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

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June 21, 2018

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 domestic upstream and downstream producers are generally allies in favor of protection, but this alliance may weaken as DVA increases, because a home tariff on finished goods decreases foreign demand for home inputs. Empirically, we examine detailed discriminatory trade policies of 27 countries plus the EU 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 inputs are customized and 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.

Key Words: Trade policy, lobbying, global value chains.
JEL Numbers: F10, F13, F14

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* The authors thank Pol Antràs, Andrew Bernard, Emily Blanchard, Chad Bown, Matilde Bombardini, Maggie Chen, Teresa Fort, Réka Juhász, Samuel Kortum, Nuno Limão, Paul Piveteau, Larry Qiu, John Romalis, Peter Schott, Heiwai Tang, and Dan Trefler for helpful comments and suggestions, as well as conference/seminar participants at Hitotsubashi, Geneva, the CCER Summer Institute in Yantai China, the CEPR conference on Global Value Chains, and the Washington Area International Trade Symposium.

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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 shipping containers as an example. Firms operating in Chinese special processing zones import materials, such as plywood, non-alloy steel and paint, from the U.S., EU, Japan, Australia, Singapore, Indonesia, and South Korea, and then export finished containers back to these same countries. While import-competing container producers in these countries would naturally favor protection, how do the suppliers of materials influence their governments' trade policy toward Chinese containers?

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 the share of a country's domestic value added contained in its imports (the DVA share) and find support for this relationship in the data.[2]

[1]For example, domestic container producers might challenge domestic steel producers over steel 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.

Our paper explores endogenous downstream protection with a focus on political organization and input customization. We begin with the observation that a downstream tariff exerts two opposing forces on a country's upstream producers: it increases input demand from downstream producers at home and decreases it from 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. 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 higher or lower downstream tariffs 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. That is, domestic upstream and downstream producers are allies in favor of protection. However, this alliance may weaken as the DVA share increases, because if inputs are customized (and thus a tariff on the final good depresses the price of exported inputs), 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 27 countries plus the EU toward China. In particular, we focus on China-specific preferential tariffs and anti-dumping filings, which 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. This gives a very disaggregate, direct measure of the input-output relationships relevant to our analysis.[3]

In addition, we measure political organization of both upstream and downstream industries by importing country and 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 imported inputs embodied in each Chinese product.

OLS regressions reveal a weak negative association between the value share of domestic exports contained in a country's imports from China (the DVA share)[4] and its tariffs on those imports. Given that the denominator of the DVA share is the value of imports being taxed, we expect OLS to be biased toward zero. This is confirmed by IV regressions that use distance-adjusted shipping rates, drawn from U.S. Merchandise Import data, as an instrument: we

[3]One limitation of our China-centric approach, however, is that we can only compute a country's *direct* domestic value added in imports from China. We cannot account for domestic value added passed through third countries or foreign value added in the country's intermediate exports. Yet we consider this cost to be outweighed by the benefits: accurate IO coefficients for Chinese exports, without the usual proportionality assumptions, and disaggregation to HS 6 digit level.

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

find that a one standard deviation increase in the DVA share decreases the preferential tariff by 1.8 percentage points and decreases the likelihood of an AD filing by 1.7 percentage points. These regressions broadly confirm the main finding of BBJ for the case of China.

Delving deeper, we find that both upstream and downstream political organization increase protection, but the effect of the former is smaller when inputs are customized and 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.

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 concludes.

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).[5] 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.[6] Together these assumptions

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

[6]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.

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 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 the literature;[7] 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

[7] 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.

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. Ludema and Mayda (2013) extend this latter approach to many countries.

Second, we are interested in a country's domestic value-added contained in its imports 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 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 two countries, home and foreign, and three goods, a final good y, an intermediate input x and a freely-traded numeraire z. Each country has an endowment of z and produces x and y under constant returns to scale, with x as input into y. Home is the exporter of x and importer of y. Home input production can be characterized by the profit function $\pi^I(q, q^*)$, where q and q^* are the prices of domestic sales and exports of the input, respectively. Partial differentiation of π^I yields the quantities of domestic sales $\pi^I_q = x_H$ and of exports $\pi^I_{q^*} = x_F$. Similarly, home production of y can be characterized by the profit function $\pi(p, q)$, where p is the price of y in the home market. Domestic output and input demand are determined by $\pi_p = y$ and $-\pi_q = x_H$, respectively. Finally, the representative home consumer has a quasi-linear indirect utility function $V = I + v(p)$, where I is income.

Home imports of the final good are subject to a tariff τ, measured as one plus the ad valorem tariff rate. Domestic and imported final goods are perfect substitutes, and thus, home and foreign prices of good y are linked according to $p = p^*\tau$. There is no tariff on the input; however, we allow for the possibility that home-produced inputs sold in each country are customized and thus sell at different prices (i.e., $q \neq q^*$). For now, we simply assume this to be the case, though we model the degree of customization explicitly in section 3.3.

3.1 The Optimal Tariff

Before adding political economy considerations, we consider how the terms of trade motive for protection is affected by domestic value added in imports. We do this by solving for the home country's welfare-maximizing final-good tariff. Home welfare can be written as the sum of final consumer surplus v, domestic profits $\pi + \pi^I$, and tariff revenue:

$$W = v(p) + \pi(p, q) + \pi^I(q, q^*) + (p - p^*)\, M(p) \tag{1}$$

Differentiating (1) with respect to τ gives,

$$\frac{dW}{d\tau} = \underbrace{-c_y \frac{dp}{d\tau}}_{dv} + \underbrace{y\frac{dp}{d\tau} - x_H \frac{dq}{d\tau}}_{d\pi} + \underbrace{x_H \frac{dq}{d\tau} + x_F \frac{dq^*}{d\tau}}_{d\pi^I} + \underbrace{(p - p^*)\, \frac{dM}{dp}\frac{dp}{d\tau} + M\frac{dp}{d\tau} - M\frac{dp^*}{d\tau}}_{dTR} \tag{2}$$

which simplifies to

$$\frac{dW}{d\tau} = (p - p^*)\frac{dM}{dp}\frac{dp}{d\tau} - M\frac{dp^*}{d\tau} + x_F\frac{dq^*}{d\tau} \tag{3}$$

Equation (3) highlights the main factors at work. The first term on the right-hand side is the standard deadweight 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 home welfare in proportion to final imports. Moreover, if the tariff impacts the price of exported inputs, it changes home welfare in proportion to the quantity of intermediate exports.

Totally differentiating the final-good market-clearing condition, $M(p) = E^*(p^*)$ gives,

$$-\mu\frac{dp}{p} = \xi^*\frac{dp^*}{p^*} \tag{4}$$

where $\mu \equiv -\frac{dM}{dp}\frac{p}{M} > 0$ and $\xi^* \equiv \frac{dE^*}{dp^*}\frac{p^*}{E^*} > 0$ are the elasticities of home import demand and foreign export supply of the final good, respectively. Substituting (4) into (3) produces the optimal tariff:

$$\tau^o - 1 = \frac{1}{\xi^*}\left(1 - \frac{q^* x_F}{p^* M}\cdot\theta^*\right) \tag{5}$$

where $\theta^* \equiv \frac{(dq^*/d\tau)(\tau/q^*)}{(dp^*/d\tau)(\tau/p^*)}$ is the ratio of the input to output percentage price changes abroad, or the ratio of terms of trade changes.

From (5), we see that the optimal tariff depends on the inverse export supply elasticity of the foreign country $\frac{1}{\xi^*}$, as in the standard optimal tariff formula. It also depends on the value of home exports of inputs relative to the value of final imports $\frac{q^* x_F}{p^* M}$, or the DVA share, which determines the relative importance of the two terms-of-trade effects. Finally, it depends on θ^*. It is tempting to argue that, by driving down the foreign output price and thus foreign input demand, the tariff would lower the price of exported inputs (i.e., $\theta^* > 0$). However, this ignores the simultaneous increase in home input demand from the protected domestic final-good industry. Unless we know how home input demand affects the price of exported inputs, we cannot in general sign θ^*. Nevertheless, if $\theta^* > 0$, the tariff *worsens* the home country's intermediate terms of trade, thus dampening the traditional terms of trade motive for a tariff. In this case, $\frac{q^* x_F}{p^* M}$, has a *negative* impact on the optimal tariff of the final good. If $\theta^* < 0$, the tariff *improves* the home country's intermediate terms of trade, which enhances the terms of trade motive for a tariff.

3.2 Political Influence

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

$$\Omega = W + \lambda \pi(p, q) + \lambda^I \pi^I(q, q^*) \tag{6}$$

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 firms, 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 industry specific, which is consistent with the format of our data on political organization; in particular, we do not allow political clout to differ within an industry. This is not an issue if all input suppliers have the same mix of domestic and foreign sales, as this would imply identical trade policy preferences. However, in a setting where the sales-mix differs across firms (e.g., if firms are differently endowed with destination-specific capital), subgroups of firms within the same industry could have opposing views. This possibility does not affect our results as long as the political clout of all such subgroups is the same, as what matters to the government is the total profit of the industry.[8]

[8] Our assumption of industry-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^I_F, than upstream firms supplying the home downstream industry, λ^I_H, and the latter's weight is equal to that of the home downstream industry, $\lambda^I_H = \lambda$. As is clear from equation (7), setting $\lambda^I_H = \lambda$ would cause $x_H \frac{dq}{d\tau}$ to cancel out of the equation. In other words, tariff-induced changes in the distribution of domestic profits between upstream and downstream suppliers would play no role in

Differentiating (6) with respect to the tariff gives,

$$\frac{d\Omega}{d\tau} = \frac{dW}{d\tau} + \lambda\left(y\frac{dp}{d\tau} - x_H\frac{dq}{d\tau}\right) + \lambda^I\left(x_H\frac{dq}{d\tau} + x_F\frac{dq^*}{d\tau}\right) \tag{7}$$

From (7) we see that political influence of producers affects the government's marginal benefit from a tariff through two channels. The weight λ increases it according to the tariff's impact on value added of final producers: the tariff increases domestic revenue $y\frac{dp}{d\tau} > 0$ but may also change payments to input suppliers, $x_H\frac{dq}{d\tau}$. The effect of λ^I depends on the tariff's impact on payments received by input suppliers at home $x_H\frac{dq}{d\tau}$ and abroad $x_F\frac{dq^*}{d\tau}$. Thus, our predictions about the impact of producer political influence depends once again on how the tariff affects input prices, which is generally ambiguous.

Setting (7) to zero and solving gives the politically optimal tariff:

$$\tau^{po} = \tau^o - \frac{\lambda^I}{\xi^*}\frac{q^* x_F}{p^* M}\cdot\theta^* + \frac{y}{-p^* M'}\left[\lambda\left(1 - \frac{q x_H}{py}\theta\right) + \lambda^I\frac{q x_H}{py}\theta\right] \tag{8}$$

where $\theta \equiv \frac{(dq/d\tau)(\tau/q)}{(dp/d\tau)(\tau/p)}$ is the ratio of the input to output percentage price changes in the home market.

From (8), 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. The second term on the right-hand side of (8) shows that the political weight of input suppliers affects the tariff in proportion to the DVA share. Whatever influence the DVA share has on the terms of trade motive for a tariff, it is reinforced by politically influential input suppliers. The last term on the right-hand side of (8) captures the level effects. It bears a striking resemblance to the optimal tariff in Grossman and Helpman (1995) but for the term in brackets, which depends on how the tariff affects the distribution of profits between final and intermediate suppliers. The political weight of final suppliers increases the tariff level in proportion to $1 - \frac{q x_H}{py}\theta$, where $\frac{q x_H}{py}\theta$ measures the change in input suppliers' value added in domestic output.[9] The

shaping tariff policy. In our framework, the distribution of domestic profits is crucial.

[9] We show in the next section that $\frac{q x_H}{py}\theta < 1$.

political influence of input suppliers has a level effect proportional to $\frac{qx_H}{py}\theta$. However, θ, like θ^*, is ambiguous in sign. Thus, our predictions about the influence of input suppliers on optimal tariffs depend critically on θ and θ^*, which capture the tariff's effects on input prices at home and abroad, respectively, operating through final good prices.

3.3 Customization

To sort out θ and θ^*, we add further structure to our model. Assume home is the sole producer of x, while both countries produce good y. Home input suppliers are endowed with $\tilde{x}$ units of "raw" input and k_i units ($i = H, F$) of destination-specific capital. To deliver one unit of the input to market i requires combining the raw input with destination-specific capital according to a Cobb-Douglas production function,

$$x_i = k_i^{\alpha} \left(s_i \tilde{x}\right)^{1-\alpha} \tag{9}$$

where s_i is the (endogenous) share of the raw input devoted to market i. Final production derives from increasing, strictly concave production functions, $y = y(x_H)$ and $y^* = y^*(x_F)$.

The assumption that intermediate suppliers are endowed with both a common factor and destination-specific capital allows us to easily model the degree of supply linkage between the home and foreign input markets. As $\alpha \to 1$, the levels of input supply to the two markets become completely independent, and thus q and q^* are determined only by input demand conditions in each country. We refer to this as the case of pure customization. As $\alpha \to 0$, the model approaches one of homogeneous inputs, in which there is a single input supply schedule and home and foreign input prices cannot diverge.

Given (9), firms choose s_i to maximize revenue, $qx_H + q^*x_F$, taking prices as given, yielding supply schedules $x_H\left(\frac{q}{q^*}\right)$ and $x_F\left(\frac{q^*}{q}\right)$, as functions of input price ratios. Input market clearing equates the supply schedules with input demand schedules, $X\left(\frac{p}{q}\right)$ and $X^*\left(\frac{p^*}{q^*}\right)$, respectively. We obtain θ and θ^* by total differentiation of the input market clearing conditions (see appendix for derivation), yielding,

$$\begin{aligned} \theta &= 1 - \psi \left(\frac{\delta^*}{\xi^*} \right) s_F \\ \theta^* &= 1 - \psi \left(\frac{\delta}{\mu} \right) s_H \end{aligned} \tag{10}$$

where $\delta \equiv \frac{X'}{X}\frac{p}{q} > 0$ and $\delta^* \equiv \frac{X^{*\prime}}{X^*}\frac{p^*}{q^*} > 0$ are input demand elasticities. The term $\psi \equiv \frac{(1-\alpha)(\mu+\xi^*)}{\alpha\delta\delta^*+(1-\alpha)(\delta^* s_F+\delta s_H)} \geq 0$ is inversely related to customization, as $\alpha = 1$ implies $\psi = 0$. Differentiating (10) gives, $\frac{\partial\theta}{\partial\alpha} > 0$, $\frac{\partial\theta^*}{\partial\alpha} > 0$, $\frac{\partial\theta}{\partial s_H} > 0$, and $\frac{\partial\theta^*}{\partial s_H} < 0$, and thus, $\theta \in \left[-\frac{\mu}{\xi^*}, 1\right]$ and $\theta^* \in \left[-\frac{\xi^*}{\mu}, 1\right]$.

Evidently, θ and θ^* depend on the degree of customization and shares of the raw input devoted to each market. If inputs are fully customized ($\alpha \to 1$), they reach their maximum values at $\theta^* = \theta = 1$. That is, input prices exactly follow output prices in each market. As $\alpha \to 0$, it is straightforward that $sgn\,(\theta) = -sgn\,(\theta^*)$. That is, in one of the two markets, input prices move in the opposite direction as local output prices. Which market this will be is related to which country looms larger in the global input market: if s_H is large, then the increase in home input demand caused by the home tariff dominates and the (global) price in the input increases, even though the output price in the foreign market declines (i.e., $\theta^* < 0$). This leads to the first testable result of the model:

Proposition 1 (Direct Effect of the DVA Share) The optimal tariff τ^o is decreasing in the DVA share for sufficiently high input customization. With low input customization, it may be increasing in the DVA share.

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*.[10]

[10]It could also be that WTO negotiations are more problematic in sectors with customized inputs because

The model also allows us to draw several conclusions about the effect of the political weights on the politically optimal tariff. Substituting the expression for θ from (10) into (8), allows us to write the politically optimal tariff in terms of θ^* (see appendix for derivation),

$$\begin{aligned}\tau^{po} = \tau^{o} + \frac{y}{-p^{*}M'}\left[\lambda\left(1-\frac{qx_H}{py}\right)+\lambda^{I}\frac{qx_H}{py}\right] \\ -\lambda^{I}\frac{q^{*}x_F}{p^{*}M}\left[\frac{\delta^{*}+(\delta-\delta^{*})\,\theta^{*}}{\xi^{*}\delta}\right]+\lambda\frac{q^{*}x_F}{p^{*}M}\left[\frac{\delta^{*}(1-\theta^{*})}{\xi^{*}\delta}\right]\end{aligned} \tag{11}$$

which by inspection yields the following:

Proposition 2 (Direct Effects of Political Weights) Holding constant the interaction terms, $\lambda^{I}\frac{q^{*}x_F}{p^{*}M}$ and $\lambda\frac{q^{*}x_F}{p^{*}M}$, the politically optimal tariff τ^{po} is increasing in the political weight of both input suppliers λ^{I} and final-good producers λ.

Proposition 3 (Interaction Effects) The politically optimal tariff τ^{po} is decreasing in $\lambda^{I}\frac{q^{*}x_F}{p^{*}M}$, if and only if $\delta^{*}+(\delta-\delta^{*})\theta^{*}>0$, and is increasing in $\lambda\frac{q^{*}x_F}{p^{*}M}$, unless customization is complete (in which case the effect is zero).

Proposition 2 states that holding constant the GVC effects, the political interests of domestic final-goods producers and their domestic input suppliers are allied in favor of import protection. It follows from the fact that $1 > \frac{qx_H}{py} \geq 0$. Proposition 3 implies that as the DVA share increases, organized input suppliers may generate less protection, as their profits are increasingly derived from exports that are negatively affected by the final tariff. The condition $\delta^{*}+(\delta-\delta^{*})\theta^{*}>0$ is always satisfied for high customization ($\theta^{*}>0$) but may be violated for low customization if $\delta-\delta^{*}$ is positive and large enough. Finally, the second part of proposition 3 implies that as the DVA share increases, organized final-good producers typically generate more protection. This is because, unless inputs are completely customized, any decrease in the price of exported inputs q^{*} caused by an increase in the final tariff mitigates the increase in the domestic price of inputs q, which increases the profits of the domestic final producers.

of contracting frictions, as Antras and Staiger (2012) argue.

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).

To construct our measure of a country's intermediate exports contained in its imports from China (DVA share), we focus on PWI transactions. 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 threefold: 1) they are arms-length transactions; 2) PWI exports from China are subject to foreign tariffs, but the imported inputs are not subject to Chinese tariffs; and 3) virtually all of the intermediate inputs imported by Chinese PWI firms are contained in Chinese PWI exports.[11]

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, countries importing finished products typically exempt the DVA associated with PWA trade from tariffs automatically. For example, under the U.S. offshore assembly program (OAP),[12]

[11] 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. They 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.

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

U.S. 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). Although the OAP program is completely consistent with our theory, which says that tariffs should be lower in proportion to the DVA share for customized inputs ($\theta^* = 1$), we exclude such trade because the tariff variation is mechanical and is not subject to the political influences we aim to explore in this paper.

Ordinary trade transactions fall short on the second 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 for ordinary exports. Further, they show that accounting for indirect imports (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 processing 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 it varies at the 6-digit HS level.

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 233 to 922 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 42-46 percent. The total import value increases from 206 to 713 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 30-35 percent.

4.2 Trade Barriers Data We also use data on trade barriers of various countries against Chinese exports. We focus on preferential tariffs and anti-dumping measures, which allow us to exploit the time dimension since they vary considerably in the period we analyze. We exclude countries that apply only MFN tariffs on China in a given year, because MFN tariffs apply to many other countries and change very little after 2000.

Data on tariffs come from WITS (World Integrated Trade Solution). Specifically, the WITS dataset records tariffs by importer, exporter, product (HS6) 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 tariff toward China on at least one product in a given year. 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. Twenty one countries offered preferential tariffs to China during the 2002-2007 period.[13] The vast majority of tariffs in terms of number of product-year cells are from countries that granted preferences to China under the Generalized System of Preference (GSP), Australia, Canada, EU, Japan, New Zealand, Norway, Switzerland and Turkey. The remainder are from China's FTAs with ASEAN, Chile and Pakistan. For each country, the table reports the years, number of HS6 products, number of product-year cells and average applied tariff across product-year cells.

The anti-dumping data come from the World Bank temporary trade barriers (TTB)

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

Database, which was collected by Bown (2014). The dataset includes information on anti-dumping filings also by importer, exporter, product (HS6) and year. The final column of Table 2 reports the 14 countries that filed anti-dumping cases against China during the 2002-2007 period. For each country, the table reports the number of product-year cells for which an anti-dumping case was filed.

5 Baseline Empirical Specification

5.1. Main variables To bring the model to the data, we assume that actors 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, as a share of country c's imports of i from China in period $t-1$.

To construct this variable we first use PWI export transactions to identify all Chinese firms that export final product i (HS6) in a given year. We then use Chinese PWI import transactions to find the value of each firm's imports of every intermediate j (HS6) from country c in each year. 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 imports of intermediate j from country c used in the production of final product i exported in year t.[14]

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

$$EX_{ict} = \sum_{f} \sum_{j} V_{fijct} \tag{12}$$

[14]We actually use intermediate imports lagged one year to capture that final goods exported in a given year probably use inputs purchased the year before.

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

$$EXS_{ic(t-1)} = \frac{EX_{ic(t-1)}}{M_{ic(t-1)}} \tag{13}$$

which serves as our proxy for country c's DVA share in its imports from China of final product i in period $t-1$.

Table 3 contains the summary statistics of the main variables used in the baseline specification. 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).[15]

The table is divided into two panels, which contain information for the tariff regressions and the anti-dumping regressions. The average applied tariff on final products in the first panel is 5.21%. The corresponding EXS is 4.60%. In the second panel, AD variable is binary variable, but we express its statistics in percentage terms to facilitate comparsion with the other variables. The mean is 0.2%. The corresponding EXS is 2.09%.

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 in section 6), we estimate a reduced-form empirical relationship between EXS and import protection, which serves as our baseline specification:

$$TB_{ict} = \beta_1 EXS_{ic(t-1)} + FE + \varepsilon_{ict} \tag{14}$$

The dependent variable, $TB_{ict} \in \{T_{ict}, AD_{ict}\}$, represents trade barriers that country c imposes on imports of product i (at 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.

[15]We present only the restricted sample to faciliate comparison between 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 preferential tariffs (those greater than or equal to 50 percent).

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

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 $EXS_{ic(t-1)}$:

$$EXS_{ic(t-1)} = \frac{Y_{i(t-1)}}{M_{ic(t-1)}} \times \frac{I_{i(t-1)}}{Y_{i(t-1)}} \times \frac{EX_{ic(t-1)}}{I_{i(t-1)}} \tag{15}$$

where $Y_{i(t-1)}$ denotes final sales of i (by Chinese PWI firms) and $I_{i(t-1)}$ denotes the value of intermediate inputs used in i from all sources. The first term on the right-hand side of (15) 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 beyond its effect on the regressor, say, through the final-good export elasticity. 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.

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.[16] 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:

$$SR_{jmt} = \sum_c \frac{C^{us}_{jcmt}}{V^{us}_{jcmt} \times D^{us}_c \times N_c} \tag{16}$$

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. 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:

$$TC_{jcmt} = SR_{jmt} \times D^{chn}_c \tag{17}$$

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 estimated ad valorem transport cost of the inputs from country c in

[16] The U.S. is not included in the tariff regressions but is in the AD regressions.

Chinese final product i at time t:

$$TCEX_{ict} = \sum_{j \in j_i} \sum_{m} \left(TC_{jcmt} \times \frac{\bar{V}_{ijm}}{\sum_{k \in k_i} \sum_m \bar{V}_{ikm}} \right) \tag{18}$$

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 (4)-(6) show the IV estimates of the baseline regression. The first-stage estimation results are found in the appendix.[17] 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 politically organized producers and input customization in the determination of preferential tariffs and anti-dumping filing rates.

[17]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 contained in imports (at the 1 percent level). The F values are high in both the tariff and anti-dumping regressions, ranging between 47 and 347, depending on the fixed effects included.

6 Empirical Results on Political Organization and Input Customization

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

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, and as discussed in Section 2, we use data 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 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 industry in these countries. From this, we get two measures of the political organization: one is the political organization of the import-competing industry (the industry in country c that produces final product i) or POF_{ic}; the other is political organization of industries in country c that export intermediates to China used in final product i, or POI_{ic}, which is computed as the weighted average of the number of trade associations in each industry in the country that exports intermediates to China used in the final product:

$$POI_{ic} = \sum_{j \in j_i} \left(POI_{jc} \times \frac{\bar{V}_{ijc}}{\sum_{k \in k_i} \bar{V}_{ikc}} \right) \tag{19}$$

where POI_{jc} is the number of trade associations in industry j in country c.[18] Summary statistics for these variables by HS section are found in the appendix.

[18]The weights are based on $\bar{V}_{ijc} = \sum_f V_{fijct_0^{ijc}}$, where t_0^{ijc} is the first year input j from country c is used in Chinese exports of i in the data.

6.2. Input Customization Index While there is no right way to measure input customization, the relevant issue for us is whether the home and foreign 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. 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 not homogeneous according to Rauch, which we denote CI_{ic}. We use the same weights as in (19) to compute the shares of such inputs from each country c embodied in each Chinese product i.[19]

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 home and foreign input prices moving in opposite directions in response to a tariff, a feature of customization. If inputs are homogeneous, such that home and foreign input prices move in tandem, then a tariff-induced boost in home 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:

$$T_{ict} = \beta_1 EXS_{ic(t-1)} + \beta_{12} \left[EXS_{ic(t-1)} \times CI_i \right] + FE + \varepsilon_{ict} \tag{20}$$

[19] 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 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, $Rauch_j$. Finally, for each final product i, we take a weighted average of $Rauch_j$ over all inputs from country c, using the same weights as in (19).

This can be thought of as the empirical implementation of equation (8), where fixed effects are meant to capture the third term on the right-hand side of (8). 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 results appear in the first three columns of 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 baseline regression witht the direct effects POI, and POF. The results are shown in the columns (4)-(6) in Table 5. We see that, as in the baseline, EXS has a negative impact on protection, while 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 upstream and downstream suppliers in favor of protection should be present for low levels of intermediate exports (low values of EXS). 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, input suppliers should lose interest in protection, provided customization is high, 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 whenever $\delta^* + (\delta - \delta^*)\theta^* > 0$, which is always satisfied for high customization but may be violated for low customization. In addition, $EXS \times POF$ should positively impact protection, except when customization is complete ($\theta^* = 1$), in which case the effect should be zero. This is because when home and foreign input prices influence each other, domestic downstream firms can drive down domestic input prices by lobbying for a higher downstream tariff.

To test these predictions, we include both the linear effects of POI and POF and their interactions with EXS in the regression as follows:

$$
\begin{aligned}
T_{ict} = {} & \beta_1 EXS_{ic(t-1)} + \beta_2 POI_{ic} + \beta_3 POF_{ic} \\
& + \beta_{12} \left[EXS_{ic(t-1)} \cdot POI_{ic} \right] + \beta_{13} \left[EXS_{ic(t-1)} \cdot POF_{ic} \right] + FE + \varepsilon_{ict}
\end{aligned}
\tag{21}
$$

Furthermore, we split our sample in half according to the degree of input customization, and run the regression separately on the two subsamples. For the high input customization subsample, we expect, $\beta_1 < 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_{12} < 0$ and $\beta_{13} \geq 0$. For the low input customization subsample, we expect $\beta_2 > 0$, $\beta_3 > 0$, and $\beta_{13} > 0$, whereas β_1 and β_{12} are probably close to zero or even positive.

The results are found in Table 6. Several conclusions stand out. First, we see that the direct effects of POI and POF are positive and significant, regardless of the degree of input customization, confirming Proposition 2. This resolves the ambiguity in the effect of POI found in Table 5. Second, consistent Proposition 3, the coefficient on the interaction term, $EXS \times POI$, is negative and significant for high input customization, while for low customization, it is negative but not significant in most cases. Third, weak support for the second part of Proposition 3 is found in coefficient estimates for $EXS \times POF$, which are positive and sometimes significant for low input customization, and positive but never significant with high customization. Finally, the direct effect of EXS is mostly negative and insignificant. While this is to be expected with low customization, it is also the case for high input customization, which is contrary to expectations. One possible explanation for the insignificant results on EXS and $EXS \times POF$ is the smaller sample size, due to splitting the sample in half, while still estimating many fixed effects for each subsample.

Finally, as an alternative to splitting the sample, we consider a single regression with additional interaction terms to capture input customization, using our continuous CI measure. Therefore, our final specification includes both the political economy and customization variables, matching equation (11):

$$\begin{aligned} T_{ict} = {} & \beta_1 EXS_{ic(t-1)} + \beta_2 POI_{ic} + \beta_3 POF_{ic} + \beta_4 \left[EXS_{ic(t-1)} \cdot CI_{ic}\right] \\ & + \beta_{12} \left[EXS_{ic(t-1)} \cdot POI_{ic}\right] + \beta_{13} \left[EXS_{ic(t-1)} \cdot POF_{ic}\right] \\ & + \beta_{24} \left[EXS_{ic(t-1)} \cdot POI_{ic} \cdot CI_{ic}\right] + \beta_{34} \left[EXS_{ic(t-1)} \cdot POF_{ic} \cdot CI_{ic}\right] + FE + \varepsilon_{ict} \end{aligned} \tag{22}$$

Theory predicts that $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 < 0$, $\beta_{13} > 0$, $\beta_{24} < 0$, $\beta_{34} < 0$. Note that the theory cannot sign β_1 and β_{12} as these pertain to the effects of EXS and $EXS \times POI$ with homogeneous inputs.

The results appear in Table 7. As before, the positive direct effects of POI and POF are robust, as is the negative effect $EXS \times POI \times CI$, which captures the mitigating effect of EXS on upstream demand for downstream protection when inputs are customized. Now, however, we also have a robust negative effect of $EXS \times CI$, implying that EXS mitgates downstream protection for goods with customized inputs even without political organization. This consistent with theory and our earlier results in Table 4. The effects of EXS and $EXS \times POI$ are insignificant, which is expected for homogenous inputs. The effects of the POF interactions are all in the direction of the theory, though in some cases lose significance. 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 Conclusions

In this paper we investigate the political economy of trade policy in global value chains (GVCs). We analyze the impact of politically organized producers of intermediate inputs on the level of protection of imported final products that contain those intermediates. We use 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 is larger and inputs are customized. 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.

References

Antras, Pol and Elhanan Helpman, 2004. "Global Sourcing." *Journal of Political Economy*, 112(3): 552-580.

Antras, Pol and and Robert W. Staiger, 1990. "Offshoring and the Role of Trade Agreements." *American Economic Review*, 102(7): 3140-3183.

Baldwin, Richard E., 1987. "Politically Realistic Objective Functions and Trade Policy: PROFs and Tariffs," *Economics Letters*, 24(3): 287-290.

Blanchard, Emily J., 2007. "Foreign Direct Investment, Endogenous Tariffs, and Preferential Trade Agreements." *B.E. Journal of Economic Analysis and Policy - Advances*,7(1).

Blanchard, Emily J., 2010. "Reevaluating the Role of Trade Agreements: Does Investment Globalization Make the WTO Obsolete?" *Journal of International Economics*, 82(1): 63-72.

Blanchard, Emily and Xenia Matschke, 2015. "US Multinationals and Preferential Market Access." *Review of Economics and Statistics*, 97(4), pp. 839-854.

Blanchard, Emily, Chad Bown and Robert Johnson, 2016. "Global Supply Chains and Trade Policy." *NBER Working Paper No. 21883.*

Bombardini, Matilde and Francesco Trebbi, 2012. "Competition and Political Organization: Together or Alone in Lobbying for trade Policy?" *Journal of International Economics*, 87(1): 18-26.

Bown, Chad P., 2014. "Temporary Trade Barriers Database." Available at http://econ.worldbank.org/ttbd/.

Bown, Chad P., and Patricia Tovar, 2011. "Trade Liberalization, Antidumping and Safeguards: Evidence from India's Tariff Reform." *Journal of Development Economics*, 96: 115-125.

Broda, Christian, Nuno Limão,and David Weinstein, 2008. "Optimal Tariffs and Market Power: The Evidence", *American Economic Review*. 98(5), 2032-2065.

Cadot, Olivier, Jaime de Melo and Marcelo Olarreaga, 2004. "Lobbying, Counterlobbying, and the Structure of Tariff Protection in Poor and Rich Countries.", *World Bank Economic Review* 18(3): 345-366.

Dai, Mi, Madhura Maitra and Miaojie Yu, 2016. "Unexcptional exporter performance in China? The role of processing trade." *Journal of Development Economics* 121(C): 177-189.

Feenstra, Robert C., and Hanson Gordon H., 2005. "Ownership and Control in Outsourcing to China: Estimating the Property-Rights Theory of the Firm." *Quarterly Journal of Economics* 120(2): 729-761.

Feenstra, Robert C., Hanson Gordon H., and Swenson Deborah L., 2000. "Offshore assembly from the United States: Production characteristics of the 9802 program." In *The impact of international trade on wages* (pp. 85-125). University of Chicago Press.

Gawande, Kishore and Usree Bandyopadhyay, 2000. "Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection." *Review of Economics and Statistics*, 82(1): 139-152.

Gawande, Kishore and Pravin Krishna, 2003. "The Political Economy of Trade Policy: Empirical Approaches," in Choi E. Kwan and James Harrigan (eds.), *Handbook of International Trade*, Vol. 1. Oxford, UK: Blackwell Publishers.

Gawande, Kishore, Pravin Krishna and Marcelo Olarreaga, 2012. "Lobbying Competition over Trade Policy." *International Economic Review*, 53(1): 115-132.

Goldberg, Pinelopi Koujianou and Maggi Giovanni, 1999. "Protection for Sale: An Empirical Investigation." *American Economic Review*, 89(5): 1135-1155.

Grossman, Gene M. and Elhanan Helpman, 1994. "Protection for Sale." *American Economic Review*, 84(4): 833-850.

Grossman, Gene M. and Elhanan Helpman, 1995. "Trade Wars and Trade Talks." *Journal of Political Economy*, 103(4): 675-708.

Helpman, Elhanan, 1997. "Politics and Trade Policy," in D. M. Kreps and K. F. Wallis (eds.), *Advances in Economics and Econometrics: Theory and Applications*, Vol. II. Cambridge, UK: Cambridge University Press.

Hummels, David, JunIshii and Kei-Mu Yi, 2001. "The Nature and Growth of Vertical Specialization in World Trade." *Journal of International Economics*, 54(1): 75-96.

Jensen, Bradford C., Dennis P. Quinn and Stephen Weymouth, 2015. "The Influence of Firm Global Supply Chains and Foreign Currency Undervaluations on US Trade Disputes." *International Organization*, Fall: 913-947.

Johnson, Robert C. and Guillermo Noguera, 2012. "Accounting for intermediates: Production sharing and trade in value added." *Journal of International Economics*, 86(2): 224-236.

Kee Hiau Looi and Heiwai Tang, 2016. "Domestic Value Added in Exports: Theory and Firm Evidence from China." *American Economic Review*, 106(6), pp. 1402-1436.

Koopman Robert, Zhi Wang, and Shang-Jin Wei. 2012. "Estimating domestic content in exports when processing trade is pervasive." *Journal of Development Economics*, 99(1): 178-189.

Koopman Robert, Zhi Wang, and Shang-Jin Wei. 2014. "Tracing Value-Added and Double Counting in Gross Exports." *American Economic Review*, 104(2): 459-94.

Levchenko Andrei, 2007. "Institutional Quality and International Trade." *Review of Economic Studies*, 74(3): 791-819.

Limão Nuno and and Patricia Tovar, 2011."Policy Choice: Theory and Evidence from Commitment via International Trade Agreements." *Journal of International Economics*, 85(2): 86-205.

Loss Bart, Marcel P. Timmer and Gaaitzen J.de Vries, 2015."How Global are Global Value Chains? A New Approach to Measure International Fragmentation." *Journal of Regional Science*, 55: 66-92

Ludema, Rodney D. and Anna Maria Mayda, 2013. "Do Terms-of-Trade Effects Matter for Trade Agreements? Theory and Evidence from WTO Countries." *Quarterly Journal of Economics*, 128(4): 1837-1893.

Ludema, Rodney D., Anna Maria Mayda, and Prachi Mishra, 2018. "Information and Legislative Bargaining: The Political Economy of U.S. Tariff Suspensions." *Review of Economics and Statistics*, 100(2): 303-318.

McCalman, Phillip, 2004. "Protection for Sale and Trade Liberalization: an Empirical Investigation." *Review of International Economics*, 12(1): 81-94.

McLaren John, 2016. "The Political Economy of Commercial Policy," in Bagwell, Kyle and Robert W. Stager (eds.), *Handbook of Commercial Policy*, Vol. 1A, North Holland.

Mitra, Devashish, Dimitrios D. Thomakosa, and Mehmet A. Ulubasoglu, 2002. "'Protection For Sale' In A Developing Country: Democracy Vs. Dictatorship." *Review of Economics and Statistics*, 84(3): 497-508.

Nunn, Nathan, 2007. "Relationship-Specificity, Incomplete Contracts and the Pattern of Trade." *Quarterly Journal of Economics*, 122(2) :569-600.

Nunn, Nathan and Daniel Trefler, 2008. "Incomplete contracts and the boundaries of the multinational firm." *Journal of Economic Behavior and Organization*, 90: 330-344.

Rauch, James, 1999. "Networks versus Markets in International Trade". *Journal of International Economics*, 48, 735.

Swenson, Deborah L., 2005. "Overseas Assembly and Country Sourcing Choices." *Journal of International Economics*, 66(1): 107-130.

Yu, Miaojie, 2015. "Processing Trade, Tariff Reductions and Firm Productivity: Evidence from Chinese Firms." *Economic Journal*, 125(585): 911¨C1189.

Appendix

A1. Derivation of θ and θ^*

Input suppliers maximize, $qk_H^{\alpha}\left(s_H x\right)^{1-\alpha} + q^* k_F^{\alpha}\left(\left(1-s_H\right)x\right)^{1-\alpha}$, yielding,

$$s_H = \frac{\left(\frac{q}{q^*}\right)^{\frac{1}{\alpha}}\left(\frac{k_H}{k_F}\right)}{1+\left(\frac{q}{q^*}\right)^{\frac{1}{\alpha}}\left(\frac{k_H}{k_F}\right)}$$

$$s_F = \frac{\left(\frac{q^*}{q}\right)^{\frac{1}{\alpha}}\left(\frac{k_F}{k_H}\right)}{1+\left(\frac{q^*}{q}\right)^{\frac{1}{\alpha}}\left(\frac{k_F}{k_H}\right)}$$

Thus, input supply to each market depends only the relative input prices. From these shares we obtain the elasticities,

$$\varepsilon_H \equiv \frac{x'_H}{x_H}\frac{q}{q^*} = \frac{(1-\alpha)}{\alpha}s_F$$

$$\varepsilon_F \equiv \frac{x'_F}{x_F}\frac{q^*}{q} = \frac{(1-\alpha)}{\alpha}s_F$$

Next we use the market clearing conditions,

$$x_H\left(\frac{q}{q^*}\right) = X\left(\frac{p}{q}\right)$$

$$x_F\left(\frac{q^*}{q}\right) = X^*\left(\frac{p^*}{q^*}\right)$$

Totally differentiating gives,

$$\left(\varepsilon_H + \delta\right)\frac{dq}{q} - \varepsilon_H\frac{dq^*}{q^*} = \delta\frac{dp}{p}$$

$$\left(\varepsilon_F + \delta^*\right)\frac{dq^*}{q^*} - \varepsilon_F\frac{dq}{q} = \delta^*\frac{dp^*}{p^*}$$

where $\delta \equiv \frac{X'}{X}\frac{p}{q}$ and $\delta^* \equiv \frac{X^{*\prime}}{X^*}\frac{p^*}{q^*}$. Solving this system of equations gives,

$$\theta = 1 - \frac{\delta^*\varepsilon_H}{\delta\delta^* + \delta^*\varepsilon_H + \delta\varepsilon_F}\left(1+\frac{\mu}{\xi^*}\right)$$

$$\theta^* = 1 - \frac{\delta\varepsilon_F}{\delta\delta^* + \delta^*\varepsilon_H + \delta\varepsilon_F}\left(1+\frac{\xi^*}{\mu}\right)$$

Using the definition of ε_H and ε_F:

$$\theta = 1 - \frac{(1-\alpha)\,\delta^* s_F}{\alpha\delta\delta^* + (1-\alpha)\left(\delta^* s_F + \delta s_H\right)}\left(\frac{\mu+\xi^*}{\xi^*}\right) = 1 - \psi\frac{\delta^*}{\xi^*}s_F$$

$$\theta^* = 1 - \frac{(1-\alpha)\,\delta s_H}{\alpha\delta\delta^* + (1-\alpha)\,(\delta^* s_F + \delta s_H)} \left(\frac{\mu+\xi^*}{\mu}\right) = 1 - \psi\frac{\delta}{\mu}s_H$$

A2. Evaluation of θ and θ^* at $\alpha = 0$

At $\alpha = 0$, θ and θ^* become,

$$\theta = 1 - \frac{\delta^* s_F}{\delta^* s_F + \delta s_H}\left(\frac{\mu+\xi^*}{\xi^*}\right)$$

$$\theta^* = 1 - \frac{\delta s_H}{\delta^* s_F + \delta s_H}\left(\frac{\mu+\xi^*}{\mu}\right)$$

Note that $\theta > 0$ iff $\frac{\delta^* s_F}{\delta^* s_F + \delta s_H} > \frac{\xi^*}{\mu+\xi^*}$, which implies $\frac{\delta s_H}{\delta^* s_F+\delta s_H} < 1 - \frac{\xi^*}{\mu+\xi^*} = \frac{\mu}{\mu+\xi^*}$ and hence $\theta^* < 0$. Thus, $sgn\,(\theta) = -sgn\,(\theta^*)$ when $\alpha = 0$.

A3. Derviation of Equation (11)

Substitute θ and θ^* into (8) and factor out ψ to obtain,

$$\begin{aligned}\tau^{po} = \tau^{o} - \frac{\lambda^I}{\xi^*}\frac{q^* x_F}{p^* M} + \frac{y}{-p^* M'}\left[\lambda\left(1-\frac{q x_H}{py}\right) + \lambda^I\frac{q x_H}{py}\right] \\ + \frac{q^* x_F}{p^* M}\frac{\psi}{\xi^*\mu}\left[\lambda^I \delta s_H + \lambda\frac{q x_H}{q^* x_F}\delta^* s_F - \lambda^I\frac{q x_H}{q^* x_F}\psi\delta^* s_F\right]\end{aligned}$$

Note that

$$\frac{q x_H}{q^* x_F} = \frac{q k_H^{\alpha}\,(s_H)^{1-\alpha}}{q^* k_F^{\alpha}\,(s_F)^{1-\alpha}} = \frac{s_H}{s_F}$$

where the last equality follows from first two equations of A1 above. Thus,

$$\begin{aligned}\tau^{po} = \tau^{o} - \frac{\lambda^I}{\xi^*}\frac{q^* x_F}{p^* M} + \frac{y}{-p^* M'}\left[\lambda\left(1-\frac{q x_H}{py}\right) + \lambda^I\frac{q x_H}{py}\right] + \\ + \frac{q^* x_F}{p^* M}\frac{\psi s_H}{\xi^*\mu}\left[\lambda^I\delta + \lambda\delta^* - \lambda^I\delta^*\right]\end{aligned}$$

Next use $\frac{\psi}{\mu} s_H = \frac{1-\theta^*}{\delta}$ and regroup to obtain:

$$
\begin{aligned}
\tau^{po} = \tau^o &+ \frac{y}{-p^* M'} \left[\lambda \left(1 - \frac{q x_H}{p y} \right) + \lambda^I \frac{q x_H}{p y} \right] \\
&- \lambda^I \frac{q^* x_F}{p^* M} \left[\frac{\delta^* + (\delta - \delta^*)\, \theta^*}{\xi^* \delta} \right] + \lambda \frac{q^* x_F}{p^* M} \left[\frac{\delta^* (1 - \theta^*)}{\xi^* \delta} \right]
\end{aligned}
$$

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

	Total		PWI		Share of PWI (%)	
Year	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	Number of HS6	Number of HS6-year	Average Tariff	Number of HS6-year
Australia	GSP	2002-2007	4,363	21,684	4.27	19
Bangladesh	China-ASEAN FTA	2007	2,865	2,865	14.88	--
Brunei	China-ASEAN FTA	2007	936	936	2.79	--
Brazil	--	--	--	--	--	40
Cambodia	China-ASEAN FTA	2007	1,369	1,369	13.97	--
Canada	GSP	2002-2007	4,656	24,010	2.94	57
Chile	China-Chile FTA	2006-2007	3,459	6,114	1.48	--
Colombia	--	--	--	--	--	87
EU	GSP	2002-2007	4,813	26,441	3.35	67
India	--	--	--	--	--	167
Indonesia	China-ASEAN FTA	2005-2007	3,838	10,390	6.34	20
Japan	GSP	2002-2007	4,474	23,346	1.80	1
Korea	China-ASEAN FTA	2007	4,042	4,042	6.97	21
Lao	China-ASEAN FTA	2005-2007	1,022	1,465	8.65	--
Malaysia	China-ASEAN FTA	2007	4,042	4,042	4.59	--
Myanmar	China-ASEAN FTA	2007	2,165	2,165	4.32	--
New Zealand	GSP	2002-2007	4,046	19,143	3.47	--
Norway	GSP	2002-2007	3,316	9,887	0.41	--
Pakistan	China-Pakistan FTA	2006-2007	3,903	6,954	14.12	--
Peru	--	--	--	--	--	94
Poland	--	--	--	--	--	4
Philippines	China-ASEAN FTA	2007	3,527	3,527	4.74	--
Singapore	China-ASEAN FTA	2007	3,875	3,875	0.0008	--
Switzerland	GSP	2002-2007	3,439	13,264	2.38	--
Taiwan	--	--	--	--	--	2
Turkey	GSP	2005-2007	3,726	9,595	2.43	107
Vietnam	China-ASEAN FTA	2005-2007	4,260	10,923	14.88	--
United States	--	--	--	--	--	126

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 in that year.

Table 3. Summary Statistics of Key Variables in Baseline Regression Samples
(All variables expressed as a percent)

A. Tariff Regressions	N	Mean	S.D.	Min	Max
T_{ict}	114,338	5.21	7.79	0	50
$EXS_{ic(t-1)}$	114,338	4.60	13.75	0	99.98
$TCEX_{ic(t-1)}$	114,338	7.25	5.66	0.99	39.02
B. Anti-dumping Regressions	N	Mean	S.D.	Min	Max
AD_{ict}	811,055	0.2	4.7	0	100
$EXS_{ic(t-1)}$	811,055	2.09	9.52	0	99.99
$TCEX_{ic(t-1)}$	811,055	8.90	6.54	0.99	39.06

(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 $EX_{ic(t-1)}$

Table 4. Baseline Estimates

	Ordinary Least Squares			Instrumental Variables		
A. Dependent Variable: T_{ict}	(1)	(2)	(3)	(4)	(5)	(6)
$EXS_{ic(t-1)}$	-0.00287**	-0.00215**	0.00153	-0.421***	-0.299***	-0.129***
	[0.00128]	[0.00103]	[0.00109]	[0.043]	[0.028]	[0.049]
N	114,277	111,711	111,639	114,277	111,711	111,639
R^2	0.562	0.602	0.803	0.139	0.418	0.795
B. Dependent Variable: AD_{ict}						
$EXS_{ic(t-1)}$	-0.00069	-0.00077**	-0.00123**	-0.373***	-0.236***	-0.181***
	[0.00035]	[0.00037]	[0.00057]	[0.142]	[0.093]	[0.069]
N	811,038	810,583	809,887	811,038	810,583	809,887
R^2	0.043	0.053	0.206	0.042	0.053	0.106
Fixed Effects	*i+c+t*	*it+ct*	$it+ct+i_2c$	*i+c+t*	*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)	(5)	(6)
$EXS_{ic(t-1)}$	-0.144***	-0.094***	-0.037	-0.363***	-0.358***	-0.145***
	[0.019]	[0.015]	[0.025]	[0.026]	[0.021]	[0.041]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.114***	-0.105***	-0.064***			
	[0.013]	[0.012]	[0.011]			
POI_{ic}				-0.059	-0.073*	0.056
				[0.038]	[0.041]	[0.042]
POF_{ic}				0.191***	0.238***	0.211***
				[0.052]	[0.056]	[0.054]
N	48,948	44,211	44,051	29,996	26,051	25,956
R^2	0.490	0.634	0.860	0.197	0.387	0.755
B. Dependent Variable: AD_{ict}						
$EXS_{ic(t-1)}$	-0.149	-0.068	-0.063	-0.137***	-0.198***	-0.158***
	[0.207]	[0.136]	[0.219]	[0.046]	[0.061]	[0.053]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.078**	-0.072***	-0.066***			
	[0.035]	[0.021]	[0.025]			
POI_{ic}				0.026	0.025	0.022
				[0.059]	[0.063]	[0.074]
POF_{ic}				0.046***	0.046***	0.024**
				[0.013]	[0.017]	[0.010]
N	172,968	170,976	170,354	133,842	132,327	131,692
R^2	0.115	0.145	0.286	0.015	0.041	0.177
Fixed Effects	$i+c+t$	$it+ct$	$it+ct+i_2c$	$i+c+t$	$it+ct$	$it+ct+i_2c$

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 in the inclusion of POI and CI, which are undefined for countries that never supply inputs used in final product i.

Table 6. Effects of Political Organization by Customization Bin, IV Estimates

	High Input Customization			Low Input Customization		
A. Dependent Variable: T_{ict}	(1)	(2)	(3)	(4)	(5)	(6)
$EXS_{ic(t-1)}$	-0.137	-0.117	0.074	-0.095	-0.078	0.091
	[0.343]	[0.375]	[0.263]	[0.261]	[0.351]	[0.302]
POI_{ic}	1.066**	1.131**	1.035**	1.080*	1.152**	1.050**
	[0.532]	[0.542]	[0.447]	[0.559]	[0.573]	[0.460]
POF_{ic}	0.178***	0.232***	0.228***	0.167***	0.217***	0.217***
	[0.057]	[0.068]	[0.077]	[0.050]	[0.059]	[0.066]
$EXS_{ic(t-1)}\times POI_{ic}$	-0.128**	-0.134***	-0.115***	-0.098	-0.108	-0.091
	[0.058]	[0.052]	[0.044]	[0.060]	[0.068]	[0.062]
$EXS_{ic(t-1)}\times POF_{ic}$	0.004	0.005	0.003	0.008**	0.009*	0.005
	[0.003]	[0.004]	[0.002]	[0.004]	[0.005]	[0.004]
N	14,939	13,017	12,942	14,818	12,935	12,863
R^2	0.242	0.453	0.831	0.205	0.419	0.803
B. Dependent Variable: AD_{ict}						
$EXS_{ic(t-1)}$	-0.088	-0.116*	-0.121	-0.059	-0.081*	-0.094
	[0.056]	[0.064]	[0.159]	[0.038]	[0.048]	[0.146]
POI_{ic}	0.332**	0.466*	0.261*	0.360**	0.483*	0.275*
	[0.147]	[0.246]	[0.146]	[0.159]	[0.256]	[0.158]
POF_{ic}	0.053***	0.049***	0.010*	0.046***	0.044***	0.008*
	[0.012]	[0.018]	[0.005]	[0.009]	[0.016]	[0.005]
$EXS_{ic(t-1)}\times POI_{ic}$	-0.043**	-0.061**	-0.038**	-0.032*	-0.048	-0.022
	[0.020]	[0.030]	[0.018]	[0.017]	[0.030]	[0.014]
$EXS_{ic(t-1)}\times POF_{ic}$	0.001	0.002	0.001	0.003***	0.004	0.002
	[0.001]	[0.002]	[0.001]	[0.001]	[0.003]	[0.002]
N	66,709	66,022	65,773	66,847	66,087	65,801
R^2	0.025	0.052	0.231	0.017	0.041	0.162
Fixed Effects	*i+c+t*	*it+ct*	$it+ct+i_2c$	*i+c+t*	*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. High/Low Input Customization defined as C_{ic} above/below the median.

Table 7. Full Model -- IV Estimates

A. Dependent Variable: T_{ict}	(1)	(2)	(3)
$EXS_{ic(t-1)}$	-0.041	-0.038	0.112
	[0.045]	[0.196]	[0.254]
POI_{ic}	1.005**	1.106**	1.153**
	[0.483]	[0.502]	[0.532]
POF_{ic}	0.175***	0.229***	0.226***
	[0.056]	[0.066]	[0.072]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.093	-0.101	-0.085
	[0.060]	[0.067]	[0.056]
$EXS_{ic(t-1)} \times POF_{ic}$	0.009**	0.010*	0.006
	[0.004]	[0.006]	[0.004]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.003***	-0.002**	-0.001*
	[0.001]	[0.001]	[0.0006]
$EXS_{ic(t-1)} \times POI_{ic} \times CI_{ic}$	-0.035**	-0.028**	-0.026**
	[0.016]	[0.013]	[0.012]
$EXS_{ic(t-1)} \times POF_{ic} \times CI_{ic}$	-0.005*	-0.005*	-0.003
	[0.003]	[0.003]	[0.002]
N	24,304	20,309	20,210
R^2	0.362	0.577	0.892
B. Dependent Variable: AD_{ict}			
$EXS_{ic(t-1)}$	-0.032	-0.057	-0.082
	[0.022]	[0.041]	[0.147]
POI_{ic}	0.331**	0.459*	0.259*
	[0.149]	[0.247]	[0.136]
POF_{ic}	0.052***	0.049***	0.010**
	[0.013]	[0.018]	[0.005]
$EXS_{ic(t-1)} \times POI_{ic}$	-0.028*	-0.042	-0.019
	[0.016]	[0.028]	[0.013]
$EXS_{ic(t-1)} \times POF_{ic}$	0.004**	0.05*	0.003
	[0.002]	[0.03]	[0.02]
$EXS_{ic(t-1)} \times CI_{ic}$	-0.014**	-0.011*	-0.002**
	[0.006]	[0.006]	[0.001]
$EXS_{ic(t-1)} \times POI_{ic} \times CI_{ic}$	-0.013*	-0.017**	-0.012**
	[0.007]	[0.008]	[0.005]
$EXS_{ic(t-1)} \times POF_{ic} \times CI_{ic}$	-0.003**	-0.003**	-0.002**
	[0.0014]	[0.0014]	[0.001]
N	98,494	96,917	96,488
R^2	0.026	0.047	0.213
Fixed Effects	$i+c+t$	$it+ct$	$it+ct+i_2c$

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.

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)	(3)
$TCEX_{ic(t-1)}$	-0.212***	-0.403***	-0.158***
	[0.015]	[0.022]	[0.023]
N	114,277	111,711	111,639
R^2	0.224	0.320	0.410
F Statistic	191	347	47
B. Anti-dumping	**(1)**	**(2)**	**(3)**
$TCEX_{ic(t-1)}$	-0.062***	-0.110***	-0.042***
	[0.004]	[0.005]	[0.005]
N	811,038	810,583	809,887
R^2	0.153	0.176	0.261
F Statistic	278	522	62
Fixed Effects	$i+c+t$	$it+ct$	$it+ct+i_2c$

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

		POI_{ic} (1)				POF_{ic} (2)			
A. Applied Tariffs	N	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
All HS Sections	30,314	2.31	3.35	0	18	1.99	3.35	0	18
1: Live animals, animal products	348	4.85	3.67	0	16	4.54	2.83	0	11
2: Vegetable products	450	3.32	2.65	0	11	2.69	1.74	0	6
3: Animal or vegetable fats and oils	19	2.91	2.72	0	10	2.22	1.34	0	4
4: Prepared foodstuffs	919	3.14	3.23	0	18	4.01	4.83	0	16
5: Mineral products	87	2.92	3.44	0	10	0.83	1.69	0	6
6: Chemical and allied products	2,379	3.69	3.84	0	18	4.26	4.06	0	10
7: Plastics and rubber products	1,752	1.82	2.90	0	18	0.86	1.86	0	7
8: Raw hides and skins, leather, fur	598	1.93	3.27	0	18	0.72	1.12	0	4
9: Wood and wood products	535	2.45	3.05	0	14	2.05	3.03	0	8
10: Pulp and paper	892	2.77	3.87	0	17	2.79	4.03	0	10
11: Textiles and textile articles	6,175	3.35	4.54	0	18	2.89	4.86	0	18
12: Footwear, headgear, etc.	751	2.44	4.05	0	18	1.07	1.83	0	5
13: Stone, plaster, cement, ceramic, glass	1,006	2.20	2.86	0	15	1.68	2.17	0	6
14: Pearls, precious stones and metals	149	2.49	2.71	0	9	2.78	2.71	0	6
15: Base metal and articles of base metal	3,034	1.82	2.49	0	13	1.48	2.23	0	7
16: Machinery & electrical equipment	6,187	1.18	1.86	0	14	0.90	1.55	0	8
17: Transportation equipment	644	1.72	2.49	0	13	1.94	2.48	0	9
18: Instruments	2,098	1.63	2.24	0	11	1.71	2.68	0	7
19: Arms and ammunition	1	6.00	.	6	6	0.00	.	0	0
20: Miscellaneous manufactures	2,278	1.80	2.77	0	17	1.05	1.90	0	6
21: Works of art, antiques	12	4.92	4.35	0	10	1.11	0.99	0	2
B. Anti-dumping	N	Mean	SD.	Min	Max	Mean	SD.	Min	Max
All HS Sections	134,011	2.18	5.51	0	81	1.98	5.84	0	81
1: Live animals, animal products	1,212	4.30	6.74	0	80	3.88	5.15	0	21
2: Vegetable products	1,526	3.72	7.38	0	81	2.32	3.18	0	14
3: Animal or vegetable fats and oils	104	5.46	12.62	0	77	2.17	2.93	0	9
4: Prepared foodstuffs	3,620	3.31	7.59	0	81	5.66	13.97	0	81
5: Mineral products	302	3.01	7.67	0	48	1.25	3.64	0	19
6: Chemical and allied products	9,503	4.80	10.51	0	77	5.71	12.28	0	48
7: Plastics and rubber products	8,294	1.70	4.68	0	48	0.70	1.92	0	15
8: Raw hides and skins, leather, fur	2,922	1.30	3.02	0	46	0.83	1.76	0	10
9: Wood and wood products	2,057	3.36	7.30	0	46	2.67	6.54	0	29
10: Pulp and paper	3,763	1.88	3.81	0	48	2.14	5.04	0	55
11: Textiles and textile articles	27,266	2.27	5.55	0	48	2.08	4.61	0	35
12: Footwear, headgear, etc.	3,124	1.84	3.77	0	36	1.06	2.46	0	11
13: Stone, plaster, cement, ceramic, glass	4,026	2.08	5.53	0	48	1.43	3.47	0	19
14: Pearls, precious stones and metals	554	3.29	7.15	0	48	3.34	6.51	0	22
15: Base metal and articles of base metal	13,267	1.80	4.41	0	48	1.49	4.37	0	41
16: Machinery & electrical equipment	30,526	1.30	3.52	0	48	1.32	4.45	0	57
17: Transportation equipment	2,554	2.16	5.13	0	48	3.33	8.63	0	49
18: Instruments	9,425	1.78	4.42	0	48	1.28	2.83	0	13
19: Arms and ammunition	15	9.79	11.33	0	31	5.60	6.20	0	12
20: Miscellaneous manufactures	9,897	1.81	4.60	0	48	1.10	3.44	0	26
21: Works of art, antiques	54	2.79	6.79	0	47	0.70	1.95	0	9

(1) POI_{ic}: Number of trade associations of intermediate industries in country *c* that exporting intermediates used in China's production of final product *i*.

(2) POF_{ic}: Number of trade associations of output (final product) producing industry *i* in country *c*.