Trade Barriers As Bargaining Outcomes

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Abstract

Whether bilateral trade barrier data conform with the Grossman-Helpman (1995) model's predictions about "trade talks" is examined in this article. A simple form of the prediction from the model is tested. Bilateral US-Japan and US-EU data from the 1990s are employed. The results are the first in the literature.

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I. Introduction

Grossman and Helpman (1995, henceforth GH95) formally model a two-level game in the context of trade protection between two countries. The framework of two-level games was first presented in Putnam (1988). Putnam's idea is that the set over which bilateral negotiations between two governments takes place is determined first by political-economic interactions between each country's government and its interest groups. Grossman and Helpman elegantly model these strategic interactions as well as those between governments. Their model is both about retaliation and conciliation. Retaliation is a Nash equilibrium in tariffs between two countries, and conciliation is the equilibrium result of bargaining over tariffs between the two governments. What is attractive about the model is that it predicts the ensuing structure of cross-industry tariffs. Thus, the model may be tested directly without recourse to ad hoc methods. This article conducts a theory based empirical test of trade barriers as bargaining outcomes, or the structure of tariffs that theoretically emerges in the Grossman-Helpman "trade talks" equilibrium.

A peek into the scores of pending trade dispute cases, any of which has the potential to boil over into a full blown trade war, is evidence enough of the relevance of the Grossman-Helpman model. It provides insight into why such disputes might occur and how they may be resolved. Whether this insight is the relevant one for understanding the structure of bilateral trade barriers is the subject of this article.

The GH95 model is built upon the foundations of their political economy model of equilibrium unilateral tariffs (Grossman and Helpman, 1994) . The model consists of a government that is amenable to lobbying by firms but it is also concerned about welfare losses from distortionary policy. Persons who possess specific capital stand to gain rents from protection. They thus have an incentive to form into lobbies with the purpose of influencing policy in a manner that benefits them. The model delivers prediction about the cross-sectional structure of tariff protection in which the level of tariff protection to a politically organized industry (that makes lobbying contributions) depends on the output-to-import ratio, the price elasticity of import demand, and the weight that government places on a dollar of lob-

bying spending versus a dollar of welfare loss from protection. Industry output captures the size of rents from protection; imports determine the extent of welfare losses from protection, so the smaller the imports the higher the tariff; akin to Ramsey pricing the lower the absolute import demand elasticity, the higher the tariff. This prediction has been empirically examined in a series of recent studies, including Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Mitra, Thomakos and Ulubasolglu (2002), McCalman (2002), and Eicher and Osang (2003).

GH95 models the strategic interactions between two large open economies, each with a political economic structure similar to that of the unilateral model. Since they are large countries, they possess market power in sets of industries, which induces governments to impose optimal tariffs on each other. The first such optimal tariff argument was formulated in Johnson (1953) and extended by numerous authors (see Gawande and Hansen, 1999, for references to more works and for empirical evidence of retaliation models). The novel contribution of GH95 is their prediction of equilibrium tariffs when the governments of these two large countries negotiate with each other. In the article we show how the GH95 prediction is linked with their unilateral result. We then proceed to test the model using bilateral trade barrier data from the 1990s between the US and Japan and the US and the EU.

The article proceeds as follows. Section II intuitively describes the GH95 model. Section III is the main empirical part of the article. The estimating equations are derived, the data described in detail, and the results presented and discussed. Section IV concludes.

II. Theory

We begin with Putnam's (1988) widely cited framework of two-level games to intuitively understand the GH95 model. At Level II, constituents in the two countries negotiate among each other and at Level I their governments negotiate an agreement. In its general form, Level II ratification in each country takes the form of competition among opposing lobbies

(as in GH94), or between domestic and foreign lobbies, or between protectionist producer and antiprotectionist consumer interests, with each interest group making contributions to the governments or expressing displeasure by withholding votes. Figure 1 intuitively depicts the framework in the context of the GH95 model in which Home's and Foreign's tariffs and export subsidies are determined jointly in industry i. In this bilateral model, the importing country, say Home, chooses to impose a tariff t_i^h and Foreign chooses an export subsidy t_i^f. The indifference curves (ICs) for Home indicate combinations of t_i^h and t_i^f over which Home's government is indifferent. These ICs arise from a political welfare function that is a weighted sum of the welfare of Home's citizens and money contributions by Home's special interest groups. The value of the home government's political welfare increases as we move towards the top left of Figure 1. The Level II interactions between a government and its polity constrain the government to do better than the bold indifference curve labeled H0. Similarly, the foreign government's political welfare increases as we move to the bottom right. The bold IC labeled F0 is the lowest level of utility it will tolerate. The elliptical area enclosed by H0 and F0 is the set over which strategic Level I interactions between the two countries occurs. If Foreign is the stronger bargainer, it will be able to force an outcome close to the point where its IC is tangential to Home's lowest acceptable IC, H0. If Home is the stronger bargainer it will be able to force an outcome close to the point F0 where its IC is tangential to Foreign's lowest acceptable IC.[1]

The GH95 model is a specific application of this general framework. The political welfare of the home government takes the form

$$a^h W^h + C^h, \tag{1}$$

where W^h is welfare of the home country residents, and C^h is the total amount of money that lobbies in the home country contribute to the government. The parameter a^h is the

[1]In a trade war the outcome may actually be worse than the lowest possible IC a government is willing to tolerate based on it's unilateral stance. If the rival government has market power, it will impose an optimal tariff that makes it better off by "beggaring its neighbor".

weight placed by the home government on a dollar of welfare relative to a dollar of campaign contributions. The foreign government's political welfare is similarly defined as

$$a^f W^f + C^f, \tag{2}$$

where the parameter a^f is the weight placed by the foreign government and the welfare of its residents W^f relative to the money contributions it receives from lobbyists that reside there.[2]

First, consider how political economic interactions within a country condition its government's choices. The production and consumption sides of the model are simple. n goods are produced with constant returns to scale technology. Each good uses labor and a (different) specific input. A numeraire good that is produced with labor alone fixes wage. The specific input is in limited supply, and hence commands rents. Rents to owners of a specific input increase with the price of the good which uses that input. Thus owners of that specific input have a strong incentive to influence government policy in a manner that raises the good's price. Knowing the government's attraction for contributions, these owners overcome the free-rider problem and organize into lobbies to make their demands most effectively communicated to their government.

Government uses trade policy, consisting of tariffs for import competing producers and export subsidies for exporters, in order to increase the domestic price of the good. In the absence of any reactions by the trading partner, a country's government will set prices unilaterally for each of the n goods via trade policy. Hence, policy is represented by the n-vector of prices $\mathbf{p}$. Lobbies representing each good move first. Each lobby presents the government with a menu of contribution offers in which it matches every possible vector $\mathbf{p}$ with its stated money contribution. This is a binding contract, and once the government sets a policy the lobby willingly pays what it said it would. To keep things simple, we will presume that a negligible proportion of the population is organized so that each lobby is concerned with

[2]We presume foreigners are precluded form lobbying in the home country and vice versa.

only the rents from protection to their own good and not the loss in welfare they experience from paying higher prices on other goods that are protected or subsidized.[3]

The government moves next. Based on all the menu offers it receives, the home government sets tariffs and subsidies in order to maximize (1) (or (2) if it is the foreign government), and collects the contributions that were promised. In this unilateral set-up Grossman and Helpman (1994) show that the equilibrium tariffs and subsidies will be set by the home government, for example, according to the following equation (the superscript h indicates Home variables):

$$\frac{t_i^h}{1+t_i^h} = \frac{I_i^h}{a^h}\left(\frac{|z_i^h|}{|e_i^h|}\right), \qquad i = 1, \ldots, n. \tag{3}$$

In (3) $t_i = (p_i^h - \pi_i)/\pi_i$ is the ad valorem tariff (positive) or export subsidy (also positive) for good i, where p_i^h is the domestic price for good i in Home and π_i its world price. In the first term on the right hand side I_i^h is an indicator variable that equals one if sector i is organized into a lobby, and $a^h > 0$ is as defined in (1). $z_i^h = X_i^h/M_i^h$ is the equilibrium ratio of output to imports (exports if M_i^h is negative) and $e_i^h = -M_i^{h\prime} \cdot p_i^h/M_i^h$ is the elasticity of import demand (positive) or export supply (negative). If industry i is an import-competing producer and it is organized ($I_i > 0$) then it is able to "buy" protection ($t_i^h > 0$). If industry i is an exporter and is organized, it is able to "buy" an export subsidy ($t_i^h > 0$). Hence, industry i is protected or subsidized only if it is organized, but not otherwise.

Equation (3) summarizes the result of Level II interactions within the Home country. Industry output captures the size of rents from protection. Imports (exports) determine the extent of welfare losses from protection (subsidies), so the smaller the imports (exports) the higher the tariff (subsidy). The Ramsey pricing logic is inherent in (3) so that the lower the absolute import demand elasticity, the higher the tariff or subsidy. The cross-sectional structure predicted by GH94 is empirically examined in a series of recent studies, including Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Mitra, Thomakos and

[3]GH94 and GH95 model the menu of offers as a Nash equilibrium among competing lobbies.

Ulubasolglu (2002), McCalman (2002), and Eicher and Osang (2003).

The possibility of strategic Level I interactions via trade talks between the two governments alter the unilateral structure of protection and subsidies. GH95 consider a bargaining equilibrium in tariffs and subsidies in bilateral negotiations between Home and Foreign. With Level I bargaining, Home and Foreign tariffs and subsidies are determined together according to the following equation (same as GH95 eq. 24). Let $\tau_i = 1 + t_i$ where t_i is the ad valorem tariff (positive) or ad valorem export subsidy (also positive) for industry i.[4]

$$\tau_i^h - \tau_i^f = \left(-\frac{I_i^h}{a^h} \frac{X_i^h}{\pi_i M_i^{h\prime}} \right) - \left(-\frac{I_i^f}{a^f} \frac{X_i^f}{\pi_i M_i^{f\prime}} \right), \tag{4}$$

where π_i is the world price of good i. If Home is the importer of good i and Foreign is the exporter then $\tau_i^h = 1 + t_i^h$, where $t_i > 0$ is the ad valorem tariff and the domestic price of good i in Home is $p_i^h = \pi_i \tau_i^h$. In Foreign, the domestic price of good i is $p_i^f = \pi_i \tau_i^f$ in which $\tau_i^f = 1 + t_i^f$, where $t_i > 0$ is the ad valorem export subsidy. X_i^h and X_i^f denote output of good i in Home and Foreign, respectively. $M_i^h > 0$ is Home's import demand function (as a function of Home's domestic price p_i^h) for good i. $M_i^f < 0$ is Foreign's export supply function (as a function of Foreign's domestic price p_i^f) for good i. Market clearing requires prices such that $M_i^h + M_i^f = 0$. Note that with market power Home's tariff and/or Foreign's export subsidy depresses the world price π_i (see e.g. Krugman and Obstfeld 2003).

III. Empirics: Methodology, Data, and Results

III.1 Methodology

From (4) we derive an estimating equation. In order to be explicit, we will follow these

[4]This equation presumes that the fraction of the population organized politically is negligible. When a significant proportion of population α is organized, the GH95 model makes predicts that home and foreign tariffs are determined according to (Grossman and Helpman 1995, equation (25)):
$\tau_i^h - \tau_i^f = \left(-\frac{I_i^h - \alpha^h}{a^h + \alpha^h} \frac{X_i^h}{\pi_i M_i^{h\prime}} \right) - \left(-\frac{I_i^f - \alpha^f}{a^f + \alpha^f} \frac{X_i^f}{\pi_i M_i^{f\prime}} \right)$.

conventions. In the importing country $z_i = X_i/M_i$ is the equilibrium ratio of domestic output ($X_i > 0$) to imports ($M_i > 0$) and the import demand elasticity $e_{di} = M_i' p_i/M_i$. Note that $z_i > 0$ for the importing industry, and $e_{di} < 0$ for the importing industry. Thus $z_i/e_i < 0$ in the importing industry. We will express our formula in terms of $z_i/|e_{di}| > 0$ in the importing industry. In the exporting country $z_i = X_i/M_i$ is the equilibrium ratio of domestic output (X_i) to exports ($M_i < 0$) and the export supply elasticity $e_{si} = M_i' p_i/M_i$. $z_i = X_i/M_i < 0$ and $e_{si} > 0$ for the exporting industry. We will express our formula in terms of $|z_i| = X_i/|M_i| > 0$, so $|z_i|/e_{si} > 0$. Then manipulations to (2) (see appendix) lead to the following log-linear equation that forms the basis for the empirical examination.

$$\ln\left(\frac{\tau_i^h}{\tau_i^f}\right) = \beta^h \left(I_i^h \times \frac{z_i^h}{|e_{di}^h|}\right) - \beta^f \left(I_i^f \times \frac{|z_i^f|}{e_{si}^f}\right) + \epsilon_i \quad \text{if Home is the importer in } i \qquad (5)$$

and

$$\ln\left(\frac{\tau_i^h}{\tau_i^f}\right) = \beta^h \left(I_i^h \times \frac{|z_i^h|}{e_{si}^h}\right) - \beta^f \left(I_i^f \times \frac{z_i^f}{|e_{di}^f|}\right) + \epsilon_i \quad \text{if Foreign is the importer in } i. \qquad (6)$$

Note that in (5), with Home as the importer of good i and Foreign the exporter, $\tau_i^h = 1+$ Home's ad valorem tariff on good i and $\tau_i^f = 1+$ Foreign's ad valorem export subsidy on good i. In (6), with Foreign as the importer of good i and Home the exporter, then $\tau_i^f = 1+$ Foreign's ad valorem tariff on good i and $\tau_i^h = 1+$ Home's ad valorem export subsidy on good i. The coefficients $\beta^h = 1/a^h$, and $\beta^f = 1/a^f$. The error term ϵ_i contains higher order Taylor series term, since (5) and (6) are derived as a first order Taylor series from the nonlinear model. It is presumed to be identically and independently normally distributed with homoscedastic variance σ^2. Estimating the coefficients econometrically (using a stochastic version of this model) thus allows us to recover the key political economy parameters a^h and a^f. The following linear model (with iid normal error term u_i with homoscedastic variance γ^2) also follows from the theory (see appendix):

$$\frac{\tau_i^h}{\tau_i^f} = \beta^h \left(I_i^h \times \frac{z_i^h}{|e_{di}^h|}\right) - \beta^f \left(I_i^f \times \frac{|z_i^f|}{e_{si}^f}\right) + u_i \quad \text{if Home is the importer in } i \qquad (7)$$

and

$$\frac{\tau_i^h}{\tau_i^f} = \beta^h \left(I_i^h \times \frac{|z_i^h|}{e_{si}^h} \right) - \beta^f \left(I_i^f \times \frac{z_i^f}{|e_{di}^f|} \right) + u_i \quad \text{if Foreign is the importer in } i. \tag{8}$$

III.2 Data

Dependent Variable

The empirical analysis is at the 6-digit NAICS level. In place of the ad valorem rate, we use the nontariff barrier (NTB) coverage ratio (or the proportion of imports from a source country that are covered by an NTB) for two reasons. The first is that tariffs are determined multilaterally since the Kennedy rounds, and using tariff data in a model that is essentially bilateral is less meaningful. The second reason is that nontariff barriers have steadily increased at the same time that tariffs have declined, and most NTBs are set bilaterally. The source of the NTB data are the UNCTAD TRAINS database. This database indicates bilateral NTBs at the 8-digit Harmonized System (HS) level of over 6000 commodities. The database identifies seven types of NTBs that are described in Table 1. Using bilateral US-Japan and US-EU imports,[5] we construct coverage ratios of each of the seven types of NTBs at the 6-digit NAICS level for each country-pair.[6] Thus we obtain US NTB coverage of imports from Japan (for each of the seven NTB types), Japan's NTB coverage of imports from the US, US NTB coverage of imports from the EU, and the EU's NTB coverage of imports from the US. These coverage ratios are used in place of t_i for the importing country so that $\tau_i = 1+$ NTB coverage ratio on imports from the partner country. The US-Japan NTB data are constructed for each of the five years between 1994-98. The US-EU data are

[5]EU consists of 15 member countries in 1995. They are Austria, Finland, Belgium, Denmark, Germany, Greece, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

[6]The U.S. Census Bureau concordance available at http://www.census.gov/foreign-trade/reference/codes/index.html#concordance was applied to aggregate the bilateral US-Japan and US-EU HS level NTB indicators down to the 6-digit NAICS lines using the relevant bilateral imports as weights.

available only for 1994.

Export subsidy data are unfortunately unavailable at the scope of this study.[7] The absence of export subsidy data implies that in the empirical analysis we must presume $t_i = 0$ for the exporting country so that $\tau_i = 1$.

Foreign and Domestic Political Organization

We presume that *all* industries are politically organized (see e.g. the Federal Election Commission website at www.fec.org and also www.opensecrets.org). It is well known that all manufacturing industries in the US are represented by political action committees (PACs) that make campaign contributions support the election campaigns of Presidential and congressional candidates. The issue of whether these industries make trade policy-related contributions is debatable, but the fact of their being politically organized indicates that they have resolved the free rider problem, and sunk in the fixed costs related to forming lobbies. We imagine that these lobbies are positioned to make contributions to represent their view on trade policy issues. It is also well known that some industries (e.g. apparel, textiles, and leather good production) contribute less and have less political clout than other industries, and this issue can only be resolved by collecting campaign contributions data across all industries. This task is not undertaken in this article and is left open as an issue for future research.

Our research into political organization of manufacturing industries in Japan and the EU indicates that in these advanced countries lobbies represent firms across the spectrum of industries. Japanese industrial sectors are formed into different organizations and associations to effectively lobby policy-makers (Nelson 1988). Lobbying activities include developing new product, preparing submissions to government, performing research studies, attending testimony, meeting with Members of Parliament; contacting politician and bureaucrats; holding news conferences and interviews, and etc. Donations from business and other organizations were 13.5 billion yen in 1998 (economics.com). In the EU most industrial organizations and

[7] In agriculture, the agreement among countries to "tariffy" their subsidies has export subsidies transparent, but not so in manufacturing.

associations are allied across member countries. They make their influence felt at the levels of national governments as well as at the EU policymaking levels of the European Commission and the European Parliament. Their lobbying activities are primarily informational through access and contacts. EU has accredited 4,179 lobbyists representing different sectors and groups.[8]

z_i and e_i

To construct $z_i = X_i/M_i$ we use output and bilateral trade data from the World Bank Trade and Production database constructed by Nicita and Olarrega (Nicita and Olarrega, 2001). The data are available at 4-digit ISIC (rev. 2) levels for US, Japan and EU. The concordance from ISIC (rev. 2) to NAICS is done in two stages. First, the data are converted from ISIC (rev. 2) to ISIC (rev. 3), and next from ISIC (rev. 3) to 6-digit NAICS.[9] Since the ISIC to NAICS mapping is one-to-many, when one ISIC industry maps into multiple (say, n) NAICS codes, the trade data for each NAICS industry is set equal to $1/n$ of the corresponding ISIC data. The adding up condition is thus preserved.

The output data are also taken from Trade and Production database at 3-digit ISIC (rev. 2). Value added is used as the definition of output. The conversion is done in the same way as for bilateral trade. The advantage of using the same database for output and imports is that they are concorded uniformly from ISIC to NAICS. As a result the variable z_i are consistently calculated.

Import demand elasticities are taken from Gallaway, McDaniel and Rivera (2003). 309 short-run elasticity estimates at 4-digit SIC (1987 basis) level are concorded into the 6-digit NAICS (1997 basis) level as follows. First, we use an SIC-to-HS concordance[10] to map the elasticity data at the HS 10-digit level. Using the import values at the 10-digit HS level, the elasticities are then aggregated down to the NAICS level (from a HS-NAICS concordance) using US

[8]EU Parliament website at http://www2.europarl.eu.int/lobby/lobby.jsp?lng=en&sort=byorg&index=ALL.

[9]Both concordance files are available at the website of UN Statistics Division: http://unstats.un.org/unsd/cr/registry/regdnld.asp?Lg=1.

[10]This was downloaded from http://data.econ.ucdavis.edu/international/usixd/wp5515d.html. The file was made available to this site by Rob Feenstra.

imports as weights. Export supply elasticities have not been estimated at the scope of this study. All export supply elasticities are thus set equal to 1. Thus, while the variables τ_i and z_i/e_i are well measured for protection and imports, the unavailability of export subsidies and export supply elasticities require simplifying assumptions about their values in order to proceed with the estimation.

Other Variables

Four industry-group dummies are used as control variables. While US census of manufacturing data may be used to construct other control variables, there is lack of such data for EU and Japan. In order to treat them symmetrically, use of the dummies is a good compromise. The four dummies are for Food processing industries, Resource Intensive industries, Capital Intensive industries and General Manufacturing.[11]

III.3 Results

Table 1 describes the seven types non tariff barriers from the TRAINS database used in this study. Descriptive statistics for bilateral US-Japan and US-EU NTBs are also presented. For example, in 1994 the mean coverage ratio of Product Characteristic Requirements was 0.152 for the US and almost zero for the EU. In other words roughly 15.2% (an import-weighted average would be exact) of US imports in the sample from the EU were covered by Tariff Quotas, while the EU did not use this type of NTB to protect against US goods. On the other hand, the US did not use Antidumping Duties on imports of manufacturing from the EU but the EU did impose Antidumping Duties on the US, though in only a few sectors. Licensing Authorization was a frequently used NTB on both sides. 12% of the sample contained incidence of this type of NTB by the US and in 13% of the sample the EU

[11] dfood=1 for NAICS codes 3114,3115,3116,3118,3119,3121,3112,3113,3259,3261.
dres=1 for 3123,3122,3131,3132,3133,3141,3149,3152,3159,3161,3162,3169,3211,3212,3219,3221,3222, 3231,3271,3272,3273,3274,3279,3329,3332,3363,3371,3379,3399.
dcap=1 for 3169,3219,3262,3271,3272,3279,3311,3312,3313,3314,3315,3322,3323,3324,3325,3326,3327, 3329,3331,3332,3333,3334,3335,3336,3339,3341,3342,3343,3344,3345,3346,3351,3352,3353,3359,3361, 3362,3363,3364,3399.
dmfg=1 for 3162,3241,3251,3252,3253,3254,3255,3256,3259,3261,3262,3333,3345,3391,3399.

imposed this NTB on US imports. Ostensibly less prohibitive, but with the potential to be quite restrictive, are quality-assurance type of NTBs, which were used quite frequently by the US. Thus, nearly 25% of the sample was covered by Product Characteristics Requirements, 17% by Product Labeling Requirements and 10% Product Inspections Requirements. The EU did not impose these types of NTBs on the US. In sum, the EU primarily used Licensing Authorization against the US but the US used quite a few different types of NTBs on EU imports.

Against Japan the US similarly used a variety of NTBs, but the most frequently used were the quality-assurance NTBs. On the Japanese side, the main NTB used was Product Characteristic Requirement. It is well known that such NTBs can be quite restrictive on the Japanese side. Anecdotal incidents abound about authorities not allowing ships on port to unload their cargo for days at a time because they have not met Japanese product characteristic requirements.

Why countries use different instruments is somewhat of a puzzle in the trade policy literature. Very little work has been done on the issue of policy choice. Does a government's ability to negotiate during strategic interactions with other governments condition its choice of instruments of protection? Or does its ability to choose from a set of instruments (perhaps based on domestic Level II considerations) condition a government's negotiating ability during its strategic interactions with another country's government. The stylized facts presented above motivate further study into the issue of strategic interaction and policy substitutability.

Even though the model is about one way trade we must deal with the fact that in the data there is considerable intraindustry trade. Thus, net imports in each industry were used to define whether a country is a importer (and imposes NTBs) or the country is an exporter (and uses exports subsidies). The pair of equations (5) and (6) are used to explore whether the ratio of one country's protection of industry i to the partner country's export subsidy can be well explained by the output-to-bilateral-gross-import ratio (scaled by the import demand elasticity) and the output-to-bilateral-gross-export ratio (scaled by the export supply elasticity) of the two countries. Estimates from this log-linear model using US Japan NTB

data are reported in Table 2.1. The US-Japan sample pools industries over 1994-98. The estimates indicate that a fairly sparse model with four dummy variables and the two focus regressors is capable of explaining the variance in the relative NTB ratios quite well. For example, the model for Tariff Quotas has an R^2 of 0 .229, and the model for Product Inspection Requirement has an R^2 of 0.406. However, the fit varies quite a bit across different types of NTBs.

The US-Japan data allow clear and precise inferences about the coefficients β^h and β^f. In the models of Tariff Quotas, Antidumping Duties, Product Characteristics Requirements, Product Labeling Requirements and Product Inspection Requirements both coefficients are estimated precisely with the expected positive signs. Thus, for these NTB types the estimates allow us to recover the implied values of the underlying political economy parameters a^h and a^f. However, the same puzzle that was found in the earlier tests of the unilateral Grossman-Helpman model is also found here, namely that the implied values of a^h and a^f are extremely high (this puzzle is examined in the survey article by Gawande and Krishna, 2003). They indicate that both the US and the Japanese governments are overwhelmingly concerned with welfare and pay negligible attention to lobbying contributions. But, as in the earlier studies, this finding is not consistent with the fairly significantly high level of NTBs these countries impose on each other's exports. The deadweight loss from protection in manufacturing has historically been quite high (de Melo and Tarr 1990, and Hufbauer et. al 1986 estimate it in the billions of dollars in the US). The implied estimates of a^h and a^f thus grossly understate both governments' valuation of campaign contributions relative to welfare. A relatively small amount of campaign contributions are used to purchase NTB protection, and the resulting deadweight losses are many times the dollar value of those campaign contributions.

The US-EU data are only available for the 1993, resulting in an effective sample of 295 NAICS industries. We note that in estimating the models from US-Japan and US-EU data we have omitted outlying values of the regressors. Whenever $|z_i/e_i| > 100$ for either Home or Foreign, that observation is dropped. This prevents a mere handful of observations from imposing undue influence on the regression coefficients. Some observations have exceedingly

large values of the output-to-import ratio simply because their imports are negligible. Those observations, and observations with zero bilateral trade are dropped. A significant proportion of industries is nonetheless represented in the sample. Nearly 60% of US, EU and Japanese value added in manufacturing is captured by the sample.

The US-EU results validate the GH95 model for fewer NTB types than did the US-Japan data. Only Tariff Quota, Product Characteristic Requirements and Product Inspection Requirements yield statistically significant estimates for at least one of the β coefficients. For most NTBs these coefficients are not statistically significantly different from zero, and therefore do not allow us to recover the underlying a^h and a^f parameters. The estimates that are positive and statistically significant, still yield very high implied values of a^h and a^f. The puzzle thus remains.

Tables 3.1 and 3.2 contain estimates from the linear model in (7) and (8). The results are qualitatively very similar to the Table 2 counterparts, indicating that the results are robust to the two specifications. The quantitative estimates imply high values for the a^h and a^f parameters. For example, the a^h estimates ranges from 345 to 5,982 for the US and from 333 to 3,698 for Japan. So, while the results qualitatively affirm the GH model with US-Japan data in the sense that both coefficients are estimated with the expected signs for most NTB types, the estimate imply that both governments are welfare maximizing. As mentioned before, and described in Gawande and Krishna (2003), this finding is at odds with the evidence about deadweight losses from the NTBs imposed by the two countries.[12]

[12]Two types of robustness exercises were performed. First, the reported results define z_i as the output-to-gross-imports (and exports) ratio. We re-estimated the model with net imports in place of gross import. The results are generally confirmed the results reported earlier. Second, we estimated a related but different specification. Since imports of one country equal to the exports of the partner country, we can multiply both sides of (5) and (6) by $|M_i|$ to get

$$\ln\left(\frac{\tau_i^h}{\tau_i^f}\right) \times M_i = \beta^h \left(I_i^h \times \frac{X_i^h}{|e_{di}^h|}\right) - \beta^f \left(I_i^f \times \frac{X_i^f}{e_{si}^f}\right) + \epsilon_{2i} \quad \text{if Home is the importer in } i \tag{9}$$

$$\ln\left(\frac{\tau_i^h}{\tau_i^f}\right) \times M_i = \beta^h \left(I_i^h \times \frac{X_i^h}{e_{si}^h}\right) - \beta^f \left(I_i^f \times \frac{X_i^f}{|e_{di}^f|}\right) + \epsilon_{2i} \quad \text{if Foreign is the importer in } i. \tag{10}$$

The error term ϵ_{2i} is heteroskedastic with variance $M_i^2\sigma^2$. We estimated the model with weighted least squares. Again the estimates generally conform to the ones reported in Tables 2 and 3. Thus, the reported

IV. Conclusion

This article presents theory-based empirical work on the determinants of bilateral nontariff barriers, using the Grossman-Helpman (1995) model to develop an econometric model. The GH95 model is qualitatively validated by US-EU and US-Japan nontariff barrier data (NTB). The model imparts a key role to institutions. Given a set of institutions, here lobbies and a government that cares about welfare as well as contributions from lobbies, the model derives a prediction about equilibrium trade barriers. It is a positive theory, and offers a deeper explanation than seen in the literature for why we continue to see a proliferation of trade barriers, despite multilaterally agreed reductions in tariffs.

In concluding we indicate directions in which the study can be improved and extended. The first is to construct export subsidy data at the industry level so that the empirics are more "complete" than in this article. The second is to account for the possible endogeneity of the regressors. For example, imports will be affected by protection, and hence imports are endogenous. Output is endogenous as well. In this article we do not undertake to correct for the endogeneity since our objective is to show how the GH95 model may be tested, and carry out preliminary tests. Constructing symmetric sets of instruments across partners is a challenging task but one that should be undertaken before the results may be taken as validating the model. Finally, the results raise the same puzzle as previous studies of the unilateral GH model did, namely, that estimates of the weight given to welfare are exceedingly high and do not appear to be consistent with the high welfare losses created by NTBs, but only a fraction of which is compensated via campaign contributions. Rigorous solutions to this puzzle would be a welcome contribution.

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results are robust to a number of variations in specification.

Appendix

I. Derivation of (3):

Manipulations to (2) yields

$$\frac{\tau_i^h}{\tau_i^f} = \frac{1-\beta^f\left(I_i^f \times |z_i^f|/e_{si}^f\right)}{1-\beta^h\left(I_i^h \times z_i^h/|e_{di}^h|\right)} \qquad \text{if Home is the importer in industry } i \tag{11}$$

and

$$\frac{\tau_i^h}{\tau_i^f} = \frac{1-\beta^f\left(I_i^f \times z_i^f/|e_{di}^f|\right)}{1-\beta^h\left(I_i^h \times |z_i^h|/e_{si}^h\right)} \qquad \text{if Foreign is the importer in industry } i. \tag{12}$$

Taking logs, we get

$$\ln\left(\frac{\tau_i^h}{\tau_i^f}\right) = \ln\left[1-\beta^f\left(I_i^f \times \frac{|z_i^f|}{e_{si}^f}\right)\right] - \ln\left[1-\beta^h\left(I_i^h \times \frac{z_i^h}{|e_{di}^h|}\right)\right] \qquad \text{if Home is the importer in } i, \tag{13}$$

and

$$\ln\left(\frac{\tau_i^h}{\tau_i^f}\right) = \ln\left[1-\beta^f\left(I_i^f \times \frac{z_i^f}{|e_{di}^f|}\right)\right] - \ln\left[1-\beta^h\left(I_i^h \times \frac{|z_i^h|}{e_{si}^h}\right)\right] \qquad \text{if Foreign is the importer in } i. \tag{14}$$

This is a nonlinear in the parameters β^f and β^h. In order to obtain a linear-in-parameter equation that is easier to estimate we linearize this equation around $\beta^f = 0$ and $\beta^h = 0$ to get (4).

Data Appendix

I. Data Availability

Country	NTB	Bilateral Trade	Output	Elasticity	Political Organization
US	1994-98	1994-98	1994-98	1989--95	Current
JP	1994-98	1994-98	1994-98		Current
EU	1994	1993	1993		Current

II. Data

1. NTBs

The NTB coverage ratio is derived from the database of United Nations' Trade Analysis and Information System (TRAINS 2000, version 7.0). This comprehensive database provides detailed information about the incidence of eight types of non-tariff measures (see Table 1) at the 8-digit HS level, as well as bilateral imports (6-digit HS) from 1994-98. The U.S. Census Bureau concordance (http://www.census.gov/foreign-trade/reference/codes/index.html#concordance) was applied to aggregate the bilateral US-Japan and US-EU HS level NTB indicators down to the 6-digit NAICS lines using the relevant bilateral imports as weights. In sum, the NTB coverage ratio for NAICS industry *i* into which *J* HS level commodities map, is computed as:

$r_i = \sum_{j=1}^{J}(M_{ij} * C_j) \Big/ \sum_{j=1}^{J} M_{ij}$, where *C* is the NTB indicator, and *M* is bilateral imports.

2. Bilateral Trade

The bilateral import and export data is from the World Bank Trade and Production database constructed by Nicita and Olarrega (Nicita and Olarrega, 2001). The data is available at 4-digit ISIC Rev2 levels for US, JP and EU. The concordance from ISIC Rev2 to NAICS is done in two stages. First, we convert ISIC Rev2 to ISIC Rev3.1, and second, we convert from ISIC Rev3.1 to NAICS (2002). Both concordance files are available at the website of UN Statistics Division (http://unstats.un.org/unsd/cr/registry/regdnld.asp?Lg=1). An issue is that the ISIC Rev3.1 to NAICS mapping is one-to-many. When one ISIC industry maps into multiple (say, *n*) NAICS codes, the trade data for each NAICS industry is 1/*n* of the ISIC data.

3. Output

The output dataset is also constructed from Trade and Production database at 3-digit ISIC Rev2. We use value added as the index of output for US, JP and EU. The conversion is derived in the same way the same as bilateral trade. The advantage of this is that output and imports are concorded uniformly from ISIC to NAICS. As a result the output-to-import ratios, which figure prominently in the regressors, are consistently calculated.

4. Elasticity

Import demand elasticities are taken from Gallaway, McDaniel and Rivera (2003). 309 short-run elasticity estimates at 4-digit SIC (1987 basis) level are concorded into the 4-digit NAICS (1997 basis) level as follows. First, we use an SIC-to-HS concordance (downloaded from http://data.econ.ucdavis.edu/international/usixd/wp5515d.html and made available by Rob Feenstra) to map the elasticity data at the HS 10-digit level. Using the import values at the 10-

digit HS level, the elasticities are then aggregated down to the NAICS level (from a HS-NAICS concordance) using US imports as weights.

5. European Union (EU)

EU consists of 15 member countries as the European Union status in 1995. They are Austria, Finland, Belgium, Denmark, Germany, Greece, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

The NTBs are constructed using the full 15 country data, while the bilateral trade and output data includes 13 member countries except Belgium and Luxembourg.

6. Political Organizations

The following two tables provide the information on the Japan and EU's manufacturing organizations and associations.

Table B-1: Political Organizations in Japan

3-digit NAICS Sectors		Organizations	Source	Indicator Dummy
311	Food Manufacturing	Brewers Association of Japan; Japan Dairy Industry Association; Japan Meat Processors Association; Japan Oilseed Processors Association; Japan Sake Brewers Association; The Brewing Society of Japan; The Japan Soft Drinks Association; The Japan Soy-sauce Brewers' Association	http://www.jinjapan.org/jd/org/003006024.html	1
312	Beverage and Tobacco Product Manufacturing			1
313	Textile Mills	Japan Apparel Industry Council, JAIC; Japan Chemical Fibers Association, JCFA; Japan Linen, Ramie & Jute Spinners' Association ; Japan Silk Association Inc., JSA; The Japan Cotton Traders' Association	http://www.jinjapan.org/jd/org/003006024.html	0
314	Textile Product Mills			0
315	Apparel Manufacturing			1
316	Leather and Allied Product Manufacturing	List of associations and organizations	http://dmoz.org/World/Japanese/%a5%d3%a5%b8%a5%cd%a5%b9/%c1%a1%b0%dd%a1%a6%c9%db/%c8%e9%b3%d7/%c3%c4%c2%ce/	1
321	Wood Product Manufacturing	Japan Wood Research Society - Japan, International Tropical Timber Organization (ITTO)	http://www.forestdirectory.com/associations.aspx	1
322	Paper Manufacturing	Japan Paper Association	http://dir.nodeworks.com/Business/Industrial_Goods_and_Services/Materials/Paper/Associations/	1
323	Printing and Related Support Activities	The Japan Federation of Printing Industries (JFPI)	http://www.jfpi.or.jp/english/index.htm	1
32	Petroleum and Coal	The Petroleum Energy Center (PEC)	http://www.pecj.or.jp/e	1

4	Products Manufacturing		nglish/framebase-e.htm	
325	Chemical Manufacturing	Japan Chemical Industry Association	http://61.204.48.89/jciadb/index_e.html	1
326	Plastics and Rubber Products Manufacturing	The Japan Plastics Industry Federation, JPIF; The Society of Rubber Industry, Japan, SRIJ	http://www.jpif.gr.jp/english/profile/m_list.html	1
327	Nonmetallic Mineral Product Manufacturing	Japan Fine Ceramics Center (JFCC)	http://www.jfcc.or.jp/english/index.html	1
331	Primary Metal Manufacturing	The Japan Institute of Metals (JIM), The Materials Process Technology Center(SOKEIZAI Center),The Society of Materials Science, Japan (JSMS);	http://www.japanmetalbulletin.com/links/related_organizations.html	1
332	Fabricated Metal Product Manufacturing	The Kozai Club / Japan Iron & Steel Exporters' Association,Metal Mining Agency of Japan (MMAJ) , Industrial Diamond Association of Japan,	http://www.wtctokyo.or.jp/english/link/link.html	1
333	Machinery Manufacturing	The Japan Machinery Federation, JMF ; The Japan Society of industrial Machinery Manufacturers	http://www.jmf.or.jp/english/top.html http://www.jsim.or.jp	1
334	Computer and Electronic Product Manufacturing	Japan Electronics and Information Technology Industries Association	http://www.jeita.or.jp/index.htm	1
335	Electrical Equipment, Appliance, and Component Manufacturing	The Japan Electrical Manufacturers' Association	http://www.denki.or.jp/	1
336	Transportation Equipment Manufacturing	Bicycle Association(Japan) Japan Automobile Manufacturers Association Inc., JAMA Japan Railway Contractors' Association, Inc. Nihon Bus Association, NBA The Japan Road Contractors Association, JRCA The Shipbuilders' Association of Japan, SAJ	http://www.jinjapan.org/jd/org/003006029.html	1
337	Furniture and Related Product Manufacturing	the International Development Association of the Furniture Industry of Japan (IDAFIJ); Federation of Japan Furniture Manufacturers Association;	http://idafij.com/IDAFIJ/; http://www.pakistanemb.itgo.com/associations.htm	1
339	Miscellaneous Manufacturing	Japan Clock & Watch Association (JCWA)	http://www.wtctokyo.or.jp/english/link/link.html	1

Note: If the industry is directly manufacturing then indicator dummy variable =1, else=0.

Table B-2. Political Organizations in EU

3-digit NAICS Classification		Organizations	Source	Indicator Variable
311	Food Manufacturing	CIAA - Confederation of the Food and Drink Industries of the EU	http://www.ebusiness-watch.org/marketwatch/links/eu_industry_associations.htm	1
312	Beverage and Tobacco Product Manufacturing			1
313	Textile Mills	European Down and Feather Association - EDFA European Textile Services Association (ETSA)	http://www.textilefiberspace.com/assn/	1
314	Textile Product Mills			1
315	Apparel Manufacturing	European Apparel and Textile Organization (EURATEX)	http://www.euratex.org/; http://www.topiawebsearch.com/Business/TextilesandNonwovens/Associations/Textiles/	1
316	Leather and Allied Product Manufacturing	European Leather Association	http://dmoz.org/Business/Textiles_and_Nonwovens/Leathers/Associations/	1
321	Wood Product Manufacturing	C.E.I. BOIS – the European Confederation of Woodworking Industries	http://www.gzs.si/sloexport/default.asp?MenuID=52&Menu=Wood%20Processing%20Industry#wood	1
322	Paper Manufacturing	Confederation of European Paper Industries CEPI	http://www.eurobrussels.com/industryOrganisations.php#linksEnergy	1
323	Printing and Related Support Activities	European Confederation of Paint, Printing Ink and Artists' Colours Manufacturers Associations	http://www.iso.ch/iso/en/stdsdevelopment/liaisonorglist/LiaisonOrgList.LiaisonOrgList	1
324	Petroleum and Coal Products Manufacturing	E&P Forum Oil Industry International Exploration and Production Forum, London,Institute of Petroleum UK	http://www.asosh.org/WorldLinks/trade_associations.htm	1
325	Chemical Manufacturing	CEFIC - The European Chemical Industry	http://www.eurobrussels.com/industryOrganisations.php#linksEnergy	1
326	Plastics and Rubber Products Manufacturing	Association of Plastics Manufacturers in Europe (APME)	http://www.apme.org/	1
327	Nonmetallic Mineral Product Manufacturing	European Ceramic Tile Manufacturers' Federation; British Cement Association	http://www.iso.ch/iso/en/stdsdevelopment/liaisonorglist/LiaisonOrgList.LiaisonOrgList; http://www.bca.org.uk/	1
331	Primary Metal Manufacturing	European Association of Manufacturers of Quality Metal Expansion Joints, Metal Bellow and Metal Hoses	http://www.iso.ch/iso/en/stdsdevelopment/liaisonorglist/LiaisonOrgList.LiaisonOrgList	1
332	Fabricated Metal Product Manufacturing	Orgalime	www.orgalime.org	1
333	Machinery Manufacturing	CECIMO, Orgalime	www.cecimo.be; www.cecimo.be	1

334	Computer and Electronic Product Manufacturing	See lists on the web resources	http://www.globalsources.com/MAGAZINE/EC/ULINKS/INDEX2.HTM	1
335	Electrical Equipment, Appliance, and Component Manufacturing	EACEM	http://www.ebusiness-watch.org/marketwatch/about/old_sectors/electronics.htm	1
336	Transportation Equipment Manufacturing	ACEA	http://www.acea.be/ACEA/index.html	1
337	Furniture and Related Product Manufacturing	European Furniture Manufacturers Federation	http://www.forestdirectory.com/associations.aspx	1
339	Miscellaneous Manufacturing	European Control Manufacturers Association, also see list on web	http://www.iso.ch/iso/en/stdsdevelopment/liaisonorglist/LiaisonOrgList.LiaisonOrgList	1

Note: If the industry is directly manufacturing then indicator dummy variable =1, else=0.

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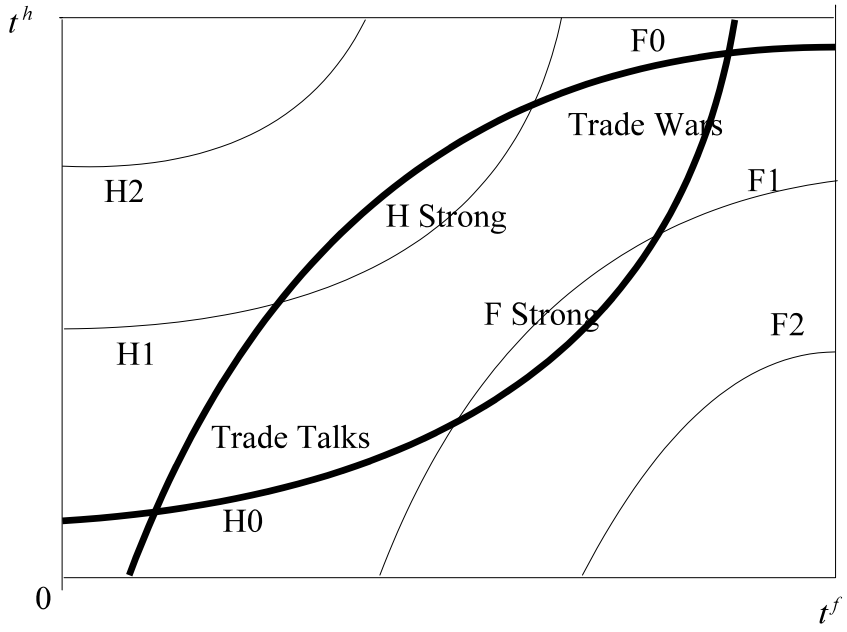

Figure 1: Putnam's bargaining set in a two-level game with political indifference curves.

Table 1: NTB Descriptions and Basic Statistics for Bilateral US-Japan and US-EU NTBs

		US NTBs on EU imports				**EU NTBs on US imports**			
Variable	Description	N	mean	s.d	% > 0	N	mean	s.d	% > 0
Tariff Quota	Tariff quota duties, rates are applied to a quota of imports under a given tariff heading.	295	0.012	0.101	2.7%	295	0.000	0.000	0.0%
Antidumping Duties	Antidumping measures, which may take the form of antidumping duties, price of undertakings or antidumping investigations.	295	0	0	0%	295	0.008	0.051	3.7%
Quotas & Prohibition	Quotas and prohibition measures. Quotas measures include global, bilateral, seasonal quotas; prohibition measures include seasonal prohibition, temporary prohibition and etc.	295	0.006	0.052	2.0%	295	0.004	0.033	3.4%
Licensing Authorization	Automatic licensing and authorization measures, including authorization for wildlife protection, political reason, national security, and etc.	295	0.051	0.192	13.2%	295	0.044	0.169	13.6%
Product Characteristic	Product characteristics requirements	295	0.152	0.323	26.1%	295	0.006	0.060	2.7%
Product Labeling	Product labeling requirement	295	0.067	0.224	16.3%	295	0.005	0.052	2.4%
Product Inspection	Product inspection requirement	295	0.078	0.250	13.2%	295	6.1×10^{-6}	1.0×10^{-4}	0.4%
		US NTBs on Japan imports				**Japan NTBs on US imports**			
		N	Mean	s.d	% > 0	N	mean	s.d	% > 0
Tariff Quota	See above	1245	0.017	0.115	3.0%	1245	0.017	0.105	4.7%
Antidumping Duties	”	1245	0.070	0.186	25.7%	1245	0	0	0%
Quotas & Prohibition	”	1245	0.008	0.063	2.6%	1245	0.044	0.179	10.1%
Licensing Authorization	”	1245	0.039	0.174	11.3%	1245	0.027	0.128	9.8%
Product Characteristic	”	1245	0.155	0.329	26.4%	1245	0.192	0.361	34.9%
Product Labeling	”	1245	0.043	0.185	13.0%	1245	0.013	0.091	4.1%
Product Inspection	”	1245	0.099	0.282	14.1%	1245	0.003	0.054	0.5%

Notes:

1. Sample is at 6-digit NAICS.
2. US-Japan NTBs pooled across 1994-98. US-EU NTBs for 1993.
3. NTB measured as coverage ratio. “%>0” column contains percentage of sample with positive NTB coverage.

Table 2.1: Estimates from Log-linear Model (5) and (6). US-Japan NTBs, 1994-98

	Dependent Variables						
	Tariff Quota	Antidumping	Quotas & Prohibition	Licensing & Authorization	Product Characteristic Requirement	Product Labeling	Product Inspection
β^h	1.877×10^{-4} (1.47)*	1.393×10^{-4} (1.85) **	statistically insig.	statistically insig.	2.600×10^{-3} (6.34)***	8.386×10^{-4} (4.58)***	5.437×10^{-4} (2.52)***
β^f	3.741×10^{-4} (2.28)***	2.282×10^{-4} (2.36)***	3.511×10^{-4} (1.64) **	statistically insig.	2.530×10^{-3} (4.79)***	4.625×10^{-4} (1.96)**	1.030×10^{-3} (3.73)***
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1245	1245	1245	1245	1245	1245	1245
k	6	6	6	6	6	6	6
R^2	0.229	0.017	0.015	0.108	0.179	0.079	0.406
Implied a^h	5.33×10^3	7.18×10^3	–	–	3.85×10^2	1.19×10^3	1.84×10^3
Implied a^f	2.67×10^3	4.38×10^3	2.85×10^3	–	3.95×10^2	2.16×10^3	9.71×10^2

Table 2.2: Estimates from Log-linear Model (5) and (6). US-EU NTBs, 1993.

	Dependent Variables						
	Tariff Quota	Antidumping	Quotas & Prohibition	Licensing & Authorization	Product Characteristic Requirement	Product Labeling	Product Inspection
β^h	1.020×10^{-3} (3.52)***	statistically insig.	statistically insig.	statistically insig.	1.910×10^{-3} (2.17)***	statistically insig.	1.640×10^{-3} (2.72)***
β^f	4.199×10^{-4} (1.56)*	statistically insig.	statistically insig.	statistically insig.	statistically insig.	statistically insig.	statistically insig.
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	295	295	295	295	295	295	295
k	6	6	6	6	6	6	6
R^2	0.152	0.020	0.014	0.017	0.027	0.056	0.078
Implied a^h	9.80×10^2	–	–	–	5.24×10^2	–	6.10×10^2
Implied a^f	2.38×10^3	–	–	–	–	–	–

Notes:

1. *t*-values in parenthesis. *, **, *** indicate statistical significance at the 0.10, 0.05 and 0.01 one-tailed levels, respectively.
2. 4 dummies included: Food Processing, Resource-intensive industries, Capital-intensive industries, and General manufacturing.
3. Sample of NAICS level industries.
4. Implied *a* values calculated as $1/\beta$ (omitted if estimate of β is statistically insignificant or negative).

Table 3.1: Estimates from Linear Model (7) and (8) . US-Japan NTBs, 1994-98

	Dependent Variables						
	Tariff Quota	Antidumping	Quotas & Prohibition	Licensing & Authorization	Product Characteristic Requirement	Product Labeling	Product Inspection
β^h	2.559×10^{-4} (1.42)*	1.672×10^{-4} (1.77)**	statistically insig.	Negative	2.900×10^{-3} (6.12)***	1.190×10^{-3} (4.57)***	6.883×10^{-4} (2.25)**
β^f	4.983×10^{-4} (2.15)***	2.748×10^{-4} (2.26)**	2.705×10^{-4} (1.58)*	statistically insig.	3.000×10^{-3} (4.92)***	6.514×10^{-4} (1.96)**	1.380×10^{-3} (3.52)***
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1245	1245	1245	1245	1245	1245	1245
k	6	6	6	6	6	6	6
R^2	0.215	0.017	0.015	0.109	0.207	0.077	0.402
Implied a^h	3.908×10^3	5.982×10^3	–	–	3.448×10^2	8.403×10^2	1.453×10^3
Implied a^f	2.007×10^3	3.639×10^3	3.698×10^3	–	3.333×10^2	1.535×10^3	7.246×10^2

Table 3.2: Estimates from Linear Model (7) and (8). US-EU NTBs, 1993

	Dependent Variables						
	Tariff Quota	Antidumping	Quotas & Prohibition	Licensing & Authorization	Product Characteristic Requirement	Product Labeling	Product Inspection
β^h	1.470×10^{-3} (3.52)***	statistically insig.	statistically insig.	statistically insig.	$2.640E\times10^{-3}$ (2.13)***	statistically insig.	2.320×10^{-3} (2.71)***
β^f	6.058×10^{-4} (1.56)*	statistically insig.	statistically insig.	statistically insig.	statistically insig.	statistically insig.	statistically insig.
Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	295	295	295	295	295	295	295
k	6	6	6	6	6	6	6
R^2	0.152	0.020	0.142	0.024	0.028	0.055	0.079
Implied a^h	6.80×10^2	–	–	–	3.79×10^2	–	4.31×10^2
Implied a^f	1.65×10^3	–	–	–	–	–	–

See Notes to Table 2.

Table A1: Statistics for dependent variable $\ln(\tau^h/\tau^f)$ in model (5) and (6)

	US-EU Data			US-Japan Data		
Variable	**N**	**mean**	**s.d**	**N**	**mean**	**s.d**
Tariff Quota	295	0.007	0.070	1245	0.012	0.082
Antidumping Duties	295	−0.006	0.039	1245	0.005	0.043
Quotas & Prohibition	295	0.001	0.016	1245	−0.012	0.095
Licensing & Authorization	295	0.001	0.109	1245	0.013	0.112
Product Characteristic	295	0.070	0.197	1245	0.009	0.257
Product Labeling	295	0.043	0.154	1245	0.019	0.108
Product Inspection	295	0.032	0.139	1245	0.043	0.159

Table A2: Statistics for dependent variable τ^h/τ^f in model (7) and (8)

	US-EU Data			US-Japan Data		
	N	**mean**	**s.d**	**N**	**mean**	**s.d**
Tariff Quota	295	1.010	0.100	1245	1.016	0.115
Antidumping Duties	295	0.995	0.033	1245	1.006	0.054
Quotas & Prohibition	295	1.001	0.018	1245	0.992	0.076
Licensing & Authorization	295	1.007	0.115	1245	1.021	0.144
Product Characteristic	295	1.097	0.278	1245	1.045	0.302
Product Labeling	295	1.058	0.215	1245	1.027	0.154
Product Inspection	295	1.045	0.197	1245	1.060	0.224

Table A3: Statistics for regressors

	US-EU Data			US-Japan Data		
	N	**mean**	**s.d**	**N**	**mean**	**s.d**
Home factor	295	22.46	16.68	1245	31.71	25.70
Foreign Factor	295	20.54	16.33	1245	22.03	20.26