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

Rodney D. Ludema[y], Anna Maria Mayda[y], Miaojie Yu[z] and Zhi Yu[x]

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 tari 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

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 "tari□s 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 tari□ 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 tari□s.

[2] The paper also analyzes the impact on the optimal tari□ 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 tari 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 di erent 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 tari -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 tari s depends on the above price e ects and

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 tari□s 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 coe□cients 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 tari 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 e ect of the former is smaller when inputs are customized and DVA as a share of final imports from China is larger. Tari s on products containing inputs that are neither customized nor politically organized appear to be una ected by the DVA share.

pin the domestic price of the intermediate input to the fixed world price, such that tari□s on downstream products cannot a□ect upstream prices. Hence, upstream producers have no interest in downstream tari□s.

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 ine□ciently 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 o□shoring 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

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

production can be characterized by the profit function $^{I}(q;q)$, where q and q are the prices of domestic sales and exports of the input, respectively. Partial differentiation of ^{I} yields the quantities of domestic sales $^{I}_{q} = x_H$ and of exports $^{I}_{q} = x_F$. Similarly, home production of y can be characterized by the profit function $(p;q)$, where p is the price of y in the home market. Domestic output and input demand are determined by $_{p} = y$ and $_{q} = x_H$, 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 , 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 $p = p$. 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 $+ \ ^{I}$, and tariff revenue:

$$W = v(p) + \quad (p;q) +$$

which simplifies to

$$\frac{dW}{d} = (p \quad p) \frac{dM}{dp} \frac{dp}{d} \quad M \frac{dp}{d} + x_F \frac{dq}{d} \tag{3}$$

home country's intermediate terms of trade, thus dampening the traditional terms of trade motive for a tari. In this case, $\frac{q\, x_F}{p\, M}$, has a negative impact on the optimal tari of the final good. If < 0, the tari improves the home country's intermediate terms of trade, which enhances the terms of trade motive for a tari.

3.2 Political In uence

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

$$= W + \quad (p; q) + \quad ^{I} \; ^{I}(q; q) \tag{6}$$

That is, the government's payo is a weighted sum of welfare, downstream domestic profits and upstream domestic profits. The weights and ^{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 and ^{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 di er 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 di ers across firms (e.g., if firms are di erently endowed with destination-specific capital), subgroups of firms within the same industry could have opposing views. This possibility does not a ect 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 di ers from the destination-specific political weights

Differentiating (6) with respect to the tariff gives,

$$\frac{d}{d} = \frac{dW}{d} + \quad y\frac{dp}{d} \quad x_H \frac{dq}{d} \quad + \quad {}^{I} \quad x_H \frac{dq}{d} + x_F \frac{dq}{d} \tag{7}$$

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

$$^{po} = \quad ^{o} \quad \frac{^{I} q\, x_F}{p\, M} \quad + \quad \frac{y}{p\, M'} \quad 1 \quad \frac{qx_H}{py} \quad + \quad {}^{I}\frac{qx_H}{py} \tag{8}$$

where $\frac{(dq=d\ )(\ =q\ )}{(dp=d\ )(\ =p)}$ 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

political influence of input suppliers has a level effect proportional to $\frac{qx_H}{py}$. However, , like , is ambiguous in sign. Thus, our predictions about the influence of input suppliers on optimal tariffs depend critically on and , 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 and , 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 $\bar{x}$ 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,

$$x_i$$

clearing conditions (see appendix for derivation), yielding,

$$\begin{aligned} &= 1 \quad - s_F \\ &= 1 \quad - s_H \end{aligned} \tag{10}$$

where $\frac{X^0 p}{X q} > 0$ and $\frac{X^0 p}{X q} > 0$ are input demand elasticities. The term $\frac{(1)(+)}{+(1)(s_F + s_H)}$ 0 is inversely related to customization, as = 1 implies = 0. Di erentiating (10) gives, $\frac{@}{@} > 0$, $\frac{@}{@} > 0$, $\frac{@}{@s_H} > 0$, and $\frac{@}{@s_H} < 0$, and thus, $2 \quad -; 1$ and $2 \quad -; 1$.

Evidently, and depend on the degree of customization and shares of the raw input devoted to each market. If inputs are fully customized (! 1), they reach their maximum values at = = 1. That is, input prices exactly follow output prices in each market. As ! 0, it is straightforward that sgn( ) = sgn( ). 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 tari dominates and the (global) price in the input increases, even though the output price in the foreign market declines (i.e., < 0). This leads to the first testable result of the model:

Proposition 1

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 from (10) into (8), allows us to write the politically optimal tariff in terms of (see appendix for derivation),

$$^{po} = {}^{o} + \frac{y}{p\,M^{\prime}} \quad 1 \quad \frac{qx_H}{py} \quad + \quad {}^{I}\frac{qx_H}{py}$$
$$\quad {}^{I}\frac{q\,x_F}{p\,M} \quad \frac{+(\qquad)}{} \quad + \quad \frac{q\,x_F}{p\,M} \quad \frac{(1 \qquad)}{} \tag{11}$$

which by inspection yields the following:

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

Proposition 3 $_{\bar{K}}$

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 (= 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 2000-200othb inexos, 4added in o7(ort)m ar27(os,)27(ce

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 Speci cation

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

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 first three columns of Table 4 present the baseline OLS regression results. The first column includes product (HS6), country and year fixed e□ects; the second column uses product-year and country-year fixed e□ects; the third column includes product-year,

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 a□ect 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

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

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 $_{12} < 0$, while the sign of $_{1}$ is theoretically ambiguous, as it captures the effect of EXS under no customization.

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:

$$T_{ict} = \quad {}_1 EXS_{ic(t-1)}$$

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):

$$\begin{aligned} T_{ict} = {} & {}_1 EXS_{ic(t-1)} + {}_2 POI_{ic} + {}_3 POF_{ic} + {}_4 EXS_{ic(t-1)} \quad CI_{ic} \\ & + {}_{12} EXS_{ic(t-1)} \quad POI_{ic} + {}_{13} EXS_{ic(t-1)} \quad POF_{ic} \\ & + {}_{24} EXS_{ic(t-1)} \quad POI_{ic} \quad CI_{ic} + {}_{34} EXS_{ic(t-1)} \quad POF_{ic} \quad CI_{ic} + FE + \varepsilon_{ict} \end{aligned} \tag{22}$$

Theory predicts that ${}_2 > 0$, ${}_3 > 0$, ${}_4 < 0$, ${}_{13} > 0$, ${}_{24} < 0$,

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 tari□s 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 e□ect 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. Tari□s on products containing inputs that are neither customized nor politically organized appear to be una□ected by the DVA share. The estimated e□ects are remarkably consistent with the theoretical predictions and provide strong evidence that DVA embodied in imports a□ects 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. O shoring and the Role of Trade Agreements." American Economic Review, 102(7): 3140-3183.

Baldwin,

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, Jun Ishii 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 In uence 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.

Lim ao 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 E ects 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. Tari 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-Speci city, Incomplete Contracts and the Pattern of Trade." Quarterly Journal of Economics, 122(2) :569-600.

Nunn, Nathan and Daniel Tre er, 2008. Incomplete contracts and the boundaries of the multinational rm." 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 ChoicesJournal of International Economics, 66(1): 107-130.

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

Appendix

A1. Derivation of and

Input suppliers maximize, $qk_H (s_H x)^{1} + q k_F ((1 \quad s_H) x)^{1}$, yielding,

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

$$S_F = \frac{q}{}$$

$$= 1 \quad \frac{(1 \quad) s_H}{+(1 \quad)(s_F + s_H)} \quad +$$

Next use $-s_H = \frac{1}{\quad}$ and regroup to obtain:

$$^{po} = {}^{o} + \frac{y}{p\ M^{0}} \quad 1 \quad \frac{qx_H}{py} + {}_{I}\frac{qx_H}{py}$$

$${}_{I}\frac{q\ x_F}{p\ M} \quad \frac{+(\qquad)}{\qquad} + \frac{q\ x_F}{p\ M} \quad \frac{(1\qquad)}{\qquad}$$

7#89":5;:<=,,#$>:<)#)?*)?@*:(A:7$#B":C#)#:D-...E-..3F
7$#B":G#9="*:?H:8?99?(H*:(A:B(99#$*

	7()#9		IJ+:		<K#$":(A:IJ+:DL	
!"#$	%&'($)*	+,'($)*	%&'($)*	+,'($)*	%&'($)*	+,'($)*
-...	-/0	--1	02	31	40	-0
-..5	-05	-33	551	25	/.	-2
-..-	4.5	-24	5-4	65	/5	4.
-..4	/46	/54	566	5-/	/4	4.
-../	10/	135	-3.	536	//	4.
-..1	23-	33.	444	-.2	//	45
-..3	030	266	/51	-/2	/4	45

!"#$%&'( )*(+,-,$./

		012&/(,$	3#451&("6(	3#451&("6(	71&2.1	3#451&("6(
	81.,41	((9661:%	;<=(	;<=>'12&	?2&,66	;<=>'12
)#/%&2-,2(	@<A	BCCB>BCCD	EFG=@	GHF=IE	EJBD	H
L2$.-2M1/N	!N,$2>)<9)3(+?)	BCCD	BFI=O	BFI=O	HEJII	>>
L&#$1,	!N,$2>)<9)3(+?)	BCCD	KG=	KG=	BJDK	>>
L&2P,-	(>>(	(>>(	>>	>>	>>	EC
!245"M,2	!N,$2>)<9)3(+?)	BCCD	HFG=K	HFG=K	HGJKD	>>
!2$2M2(	@<A	((((((((((				

$%UI*!7#!1EFF%&L!1B%B',B'J,!-(!V*L!W%&'%UI*,!'.!A%,*I'.*!)*+&*,,'-.!1%FGI*,
>"II!K%&'%UI*,!*3G&*,,*D!%,!%!G*&J*.B?

!"#!$%&'((!)*+&*,,'-.,	/	0*%.	1#2#	0'.	0%3
! "#$	4456778	9#:4	;#;<	=	9=
%&'"#$()?	4456778	5#@=	47#;9	=	<<#<8
!*%&"#$()?	4456778	;#:9	9#@@	=#<<	
A#!!".B'CDEFG'.+!)*+&*,,'-.,	/	0*%.	1#2#	0'.	0%3
+, "#$	8446=99	=#:	5#;	=	4==
%&'"#$()?	8446=99	:#=<	<#9:	=	<<#<<
!*%&"#$()?	8446=99	8#<=	@#95	=#<<	

>4?!,H!%GGI'*D!B%&'((!-(!G&*(*&*.J*C+&%.B'.+!J-E.B&'*,$#!G,"#$H!D!2!('I'.+,!'.!G*&'-D!B#!
>:?%&'"#$()?H!!K%IE*!-(!'.B*&F*D'%B*!'.GEB,!(&-F!J-E.B&L!J!'.!MN'.%O,!PQR!*3G-&B,!-(!('.%I!G&-DEJB!'
-K*&!J-E.B&#0,!B-B%I!'FG-&B!K%!&H!MN'.%!'.!G*&'-D!BC4#
>7?!%&"#$()?H!*,B'F%B*D!B&%.,G-&B!J-,B!-(!ST

V+./%#6"#B+H%/-'%#EH)-P+)%H

	W,(-'+,O#X%+H)#NYL+,%H			Z'H),LP%')+/#*+,-+./%H		
!"#$%&%'(%')#*+,-+./%0#$	123	143	153	163	173	183
%&'"#$()3	9:"::4;<== ?:"::24;@	9:"::427== ?:"::2:5@	:"::275 ?:"::2:>@	9:"642=== ?:":65@	9:"4>>=== ?:":4;@	9:"24>=== ?:":6>@
* +'	226A4<< :"784	222A<22 :"8:4	222A85> :";:5	226A4<< :"25>	222A<22 :"62;	222A :"<>7
B"#$%&%'(%')#*+,-+./%0#$						
%&'"#$()3	9:":::8> ?:":::57@	9:":::<<== ?:":::5<@	9:"::245== ?:":::7<@	9:"5<5=== ?:"264@	9:"458=== ?:":>5@	9:"2;2=== ?:":8>@
* +'	;22A:5; :":65	;2:A7;5 :":75	;:>A;;< :"4:8	;22A:5; :":64	;2:A7;5 :":75	;:>A;;< :"2:8
C-D%(#EFF%G)H	"1 #1 $	"$ #$	"$ #$ ",#	"1 #1 $	"$ #$	"$ #$ ",#

JK)%0'(&,K(LG)#1MN#32AKL'),O/$)(-P%1O%+",G/LH),O1MN43"#N)+'(+,(#%,,K,H#-'G/L(%(#-'#.,+GQ%)H#+,%#,
+'(#G/LH)%,%(#+)#MN69GKL'),O#/%R%/A#S-)T##=A#==A#+'(#===#(%'K)%A#,%H&%G)-R%/OA#H-U'-F-G

!"#$%&%'(%')#*+,-+./%0	123	143	153	163	173	183
&'(	9:"266;;;	9:":<6;;;	9:":5=	9:"585;;;	9:"57>;;;	9:"267;;;
	?:":2<@	?:":27@	?:":47@	?:":48@	?:":42@	?:":6
&'(A+	9:"226;;;	9:"247;;;	9:"2<7;;;			
	?:":25@	?:":24@	?:":22@			
-.,				9:":7<	9:":=5;	:":78
				?:":5>@	?:":62@	?:":64@
-./				:"2<2;;;	:"45>;;;	:"422;;;
				?:":74@	?:":78@	?:":76@
0	6>B<6>	66B422	66B:72	4<B<<8	48B:72	47B<
1^2	:"6<:	:"856	:">8:	:"2<=	:"5>=	:"=77

0 T[(86;1(:7389.844 re W n BT 6 398.048 493.476 389.844 re W n BT /C

C"#$%&%'(%')#*+,-+./%0#

!"#$%&%'(%')#*+,-+./%0#	123	143	153	163	173	183
%&'"#1$()3	9:"25;	9:"22;	:":;6	9:":<7	9:":;=	:":<2
	>:"565?	>:"5;7?	>:"485?	>:"482?	>:"572?	>:"5:4
*+,"#	2":88@@	2"252@@	2":57@@	2":=:@	2"274@@	2":7:@@
	>:"754?	>:"764?	>:"66;?	>:"77<?	>:"7;5?	>:"68:
*+-"#	:"2;=@@@	:"454@@@	:"44=@@@	:"28;@@@	:"42;@@@	
	>:":7;?	>:":8=?	>:":;;?	>:":7:?	>:":7<?	>:":88?
%&'"#1$()3A*+,"#	9:"24=@@	9:"256@@@	9:"22	9:"2:=	9:":<2	
	>:":7=?	>:":74?	>:":66?	>:":8:?	>:":8=?	>:":84?
%&'"#1$()3A*+-"#	:"::6	:"::7	:"::5	:"::=@@	:"::<@	:"::7
	>:"::5?	>:"::6?	>:"::4?	>:"::6?	>:"::7?	>:"::6?
.	26B<5<	25B:2;	24B<64	26B=2=	24B<57	24B
/0	:"464	:"675	:"=52	:"4:7	:"62<	:"=:5

C"#$%&%'(%')#*+,-+./%0#						
%&'"#1$()3	9:":==	9:"228@	9:"242	9:":7<	9:":=2@	9:":<6
	>:":78?	>:":86?	>:"27<?	>:":5=?	>:":6=?	>:"268
*+,"#	:"554@@	:"688@	:"482@	:"58:@@	:"6=5@	:"4;7@
	>:"26;?	>:"468?	>:"268?	>:"27<?	>:"478?	>:"27
*+-"#	:":75@@@	:":6<@@@	:"2:@	:":68@@@	:":66@@@	:":=@
	>:":24?	>:":2=?	>:"::7?	>:"::<?	>:":28?	>:"::7?
%&'"#1$()3A*+,"#	9:":65@@	9:":82@@	9:":5=@@	9:":54@	9:":6=	9:":44
			:"58:@@			

!"#$%&%'(%')#*+,-+./%0#	123	143	153
%&'"#1$()3	67"782	67"759	7"224
	:7"78;<	:7"2=><	:7"4;8<
*+,"#	2"77;??	2"27>??	2"2;5??
	:7"895<	:7";74<	:7";54<
*+-"#	7"2@;???	7"44=???	7"44>???
	:7"7;><	:7"7>><	:7"7@4<
%&'"#1$()3A*+,"#	67"7=5	67"272	67"79;
	:7"7>7<	:7"7>@<	:7"7;><
%&'"#1$()3A*+-"#	7"77=??	7"727?	7"77>
	:7"778<	:7"77><	:7"778<
%&'"#1$()3A,"#	67"775???	67"774??	67"772?
	:7"772<	:7"772<	:7"777><
%&'"#1$()3A*+,"#A,"#	67"75;??	67"749??	67"74>??
	:7"72><	:7"725<	:7"724<
%&'"#1$()3A*+-"#A,"#	67"77;?	67"77;?	67"775
	:7"775<	:7"775<	:7"774<
/	48B578	47B57=	47B427
0[1]	7"5>4	7";@@	7"9=4

C"#$%&%'(%')#*+,-+./230#			
%&'"#1$()3	67"754	67"7;@	67"794
	:7"744<	:7"782<	:7"28@<
*+,"#	7"552??	7"8;=?	7"4;=?
	:7"28=<	:7"48@<	:7"25><
*+-"#	7"7;4???	7"78=???	7"727??
	:7"725<	:7"729<	:7"77;<
%&'"#1$()3A*+,"#	67"749?	67"784	67"72=
	:7"72><	:7"749<	:7"725<
%&'"#1$()3A*+-"#	7"778??	7"7;?	7"775
	:7"774<	:7"75<	:7"74<
%&'"#1$()3A,"#	67"728??	67"722?	67"774??
	:7"77><	:7"77><	:7"772<
%&'"#1$()3A*+,"#A,"#	67"725?	67"72@??	67"724??
	:7"77@<	:7"779<	:7"77;<
%&'"#1$()3A*+-"#A,"#	67"775??	67"775??	67"774??
	:7"7728<	:7"7728<	:7"772<
/	=9B8=8	=>B=2@	=>B899
0[1]	7"74>	7"78@	7"425

D-E%(#FGG%H)I	"J#J$	"$J#$	"$J#$J"[1]#

KL)%0#%&"#4$()5#-I#MI%(#+I#+'#N'I),MO%'#&L"#4$()5#B#PQ%,%R%,#-)#+&
S)+'(+,(#%,,L,I#-'H/M(%(#-'#.,+HT%)I#+,%#,L.MI)#+'(#H/MI)%,%(#+
HLM'),V#/%R%/B#P-)Q##?B#??B#+'(#???#(%'L)%B#,%I&%H)-R%
7"27B#7"7;B#+'(#7"72"#

$%JKG#!+"#>%)GK'?G#LM#H)<'B%<G)#/#+)<#;<%DG
NGCG?@G?<#M%#$%JKGO#
L?)<&ABG?<#($.&# O"##$

!"#$%&'(()	*+,	*-,	*.,
!"#$	/0"-+-111 50"0+36	/0"20.111 50"0--6	/0"+34111 50"0-.6
* +' -#;<%<')<'=	++27-88 0"--2 +:+	+++78++ 0".-0 .28	+++79.: 0"2+0 28
>"#!?<'/@ABC'?D	*+,	*-,	*.,
!"#$	/0"09-111 50"0026	/0"++0111 50"0036	/0"02-111 50"0036
* +' -#;<%<')<'=	4++70.4 0"+3. -84	4+0734. 0"+89 3--	40:7448 0"-9+ 9-
E'FG@#H((G=<)			

)*J%'#!="#1EDD*+T#16*6&-6&5-#7,#K7%&6&5*%#\5707DT#H*+&*J%'-#&0#WH#N'I+'--&70#1*D$%'-

		!"# $%Y;Z				!"" $%Y=Z			
!"#!$$%&'(#)*+&,,-	.	/'*0	1"2"	/&0	/*3	/'*0	1"2"	/&0	/*3
!%%#41#1'56&70-	#######89:8;<####	="8;	8"8>	9	;?	;"@@	8"8>	9	;?
;A#B&C'#*0&D*%-:#*0&D*%#$+7(E56-	#########8<?#########<"?>		8"FG	9	;F	<""><	="?8	9	;;
=A#H'I'6*J%'#$+7(E56-	#########<>9#########8"8=		="F>	9	;;	="F@	;"G<	9	F
8A#!0&D*%#7+#C'I'6*J%'#,*6-#*0(#7&%-	##########!@#########"!@;##		="G=	9	;9	="==	;"8<	9	<
<A#K+'$*+'(#,77(-6E,,-	#########@;@#########8";<		8"=8	9	;?	<"9;	<"?8	9	;F
>A#/&0'+*%#$+7(E56-	##########?G#########"!@##		8"<<	9	;9	9"?8	;"F@	9	F
FA#LM'D&5*%#*0(#*%%&'(#$+7(E56-#	#########:8G@######8"F@		8"?<	9	;?	<"=F	<"9F	9	;9
GA#K%*-6&5-#*0(#+EJJ'+#$+7(E56-	########!G>#########;"?=		="@9	9	;?	9"?F	;"?F	9	G
?A#N*O#M&('-#*0(#-P&0-:#%'*6M'+:#,E+	#########>@?#########;"@8		8"=G	9	;?	9"G=	;";=	9	<
@A#Q77(#*0(#O77(#$+7(E56-	#########>8>#########"<>		8"9>	9	;<	="9>	8"98	9	?
;9A#KE%$#*0(#$*$'+	#########?@#########"GG		8"?G	9	;G	="G@	<"98	9	;9
;;A#)'36&%'-#*0(#6'36&%'#*+6&5%'-	########F:;G>#######8"8>		<""> <	9	;?	="?@	<"?F	9	;?
;=A#R776O'*+:#M'*(I'*+:#'65"	#########G>;#########"<<		<"9>	9	;?	;"9G	;"?8	9	>
;8A#1670':#$%*-6'+:#5'D'06:#5'+*D&5:#I%#+#########!99F#######="=9			="?F	9	;>	;"F?	=";G	9	F
;<A#K'*+%-:#$+'5&7E-#-670'-#*0(#D'6*%-	#########!<@#########"<@		="G;	9	@	="G?	="G;	9	F
;>A#S*-'#D'6*%#*0(#*+6&5%'-#7,#J*-'#D'6*%#######8:98<#######;"?=			="<@	9	;8	;"<?	="=8	9	G
;FA#/*5M&0'+T#U#'%'56+&5*%#'VE&$D'06######F:;?G#######;";?			;"?F	9	;<	9"@9	;">>	9	?
;GA#)+*0-$7+6*6&70#'VE&$D'06	#########F<<#########;"G=		="<@	9	;8	;"@<	="<?	9	@
;?A#W0-6+ED'06-	#########:9@?#######;"F8		="=<	9	;;	;"G;	="F?	9	G
;@A#!+D-#*0(#*DDE0&6&70	###########!#########F"99#####		"	F	F	9"99	"	9	9
=9A#/&-5'%%*0'7E-#D*0E,*56E+'-	#########:#G?#######;"?9		="GG	9	;G	;"9>	;"@9	9	F
=;A#Q7+P-#7,#*+6:#*06&VE'-	##########!##########<"!@##		<"8>	9	;9	;";;	9"@@	9	=
S"#!06&X(ED$&0I	.	/'*0	12"	/&0	/*3	/'*0	12"	/&0	/*3
!%%#41#1'56&70-	######!8<:9;;####	=";?	>">;	9	?;	;"@?	>"?<	9	?;
;A#B&C'#*0&D*%-:#*0&D*%#$+7(E56-	########!!=;##########<"89		F"G<	9	?9	8"??	>";>	9	=;
=A#H'I'6*J%'#$+7(E56-	########!>=F#######8"G=		G"8?	9	?;	="8=	8";?	9	;<
8A#!0&D*%#7+#C'I'6*J%'#,*6-#*0(#7&%-	#########!9<#########>"<F		;="F=	9	GG	=";G	="@8	9	@
<A#K+'$*+'(#,77(-6E,,-	########8:F=9#######8"8;		G">@	9	?;	>"FF	;8"@G	9	?;
>A#/&0'+*%#$+7(E56-	#########89=#########8"9;		G"FG	9	<?	;"=>	8"F<	9	;@
FA#LM'D&5*%#*0(#*%%&'(#$+7(E56-#	########@:>98#######<"?9		;9">;	9	GG	>"G;	;="=?	9	<?
GA#K%*-6&5-#*0(#+EJJ'+#$+7(E56-	########?:=@<#######;"G9		<"F?	9	<?	9"G9	;"@=	9	;>
?A#N*O#M&('-#*0(#-P&0-:#%'*6M'+:#,E+	#########:@=#########;"89		8"9=	9	<F	9"?8	;"GF	9	;9
@A#Q77(#*0(#O77(#$+7(E56-	#########:9>G#######8"8F		G"89	9	<F	="FG	F"><	9	=@
;9A#KE%$#*0(#$*$'+	########8:GF8#######;"??		8"?;	9	<?	=";<	>"9<	9	>>
;;A#)'36&%'-#*0(#6'36&%'#*+6&5%'-	########G!=FF####	="=G	>">>	9	<?	="9?	<"F;	9	8>
;=A#R776O'*+:#M'*(I'*+:#'65"	########8:;=<#########;"?<		8"GG	9	8F	;"9F	="<F	9	;;
;8A#1670':#$%*-6'+:#5'D'06:#5'+*D&5:#I%#+########<:9=F#######="9?			>">8	9	<?	;"<8	8"<G	9	;@
;<A#K'*+%-:#$+'5&7E-#-670'-#*0(#D'6*%-	#########>><#########8"=@		G";>	9	<?	8"8<	F">;	9	==
;>A#S*-'#D'6*%#*0(#*+6&5%'-#7,#J*-'#D'6*%######!8:=FG####	;"?9		<"<;	9	<?	;"<@	<"8G	9	<;
;FA#/*5M&0'+T#U#'%'56+&5*%#'VE&$D'06######89:>=F####	;"89		8">=	9	<?	;"8=	<"<>	9	>G
;GA#)+*0-$7+6*6&70#'VE&$D'06	#########:>><#########=";F		>";8	9	<?	8"88	?"F8	9	<@
;?A#W0-6+ED'06-	########@:<=>#######;"G?		<"<=	9	<?	;"=?	="?8	9	;8
;@A#!+D-#*0(#*DDE0&6&70	##########!>##########@"G@		;;"88	9	8;	>"F9	F"=9	9	;=
=9A#/&-5'%%*0'7E-#D*0E,*56E+'-	########@:?@G#####;"?;		<"F9	9	<?	;";9	8"<<	9	=F
=;A#Q7+P-#7,#*+6:#*06&VE'-	##########><##########"G@		F"G@	9	<G	9"G9	;"@>	9	@

Y;Z!"# $%A#.EDJ'+#7,#6+*('#*--75&*6&70-#7,#&06'+D'(&*6'#&0(E-6+&'-#&0#M%6E0$#+6&0I#&06'+D'(&*6'-#E-'(#&0#LM&0*[-#$+7(E56&70#7,#$&,&0*%#$+7(E5

Y=Z"# $%A#.EDJ'+#7,#6+*('#*--75&*6&70-#7,#7E6$E6#Y,&0*%#$+7(E56Z#$+7(E5&0I#&0#E+6+T#