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Optimal Tariffs with FDI: The Evidence*

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Abstract

Recent theoretical work suggests that the presence of foreign direct investment (FDI) lowers a country's noncooperative Nash tariff. To test this hypothesis, we first adapt the theoretical model formulated by Blanchard (2010) to derive an intuitive, empirically testable equation. This equation is an augmentation of the standard formula equal to the inverse of export supply elasticity. Using constructed estimates of export supply elasticities and measures of FDI, we test this hypothesis with respect to tariffs set by China prior to 2001. We focus on China before its accession into the World Trade Organization (WTO) for two primary reasons: first, China is a recipient of FDI during this time; and second, prior to becoming a WTO member China can be seen as a player in a noncooperative game. We find evidence to suggest that before entering the WTO, China chooses lower tariffs, ceteris paribus, for industries that receive more FDI. This is an important result since having a better understanding of how countries act unilaterally will provide insight into the multilateral cooperative outcome; that is trade negotiations.

JEL classification: F10; F13; F15

Keywords: Foreign direct investment; and Optimal tariffs

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1 Introduction

The fact that a country can improve its domestic welfare by imposing a trade restrictions on incoming foreign goods is not new and has been the topic of discussion for centuries.[1] Indeed, over one hundred years ago Bickerdike (1906) linked a country's "optimal" tariff to the elasticity of home's import demand, which was later formalized by Johnson (1950-51) to be equal to the inverse of the elasticity of foreign export supply.[2] This has come to be known as how well a country can affect it's terms of trade or the "terms-of-trade effect". Despite the generality of Johnson's result, researchers sixty years later are still "fine-tuning" the classic formula.[3] However, with the exception of a few, the majority of these models maintain that all domestic (foreign) production is owned by domestic (foreign) agents and all consumption takes place within respective borders.[4] We relax the first assumption by allowing for foreign direct investment (FDI) and empirically test the affect this has on a country's noncooperative tariff setting.[5] This is an important assumption to relax given the large stock (and flow) of FDI occurring in the world. As a preview, we find evidence that suggest, absent negotiation, countries tend to set lower tariffs on industries that receive more FDI. This is line with theoretical predictions that will be discussed below and formally introduced in Section 2.

There are two main channels in which the presence (or threat) of FDI can lower the benefits of a tariff on imports in the standard apolitical setting. One channel is through

[1] See Irwin (1996) for a fantastic historic account of the debate on the merits of free trade.

[2] Throughout this paper, we use "optimal tariff" interchangeably with the country's "non-cooperative endogenous tariff".

[3] Most recently Felbermayr, Jung, and Larch (2011) characterize a country's unilateral optimal tariff in a monopolistic setting with firm heterogeneity à la Melitz (2003). See also Demidova and Rodriguez-Clare (2009) which investigates various domestic trade policies in a small-economy version of the Melitz model and Cole and Davies (2011) which imposes fixed cost heterogeneity and the possibility of foreign direct investment.

[4] A notable exception is Bhagwati and Brecher (1980) which allows for foreign-owned factors of production and finds that trade liberalization may actually worsen national welfare. However, the authors do not allow for tariff revenue as they only look at two scenarios: (1) exogenous shifts in the terms of trade and (2) a comparison between free trade and autarky.

[5] The second assumption is relaxed in Cole and Davies (2010) which allows for domestic agents to consume abroad through tourism and value differently varieties that are only available in the foreign country.

so-called "tariff-jumping" – where a foreign firm finds it more profitable to open a subsidiary within domestic boarders to escape paying a tariff. Of course, a tariff is not the only reason a foreign firm would choose to engage in FDI.[6] Thus, the second channel comes from the fact that, given FDI is already present within a country, the domestic government cannot protect the domestic industry solely through a tariff on imports without also protecting the foreign owned affiliates. With regard to tariff-jumping, Ellingsen and Wärneryd (1999) define the optimal tariff as one that maximizes domestic firm profits and shows that in the presence of tariff-jumping, the preferred tariff is one just low enough to prevent FDI. Thus, in this setting, firms do *not* want full protection, but something less. A drawback from this analysis, which follows from assuming firm homogeneity, is that there is no FDI in equilibrium. Cole and Davies (2011) further explores the effect of tariff-jumping on noncooperative tariffs in the presence of heterogeneous firms. Here, the optimal tariff maximizes the welfare of a representative agent and the presence of FDI, again, lowers the noncooperative Nash tariff. The primary difference between this analysis and Ellingsen and Wärneryd (1999) is that both multinationals and exporters are present in equilibrium in Cole and Davies (2011); a result more prevalent in the real world. Since both multinationals and exporters are present, the analysis by Cole and Davies (2011) also includes the second channel mentioned.[7]

In a different approach from Cole and Davies (2011) and Ellingsen and Wärneryd (1999), Blanchard (2010) uses exogenous foreign equity holdings in both the export and import sector to illustrate how foreign investment can lower a country's optimal tariff. When firms in both countries are owned by agents in both countries, a unilateral tariff in the domestic country provides gains to foreign owners of domestic firms (the non-discriminatory protection channel) and losses to domestic owners of foreign firms. Additionally, Blanchard (2007) finds that vertical FDI also lowers a country's optimal tariff. In this model domestic firms invest

[6]See, for example, Horstmann, and Markusen (1992), Brainard (1997) and Helpman, Melitz and Yeaple (2004) for horizontal motives and Markusen (2002, Ch.9) for vertical motives to name a few.

[7]An intuitive example would be the following: If the United States imposed a tariff on Japanese automobiles, then firms such as Nissan and Toyota would increase production by plants already within the U.S. borders (the tariff-jumping channel). Moreover, BMW, which has a plant in South Carolina, would also benefit from the tariff (the non-discriminatory protection channel) as their cars become relatively cheaper.

in the host country for purposes of exporting back to the home country, thus extracting rent from the foreign firm by a government is indirectly extracting rent from domestic firms as well. Blanchard and Matschke (2010) empirically test this claim using U.S. multinationals and rates of U.S. preferential market access and find support.

Empirical work investigating noncooperative tariff setting is difficult and consequently sparse. Bagwell and Staiger (2011) find broad support for the terms-of-trade hypothesis by looking at tariff setting by WTO members. Additionally, Broda, Limão, and Weinstein (2008) (BLW) investigate non-WTO members to truly isolate noncooperative behavior and find that market power matters in tariff setting. BLW develop methods to estimate export supply elasticities following Feenstra (1994) and Broda and Weinstein (2008); they find that non-WTO members set higher tariffs on goods that are inelastically supplied by foreign countries.[8] These models assume that all of domestic production is owned by domestic firms and consequently all of the increased producer surplus as a result of protection is kept completely within the domestic borders. In other words, they ignore the effect of foreign investment on optimal tariffs.

Though, to our knowledge, we are the first to empirically test the theoretical predictions of the effect horizontal FDI has on noncooperative tariffs, we are not the first to link FDI with trade policy. In what Bhagwati et al. (1987) coined *quid pro quo* FDI, there has been mixed empirical evidence.[9] Blonigen and Feenstra (1997) find that the threat of protection had a substantial, positive effect on greenfield FDI in the United States in the 1980s, but the protection variable used is a dummy variable taking on only values of zero and one. Since legislators are not offered a menu of protectionist policies, it is impossible to gauge the level

[8]Furthermore, Goldberg and Maggi (1999) empirically test the hypothesis of Grossman and Helpman (1994) and find modest support for protection being "sold". The authors use nontariff barriers instead of actual tariff rates and also do not specifically include FDI in their specifications. McCalman (2004) implements the specification in Goldberg and Maggi (1999) to analyze the process of trade liberalization in Australia and suggests that "the process of trade liberalization has been driven by increases in both the fraction of the voting population represented by a lobby, and the government's relative valuation of welfare" (pg 91).

[9]The term *quid pro quo* FDI refers to when a firm invests in a foreign country to reduce the "threat" of protection in the future.

of protection which presumed social welfare maximizers would prefer. Similarly, Blonigen and Figlio (1998) investigate the effect of FDI on U.S. legislators' votes on protectionist policies between 1985 and 1994 and finds that *quid pro quo* FDI has an effect, but not in a systematic way. For instance, legislators who were initially more protectionist in nature tended to increase their support for trade restrictions, whereas legislators who took more of free trade stance were inclined to support lower trade restrictions.

It is quite difficult to empirically test a theoretical hypothesis dealing with non-cooperative tariff setting in general and particularly so if one wants to include effects of FDI. The reason, as typical, is data limitations. In order to test whether the presence of FDI has an effect on a country's non-cooperative tariff requires a country to be: (1) acting non-cooperatively; and (2) receiving FDI. China is a logical choice because prior to 2001, it was not a member of the WTO and was both receiving and reporting foreign investment at the 2-digit SIC level. It is important to investigate a non-WTO member because tariffs set between WTO countries are cooperative in nature and we are testing the effects of foreign investment on the non-cooperative optimal tariff. Utilizing this data, we find empirical evidence that suggests greater foreign investment leads to lower tariffs.

The paper is organized as follows. Section 2 presents our theoretical motivation. In section 3, we present our empirical results and section 4 concludes.

2 The Theoretical Model

As mentioned in the introduction, there are two main channels in which FDI can affect a country's optimal tariff. The first is through tariff-jumping and has been illustrated by Cole and Davies (2011). When firms choose to create a foreign subsidiary in order to avoid paying the tariff, the effect is essentially to make the foreign export supply more elastic ("exports" in the sense of a good not variety - i.e. the supply of Japanese cars not Toyota Camrys). However, this does not map easily into an empirical specification because an industry could

have very little FDI for many reasons; one being a low tariff. Thus, one would need to devise an index to represent the "threat" of tariff-jumping. Moreover, as Blonigen (2002) points out for the U.S., Japanese firms are the only primary examples of tariff jumping, yet there are many examples of multinationals from other countries. The second channel and the one implemented here is described by Blanchard (2010) as the internal effect of foreign ownership. The intuition here is that a country has less incentive to protect the import industry if the industry is, at least partially, owned by foreigners. We present a theoretical model that closely follows Blanchard (2010).

There are two countries, Home and Foreign, and two goods, x and y, where variables denoted with a superscript asterisk $(*)$ represents Foreign. Goods markets are perfectly competitive. We assume that Home has a comparative advantage in good y and thus its natural import is good x. We restrict to the case where only Foreign can participate in FDI and can do so only in the Home's import sector. Relaxing these restrictions will not affect the results. We denote the percentage of Home production of good x operated by a foreign subsidiary by ϕ (thus domestically owned home production is equal to $(1-\phi)$).

Defining good y to be the numeraire, the Home and Foreign's local price ratio is, respectively

$$p \equiv \frac{p_x}{p_y}, \text{ and } p^* \equiv \frac{p_x^*}{p_y^*}.$$

Thus, the world price ratio is p^w, and the Home terms-of-trade is $\frac{1}{p^w}$. We assume the Home government maximizes the utility of a representative agent with Gorman form preferences.[10] We restrict its only policy tool to an *ad valorem* tariff on imports, which we denote by t where $\tau = (1+t)$.[11] Therefore, the relative local prices can be written as a function of the tariff and the world price, $p = \tau p^w \equiv p(\tau, p^w)$ and $p^* = p^w$. Aggregate Home (Foreign) demand for each good depends on only local prices and national income, $I(I^*)$, so that $d_i \equiv d_i(p, I)$

[10] We further make the common assumption that preferences are identical across countries.

[11] We are intentionally ignoring the tariff policy of the Foreign country, in order to minimize notation. Implicitly any effect Foreign's tariff policy has on the world price will be embedded in the Foreign export supply elasticity.

and $d_i^*(p^*, I^*)$ for $i \in \{x, y\}$ where

$$I = (1-\phi)pq_x(p) + q_y(p) + (p - p^w)\left[d_x(p, I) - q_x(p)\right] \quad (1)$$

$$I^* = q_x^*(p^*) + \frac{1}{p^*}q_y^*(p^*) + \phi\tau q_x(p). \quad (2)$$

Home's income can be interpreted as the share of domestically owned local GDP plus tariff revenue. Similarly, Foreign's income is their domestic GDP plus the real returns from ownership abroad.

The balanced budget conditions for both countries are

$$p^w M_x = E_y - \phi p q_x, \text{ and} \quad (3)$$

$$M_y^* = p^w E_x^* + \phi p q_x \quad (4)$$

where $M_x(p, I) \equiv d_x(p, I) - q_x(p)$ denotes Home's imports of good x and $E_y(p, I) \equiv q_y(p) - d_y(p, I)$ is Home's exports of y (similarly for Foreign as well). Finally, the equilibrium world price, $\tilde{p}^w$, is determined by the goods market clearing condition:

$$E_x^*(p(\tau, \tilde{p}^w), \tilde{p}^w) = M_x(p(\tau, \tilde{p}^w), \tilde{p}^w). \quad (5)$$

The optimal tariff for Home is one that maximizes the indirect utility of the representative agent, $V(p, I)$. Thus,

$$t^o = \arg\max_t V(p(\tau, \tilde{p}^w), I(p(\tau, \tilde{p}^w), \tilde{p}^w)) \quad (6)$$

Differentiating and solving the first order condition yields:

$$t^o = \frac{1}{\hat{\epsilon}_x^*}\left(1 + \frac{\phi q_x}{\lambda M_x}\right), \quad (7)$$

where $\lambda \equiv \frac{\partial p^w}{\partial \tau} / \frac{dp}{d\tau} < 0$, and $\hat{\epsilon}_x^* \equiv \epsilon_x^* + \frac{\partial E_x^*(p^*, I^*)}{\partial I^*}\frac{\partial I^*(p, p^w)}{\partial p}\frac{p^w}{E_x^*}\frac{1}{\lambda}$, where $\epsilon_x^* \equiv \frac{dE_x^*}{dp^w}\frac{p^w}{E_x^*}$ is Foreign

export supply elasticity.[12] It follows that in the absence of FDI, the standard result of $t^o = \frac{1}{\epsilon_x^*}$ remains.[13] Therefore, the prediction of this model is that as Foreign export supply becomes more elastic and/or more FDI is present in an industry, the noncooperative optimal tariff should be lower.

3 The Empirical Model

3.1 Baseline Model

Equation (7) forms the basis of the model specification. However, some adjustments must be made. First, we do not have a measure for the latter part of $\hat{\epsilon}_x^*$, i.e. $\frac{\partial E_x^*(p^*,I^*)}{\partial I^*}\frac{\partial I^*(p,p^w)}{\partial p}\frac{p^w}{E_x^*}\frac{1}{\lambda}$. Consequently, we use a measure for the inverse elasticity of foreign export supply, $\frac{1}{\epsilon_x^*} =$ Inv_Exp_Elas. Furthermore, to account for any political influence of certain industries, we include industry dummies defined by section according to the Harmonized Standard Tariff schedule, which we define as the vector $\boldsymbol{\eta}$.[14] In the theoretical model, the term ϕq_x represents the share of the domestic import sector sales that is foreign owned. We assume that this share is greater than 10% to ensure this is actually FDI and not simply portfolio holdings. We adhere to the theoretical prediction in equation (7) and therefore, the general econometric model we employ can be written as follows

$$t_v = \text{Inv\_Exp\_Elas}_v + \frac{1}{\lambda}\left(\frac{\text{F\_Share}_v * \text{Inv\_Exp\_Elas}_v}{\text{Imports}_v}\right) + \boldsymbol{\beta\eta}_v + u_v, \tag{8}$$

where the *ad valorem* tariff, t, varies by HS 4-digit variety, v. The inverse of foreign export elasticity, Inv_Exp_Elas, varies by HS 4-digit variety and the term F_Share varies by SIC 2-digit variety with $\frac{1}{\lambda}$ our parameter of interest. F_Share represents the share of sales attributed to foreign investment and will be explained in more detail in the Data section. Finally, the

[12] The result that $\lambda < 0$ is based on assuming away the Metzler and Lerner paradoxes.

[13] In this case $\phi = 0$ and $\frac{\partial I^*(p,p^w)}{\partial p} = 0$.

[14] Industry dummies are defined in Table 6 in the Appendix.

term u_v is a well behaved error term.

3.2 Data

Tariff data come from the TRAINS database, which provides data at the 6-digit Harmonized System (HS) level. We use the weighted average across countries of *ad valorem* tariffs set by China against the rest of the world. Data on export supply elasticities come from BLW. The authors follow the methodology of Feenstra (1994) and Broda and Weinstein (2006) to estimate the export supply elasticities at the 4-digit HS level over the period 1994-2003. Their data consists of 15 countries for which a large fraction of products are not constrained by WTO membership. A more detailed explanation of the methodology is available in BLW.

Foreign direct investment is taken from the Almanac of China Foreign Economic Relations and Trade at the 2-digit Standard Industrial Classification (SIC) product level. Data on total industry value is from the 1993 Chinese Statistical Yearbook. Value of output is "Gross Output Value of Industry" for industrial enterprises with independent accounting systems in 1992, reported in million yuan (pp. 374-75) and converted to 1992 U.S. dollars using exchange rates provided by Federal Reserve Economic Data. Industry headings were concorded to SIC 2-digit industries by the authors in the manner illustrated in Table 7 in the Appendix. Values for total imports are taken from the TRAINS database, they represent total imports from the countries in the sample, and are at the 4-digit HS level. All variables have been merged using the concordances provided by the World Integrated Trade Solution (WITS) to match the 4-digit HS classification. Thus, data at the 4-digit level are simple averaged and data at the 2-digit level are repeated.

Table 1 provides summary statistics for the main variables of interest. The variable t_v^{1993} is the *ad valorem* tariff in 1993, and Imports is the total import value in each 4-digit HS sector in 1992. FDI is the stock of foreign investment, Dom_Invest is domestic investment, and Value is the value of sales; all of which are in 1992 and denominated in 1 million U.S.

dollars.[15] The variables from 1994 are lagged one year to account for possible endogeneity issues; this will be discussed more later. We construct our variable F_Share by employing the following formula:

$$\text{F\_Share} = \left(\frac{\text{FDI}}{\text{FDI} + \text{Dom\_Invest}} \right) * \text{Value}.$$

Table 1: Summary statistics

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
t_v^{1993}	37.79	25.96	0	182.2	1122
Inverse_Export_Elasticity	91.8	266.9	0.002	1,254.5	1,122
Import	69.9	182.6	≈0	1,724.3	1,121
F_Share	0.17	0.14	0	0.5	1,160
Value	28,985	16,548	1,867	51,312	1,041

As mentioned in the introduction, we use Chinese data for two very specific reasons. The first is that we need a country that is receiving FDI and China meets this criterion. Figure 1 shows investment flows from 1985 to 1996. As can be seen, there is very little FDI (and total investment for that matter) before 1990. Though FDI begins to increase after 1990, it does not really start to gain momentum until after 1992. By observing this graph, it would seem reasonable to focus on later years like 1996 to capture more foreign investment. However, our theoretical model is for countries that are acting noncooperative and we need to be aware of possible trade negotiations affecting how China sets its tariff, which brings us to our second reason for choosing China as our country of interest.

The second reason China is a good match is we need a country that is, as closely as possible, acting in noncooperative way; i.e. the country cannot be a member of the WTO. Though China does not join the WTO until 2001, the process begins much earlier. To provide some context, observe a report issued by the WTO in February of 2001 that contains discussion on the process of China's accession:

[15]To create the stock variable, we drop observations from Hong Kong and Taiwan and then sum the flow of aggregate FDI from 1990 to 1992.

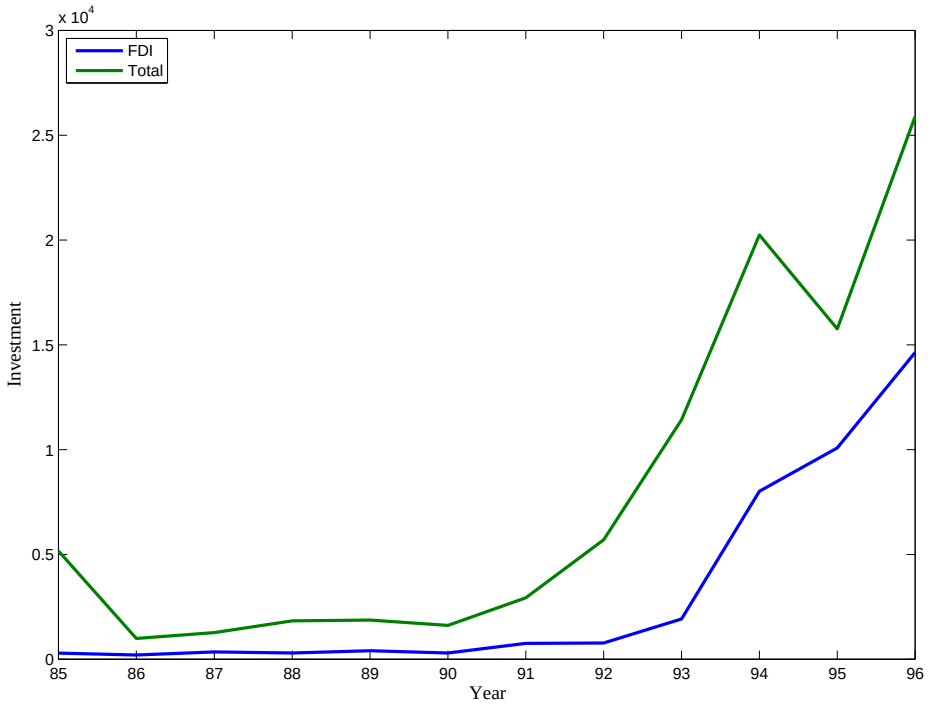

Figure 1: Chinese Investment Flows

> "Many questions have been raised as to when China could accede to the WTO and whether it would accede as a developing or developed country. Such questions on China's terms of entry are an inherent part of the negotiation. While accession processes vary in length and can take several years to complete, much depends on the readiness of the applicant country to meet not only the rules and obligations of the WTO's market economy principles, and its policies of pro-competition and non-discrimination, but also the market access conditions for goods and services which the applicant country grants to other WTO Members. Because decisions in the WTO, including those of the Working Party, are normally based on consensus, all WTO Members and the country seeking membership must be in agreement that their individual concerns have been met and that all outstanding issues have been resolved in the course of the deliberations." (WTO 2001, p. 2)

There are two important points to note here. The first is the question of whether China is to be considered a developed or developing country. This is important because, as paragraph 2 of Article XI implies, a developing country may be allowed special allowance or a phase in period to conform to the non-discrimination rule. This is not a binary decision, but unique to each situation. If China has concerns on making a "smooth transition" and

minimizing price distortions, the expectation of this decision is important. Second, the Working Party mentioned is comprised of WTO member governments in order to guide the accession process. Additionally, a significant portion of the accession process involves bilateral negotiations between China and WTO members. These are done privately and, given the potential length of these negotiations, it is safe to assume that these began early as well. Thus, using tariffs set in the year 2000 or even in 1996 may not be sufficiently far away from 2001 to capture noncooperative behavior.

In order to have a better idea of the appropriate year to focus on, we replicate the results of Broda et. al (2004) for China. These results are presented in Table 2. If we were to take the significance of the variable Inv_Exp_Elas as an indication of whether China is acting noncooperatively, then 1993 (the year used in BLW) would be the most recent year we should use as the export elasticity becomes insignificant in 1994 and negative and insignificant for the years after.[16] For this reason and that previously discussed regarding the amount of inward FDI, we focus our attention on tariffs set in 1993 and FDI in 1992.[17]

Table 2: Broda, Limão, and Weinstein - IV

Dependent Variable:	t_v^{1993}	t_v^{1994}	t_v^{1996}	t_v^{1998}	t_v^{2000}	$\%\Delta t_v$
	(1)	(2)	(3)	(4)	(5)	(6)
log(Inv_Exp_Elas)	3.59	1.670	-.045	-.551	-1.066	-.203
	(1.717)**	(1.354)	(.923)	(.668)	(.699)	(.093)**
cons	63.225	63.120	45.051	25.536	26.116	-.388
	(3.598)***	(2.219)***	(1.040)***	(.930)***	(1.306)***	(.222)*
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	933	1028	1046	1046	1046	1010
R^2	0.304	.325	.381	.331	.294	0.047

Notes: The percentage change in tariff, $\%\Delta t_v = (t_v^{2000} - t_v^{1994})/t_v^{1994}$.

[16] As an interesting check, we quickly investigate the effect the elasticity of export supply on the percentage change in tariffs from 1994 to 2000 and it appears that China is lowering tariffs the most on industries that face a more inelastic export supply. Though this is tangential to our paper, it lends support to the findings of Bagwell and Staiger (2011).

[17] Again, we are lagging values of investment, imports, and value of sales to account for endogeneity. Though we may be concerned that a one year lag is not sufficient, given the results of Brainard (1997) on the proximity-concentration tradeoff, any effects of enodgeneity would work against our hypothesis. Thus, finding a negative and significant coefficient on our FDI measure would be stronger if we able to completely account for the endogeneity between FDI and tariffs.

3.3 Results

The econometric technique we employ is non-linear least squares and is done primarily for consistency issues. If we take logs of our theoretical specification for the optimal tariff, we get

$$\log(t^o) = \log\left(\frac{1}{\hat{\epsilon}_x^*}\right) + \log\left(1 + \frac{1}{\lambda}\frac{\phi q_x}{M_x}\right), \tag{9}$$

which is non-linear in the parameter of interest, λ. However, we first investigate the relationship in levels. The first specification in Table 3 is the structural equation (8) without accounting for any industry fixed effects and constraining the intercept to be equal to the inverse elasticity of export supply. Our parameter of interest is negative (the expected sign) and highly significant. Since R-squared values in nonlinear least squared regressions have little to no interpretation, we report the correlation between the predicted and the actual tariff value, ρ. Our result is robust to including industry fixed effects as can be seen by specification (2). In specification (3), we allow a coefficient on Inv_Exp_Elas (α) and a constant. Though, α is not significant, it is the expected sign and our correlation measure, ρ, is much higher.

Though our results in levels appear nice, we are concerned with nonspherical errors. Taking logs of both sides makes our errors more resemble white noise. Therefore, we repeat our first set of regressions in logs and present the results in specifications (4) - (6) in Table 3. The qualitative results remain the same in all specifications and we see slight significance for our coefficient on Inv_Exp_Elas (t-statistic = 1.99). Furthermore, we can see that the correlation between our predicted tariff and the actual tariff is marginally better in the structural equation in logs.

Table 3: Base Estimates of the Effect of FDI Presence on the Optimal Tariff

	Levels			Logs		
	(1)	(2)	(3)	(4)	(5)	(6)
α			0.002			0.024
			(0.003)			(0.012)*
1/lambda	-1.0e-08	-8.5e-09	-4.1e-10	-1.0e-08	-1.0e-08	-5.4e-09
	(9.1e-11)***	(1.1e-09)***	(1.2e-10)***	(2.9e-12)***	(4.8e-11)***	(1.4e-09)***
Industry fixed effects	No	Yes	Yes	No	Yes	Yes
Constant	No	No	Yes	No	No	Yes
ρ	0.012	0.051	0.591	0.091	0.158	0.578

Notes: Standard errors in parenthesis and clustered at the 2-digit SIC level, and $N = 1041$.

One may possibly concerned with our measure of export supply elasticity. A common fix employed in the political economy literature is to bring the export elasticity to the left-hand side of the equation (see Goldberg and Maggi (1999) and McCalman (2004)). This approach eliminates both the endogeneity and measurement error issues.[18] We present the results from this robustness check in Table 4. These results are almost identical to the double log specifications in Table 3 with a slightly less ρ.

Table 4: Inverse Export Elasticity on LHS

	Logs		
	(1)	(2)	(3)
1/lambda	-8.9e-09	-9.9e-09	-9.9e-09
	(2.2e-10)***	(2.13e-10)***	(2.1e-10)***
Industry fixed effects	No	Yes	Yes
Constant	No	No	Yes
ρ	0.051	0.328	0.395

Notes: Standard errors in parenthesis and clustered at the 2-digit SIC level, and $N = 1041$.

Another possible concern is that although our model is for horizontal FDI, a large amount of FDI into China during this period may be vertical FDI. As a robustness check we rerun

[18]The measurement error is addressed because the noise associated with estimating ϵ_i is incorporated into the error of estimated equation; see Greene (1990).

our specifications after dropping observations that belong to the SIC industries 22, 23, 35, and 36, as these are industries typically associated with vertical FDI/export platform. We present these results in Table 5 and, as can be seen, the qualitative results remain.

Table 5: Estimates of the Effect of Horizontal FDI Presence on the Optimal Tariff

	Levels			Logs		
	(1)	(2)	(3)	(4)	(5)	(6)
α			-1.0e-05			0.021
			(0.003)			(0.012)
1/lambda	-1.0e-08	-9.0e-09	-4.9e-10	-1.0e-08	-1.0e-08	-6.0e-09
	(7.5e-11)***	(1.1e-09)***	(9.6e-11)***	(2.9e-12)***	(2.0e-11)***	(9.0e-10)***
Industry fixed effects	No	Yes	Yes	No	Yes	Yes
Constant	No	No	Yes	No	No	Yes
ρ	0.026	0.025	0.537	0.091	0.125	0.533

Notes: Standard errors in parenthesis and clustered at the 2-digit SIC level, and $N = 771$.

4 Conclusion

In this paper we investigate whether the presence of FDI in an industry affects the non-cooperative optimal tariff for that industry. We provided a theoretical model based off of Blanchard (2010) along with theoretical intuition by Cole and Davies (2011) and Ellingsen and Wärneryd (1999) that predicts the optimal tariff is decreasing in the share of foreign ownership in an industry. We then took this prediction to the data by utilizing Chinese data prior to their induction into the WTO. We find empirical support for our theoretical prediction. This finding is important for two main reasons. First, it is imperative to understand noncooperative strategies in order to better understand how to reach Pareto superior negotiated outcomes. Secondly, it highlights firm profits are *not* constrained within country borders and this affects strategic trade policy.

APPENDIX

Table 6: U.S. HST Industry Definitions

Section	Definition
sect1:	Live animals; animal products
sect2:	Vegetable products
sect3:	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes.
sect4:	Prepared foodstuffs; beverages, spirits, and vinegar; tobacco and manufactured tobacco substitutes.
sect5:	Mineral products.
sect6:	Products of the chemical or allied industries.
sect7:	Plastics and articles thereof rubber and articles thereof.
sect8:	Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm gut).
sect9:	Wood and articles of wood; wood charcoal; cork and articles of cork; manufacturers of straw, of esparto or other plaiting materials; basketware and wickerwork.
sect10:	Pulp of wood or of other fibrous cellulosic material; waste and scrap of paper or paperboard; paper and paperboard and articles thereof.
sect11:	Textile and textile articles.
sect12:	Footwear, headgear, umbrellas, sun umbrellas, walking sticks, seatsticks, whips, riding-crops and parts thereof; prepared feathers and articles made therewith; artificial flowers; articles of human hair.
sect13:	Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware.
sect14:	Natural or cultured pearls, precious or semiprecious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewelry; coin.
sect15:	Base metals and articles of base metal.
sect16:	Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.
sect17:	Vehicles, aircraft, vessels and associated transport equipment.
sect18:	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof.
sect19:	Arms and ammunition; parts and accessories thereof.
sect20:	Miscellaneous manufactured articles.
sect21:	Works of art, collectors' pieces and antiques.
sect22:	Special classification provisions; temporary legislation; temporary modifications proclaimed pursuant to trade agreements legislation; additional import restrictions proclaimed pursuant to section 22 of the agricultural adjustment act, as amended.

Table 7: SIC Industry Heading(s)

SIC	Definition
8	Logging and transport of timber and bamboo
10	Ferrous metals mining and dressing; Nonferrous metals mining and dressing
12	Coal mining and dressing
13	Petroleum and natural gas extraction
14	Building materials and other non-metal; Salt mining; Other minerals mining and dressing
20	Food processing; Beverage processing
21	Tobacco processing
22	Textile industry
23	Sewing industry
24	Timber processing, bamboo, can, palm fiber and straw products
25	Furniture manufacturing
26	Paper making and paper products
27	Printing
28	Chemicals and allied products; Medical and pharmaceutical products; Chemical fibers
29	Petroleum processing; Coking, gas and coal related products
30	Rubber products; plastic products
31	Leather, furs, and related products
32	Building materials and other non-metal
33	Smelting and pressing of ferrous metals; Smelting and pressing of non-ferrous
34	Metal products
35	Machine building industry
36	Electric equipment and machinery; Electronic and telecommunications equipment
37	Transportation equipment
38	Instruments, meters and other measuring equipment
39	Cultural, educational, and sports articles; Arts and crafts articles

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