticities but abstracting from coefficient heterogeneity.

4 Data

4.1 Trade Data The trade data come from the Chinese transactions-level database collected by China's General Administration of Customs (CGAC) for the period of 2000-2006. This dataset contains rich information for all Chinese export and import transactions over this period. For each export or import transaction, the dataset records the firm, product (at the HS8 level), country (destination of exports or source of imports), time (year and month), value, quantity, customs port, transportation mode, etc. It also groups transactions into three main trade types: ordinary trade, processing with imports (PWI) and processing with assembly (PWA).

Under PWI, Chinese firms purchase inputs from abroad, use them to produce finished products, and export the resulting output. The main advantages of PWI for our purposes are four: 1) they are arms-length transactions; 2) PWI exports from China are subject to foreign tariffs; 3) the imported inputs under PWI are not subject to Chinese tariffs; and 4) virtually all of the intermediate inputs imported under PWI are contained in Chinese PWI exports.[21] We include PWI transactions in both the numerator and the denominator of our measure of the DVA share.

PWA transactions fall short on the first two of these criteria. Under PWA, the Chinese firm does not purchase the imported inputs. Instead, the inputs are supplied by the foreign buyer of the finished products, which pays the Chinese firm a processing fee. Similar to transfer prices, reported PWA transaction values may reflect incentives to misreport, either to lower corporate taxes or to escape Chinese capital account controls. Furthermore, typically countries importing finished products exempt the DVA portion of PWA imports from tariffs automatically. For example, under the U.S. offshore assembly program (OAP),[22] U.S.

[21] While it is technically possible for a PWI importer to sell to the domestic market, it would suffer a tariff penalty for doing so. Kee and Tang (2016), which is the most thorough treatment of this subject to date, dismiss this possiblity. A greater threat, in their view, is that a PWI importer might resell its imports to another PWI firm, which could be a measurement problem for us if the two firms are in different sectors. Kee and Tang (2016) take steps to filter out such firms but find that their results are not sensitive to this filtering. Hence, we do not filter our data along these lines.

[22] Otherwise known as the 9802 provision of the Harmonized System code.

firms that export component parts and have them assembled overseas, pay tariffs only on the foreign value-added when the finished product is imported back into the United States (Swenson, 2005; Feenstra, Hanson, Swenson, 1999). Finger (1975) writes that "nearly all industrial countries ... provide for duty-free re-entry of domestically produced components which have been assembled abroad." (page 365). Note that these programs – that set zero tariffs on the DVA portion of PWA imports – are consistent with our theory, which says that tariffs should be at their lowest if the DVA share equals one ($\frac{q_F x_{HF}}{p_H^* M_H} = 1$) and inputs are customized ($\theta^* = \eta$) (see equation (17)).

To conclude, PWA transactions receive a zero foreign tariff for a large fraction of their value. Specifically the tariff does not apply to the DVA portion of PWA imports, which is on average 64 percent. Moreover, according to Finger (1975), some offshore assembly programs apply the tariff only to the assembly value added – they do not even apply tariffs to foreign intermediate inputs contained in PWA imports. Hence, if we were to consider PWA transactions, we would need to treat them separately from other imports of the same product; moreover, accounting for them would only add to the significance of our results.[23] We decided to be conservative and exclude PWA transactions from the denominator, and as a consequence also the numerator, of the DVA share.

Ordinary trade transactions fall short on the latter two of our criteria. First, imported inputs are subject to potentially endogenous Chinese tariffs. Second, one cannot determine how much of the inputs imported by ordinary exporters are used in exports versus domestic sales. Koopman, Wang and Wei (2012) and Kee and Tang (2016) adopt a proportionality assumption to estimate the imported content of ordinary exports (i.e., imported inputs are assigned to ordinary exports according to the share of ordinary exports in gross output) and find that the imported content of Chinese processing exports is many times larger than

[23] In other words, if we decided to account for PWA transactions, we would need to have two separate categories for each product, since two different tariffs apply: the portion of DVA of PWA imports, which receives a zero tariff, and the portion of non-DVA of PWA imports, which receives the same tariff as the rest of imports. For the former portion, the theoretical predictions are exactly satisfied so if we were to include those observations, our results would improve. For the latter portion, the DVA share is by definition zero for all products, which means that in the regressions it would be captured by the constant.

for ordinary exports. Further, they show that accounting for indirect imports through the domestic market (i.e., imported inputs contained in domestically-produced inputs that go into final exports) adds very little beyond direct imports, which we measure. Thus, by using direct imports contained in PWI exports, we believe we are capturing the most important driver of a foreign country's value added in overall Chinese exports, with the advantage that we can establish the input-output linkage at the firm level. To conclude, we exclude ordinary transactions from the numerator of the DVA share but we include them in the denominator of the DVA share, since ordinary trade exports by China are subject to the same tariff as PWI exports.

Table 1 contains the summary statistics of the trade data. The table reports Chinese export and import values, both total and PWI, as well as the share of PWI in total exports and imports in each year during 2000-2006. The total export value increases from 249 to 969 billion dollars during the period, while the total export value of PWI increases from 97 to 415 billion dollars. The share of PWI out of total exports is pretty stable in the range of 39-44 percent. The total import value increases from 225 to 788 billion dollars during the period, while the total import value of PWI increases from 65 to 247 billion dollars. The share of PWI imports out of total imports is pretty stable in the range of 27-31 percent.

4.2 Trade Barriers Data We use data on trade barriers of various countries against Chinese exports. We focus on preferential tariffs and anti-dumping measures, which are specifically applied to China, and allow us to exploit the time dimension since they vary in the period we analyze: For example, in the preferential tariff regressions, we are able to exploit an average number of tariff changes per year which is 1599 for Korea (under the China-ASEAN FTA), 1090 for Chile (under the China-Chile FTA), 421 for Pakistan (under the China-Pakistan FTA) and 224 for Canada (under GSP). In the tariff regressions we exclude countries that use only MFN tariffs against China – because MFN tariffs apply to many other countries and change very little after 2000 – and include countries that granted China preferential treatment in our period of analysis (2002-2007) (under either GSP, the China-

ASEAN FTA, the China-Chile FTA, the China-Pakistan FTA).[24] For the latter countries, we use data for the "years in effect" of the preferential regimes (see third column in Table 2) as well as the year before the beginning of the preferential regime. Therefore, we exploit variation in preferential treatment both at the extensive margin – whether a preference is granted – and at the intensive margin – the value of preferential tariffs once the preference is granted.[25] In the anti-dumping regressions we consider all years of observations between 2002 and 2007 for countries that have an anti-dumping program, i.e. countries with an anti-dumping filing in any year within that period.

Data on tariffs come from WITS (World Integrated Trade Solution). Specifically, the WITS dataset records tariffs by importer, exporter, product (at the HS6 level) and year. All tariffs are AV (ad-valorem, 99% of all tariffs) or AVE (ad-valorem equivalent, 1%). Four tariff series are reported: MFN, Preferential, Applied and Bound. For our preferential tariff regressions, we designate China as the exporter, and we choose as importers those countries with a preferential regime, as explained above. We use the applied tariff series whenever possible. The applied tariff is equal to either the preferential or MFN tariff, unless it is missing. If it is missing but a preferential tariff is present, we use the preferential tariff. If both the applied and preferential tariffs are missing, we use the MFN tariff. This method is intended to capture the applied tariffs of all countries that grant preferences to China in a given year. Typically, such a country applies a preferential tariff to some products from China but not all.

Table 2 reports the summary statistics for the tariffs. Eighteen countries offered preferential tariffs to China during the 2002-2007 period. The vast majority of tariffs in terms of number of product-year observations are from countries that granted preferences to China under the Generalized System of Preference (GSP), Australia, Canada, EU, Japan, New Zealand, Norway and Turkey. The remainder are from China's FTAs with ASEAN, Chile

[24] Trade barrier data cover 2002-2007 because we used double lagged explanatory variables drawn from trade data covering 2000-2006.

[25] We run a robustness check where we exclude the year before the beginning of the preferential regime with a given country. In that year all tariff rates are MFN. Our results are robust.

and Pakistan. For each country, the table reports the number of observations, the average tariff across product-year cells and the average number of tariff changes per year.

The anti-dumping data come from the World Bank temporary trade barriers (TTB) Database, which was collected by Bown (2014). The dataset includes information on anti-dumping filings also by importer, exporter, product (HS6) and year. The last two columns of Table 2 report data for the 14 countries that filed anti-dumping cases against China during the 2002-2007 period. For each country, the table shows the number of observations as well as the number of AD filings. Based on these data we construct the anti-dumping dummy variable, AD_{ict}, which equals one if country c has an application on file to obtain anti-dumping protection on product i in year t. We focus on filings for anti-dumping protection rather than on the actual imposition of anti-dumping duties since there is evidence in the literature that filings matter above and beyond the actual imposition of duties. For example, Prusa (2001) shows that trade flows drop for AD investigations even if the final determination is negative. It should also be noted that many AD investigations end with price undertakings rather than a tariff (i.e., the foreign firms agree to raise prices, in exchange for no tariff imposed). Finally, several studies focus on filings specifically as the dependent variable in the analysis of the impact of political/strategic explanatory variables (Prusa and Skeath 2002, Blonigen and Bown 2003, Feinberg and Reynolds, 2006).[26]

5 Baseline Empirical Specification

5.1. Main variables To bring the model to the data, we assume that governments use information available in period $t-1$ to decide on trade barriers in period t. Therefore, a key regressor will be $EXS_{ic(t-1)}$, which is country c's exports of intermediate inputs used to produce Chinese exports of final product i, relative to country c's imports of i from China,

[26] We also run a robustness check where the dependent variable ($ADIMPOSED_{ict}$) indicates whether anti-dumping duties were imposed. Our results are robust.

all in period $t-1$.

To construct this variable we first use data on PWI export transactions to identify Chinese firms that carry out PWI exports of final product i (HS6) in a given year t. We then use data on Chinese PWI import transactions to find the value of each of those firms' imports of every intermediate j (at the HS6 level) from country c in each year.[27] If a firm exports more than one product, we allocate the firm's intermediate imports to its exported products, according to the share of each exported product in its total exports. Thus, we obtain V_{fijct} which is firm f's PWI imports of intermediate j from country c used in the production of final product i exported in year t.[28]

Summing V_{fijct} over firms and intermediates produces country c's PWI exports of intermediate inputs used to produce Chinese PWI exports of final product i in year t:

$$EX_{ict} = \sum_{f} \sum_{j} V_{fijct} \tag{22}$$

This is lagged and divided by country c's non-PWA lagged imports of final product i from China, $M_{ic(t-1)}$, to obtain,

$$EXS_{ic(t-1)} = \frac{EX_{ic(t-1)}}{M_{ic(t-1)}} \tag{23}$$

which serves as our proxy for country c's DVA share, that is a country's PWI exports of intermediate inputs, used by Chinese PWI firms to produce the product in question, relative

[27] We use intermediate imports lagged one year to capture that final goods exported in a given year probably use inputs purchased the year before. In addition, to construct the numerator of EXS, we focus on PWI imports of intermediate inputs of Chinese firms that carry out PWI exports. This is reasonable given that the share of PWI imports of intermediate inputs by firms that do not carry out PWI exports (in the following year) out of total PWI imports is only 4 percent in 2000-2006. Moreover, the share of PWI imports of intermediate inputs by firms that do not carry out *any* exports (in the following year) out of total PWI imports is only 3 percent in 2000-2006.

[28] Therefore the imports by Chinese firms of intermediate inputs, which we include in the numerator of EXS, are used to produce good i which is exported either to country c or to another country. This makes sense from a theoretical point of view. In the model, the final good is exported to multiple countries. Thus, a reduction in the price of the final good in China – due to country c's tariff – will decrease China's production of the final good (regardless of destination) and, as a consequence, will decrease China's demand for country c's inputs in total, not just c's inputs contained in final goods sold to c. Therefore, country c's terms of trade loss in the Chinese input market is proportional to the reduction in country c's total exports of the inputs to China – i.e. exports of the inputs used to produce the final goods exported to any country.

to country c's non-PWA imports from China of final product i in period $t-1$.

Table 3a contains the summary statistics of the main variables used in the regressions. The sample is restricted to observations with non-missing values for trade barriers, EXS and its instrumental variable, $TCEX$ (which is described in section 5.3).[29] The table has various panels that refer to different samples used in the regressions tables. The average tariff on final products in the sample used for the baseline tariff regressions is 6.29%. The corresponding EXS is 4.76%. In the sample used for the baseline anti-dumping regressions, 1.11% is the percentage of country-year observations characterized by an anti-dumping application on file. The corresponding EXS is 5.31%.

5.2. Baseline OLS Results From a theoretical point of view, the impact of a country's DVA share of imports from China on China-specific protection is ambiguous, as it depends on political economy and customization factors. Absent measures of these factors (which we consider later in the paper), we estimate a reduced-form empirical relationship between EXS and import protection, which serves as our baseline specification:

$$TB_{ict} = \beta_1 EXS_{ic(t-1)} + FE + \varepsilon_{ict} \tag{24}$$

The dependent variable, $TB_{ict} \in \{T_{ict}, AD_{ict}\}$, represents trade barriers that country c imposes on imports of product i (at the HS6 level) from China in period t. The trade barriers are either tariff rates, T_{ict}, or a dummy variable indicating whether an antidumping case is filed, AD_{ict}. FE in the specification stands for various fixed effects. ε_{ict} is the error term.

The first two columns of Table 4 present the baseline OLS regression results. The first column includes product (HS6)-year and country-year fixed effects while the second column includes product (HS6)-year, country-year and industry (HS2)-country fixed effects. In these OLS regressions, we find a weak negative correlation between EXS and trade barriers. The

[29] We focus on the restricted sample of the IV regressions (that we also use to run the OLS regressions) to facilitate comparison between the OLS and IV results. However, the summary statistics and OLS results for the unrestricted sample are very similar. Note that we have also dropped outliers by removing the top 1% of tariffs (those greater than or equal to 50 percent).

coefficient in column (2), panel A is positive and insignificant. The rest of the coefficients are negative and significant but their magnitude is very small.

5.3. Baseline IV Results The OLS regressions might be affected by endogeneity. The most likely bias is from reverse causality, as a trade barrier imposed on an imported final product should decrease imports of that product, which is the denominator of EXS (it could also impact the numerator of EXS, though probably to a lesser extent). This would suggest an upward bias (towards zero) in the coefficient on EXS. Although we measure EXS with a lag, the dependent variable might be serially correlated, in which case endogeneity would still be a problem. Hence we need to instrument for EXS.

A valid instrument should be correlated with the endogeneous regressor, $EXS_{ic(t-1)}$, but not affect the dependent variable, TB_{ict}, except through its effect on the regressor. To clarify the problem, consider the following decomposition of $EXS_{ic(t-1)}$:

$$EXS_{ic(t-1)} = \frac{Y_{i(t-1)}}{M_{ic(t-1)}} \times \frac{I_{i(t-1)}}{Y_{i(t-1)}} \times \frac{EX_{ic(t-1)}}{I_{i(t-1)}} \tag{25}$$

where $Y_{i(t-1)}$ denotes total final sales of good i (by Chinese PWI firms) and $I_{i(t-1)}$ denotes the total value of intermediate inputs used in i from all sources. The first term on the right-hand side of (24) is the ratio of China's exports to all countries relative to its exports to country c. A tariff on the final good probably increases this ratio; however, it would be hard to find an instrument for this term that would not also potentially affect country c's tariff directly. The second term is the cost share of intermediate inputs in final sales. This term has no country variation by definition and probably little time variation (in a Cobb-Douglas production function, for example, it would be constant). Finally, the third term captures c's exports of intermediate inputs relative to intermediate inputs from all sources. This term is most likely affected by trade costs involving intermediates specific to c. As such costs probably would not affect the choice of the final-good tariff except through its effect on $EXS_{ic(t-1)}$, a country-product-time varying measure of intermediate trade costs could be a valid instrument.[30]

We construct a variable which captures the exogeneous variation in transport costs between China and countries that export the intermediates and import the final product. Rather than use direct data on transport costs between China and foreign countries, we construct a proxy by using U.S transport cost data.[31] The U.S. Imports of Merchandise Dataset from the U.S. Census Bureau has weight, value, transport charges (freight and insurance in total) by product (HS10)-country-time-mode, where mode can be either vessel or airplane. We construct a measure of transport costs to China of inputs from country c used in China's exports of product i, $TCEX_{ict}$, with a three-step procedure.

First, we compute the average ad valorem shipping rate for U.S. imports per mile for input j via mode m at time t:

$$SR_{jmt} = \sum_{c} \frac{C^{us}_{jcmt}}{V^{us}_{jcmt} \times D^{us}_{c} \times N_c} \tag{26}$$

where C^{us}_{jcmt}, V^{us}_{jcmt}, D^{us}_{c} and N_c denote transport charges, value of imports, distance from the U.S., and number of origin countries, respectively. Note that in this first step we net out country-specific variation by taking the average across countries. Second, we adjust this shipping rate to account for the distance of country c to China, D^{chn}_{c}, to arrive at an estimate of the Chinese ad valorem transport cost for input j from country c, via mode m at time t:

$$TC_{jcmt} = SR_{jmt} \times D^{chn}_{c} \tag{27}$$

Summary statistics for TC_{jcmt} and SR_{jmt} are reported in Table 3b. Finally, we aggregate the transport costs over all intermediate inputs and modes used in final product i usings as weights the Chinese PWI imported input shares from a base year. Thus we arrive at an

[30]In other words, to address endogeneity driven mostly by the denominator of EXS, that is imports, we construct an instrument which focuses on the numerator. As long as the first stage is strong, which is true as shown below, this is a valid instrument – assuming that the exclusion restriction is satisfied, which we believe we make a strong case for.

[31]Note that the U.S. is not included in the tariff regressions but is in the AD regressions.

estimated ad valorem transport cost of the inputs from country c in Chinese final product i at time t:

$$TCEX_{ict} = \sum_{j \in j_i} \sum_{m} \left(TC_{jcmt} \times \frac{\bar{V}_{ijm}}{\sum_{k \in k_i} \sum_m \bar{V}_{ikm}} \right) \tag{28}$$

where $\bar{V}_{ijm} = \sum_f \sum_c V_{fijcmt_0^i}$ and t_0^i is the first year China exports i in the data. Note that the weights are not specific to country c.

The instrument varies by country, time and final product. The country variation is due to distance to China (step 2). The time variation comes from U.S. shipping rates (step 1). The product variation comes from cross-input variation in U.S. shipping rates (step 1) and cross-final-product variation in base-year input weights (step 2).

Table 4, columns (3)-(4) show the IV estimates of the baseline regressions. The first-stage estimation results are shown in the appendix.[32] These estimates confirm the negative and significant coefficient on EXS that we had found in the OLS regressions. However, the estimates are now larger in magnitude, consistent with our conjecture of a bias in the OLS estimates towards zero due to the imports in the denominator of EXS. The results are significant in all specifications, including the most demanding one with product-year, country-year and industry-country fixed effects. These findings confirm the results in BBJ and represent the starting point of our empirical analysis whose main contribution is to highlight the roles of input customization and politically organized producers in the determination of preferential tariffs and anti-dumping filing rates.

6 Input Customization and Political Organization

In this section, we test the predictions of the theoretical model directly by accounting for the extent of input customization and for politically organized producers. We begin by

[32]The first-stage regresses $EXS_{ic(t-1)}$ on $TCEX_{ic(t-1)}$. It shows a negative and significant impact of our exogenous measure of transport costs on the value share of domestic exports relative to imports (at the 1 percent level). The F values are high in both the tariff and anti-dumping regressions, ranging between 35 and 293 in the tariff regressions and between 54 and 416 in the anti-dumping regressions, depending on the fixed effects included.

constructing the relevant variables.

6.2. Input Customization Index While there is no right way to measure input customization, the relevant issue for us is whether the source and processor input prices must move together or can diverge. Rauch (1999) classifies products as homogenous if they are sold on an exchange or reference priced, which suggests price co-movement across countries, and as differentiated (*diff*) otherwise. Following Nunn (2007), we create an index of input customization (or "relationship-specificity," in Nunn's terminology) for a final product, as the share of inputs embodied in that product, which are differentiated according to Rauch, which we denote CI_{ic}. CI_{ic} is computed as the weighted average of $diff_j$ across sectors in country c that export intermediates to China used in the production of final product i:

$$CI_{ic} = \sum_{j \in j_i} \left(diff_j \times \frac{\bar{V}_{ijc}}{\sum_{k \in k_i} \bar{V}_{ikc}} \right) \tag{29}$$

The weights are based on $\bar{V}_{ijc} = \sum_f V_{fijct_0^{ijc}}$, where t_0^{ic} is the first year that any input of country c's is used in Chinese exports of i in the data.[33] We also run robustness checks that use alternative measures of input customization, namely the quality ladder index by Khandelwal and a measure of dispersion of unit values – we explain the details of these measures later in the paper.

6.1. Political Organization Variables Both producers of the import-competing good and of the intermediate inputs in country c may lobby the government to affect the level of protection on final products. Following Grossman and Helpman (1994), we assume industry lobbying requires political organization. We use data from Ludema and Mayda (2013) on trade associations at the industry level to proxy for political organization.

The data come from the World Guide to Trade Associations (1995) which identifies

[33] The original Rauch classification is at the 4-digit SITC (Standard International Trade Classification) level, and we assign a value of 0 to inputs which are sold on an exchange or reference priced and a value of 1 to all the other inputs, based on Rauch's conservative criterion (results are robust to the liberal criterion). We use a concordance between 4-digit SITC codes and 10-digit HS codes and aggregate the binary variable to the 6-digit HS level (by taking the average of all 10-digit HS products within the same 6-digit HS product) producing $diff_j$.

trade associations by country and subject for 185 countries and several hundred subjects, about 300 of which correspond to goods. We use a concordance between WGTA-industries and 4-digit HS codes to get the number of trade associations in each 4-digit HS code in these countries. We construct a political organization variable PO_{kc} for 4-digit HS industry k in country c, which is based on considering three groups of industries for each country. The first group of industries are those with no trade associations: we assign to this group the value of 0. For the rest of industries, we create two groups according to whether they are in the top/bottom half in terms of the number of trade associations, and assign to these groups the values of 2 and 1 respectively. We set $PO_{ic} = PO_{kc}$ for all 6-digit HS products i within 4-digit HS code k. From this, we get the two measures of political organization we use in the regressions: one is the political organization of producers in country c of final product i or POF_{ic} which exactly equals PO_{ic}; the other is the political organization of producers in country c of intermediates used in final product i, or POI_{ic}, which is computed as the weighted average of PO_{jc} across sectors in the country that export intermediates to China used in the final product:

$$POI_{ic} = \sum_{j \in j_i} \left(PO_{jc} \times \frac{\bar{V}_{ijc}}{\sum_{k \in k_i} \bar{V}_{ikc}} \right) \tag{30}$$

We use the same weights as in (29) to compute the shares of such inputs from each country c embodied in each Chinese product i. Summary statistics for these variables by HS section are found in the appendix (Table A2).

6.3. Empirical Analysis Proposition 1 states that a country's optimal tariff is declining in the DVA share of its final imports for sufficiently high input customization but not necessarily for low customization. This is because the dampening effect of DVA on the terms-of-trade motive for protection relies on source and processor input prices moving in opposite directions in response to a tariff, which is a feature of customization. If inputs are homogeneous, such that home and foreign input prices move in tandem, then a tariff-induced boost in source input demand could drive up foreign input prices, thus enhancing the terms-of-trade motive for downstream protection.

To provide a first look at whether the effect of EXS on protection is sensitive to customization, we include the interaction of the customization index with EXS in our baseline specification:

$$T_{ict} = \beta_1 EXS_{ic(t-1)} + \beta_{12} \left[EXS_{ic(t-1)} \times CI_{ic}\right] + FE + \varepsilon_{ict} \tag{31}$$

This can be thought of as the empirical implementation of Proposition 1. We expect $\beta_{12} < 0$, while the sign of β_1 is theoretically ambiguous, as it captures the effect of EXS under no customization. The estimates of equation (30) appear in columns (1)-(2) in Table 5. Consistent with the theory, we find that the negative effect of EXS on protection is primarily found in sectors with customized inputs. Products containing inputs that are not customized have an insignificant impact in most specifications.

To provide a first look at the effects of political organization in the data, we augment the specification (30) with the direct effects POI and POF. The results are shown in columns (3)-(4) in Table 5. We see that, as in the first two columns, EXS has a negative impact on protection in sectors with customized inputs but, for imputs that are not customized, the impact is insignificant in most regressions. Moreover, as in Grossman and Helpman (1994), POF has a strong positive effect. The effect of POI is insignificant or slightly negative, suggesting perhaps that organized input suppliers in general have no clear policy position. It is important to note, however, that this regression does not control for interaction effects between EXS and political organization, as our Proposition 2 requires. Thus, the apparent ambiguity in the position of input suppliers indicated by this naive reduced-form regression is potentially misleading.

The theoretical model indicates that a clear alliance between intermediate and final suppliers in favor of protection should be present for low levels of intermediate exports (low values of EXS) and independently from the degree of customization. As the DVA share increases, such that input suppliers derive more of their profits from exports to PWI firms in China, the political interests of the two producer groups may diverge. According to Proposition 3, as the DVA share increases, intermediate suppliers should lose interest in protection, while final producers should push harder for protection provided customization is not too high. More precisely, $EXS \times POI$ should have a negative impact on protection. In addition, $EXS \times POF$ should positively impact protection, except when customization is complete ($\theta^* = \eta$), in which case the effect should be zero (to capture the latter effect we should introduce the triple interaction $EXS \times POF \times CI$ and find that its impact is negative). This is because with incomplete customization, final producers in the source country know that the effect of a tariff increase on domestic input prices will be mitigated by the influence of input prices abroad, which should embolden them to lobby for a higher tariff. To test these predictions, we include the linear effects of POI and POF, their interactions with EXS, and the triple interaction $EXS \times POF \times CI$ in the regression as follows (matching equation (20)):

$$\begin{aligned} T_{ict} = {} & \beta_1 EXS_{ic(t-1)} + \beta_2 \left[EXS_{ic(t-1)} \cdot CI_{ic}\right] + \beta_3 POI_{ic} + \beta_4 POF_{ic} \\ & + \beta_{13} \left[EXS_{ic(t-1)} \cdot POI_{ic}\right] + \beta_{14} \left[EXS_{ic(t-1)} \cdot POF_{ic}\right] \\ & + \beta_{24} \left[EXS_{ic(t-1)} \cdot CI_{ic} \cdot POF_{ic}\right] + FE + \varepsilon_{ict} \end{aligned} \quad (32)$$

Theory predicts that $\beta_2 < 0$, $\beta_3 > 0$, $\beta_4 > 0$, $\beta_{13} < 0$, $\beta_{14} > 0$ and $\beta_{24} < 0$. Note that the theory cannot sign β_1 as this pertains to the effect of EXS with homogeneous inputs.[34]

[34] As in equation (21) we interpret the coefficients as marginal deviations for the average non-source country, which is assumed face a finite elasticity of export supply for the final good. That is, the average country is "large" in product i. An alternative would be to allow coefficient heterogeneity by interacting each variable involving EXS with an estimate of market power (i.e., inverse export supply elasticity) which varies by industry and country. In the empirical analysis we did not include this dimension since the predictions we bring to the data are already very rich and imply several double and triple interaction variables. If we were to account for the extent of market power of country c for each product, we would have to include quadruple interaction terms. In addition, estimates of market power in the literature are noisy, and market share is probably not a reliable proxy. Rather than to introduce this additional measurement error, we prefer to abstract from heterogeneity in market power, and instead estimate average treatment effects. Moreover, as

The results are found in Table 6. Several conclusions stand out. First, the direct effect of EXS is always insignificant, which is expected as it corresponds to homogenous inputs, while the interaction effect $EXS \times CI$ is negative and robust, implying that EXS mitigates downstream protection for goods with customized inputs, even without political organization. These results are consistent with theory and our earlier estimates in Table 5. Second, we see that the direct effects of POI and POF are positive and significant, confirming Proposition 2. This resolves the ambiguity in the effect of POI found in Table 5. Third, consistent with Proposition 3, the coefficient on the interaction term, $EXS \times POI$, is negative and significant. Fourth, support for the second part of Proposition 3 is found in the coefficient estimates for $EXS \times POF$, which is positive and significant, and for $EXS \times POF \times CI$ which is negative and significant. Overall, these results are remarkably consistent with the theoretical predictions. This is exceptional, given the high number of sign predictions implied by the model and considering how demanding our specification is in terms of fixed effects.

7 Robustness checks

We run three sets of robustness checks. First, note that when ordinary trade is low and therefore the PWI to ordinary trade ratio is high, our measure of the DVA share is more precise, i.e. there is less measurement error. In Table 7, we estimate the full specification (equation (31)) for two separate subsamples, which include respectively: product codes with low PWI to ordinary trade ratio; and product codes with high PWI to ordinary trade ratio. We find that the results are generally larger in magnitude and more significant when the PWI to ordinary trade ratio is high, which is consistent with expectations.

our coefficient estimates represent an average across countries, if there are countries in the sample that have little market power, then presumably they would drive the estimates toward zero. The fact that we obtain statistically significant estimates nonetheless we take as support for the theory.

Another market power concern might be China's "largeness" in the input market, i.e., China's ability to influence the source country's intermediate export price, which could vary by product. This type of market power, and hence this source of coefficient heterogeneity, is captured to some extent by our measure of input customization.

Second, in Table 8 we check the robustness of our results to: using as dependent variable preferential tariffs expressed as deviations from MFN, that is to using as dependent variable preference margins; and to excluding the year before the first preference was granted, that is to exploiting variation in preferential tariffs only at the intensive margin – the value of the preferential tariffs once the preference is granted – and not at the extensive margin – whether a preference is granted. In particular Table 8 includes: the specification with preferential tariffs as the dependent variable, excluding the year before the first preference was granted (i.e. accounting only for the intensive margin); (regression (1)); the specification with the preference margin as the dependent variable, excluding the year before the first preference was granted (i.e. accounting only for the intensive margin) (regression (2)); the specification with the preference margin as the dependent variable, including the year before the first preference was granted (i.e. accounting for both the extensive and intensive margins) (regressions (3)); the specification with the binary preference dependent variable, including the year before the first preference was granted (i.e. accounting for only the extensive margin) (regression (4)). Our results are robust.

We carry out two additional robustness checks in Table 8. In regression (5) we replace the anti-dumping-filing dependent variable, AD_{ict}, with the anti-dumping-imposition dependent variable, $ADIMPOSED_{ict}$. Next, given that we use U.S. data to construct the instrument, in column (6) we estimate the AD regressions excluding the United States from the sample (note that the sample of the tariff regressions does not include the United States). Our results are broadly robust.

Finally, in Table 9, we test the robustness of our results to constructing our regressors in alternative ways. Specifically, we first address the issue that our DVA share variable (EXS) does not exclude the foreign value-added contained in intermediate input exports of country c nor include "indirect" domestic value added, that is domestic value added of country c contained in a third country's (c') intermediate exports to China. In column (1) we first run the regression where we use the restricted sample of observations for which we have data in the OECD TiVA database, which we used to construct our new measure of EXS. Next, in column (2), we show that our results are robust to constructing the "domestic value-added share" as

$$\frac{1}{M_{ic}} \sum_{c'} \sum_{f} \sum_{j} DVA_{jcc'} * V_{fijc'} \tag{33}$$

where $V_{fijc'}$ is imports from country c' by firm f of inputs j used to produce good i and $DVA_{jcc'}$ is the share of country c content in country c''s intermediate input exports of goods j to China. Note that, by applying equation (32), we both exclude foreign value added (see equation (32) when $c' = c$) and include indirect domestic value added. We used the 2005 OECD TiVA database and downloaded the gross exports of intermediate products by origin of value added and destination. Each value is the amount of valued added from the "source" (country c) contained in the intermediate exports of the "country" (i.e. exporter c') to the "partner" (importer, i.e. China). We divided that value by gross exports of intermediate products to get the shares $DVA_{jcc'}$. Our results are robust.

In columns (3) and (4), Table 9, we explore how our results change when we use alternative measures of input customization. In column (3), we replace the Rauch index with the quality ladder index by Khandelwal; in column (4), we replace the Rauch index with a measure of dispersion of unit values (from CEPII) by 6-digit HS product code and country in the year 2000: specifically, we construct the coefficient of variation (standard deviation divided by the mean) of unit values, for most of the countries in our sample and 6-digit HS product codes. Our results are robust.

Finally, in regression (5), Table 9, we include PWA in the denominator of *EXS* and, once again, we find that our results are robust.

8 Conclusions

In this paper we have investigated the political economy of trade policy in a context characterized by the existence of global value chains (GVCs). We have analyzed the impact of politically organized producers of intermediate inputs on the level of protection of imported final products that contain those intermediates. We have used Chinese transaction-level processing trade data as well as information on preferential tariffs and anti-dumping investigations of China's trading partners. We find that political organization of both the import-competing sector and their domestic input suppliers increases protection, when the value share of domestic exports contained in a country's imports from China (EXS) is small. However, the positive effect of politically organized domestic input suppliers on protection is mitigated as the DVA share of final imports from China increases. Tariffs on products containing inputs that are neither customized nor politically organized appear to be unaffected by the DVA share. The estimated effects are remarkably consistent with the theoretical predictions and provide strong evidence that DVA embodied in imports affects the political calculus of trade policy.

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Appendix

A1. Derivation of import demand and export supply elasticities

Totally differentiate the final-good market clearing condition:

$$\left(\frac{1-\gamma}{\gamma}\hat{p}_H - \frac{\delta}{\gamma}\hat{q}_H\right)\frac{y_H}{y} + \left(\frac{1-\gamma}{\gamma}\hat{p}^* - \frac{\delta}{\gamma}\hat{q}_F\right)\frac{y_F}{y} = -\epsilon_H \Delta_H \hat{p}_H - \sum_{c\neq H}\epsilon_c \Delta_c \hat{p}^*$$

Substitute in (10) and (11) and define, $G_H = \frac{y_H}{y}\left(\frac{1-\gamma}{\gamma} - \frac{\delta}{\gamma}\eta + \frac{\delta}{\gamma}\eta s_F (1-\tilde{\alpha})\right) + \epsilon_H \Delta_H$ and $G_H^* = \frac{y_F}{y}\left(\frac{1-\gamma}{\gamma} - \frac{\delta}{\gamma}\eta + \frac{\delta}{\gamma}\eta s_H (1-\tilde{\alpha})\right) + \sum_{c\neq H}\epsilon_c \Delta_c$. Then the above condition becomes,

$$G_H \hat{p}_H - \frac{y_H}{y}\frac{\delta}{\gamma}\eta s_F (1-\tilde{\alpha})\,\hat{p}^* + G_H^* \hat{p}^* - \frac{y_F}{y}\frac{\delta}{\gamma}\eta s_H (1-\tilde{\alpha})\,\hat{p}_H = 0$$

It follows that the $\hat{E}_H^*$ and $\hat{M}_H$ are given by, $\hat{E}_H^* = G_H^* \hat{p}^* - \frac{y_F}{y}\frac{\delta}{\gamma}\eta s_H (1-\tilde{\alpha})\,\hat{p}_H$ and $\hat{M}_H = -G_H \hat{p}_H + \frac{y_H}{y}\frac{\delta}{\gamma}\eta s_F (1-\tilde{\alpha})\,\hat{p}^*$, respectively.

Now we solve the solve the above condition to obtain:

$$\frac{\hat{p}_H}{\hat{p}^*} = -\frac{G_H^* - \frac{y_H}{y}\frac{\delta}{\gamma}\eta s_F (1-\tilde{\alpha})}{G_H - \frac{y_F}{y}\frac{\delta}{\gamma}\eta s_H (1-\tilde{\alpha})}$$

Substituting this solution back into our definitions of $\hat{E}_c^*$ and $\hat{M}_c$ produces the import demand and export supply elasticities:

$$\mu_H \equiv -\frac{\hat{M}_c}{\hat{p}_H} = \frac{G_H^* G_H - \frac{y_H}{y}s_F\frac{y_F}{y}s_H\left(\frac{\delta}{\gamma}\eta\right)^2(1-\tilde{\alpha})^2}{G_H^* - \frac{y_H}{y}\frac{\delta}{\gamma}\eta s_F (1-\tilde{\alpha})}$$

$$\xi_H^* \equiv \frac{\hat{E}_H^*}{\hat{p}^*} = \frac{G_H^* G_H - \frac{y_H}{y}s_F\frac{y_F}{y}s_H\left(\frac{\delta}{\gamma}\eta\right)^2(1-\tilde{\alpha})^2}{G_H - \frac{y_F}{y}\frac{\delta}{\gamma}\eta s_H (1-\tilde{\alpha})}$$

A2. Proof of Lemma 1

Substituting $-\mu_H \hat{p}_H = \xi_H^* \hat{p}^*$ into equation (11) yields,

$$\frac{\hat{q}_0}{\hat{p}^*} = \eta \left[1 - s_H \left(1 - \tilde{\alpha}\right) \left(\frac{\xi_H^* + \mu_H}{\mu_H} \right) \right]$$

Noting that $\hat{p}^*/\hat{\tau} < 0$, it follows that (13) is necessary and sufficient for q_F to increase in response to a final-good tariff.

Setting $\tilde{\alpha} = 0$, this condition becomes

$$1 < s_H \left(\frac{\xi_H^* + \mu_H}{\mu_H} \right)$$

Using the expressions for ξ_H^* and μ_H derived in A1 and simplifying gives (14):

$$\epsilon_H \Delta_H < s_H \left[\frac{s_F \left(\tau_H - 1\right)}{\tau_H s_F + s_H} \left(\frac{1 - \gamma}{\gamma} \right) + \sum_{c=1}^{N} \epsilon_c \Delta_c \right]$$

A3. Derviation of the politically optimal tariff

We set (19) equal to zero and restate it in hat terms:

$$\left(\tau^{po} - 1\right) \mu_H \frac{\hat{p}_H}{\hat{p}^*} = -1 + \frac{q_F x_H}{p^* M_H} \frac{\hat{q}_F}{\hat{p}^*} + \lambda_H \left(\frac{p_H y_H}{p^* M_H} - \frac{q_H x_{HH}}{p^* M_H} \frac{\hat{q}_H}{\hat{p}_H} \right) \frac{\hat{p}_H}{\hat{p}^*} + \lambda_H^I \left(\frac{q_H x_{HH}}{p^* M_H} \frac{\hat{q}_H}{\hat{p}_H} \frac{\hat{p}_H}{\hat{p}^*} + \frac{q_F x_H}{p^* M_H} \frac{\hat{q}_F}{\hat{p}^*} \right)$$

Substituting in $-\mu_H \hat{p}_H = \xi_H^* \hat{p}^*$ yields,

$$\tau^{po} = \tau^o + \frac{y_H p_H}{p^* M_H \mu_H} \left(\lambda_H - \lambda_H \frac{q_H x_{HH}}{p_H y_H} \frac{\hat{q}_H}{\hat{p}_H} + \lambda_H^I \frac{q_H x_{HH}}{p_H y_H} \frac{\hat{q}_H}{\hat{p}_H} \right) - \lambda_H^I \frac{1}{\xi_H^*} \frac{q_F x_H}{p^* M_H} \frac{\hat{q}_F}{\hat{p}^*}$$

Next substitute in equations governing the relationship between intermediate and final prices, which are $\frac{\hat{q}_H}{\hat{p}_H} = \eta \left[1 - s_F \left(1 - \tilde{\alpha}\right) \left(\frac{\xi_H^* + \mu_H}{\xi_H^*} \right) \right]$ and $\frac{\hat{q}_F}{\hat{p}^*} = \eta \left[1 - s_H \left(1 - \tilde{\alpha}\right) \left(\frac{\xi_H^* + \mu_H}{\mu_H} \right) \right]$.This produces,

$$\tau^{po} = \tau^{o} + \frac{y_H p_H}{p^* M_H \mu_H} \left[\lambda_H \left(1 - \delta\eta\right) + \lambda_H^I \delta\eta \right] - \lambda_H^I \frac{1}{\xi_H^*} \frac{q_F x_H}{p^* M_H} \eta$$
$$+ \left[\frac{q_H x_{HH} s_F}{p^* M_H} \lambda_H - \left[q_H x_{HH} s_F - q_F x_{HF} s_H \right] \frac{\lambda_H^I}{p^* M_H} \right] \eta \left(1 - \tilde{\alpha}\right) \left(\frac{\xi_H^* + \mu_H}{\mu_H \xi_H^*} \right)$$

Using the definition of s_H, we see that $q_H x_{HH} s_F - q_F x_H s_H = 0$. Further, using $\eta s_H \left(1 - \tilde{\alpha}\right) \left(\frac{\xi_H^* + \mu_H}{\mu_H} \right) = \eta - \theta^*$ gives the final result (20).

Table 1. Summary Statistics of Trade Data (2000-2006)
Trade values in billions of dollars

Year	Total		PWI		Share of PWI (%)	
	Exports	Imports	Exports	Imports	Exports	Imports
2000	249	225	97	65	39	29
2001	291	266	115	71	40	27
2002	301	273	123	81	41	30
2003	438	413	188	124	43	30
2004	594	561	260	168	44	30
2005	762	660	333	207	44	31
2006	969	788	415	247	43	31

Table 2. Summary Statistics of Trade Barriers (2002-2007)[a]

Country	Preferences		Applied Tariffs[b]			AD Filings	
	Regime	Years in Effect	No. of Obs	Average Tariff	Ave.No.of Tariff Changes per year	No. of Obs	No. of AD Filings[c]
Australia	GSP	2002-2007	14,651	4.92	111	15,061	47
Bangladesh	China-ASEAN FTA	2007	3,793	15.62	919	--	--
Brazil	--	--	--	--	--	11,271	55
Cambodia	China-ASEAN FTA	2007	1,653	14.03	52	--	--
Canada	GSP	2002-2007	15,409	3.72	224	15,925	116
Chile	China-Chile FTA	2006-2007	5,938	2.99	1090	--	--
Colombia	--	--	--	--	--	9,385	197
European Union	GSP	2002-2007	16,323	3.23	158	16,973	179
India	--	--	--	--	--	14,436	379
Indonesia	China-ASEAN FTA	2005-2007	9,316	6.47	327	15,478	24
Japan	GSP	2002-2007	15,635	2.18	231	--	--
Korea	China-ASEAN FTA	2007	5,149	9.71	1599	17,611	46
Lao	China-ASEAN FTA	2005-2007	1,278	8.95	2	--	--
Malaysia	China-ASEAN FTA	2007	5,274	6.85	975	--	--
New Zealand	GSP	2002-2007	11,156	4.22	118	--	--
Norway	GSP	2002-2007	5,449	0.65	34	--	--
Pakistan	China-Pakistan FTA	2006-2007	6,788	14.43	421	--	--
Peru	--	--	--	--	--	8,948	361
Philippines	China-ASEAN FTA	2007	5,050	5.89	952	--	--
Singapore	China-ASEAN FTA	2007	5,602	0.01	2	--	--
Turkey	GSP	2005-2007	7,010	2.09	41	12,918	244
Vietnam	China-ASEAN FTA	2005-2007	9,077	14.74	329	--	--
United States	--	--	--	--	--	22,679	304

a. Trade barrier data covers 2002-2007, as we use lagged trade data covering 2000-2006.

b. All applied tariffs of countries with at least one preferential tariff on China during 2002-2007 since the year before which they granted the first preference to China.

c. The number of observations with an anti-dumping filing either currently or at some point in the past during 2002-2007.

Table 3a. Summary Statistics of Variables in the Regressions

Sample 1. Baseline Regressions (Table 4)					
A. Tariff Regressions	N	Mean	S.D.	Min	Max
T_{ict}	144,551	6.29	8.99	0	50
$EXS_{ic(t-1)}$	144,551	4.76	14.10	0	99.99
$TCEX_{ic(t-1)}$	144,551	6.86	5.68	0.99	39.02
B. Anti-dumping Regressions	N	Mean	S.D.	Min	Max
AD_{ict}	160,685	1.11	10.45	0	100
$EXS_{ic(t-1)}$	160,685	5.31	14.80	0	99.99
$TCEX_{ic(t-1)}$	160,685	8.98	6.87	1.01	39.03
Sample 2. CI Regressions (Columns 1-2 of Table 5)					
A. Tariff Regressions	N	Mean	S.D.	Min	Max
T_{ict}	57,281	6.61	8.99	0	50
$EXS_{ic(t-1)}$	57,281	11.29	19.97	0	99.99
$TCEX_{ic(t-1)}$	57,281	6.19	4.65	0.99	39.01
CI_{ic}	57,281	0.49	0.41	0	1
B. Anti-dumping Regressions	N	Mean	S.D.	Min	Max
AD_{ict}	73,512	1.04	10.17	0	100
$EXS_{ic(t-1)}$	73,512	11.49	20.08	0	99.99
$TCEX_{ic(t-1)}$	73,512	7.65	5.92	1.01	39.01
CI_{ic}	73,512	0.46	0.40	0	1
Sample 3. PO Regressions (Columns 3-4 of Table 5) and Full Regressions (Table 6)					
A. Tariff Regressions	N	Mean	S.D.	Min	Max
T_{ict}	30,088	5.99	8.39	0	50
$EXS_{ic(t-1)}$	30,088	13.04	21.09	0	99.88
$TCEX_{ic(t-1)}$	30,088	6.35	4.62	0.99	39.01
CI_{ic}	30,088	0.47	0.41	0	1
POI_{ic}	30,088	0.81	0.85	0	2
POF_{ic}	30,088	0.70	0.88	0	2
B. Anti-dumping Regressions	N	Mean	S.D.	Min	Max
AD_{ict}	45,504	0.83	9.09	0	100
$EXS_{ic(t-1)}$	45,504	13.01	21.13	0	99.95
$TCEX_{ic(t-1)}$	45,504	7.53	5.83	1.01	39.01
CI_{ic}	45,504	0.45	0.39	0	1
POI_{ic}	45,504	1.05	0.89	0	2
POF_{ic}	45,504	0.99	0.93	0	2

Notes:

(1) T_{ict}: applied tariff of preference-granting countries in period t.
AD_{ict}: AD filings in period t.

(2) $EXS_{ic(t-1)}$: value of intermediate inputs from country c in China's PWI exports of final product i in $t-1$ over country c's total import value of i from China in period $t-1$.

(3) $TCEX_{ic(t-1)}$: estimated transport cost of $EX_{ic(t-1)}$.

(4) CI_{ic}: customization of input exported from country c and embodied in Chinese final product i.

(5) POI_{ic}: political organization of country c's industries that export inputs embodied in Chinese final product i.

(6) POF_{ic}: political organization of country c's industry that produces final product i.

* (1)(2)(3) are expressed as a percent.

Table 3b. Summary Statistics of Building Blocks of Instruments $TCEX_{ict}$

A. SR_{jmt}	N	Mean	S.D.	Min	Max
m=vessel	44,275	0.000017	0.000023	2.13×10^{-11}	0.0015
m=air	44,275	0.000044	0.000071	2.88×10^{-9}	0.0032
B. TC_{jcmt}	N	Mean	S.D.	Min	Max
m=vessel	6,687,186	0.0898	0.1449	1.62×10^{-8}	17.89
m=air	6,687,186	0.2368	0.4352	2.19×10^{-6}	38.22

Table 4. Baseline Estimates

	Ordinary Least Squares		Instrumental Variables	
A. Dependent Variable: T_{ict}	(1)	(2)	(3)	(4)
$EXS_{ic(t-1)}$	-0.00299**	0.00142	-0.395***	-0.167***
	[0.00137]	[0.00107]	[0.036]	[0.063]
N	144,551	144,551	144,551	144,551
R^2	0.631	0.807	0.671	0.801
1st stage F of $EXS_{ic(t-1)}$			293	35
B. Dependent Variable: AD_{ict}				
$EXS_{ic(t-1)}$	-0.00435**	-0.00631***	-0.376***	-0.318***
	[0.00210]	[0.00206]	[0.132]	[0.112]
N	160,685	160,685	160,685	160,685
R^2	0.145	0.284	0.144	0.264
1st stage F of $EXS_{ic(t-1)}$			416	54
Fixed Effects	$it+ct$	$it+ct+i_2c$	$it+ct$	$it+ct+i_2c$

Note: i-product (HS6), c-country, t-time(year), i_2-industry(HS2). Standard errors included in brackets are robust and clustered at HS4-country level, with *, **, and *** denote, respectively, significance at 0.10, 0.05, and 0.01.

Table 5. First Look at Input Customization and Political Organization -- IV Estimates

A. Dependent Variable: T_{ict}	(1)	(2)	(3)	(4)
$EXS_{ic(t-1)}$	-0.120***	-0.043	-0.289**	-0.108
	[0.017]	[0.031]	[0.137]	[0.096]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.126***	-0.076***	-0.073***	-0.061***
	[0.013]	[0.012]	[0.024]	[0.016]
POI_{ic}			-1.291*	-0.992
			[0.714]	[0.747]
POF_{ic}			0.622***	0.557***
			[0.158]	[0.147]
N	57,281	57,281	30,088	30,088
R^2	0.607	0.849	0.581	0.746
1st stage F of $EXS_{ic(t-1)}$	248	60	110	30
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	1,345	1,298	467	397
B. Dependent Variable: AD_{ict}				
$EXS_{ic(t-1)}$	-0.051	-0.034	-0.223	-0.196
	[0.062]	[0.057]	[0.187]	[0.165]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.268***	-0.215***	-0.273***	-0.209***
	[0.085]	[0.076]	[0.072]	[0.067]
POI_{ic}			-1.598	-1.201
			[1.246]	[1.031]
POF_{ic}			0.249***	0.066***
			[0.085]	[0.023]
N	73,512	73,512	45,504	45,504
R^2	0.246	0.391	0.158	0.262
1st stage F of $EXS_{ic(t-1)}$	269	81	107	24
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	1,774	1,839	703	695
Fixed Effects	*it+ct*	$it+ct+i_2c$	*it+ct*	$it+ct+i_2c$

Note: $TCEX_{ic(t-1)}$ is used as an Instrument for $EXS_{ic(t-1)}$, wherever it appears. Standard errors included in brackets are robust and clustered at HS4-country level, with *, **, and *** denote, respectively, significance at 0.10, 0.05, and 0.01. The dropoff in *N* relative to Table 4 is due to inclusion of *POI* and *CI*, which are undefined for some products and countries for which there are no customization or political organization data.

Table 6. Full Model -- IV Estimates

A. Dependent Variable: T_{ict}	(1)	(2)
$EXS_{ic(t-1)}$	-0.074	0.094
	[0.217]	[0.243]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.065**	-0.055**
	[0.029]	[0.026]
POI_{ic}	2.427**	2.414**
	[1.187]	[1.186]
POF_{ic}	0.448**	0.457**
	[0.217]	[0.221]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.286**	-0.262*
	[0.132]	[0.142]
$EXS_{ic(t-1)} \times POF_{ic}$	0.019**	0.011**
	[0.009]	[0.005]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.012**	-0.007**
	[0.006]	[0.003]
N	30,088	30,088
R^2	0.684	0.843
1st stage F of $EXS_{ic(t-1)}$	64	17
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	325	274
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	297	84
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	327	35
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	714	454
B. Dependent Variable: AD_{ict}		
$EXS_{ic(t-1)}$	-0.082	-0.089
	[0.061]	[0.128]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.267***	-0.203***
	[0.078]	[0.072]
POI_{ic}	0.313**	0.204**
	[0.148]	[0.095]
POF_{ic}	0.115***	0.023**
	[0.041]	[0.011]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.147**	-0.108*
	[0.069]	[0.058]
$EXS_{ic(t-1)} \times POF_{ic}$	0.013**	0.006**
	[0.006]	[0.003]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.006**	-0.006**
	[0.003]	[0.003]
N	45,504	45,504
R^2	0.135	0.259
1st stage F of $EXS_{ic(t-1)}$	66	14
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	416	405
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	498	164
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	394	77
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	698	514
Fixed Effects	$it+ct$	$it+ct+i_2c$

Table 7. Industries with Low or High PWI/ordinary Ratio

A. Dependent Variable: T_{ict}	Low	High
$EXS_{ic(t-1)}$	0.083	0.109
	[0.155]	[0.364]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.052**	-0.059**
	[0.024]	[0.027]
POI_{ic}	2.212*	2.627***
	[1.203]	[0.976]
POF_{ic}	0.413**	0.508**
	[0.198]	[0.237]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.232	-0.288**
	[0.164]	[0.132]
$EXS_{ic(t-1)} \times POF_{ic}$	0.009*	0.013**
	[0.005]	[0.006]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.005*	-0.009**
	[0.003]	[0.004]
N	14,755	15,333
R^2	0.801	0.842
1st stage F of $EXS_{ic(t-1)}$	13	16
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	77	141
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	46	25
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	19	17
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	93	275
B. Dependent Variable: AD_{ict}		
$EXS_{ic(t-1)}$	-0.073	-0.102
	[0.115]	[0.137]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.182**	-0.226***
	[0.085]	[0.064]
POI_{ic}	0.173*	0.232**
	[0.091]	[0.103]
POF_{ic}	0.019*	0.027***
	[0.011]	[0.010]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.086	-0.123**
	[0.055]	[0.059]
$EXS_{ic(t-1)} \times POF_{ic}$	0.004**	0.008**
	[0.002]	[0.004]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.005*	-0.007**
	[0.003]	[0.003]
N	22,103	23,401
R^2	0.241	0.273
1st stage F of $EXS_{ic(t-1)}$	14	20
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	132	203
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	63	57
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	30	38
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	131	289
Fixed Effects	$it+ct+i_2c$	$it+ct+i_2c$

Table 8. Variation of Dependent Variable

	(1)	(2)	(3)	(4)	(5)	(6)
$EXS_{ic(t-1)}$	0.089	0.044	0.039	0.0035	-0.055	-0.076
	[0.238]	[0.108]	[0.074]	[0.0097]	[0.067]	[0.117]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.072**	-0.044*	-0.041*	-0.0065**	-0.124*	-0.142**
	[0.033]	[0.024]	[0.023]	[0.0029]	[0.068]	[0.067]
POI_{ic}	2.895**	1.345**	1.296**	0.1883**	0.163*	0.196**
	[1.379]	[0.632]	[0.608]	[0.0898]	[0.094]	[0.091]
POF_{ic}	0.566**	0.331**	0.265**	0.0421**	0.011**	0.027**
	[0.257]	[0.158]	[0.124]	[0.0197]	[0.005]	[0.012]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.305*	-0.175*	-0.163*	-0.0131*	-0.047#	-0.087*
	[0.168]	[0.094]	[0.091]	[0.0071]	[0.032]	[0.048]
$EXS_{ic(t-1)} \times POF_{ic}$	0.012**	0.007***	0.007***	0.0014*	0.004**	0.006**
	[0.006]	[0.002]	[0.002]	[0.0008]	[0.002]	[0.003]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.008**	-0.004**	-0.004**	-0.0006***	-0.004**	-0.005*
	[0.004]	[0.002]	[0.002]	[0.0002]	[0.002]	[0.003]
N	24,155	24,068	28,659	30,151	45,504	36,833
R^2	0.804	0.574	0.654	0.500	0.168	0.182
1st stage F of $EXS_{ic(t-1)}$	18	18	17	17	14	10
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	202	201	256	274	405	344
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	41	41	66	84	146	136
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	25	25	31	35	77	58
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	332	331	432	453	514	497
Fixed Effects	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$

Notes:
(1) Specification with preferential tariffs as the dependent variable, excluding year before.
(2) Specification with preference margin as the dependent variable, excluding year before.
(3) Specification with preference margin as the dependent variable, including year before.
(4) Specification with binary preference as the dependent variable, including year before.
(5) Specification with AD imposed (rather than AD filing) dummy as the dependent variable.
(6) AD-filing specification with the sample excluding the United States.
The p-value is 0.142.

Table 9. Variation of Regressors

A. Dependent Variable: T_{ict}	(1)	(2)	(3)	(4)	(5)
$EXS_{ic(t-1)}$	0.099	0.071	0.084	0.093	0.105
	[0.223]	[0.158]	[0.176]	[0.198]	[0.257]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.051**	-0.034*	-0.028**	-0.043*	-0.061**
	[0.024]	[0.018]	[0.012]	[0.024]	[0.027]
POI_{ic}	2.398**	2.353*	2.576**	2.483**	2.407**
	[1.154]	[1.256]	[1.235]	[1.198]	[1.178]
POF_{ic}	0.449**	0.423**	0.418**	0.425**	0.445**
	[0.212]	[0.196]	[0.189]	[0.201]	[0.214]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.273*	-0.168*	-0.251*	-0.268*	-0.291*
	[0.151]	[0.092]	[0.136]	[0.156]	[0.156]
$EXS_{ic(t-1)} \times POF_{ic}$	0.012**	0.007*	0.012**	0.011**	0.012*
	[0.006]	[0.004]	[0.006]	[0.005]	[0.007]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.007**	-0.004**	-0.003**	-0.005*	-0.008**
	[0.003]	[0.002]	[0.001]	[0.003]	[0.004]
N	29,625	29,625	28,530	24,859	30,682
R^2	0.836	0.786	0.831	0.833	0.839
1st stage F of $EXS_{ic(t-1)}$	17	16	17	14	18
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	277	143	139	140	266
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	81	74	77	40	92
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	36	32	35	22	36
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	451	213	242	212	457
B. Dependent Variable: AD_{ict}					
$EXS_{ic(t-1)}$	-0.089	-0.061	-0.079	-0.068	-0.097
	[0.128]	[0.093]	[0.108]	[0.098]	[0.132]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.203***	-0.138**	-0.096**	-0.152*	-0.225**
	[0.072]	[0.065]	[0.044]	[0.083]	[0.094]
POI_{ic}	0.204**	0.211*	0.197**	0.201**	0.212**
	[0.095]	[0.116]	[0.093]	[0.094]	[0.094]
POF_{ic}	0.023**	0.023**	0.021**	0.022**	0.024**
	[0.011]	[0.011]	[0.010]	[0.010]	[0.011]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.108*	-0.075*	-0.121*	-0.099*	-0.121*
	[0.058]	[0.041]	[0.065]	[0.052]	[0.065]
$EXS_{ic(t-1)} \times POF_{ic}$	0.006**	0.005*	0.006**	0.005*	0.007*
	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]
$EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	-0.006**	-0.004**	-0.004**	-0.005*	-0.007*
	[0.003]	[0.002]	[0.002]	[0.003]	[0.004]
N	45,504	45,504	43,590	37,493	46,580
R^2	0.259	0.216	0.268	0.235	0.248
1st stage F of $EXS_{ic(t-1)}$	14	12	19	16	15
1st stage F of $EXS_{ic(t-1)} \times CI_{ic}$	405	187	213	190	412
1st stage F of $EXS_{ic(t-1)} \times POI_{ic}$	164	135	149	76	150
1st stage F of $EXS_{ic(t-1)} \times POF_{ic}$	77	56	80	39	73
1st stage F of $EXS_{ic(t-1)} \times CI_{ic} \times POF_{ic}$	514	286	325	203	526
Fixed Effects	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$	$it+ct+i_2c$

Notes:
(1) Specification with restricted sample of observations for which we have data in the OECD IO table.
(2) Specification where variables are defined accounting for foreign value added and indirect DVA, using OECD IO table.
(3) Specification where we replace Rauch classification with Khandawal quality ladders.
(4) Specification where we replace Rauch classification with price dispersion.
(5) Specification where we include PWA in the denominator of *EXS*.

Table A1. Baseline IV Estimates - 1st Stage
Dependent Variable: $EXS_{ic(t-1)}$
Instrument for $EXS_{ic(t-1)}$: $TCEX_{ic(t-1)}$

A. Tariffs	(1)	(2)
$TCEX_{ic(t-1)}$	-0.335*** [0.020]	-0.123*** [0.021]
N	144,551	144,551
R^2	0.306	0.398
F-stat	293	35
B. Anti-dumping		
$TCEX_{ic(t-1)}$	-0.312*** [0.015]	-0.121*** [0.016]
N	160,685	160,685
R^2	0.298	0.383
F-stat	416	54
Fixed Effects	$it+ct$	$it+ct+i_2c$

Note: i-product(HS6), c-country, t-time(year), i_2-industry(HS2). Standard errors included in brackets are robust and clustered at HS4-country level, with *,**,and *** denote, respectively, significance at 0.10, 0.05, and 0.01.

Table A2. Summary Statistics of Political Economy Variables in Full IV Regression Samples

		POI_{ic}				POF_{ic}			
A. Applied Tariffs	*N*	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
All HS Sections	30,088	0.81	0.85	0	2	0.70	0.88	0	2
1: Live animals, animal products	321	1.69	0.63	0	2	1.76	0.60	0	2
2: Vegetable products	361	1.57	0.70	0	2	1.55	0.66	0	2
3: Animal or vegetable fats and oils	9	1.62	0.69	0	2	1.78	0.67	0	2
4: Prepared foodstuffs	940	1.28	0.83	0	2	1.13	0.81	0	2
5: Mineral products	70	1.00	0.81	0	2	0.64	0.82	0	2
6: Chemical and allied products	2,182	1.06	0.90	0	2	1.18	0.88	0	2
7: Plastics and rubber products	1,846	0.66	0.80	0	2	0.40	0.75	0	2
8: Raw hides and skins, leather, fur	649	0.59	0.77	0	2	0.53	0.84	0	2
9: Wood and wood products	520	0.88	0.83	0	2	0.70	0.92	0	2
10: Pulp and paper	859	0.71	0.90	0	2	0.66	0.92	0	2
11: Textiles and textile articles	6,434	0.98	0.81	0	2	0.77	0.88	0	2
12: Footwear, headgear, etc.	790	0.67	0.79	0	2	0.49	0.77	0	2
13: Stone, plaster, cement, ceramic, glass	941	0.82	0.84	0	2	0.77	0.94	0	2
14: Pearls, precious stones and metals	122	0.95	0.92	0	2	1.01	0.91	0	2
15: Base metal and articles of base metal	2,957	0.72	0.84	0	2	0.67	0.86	0	2
16: Machinery & electrical equipment	6,057	0.59	0.78	0	2	0.54	0.79	0	2
17: Transportation equipment	590	0.70	0.84	0	2	0.81	0.89	0	2
18: Instruments	2,022	0.64	0.84	0	2	0.55	0.87	0	2
19: Arms and ammunition	-	.	.	.	.	.	.	.	.
20: Miscellaneous manufactures	2,408	0.71	0.80	0	2	0.51	0.86	0	2
21: Works of art, antiques	10	0.89	0.99	0	2	0.80	1.03	0	2
B. Anti-dumping	*N*	Mean	SD.	Min	Max	Mean	SD.	Min	Max
All HS Sections	45,504	1.05	0.89	0	2	0.99	0.93	0	2
1: Live animals, animal products	563	1.75	0.52	0	2	1.91	0.40	0	2
2: Vegetable products	668	1.56	0.67	0	2	1.59	0.57	0	2
3: Animal or vegetable fats and oils	33	1.48	0.76	0	2	1.70	0.59	0	2
4: Prepared foodstuffs	1,474	1.46	0.74	0	2	1.37	0.47	0	2
5: Mineral products	116	1.11	0.82	0	2	0.87	0.86	0	2
6: Chemical and allied products	3,841	1.26	0.89	0	2	1.33	0.89	0	2
7: Plastics and rubber products	2,653	0.92	0.89	0	2	0.68	0.90	0	2
8: Raw hides and skins, leather, fur	885	0.88	0.84	0	2	0.81	0.92	0	2
9: Wood and wood products	760	1.08	0.89	0	2	0.90	0.96	0	2
10: Pulp and paper	1,162	0.99	0.96	0	2	0.96	0.99	0	2
11: Textiles and textile articles	9,380	1.29	0.79	0	2	1.16	0.91	0	2
12: Footwear, headgear, etc.	1,059	1.00	0.85	0	2	0.70	0.88	0	2
13: Stone, plaster, cement, ceramic, glass	1,515	0.90	0.90	0	2	0.94	0.96	0	2
14: Pearls, precious stones and metals	211	1.20	0.90	0	2	1.20	0.94	0	2
15: Base metal and articles of base metal	4,359	0.97	0.92	0	2	0.99	0.95	0	2
16: Machinery & electrical equipment	9,355	0.82	0.87	0	2	0.80	0.89	0	2
17: Transportation equipment	935	0.95	0.90	0	2	1.11	0.92	0	2
18: Instruments	3,204	0.91	0.91	0	2	0.87	0.94	0	2
19: Arms and ammunition	5	1.60	0.89	0	2	1.60	0.89	0	2
20: Miscellaneous manufactures	3,308	0.90	0.88	0	2	0.76	0.93	0	2
21: Works of art, antiques	18	0.87	1.00	0	2	0.56	0.92	0	2