Reconsidering the Empirical Evidence on the Grossman-Helpman Model of Endogenous Protection

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Abstract

The emergence of the Grossman and Helpman (1994) model of endogenous protection as the preeminent model in the political economy of trade literature has been significantly advanced by the finding that its predictions about the cross-industry pattern of protection are broadly consistent with the data. Specifically, Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) both find that trade protection is decreasing with import penetration among "organized industries" and increasing with import penetration among "unorganized industries." However, an unaddressed puzzle is the fact that industries classified as unorganized make lobbying contributions to the government and receive positive amounts of protection. In this paper we argue that reconciling these puzzles with the Grossman-Helpman model significantly changes its predictions about the cross-industry pattern of protection, and thus has important implications for the empirical implementation of the Grossman-Helpman framework.(JEL F1)

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1 Introduction

Recent interest in the political economy determinants of trade policy has been accompanied by the emergence of Grossman and Helpman (1994) as the preeminent model in this literature. The Grossman-Helpman model provides an explicit structural framework in which organized self-interest groups influence governmental decisions through the use of political contributions. The acceptance of the Grossman-Helpman (henceforth G-H) model in the trade policy literature has been advanced by the publication of several influential papers (most notably, Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000)) which propose to investigate the empirical validity of the G-H model. Both papers conclude that the observed pattern of protection is consistent with the predictions of the G-H model. Specifically, these conclusions are based on their findings that trade protection is decreasing with import penetration in industries classified as "organized" and increasing in import penetration in industries classified as "non-organized." These initial studies have since been followed by numerous empirical applications of the G-H framework, such as Mitra, Thomakos, and Ulubasoglu (2002), Grether, de Melo, and Olarrega (2001), McCalman (2001) and Eicher and Osang (2002).

However, there are two puzzles embedded in this empirical work. First, estimating the G-H model requires classifying industries as either organized or unorganized. However, data on political action committee (PAC) campaign contributions implies that all of the relevant industries are organized (i.e., contribution levels are positive for all manufacturing industries). This fact is typically dealt with in the literature by assuming that industries lobby to affect both domestic policy and trade policy, and thus one can separate the trade-related PAC spending from general PAC spending to create a measure of whether an industry is organized with respect to trade policy lobbying. However, the structural equation of cross-industry tariff protection from Grossman and Helpman (1994), which these empirical papers estimate, is derived under the assumption that countries have access *only* to trade policy as a redistributive device (i.e., alternative domestic policies are not available). In this paper, we argue that excluding alternative policies represents a misspecification problem in the empirical literature. Specifically, we show that, when alternative policies (such as production subsidies/taxes) are

incorporated into the G-H framework, the expression for the equilibrium tariff is different than that estimated in previous work.

The second puzzle is that, while the G-H model predicts that unorganized industries should receive negative protection (e.g., an import subsidy), industries classified as unorganized in the empirical literature in fact receive positive levels of trade protection. Empirically, this second fact is typically dealt with by introducing a constant term and/or an additive error term into the trade protection equation. The inclusion of these terms is intended to capture "other reasons" for trade protection outside the G-H framework. In this paper, we argue that the presence of such extraneous factors influencing the amount of trade protection represents a second misspecification problem in the empirical literature. Specifically, we show that, when extraneous political factors are incorporated into the government's objective function, the correlation between trade protection, import penetration and import demand elasticity is no longer conditional on the classification of industries into organized and unorganized.

The implication of these findings is that researchers must more rigorously account for the presence of domestic policy support and extraneous political factors in any empirical work involving the G-H model. As an illustration, we introduce a modified G-H model that includes domestic policies and additional political factors, derive some predictions on the cross-sectional structure of both trade and domestic policy support, and test these predictions on a dataset of government support to agricultural industries. We show that a simple modification of the G-H model that can capture both multiple policy instruments and extraneous political factors is broadly consistent with the data.

The structure of the paper is as follows. In Section 2, we review the previous empirical tests of the G-H model. In Sections 3 and 4 we investigate two empirical puzzles raised by the data: why unorganized industries lobby and why unorganized industries receive positive amounts of protection. In Section 5 we modify the G-H framework to accommodate these two puzzles, and empirically estimate our revised G-H model. Finally, we conclude in Section 6.

2 Evidence on the Grossman-Helpman Model

Grossman and Helpman (1994) postulate a specific factor model in which, in some sectors, the owners of a specific factor organize to form a lobbying group to influence the government with political contributions. Politicians meanwhile maximize a weighted welfare function with two components: political contributions by lobbying groups and aggregate social welfare. The interaction between the politicians and lobbying group takes the form of a menu auction. In the first stage, each lobbying group simultaneously presents the government with a contribution schedule specifying a contribution level for every possible level of political support. In the second stage, the government chooses the level of political support to maximize its objective function and collects the corresponding contribution level from the lobby. Under the assumption that governmental policies consist only of a vector of trade taxes/subsidies, Grossman and Helpman (1994) demonstrate that the equilibrium cross-industry pattern of protection is given by:

$$\frac{\tau_i^o}{1+\tau_i^o} = \frac{I_i - \alpha_L}{a + \alpha_L} \frac{z_i}{e_i} \ , \ i = 1, ..., n \tag{1}$$

In (1), τ_i^o is the ad valorem tariff on good i in equilibrium. On the right hand side, I_i is an indicator variable that equals one if sector i is organized, the parameter $\alpha_L > 0$ is the fraction of the population organized into a lobby and the parameter $a > 0$ is the weight that the government places on aggregate welfare relative to political contributions. Finally, z_i is the inverse import penetration ratio and e_i is the absolute elasticity of import demand.

Equation 1 demonstrates the influence of lobbies on governmental policies. Assuming that sector i is an import industry, it is direct to derive from (1) that if the industry is organized (i.e., $I_i = 1$), it will receive an import tariff ($\tau_i^o > 0$). If the sector is not organized (i.e., $I_i = 0$), the industry will face an import subsidy ($\tau_i^o < 0$). Equation (1) makes the additional prediction that the extent of any deviation from free trade is a function of the import penetration ratio (z_i) and the elasticity of import demand (e_i).

Following Gawande and Bandyopadhyay (2000), we can rewrite (1) in an empirically testable form:

$$\frac{\tau_i^o}{1+\tau_i^o} = \delta_1 \frac{z_i}{e_i} + \delta_2 I_i \frac{z_i}{e_i} + \epsilon_i \ , \ i = 1, ..., n \tag{2}$$

Or, as in Goldberg and Maggi (1999), we can move the import elasticities to the left-hand side:

$$\frac{\tau_i^o}{1+\tau_i^o} e_i = \delta_1 z_i + \delta_2 I_i z_i + \epsilon_i \ , \ i = 1, ..., n \tag{3}$$

In either case, the predictions of the G-H model are that: (1) $\delta_1 < 0$, (2) $\delta_2 > 0$ and (3) $\delta_1 + \delta_2 > 0$. Intuitively, these predictions reflect the fact that the interaction between tariff protection, import penetration ratios and import elasticities differs depending on whether the industry is organized or not.

These predictions were first tested in Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000). Both studies use NTB coverage ratios in the U.S. as the measure of trade protection, and both use data on corporate political contributions to assign the political organization indicator variable (I_i) to each industry. In Goldberg and Maggi (1999), this is accomplished by using various threshold levels of campaign contributions to determine whether an industry is classified as organized. Gawande and Bandyopadhyay (2000) regress campaign contributions on a set of variables including import penetration. Those industries with positive predicted campaign contributions are considered organized. From their estimation of (2), Gawande and Bandyopadhyay (2000) find that $\delta_1 = -0.0003$ and $\delta_2 = 0.0003$. From their estimation of (3), Goldberg and Maggi (1999) find that $\delta_1 = -.009$ and $\delta_2 = .0106$. Thus, both papers find empirical support for the prediction that the correlation between trade protection and trade variables is dependent on whether the industry is organized, and the signs of the estimates are consistent with the G-H predictions.

It should be apparent from the above discussion that the empirical support for the G-H model is contingent on the proper sorting of industries into organized and unorganized categories. However, a puzzle in the data is that industries are classified as unorganized even though they make positive contributions to the government and receive positive amounts of trade protection. In the sections that follow we argue that accounting for these puzzles significantly changes the empirical specification of the model.

3 Why Do Unorganized Firms Lobby?

As mentioned previously, a key component of empirical work on the G-H model is the proper classification of industries into organized and unorganized. Each paper in this literature uses a somewhat ad-hoc method to accomplish this sorting. An obvious question is why no paper employs a strict interpretation of the G-H model, in which an industry is considered organized if its contribution level is positive. This question is explicitly answered in Goldberg and Maggi (1999): "In our data, contribution levels are positive for all 3-digit industries, so that a literal interpretation of the model would imply that all sectors in the economy are organized. However, this implication would be valid only if contributions were made exclusively to influence trade policies... in reality, firms contribute for a variety of other reasons, in particular to influence domestic policy." Thus, the empirical tests of G-H were conducted under the explicit assumption that industry groups lobby for both trade policy and domestic policy, but the estimating equation for trade policy (equation 1) was derived under the explicit assumption that trade policy is the only policy instrument available to the government.

Such an approach is valid if one assumes that the cross-sectional pattern of trade policy is independent of domestic policy considerations. In this section we incorporate alternative policy instruments into the standard framework of Grossman and Helpman (1994) of a small economy populated by individuals with identical preferences but different factor endowments. Integrating multiple policy instruments into the G-H framework is also done by Dixit (1996), although that paper does not discuss the proper empirical testing of the model. Thus, the discussion in this section will be brief.

Following Grossman and Helpman (1994), each individual maximizes a quasilinear utility function where good x_0 is the numeraire good with a world and domestic price equal to one. With these preferences, aggregate demand for good x_i is denoted by $D_i(p_i)$ and, by Roy's Identity, is equal to the partial derivative of the aggregate consumer surplus function $[\delta(p)]$ with respect to the consumer price of good x_i (i.e., $D_i(p_i) = \frac{-\partial\delta(p)}{\partial p_i}$).

Good x_0 is produced using labor alone at constant returns to scale (thus, the wage rate in this sector equals one). Production of the non-numeraire goods requires labor and a sector-

specific factor, with constant returns to scale and diminishing marginal returns. Thus, the aggregate reward to the specific factor used in producing good x_i is a function of the producer price of good x_i and denoted by $\pi_i(p_i^s)$. By Hotelling's Lemma the industry supply function is then given by $X_i(p_i^s) = \pi_i'(p_i^s)$.

We allow governments access to both trade policies (which drive a wedge between domestic and world prices) and production policies (which drive a wedge between domestic producer and consumer prices). Thus, the domestic consumer price of good x_i is given by: $p_i = p_i^w + \tau_i$ where τ_i is a trade tax/subsidy (an import tariff/export subsidy if positive) and p_i^w is the (exogenous) world price of the good. Likewise, the producer price of good x_i is given by: $p_i^s = p_i^w + t_i + \tau_i$ where t_i is a production tax/subsidy (a subsidy if positive).[1]

Government policy results in revenue which is redistributed in lump-sum fashion to all citizens. The net revenue from all taxes and subsidies is given by:

$$r(t,\tau) = \sum_i \{\tau^i[D_i(p_i) - X_i(p_i^s)] - t_i[X_i(p_i^s)]\} \tag{4}$$

As in the G-H model, owners of some factors of production organize to form political lobbies. Each organized lobby submits a contribution schedule to the government that outlines the amount that the lobby is willing to contribute to the government depending upon the governmental policy that is implemented. It is assumed that lobbies maximize the joint welfare of their members, which is a function of the rents to their input and their share of government transfers and consumer surplus:

$$\Omega_i(t,\tau) = \pi_i(p_i^s) + \alpha_i[r(t,\tau) + \delta(p)] \tag{5}$$

where α_i gives the fraction of the population that owns the input used to produce good i. Each lobby then submits a contribution schedule C_i to the government so as to maximize lobby welfare: $v_i = \Omega_i(t,\tau) - C_i(t,\tau)$. The government then sets policy to maximize a weighted

[1]It should be noted that there exists a universe of potential domestic policies that industries can lobby over. In this paper, we confine our attention to a particular one: production subsidies/taxes (i.e., the wedge between domestic producer and consumer prices), since that seems the most obvious policy instrument for organized industries to lobby over. However, our main argument is not that production subsidies/taxes are the only alternative domestic policy that matters, but that the inclusion of additional policy instruments (like production subsidies/taxes), will have important implications for the equilibrium pattern of protection.

utility function that depends on both voter welfare ($\sum_i \Omega_i$) and contributions from the organized lobbies:

$$v_G = \sum_{i \in L} C_i(t, \tau) + a \sum \Omega_i(t, \tau) \tag{6}$$

where L is the set of organized industries and a is the weight that the government places on aggregate welfare relative to political contributions.

To derive equilibrium policies, Grossman and Helpman (1994) assume that the government-lobby interaction takes the form of a menu auction. To simplify the analysis, we follow Goldberg and Maggi (1999) and assume that equilibrium policies are the outcome of a Nash bargaining game in that the joint surplus of all parties involved is maximized. This joint surplus is given by:

$$\Omega = \sum_{i \in L} \Omega_i(t, \tau) + a \sum \Omega_i(t, \tau) \tag{7}$$

Taking the derivative of joint welfare with respect to domestic policy, t_i, and rearranging yields the first-order condition for domestic policy:

$$t_i = \frac{I_i - \alpha_L}{\alpha_L + a} \frac{X_i(p_i^s)}{X_i'(p_i^s)} - \tau_i \tag{8}$$

where $\alpha_L = \sum_{i \in L} \alpha_i$ is the share of the population that is a member of some lobby and I_i is a dummy variable that indicates whether industry i is organized. Likewise, taking the derivative of joint welfare with respect to trade policy, τ_i, and rearranging yields:

$$\tau_i = \frac{I_i - \alpha_L}{\alpha_L + a} \frac{X_i(p_i^s)}{-M_i'(p_i, p_i^s)} + t_i \frac{X_i'(p_i^s)}{M_i'(p_i, p_i^s)} \tag{9}$$

where $M_i(p_i, p_i^s) = D_i(p_i) - X_i(p_i^s)$ represents net import demand. The above first-order condition for trade policy provides the prediction tested in the previous empirical literature. This can be seen by expressing it in ad-valorem terms:

$$\frac{\tau_i^o}{1 + \tau_i^o} = \frac{I_i - \alpha_L}{\alpha_L + a} \frac{z_i}{e_i} + t_i^o \frac{X_i'(p_i^s)}{M_i'(p_i, p_i^s)} \tag{10}$$

where τ_i^o is the ad-valorem tariff on good i, z_i is the inverse import penetration ratio ($z_i = X_i/M_i$) and e_i is the absolute elasticity of import demand. Thus, (10) predicts that, *conditional on the amount of domestic policy support*, trade policy is a function of import penetration

ratios and import elasticities. This observation raises concerns about omitted variable bias in the previous empirical work. Since domestic policy support is an endogenous variable that is correlated with many of the same variables that influence trade policy support, such concerns are well-founded. Indeed, substituting the first-order condition for domestic policy into (9) one can derive the *unconditional* expression for trade policy support for both organized and unorganized industries is given by $\tau_i = 0$. Thus, in equilibrium, the generalized G-H model implies neither a distinction between organized and unorganized industries in the use of trade policy, nor an unconditional relationship between trade policy and import penetration or import elasticities.[2]

This result, that equilibrium trade policy involves free trade, is not that surprising as it was previously stressed by Dixit (1996) and is based on the well-known first-best principles that a direct production subsidy will be a more efficient means of transferring resources to an organized industry than a tariff or quota. However, it creates a potential problem for empirically estimating and testing the G-H model using data solely on trade policy. Specifically, to derive cross-sectional predictions on the pattern of trade policy support under the assumption that industries are actively lobbying for domestic policy, one needs to extend Dixit (1996) and incorporate into the G-H model a formal justification for the use of trade policy as a means of redistribution. As an illustration, we conduct such an investigation in section 5.

4 Why do Unorganized Industries Receive Protection?

A second puzzle in the data is that most industries classified as unorganized receive positive levels of trade protection from the government. One of the basic predictions of the G-H model is that unorganized industries should receive import subsidies and export taxes (as a means of benefiting consumers by lowering domestic prices). However, in reality, such instruments are rarely observed. Obviously, the lack of negative levels of protection cannot be taken as a refutation of the G-H model, but simply as an indication that some extraneous factors also

[2]In the stochastic version of the model, the distribution of trade policy across industries will simply be equal to the distribution of the error term on the right-hand side of the equation. Thus, this distribution will be independent of both the level of organization and the trade variables.

influence the equilibrium level of trade protection.

Empirically, this second fact is typically dealt with by introducing a constant term (as in Gawande and Bandyopadhyay (2000) and/or an additive error term (as in Goldberg and Maggi (1999)) into the trade protection equation.[3] As noted by Goldberg and Maggi, these terms, "can be thought of as a composite of variables potentially affecting protection that might have been left out of the theoretical model". Such an approach is valid if one assumes that introducing such additional factors into the G-H framework does not affect the relationship between the magnitude of protection, the classification of the industry (organized or unorganized) and the vector of industry characteristics. Thus, in this section we integrate extraneous political factors into the standard G-H framework.

The simplest way to integrate additional political factors into the G-H model is to replace the assumption that governments maximize industry contributions and (anonymous) utilitarian social welfare, with the assumption that governments maximize industry contributions and (non-anonymous) generalized utilitarian social welfare.[4] In other words, assume the framework of G-H (in which trade policy is the only available policy instrument) but replace (6) with the modified government welfare function:

$$v_G = \sum_{i \in L} C_i + \sum_i a_i \Omega_i \tag{11}$$

where L is the set of organized industries and a_i is the weight that the government places on aggregate welfare of individuals in the i^{th} industry (relative to political contributions). The original justification by Grossman and Helpman (1994) for including (anonymous) utilitarian social welfare in the government's objective function was to capture incumbent politicians attempting to maximize their reelection prospects (where reelection is partially dependent on the utility level achieved by a representative voter). However, in an electoral system it seems geographic and locational considerations may be important in how much weight policy makers

[3]Goldberg and Maggi (1999) do not include a constant term, but run a censored (Tobit) regression model and argue that the presence of positive protection for unorganized sectors is consistent with the presence of an additive error term.

[4]There exist a myriad of means by which political factors can be introduced into the G-H framework. Our argument in this section is not that a generalized social welfare function is the only means by which political factors can be introduced, but rather that accounting for extraneous political factors can have important implications for the pattern of trade protection across industries.

place on the utility of a voter. Thus, (11) replaces the utilitarian social welfare function of the G-H model with a generalized utilitarian social welfare function. A potential justification for (11) can be found in the empirical work of Busch and Reinhardt (1999) who argue that geographic considerations do play a role in how favorably the government treats industries. Thus, the a_i weights can be thought of as exogenous political factors related to the location of industry.

Following the procedure of the previous section, we maximize the joint surplus of all parties involved and derive the first-order condition for trade policy which can be expressed as:

$$\frac{\tau_i^o}{1+\tau_i^o} = \frac{(I_i - \alpha_L) + (a_i - A)}{\alpha_L + A} \frac{z_i}{e_i} \ , \ i = 1, ..., n \tag{12}$$

This expression is similar to that of the unmodified G-H model, with the addition of two additional terms: a_i, which is the weight the government places on the welfare of individuals in industry i and $A = \sum_i \alpha_i a_i$, which is the (weighted) average of the weight that the government places on societal welfare relative to industry contributions.

The above derivation, (12), is important because the empirical validity of the G-H model has consistently been tested by investigating whether the magnitude of trade protection is increasing in $\frac{z_i}{e_i}$ for organized industries and decreasing in $\frac{z_i}{e_i}$ for unorganized industries (see the discussion in Section 2). However, the empirical finding that tariff protection is decreasing in $\frac{z_i}{e_i}$ for unorganized industries, which has been interpreted as supportive of the G-H model, is perplexing from a theoretical standpoint. Specifically, $\frac{z_i}{e_i}$ is commonly interpreted as measuring the benefits to the affected industry of tariff protection relative to the costs borne by society. Thus, finding that tariff protection is decreasing in $\frac{z_i}{e_i}$ is equivalent to finding that tariff protection is increasing with the deadweight costs of such protection. Equation (12) provides a potential answer to this puzzle since it suggests that the G-H framework does not necessarily make this prediction. Rather, the G-H framework predicts that *deviations from free trade* are increasing in $\frac{z_i}{e_i}$ (i.e., import subsidies/export taxes are increasing in $\frac{z_i}{e_i}$ for unorganized industries). This distinction becomes important in the presence of exogenous political factors that potentially could result in unorganized industries receiving positive protection. Specifically, (12) suggests that among industries which are unorganized (i.e., $I_i > \alpha_L$) but receive positive protection (i.e., $I_i + a_i >$

$\alpha_L + A$) trade protection is *increasing*, not decreasing, in $\frac{z_i}{e_i}$.

This result, that the degree of tariff protection is potentially increasing in $\frac{z_i}{e_i}$ for all industries (organized or unorganized) that receive positive levels of protection is not surprising given the basic intuition of the G-H model. However, it creates a potential problem for empirical work as it suggests that extraneous political factors must be formally incorporated into the G-H model in order to derive consistent predictions.

5 Empirical Specification

In this paper we have argued that there is an apparent paradox inherent in empirical tests of the G-H model. Specifically, to empirically implement the model, researchers must assume the presence of alternative policy instruments (to explain why unorganized industries lobby) and extraneous political factors (to explain why unorganized industries receive positive amounts of protection). However, we have argued that the key testable predictions of the G-H model, that import tariffs are increasing in $\frac{z_i}{e_i}$ for organized industries and decreasing in $\frac{z_i}{e_i}$ for unorganized industries, are potentially no longer valid under these assumptions.

In our opinion, that leaves two alternatives for future empirical applications of the G-H model. First, one could attempt to derive a set of assumptions under which the pattern of protection tested in the traditional empirical literature is consistent with the presence of alternative policy instruments and extraneous political factors. For example, if industries lobby solely for domestic policies that are completely independent of prices (e.g., gay marriage or abortion), then the equilibrium expression for trade policy would be independent of the presence of domestic policy.[5] Likewise, if $(a_i - A)$ were an inverse function of $\frac{z_i}{e_i}$ in (11), then additional political considerations could be captured by an additive constant or error term in the empirical specification. However, we feel that a more promising approach is to explicitly introduce alternative policy instruments and extraneous political factors into the G-H framework and empirically implement the resulting structural equation.

As an illustration of such an approach, take the setting of Section 3 (in which governments

[5]Of course this assumption might be difficult to reconcile with profit-maximizing behavior.

have access to both trade and domestic policy), but assume that the government receives some additional benefit, $G(\tau)$, to using trade policy. Thus, we replace (6) with the modified government welfare function:

$$v_G = \sum_{i \in L} C_i + \sum_i \Omega_i + G(\tau) \tag{13}$$

One can think of $G(\tau)$ as simply representing exogenous political or administrative factors that result in the government preferring the use of trade policy to other policy instruments. Alternatively, one could assume an additional cost $G(t)$ to using domestic policy as such an approach results in identical predictions about the cross-sectional pattern of industry trade protection. Note that the presence of $G(\tau)$ in the government's objective function provides a justification for both why tariffs might be used as a means of redistribution in the presence of alternative policy instruments, and why unorganized industries might receive positive trade protection (i.e., it solves both of our empirical puzzles). Given that government's preference for tariffs as an instrument of redistribution remains an unanswered question in the political economy of trade literature (see Rodrik (1995) for a discussion) we do not take a stand, in this paper, on the formal justification for $G(\tau)$.[6]

For analytical simplicity we assume this benefit is continuously differentiable and well-behaved: $G_\tau \geq 0$ and $G_{\tau\tau} \leq 0$. Repeating the calculations of the previous section, the first-order condition for the equilibrium trade policy can be expressed by:

$$\tau_i = \frac{1}{\alpha_L + a} \frac{G_{\tau_i}}{D_i'(p_i)} \tag{14}$$

which can also be expressed in ad-valorem terms as:

$$\frac{\tau_i^o}{1 + \tau_i^o} = \frac{1}{\alpha_L + a} \frac{G_{\tau_i}}{D_i(p_i)\eta_i} \tag{15}$$

[6]There is no shortage of potential justifications for why an inefficient policy instrument might be used as a redistributive device. Unfortunately, many of these justifications (e.g., see Rodrik (1986) , Staiger and Tabellini (1987) and Grossman and Helpman (1994)) involve some actor credibly committing not to use or lobby for the more efficient policy instrument. Thus, they have difficulty explaining the situation faced by Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) in which industries lobby for and receive both trade and domestic policy support. Other explanations, such as the optimal obfuscation model of Magee, Brock, and Young (1989) or the administrative cost model of Heller and Shell (1974) have not yet been fully developed. Thus, in this paper, we leave $G(\tau)$ unexplained.

where η_i is the absolute elasticity of demand. The above expression implies that trade policy will be used in equilibrium if it is an administratively or politically more efficient means of redistributing resources than direct production subsidies (i.e., if $G_{\tau_i} > 0$). However, the degree to which trade policy will be employed is not related to import penetration (M_i/X_i) or the elasticity of *import* demand (ϵ_i) but rather to consumer demand (D_i) and the elasticity of *consumer* demand (η_i). This should make intuitive sense as what matters is not the *absolute* efficiency of trade policy, but rather the *relative* efficiency of trade policy. Intuitively, an import tariff is a combination production subsidy and consumption tax. Thus, the use of tariffs as a redistributive device (as opposed to production subsidies) imposes additional costs on the consumers of the good. These costs will be greater (and thus the equilibrium tariff will be lower) the more the good is consumed (D_i) and the more elastic is the demand function (η_i).

To empirically test this prediction, we require data on (1) prices (note that trade policy support in this model is simply a wedge between world and domestic prices), (2) demand quantities and (3) demand elasticities. Unfortunately, such data are not available for manufacturing industries, but a cross-country USDA database (Sullivan, Wainio, and Roningen (1989)) does provide these data for 22 agricultural commodities in the years 1984 and 1986. More detail on this data set is given in Appendix A. Given the limited degrees of freedom, we estimate our model for all developed countries with available data as a robustness check.

To empirically implement our modified G-H model, we assume that the marginal benefit to trade policy (G_τ) is constant across industries.[7] To deal with potential measurement error in our elasticity estimates, we follow a procedure suggested by Goldberg and Maggi (1999) and move the elasticity estimates to the left-hand side:[8]

$$\frac{\tau_i^o}{1+\tau_i^o}\eta_i = \alpha + \delta\frac{1}{D_i(p_i)} + \epsilon_i \ , \ i = 1, ..., n \tag{16}$$

The testable prediction of our modified G-H model is that trade protection is decreasing

[7]This is obviously a strong assumption but does have some justification. Specifically, while several theoretical papers have provided justifications for why tariffs are preferred to subsidies as policy instruments, a common thread in these models is that the key parameter in determining which instrument is preferred is a country-level parameter (and thus, constant across industries). See Ederington and Minier (2005) for a discussion and some empirical evidence.

[8]The constant term, α, is not implied by the theory, but is included to prevent a spurious correlation between τ_i and $D_i(p_i)$.

Table 1: Trade Policy Support

Country	Coefficient	Standard error	Observations
United States	15.54	28.91	13
Canada	20.91	10.97*	7
European Community	219.56	55.31***	14
Spain	11.43	18.96	11
Portugal	1.94	4.67	7
Japan	4.69	12.44	12
South Africa	146.40	62.41	3

Notes to Table: Reported results are coefficient estimates (robust standard errors) from regressions of the 1986 value of $[\tau/(1+\tau)] \cdot \eta$ on the inverse of demand quantity; regressors are 1984 values. Constant terms are included in the regressions but omitted here. Observations for which $\tau < 0$ (in 1986) are omitted; sample sizes for each regression appear in the right-hand column. *** indicates statistical significance at 99%, and * at 90%.

in $D_i(p_i)$ among industries receiving positive trade protection and increasing in $D_i(p_i)$ among industries receiving negative trade protection. Given the lack of industries receiving negative trade protection in the agriculture industry, we confine our attention to organized industries with positive levels of trade policy support (i.e., $\tau_i > 0$). Our interest is in the predicted inverse relationship between trade policy support and consumer demand (i.e., $\delta > 0$). To deal with the potential endogeneity of quantity demanded (D_i) we use the lagged values of demand in 1984 as instruments for demand in 1986. Given potential concerns about heteroskadastecity in the error term, we use Huber-White robust standard errors.

Results of this regression for the seven developed countries/regions with sufficient numbers of industries receiving trade protection are given in Table 1 for the year 1986.[9] These results are generally supportive of the predictions of the modified G-H model. Specifically, in all seven regressions, our estimate of δ is positive, and it is statistically significant (despite very limited degrees of freedom) in two of those regressions. The relationships between $\frac{\tau_i^o}{1+\tau_i^o}\eta_i$ and $\frac{1}{D_i(p_i)}$ are also illustrated in Figure 1. As can be seen, in accord with the prediction of our modified G-H model, we find strong (but not unambiguous) evidence that trade policy support is inversely

[9]Several countries are omitted since they do not exhibit positive levels of trade policy support for enough industries. See Appendix A for details.

related to consumer demand in our sample of countries. This result is promising because it suggests that a very simple modification of the G-H model achieves all three of our goals: (1) it is capable of explaining why trade policy is used in equilibrium in the presence of alternative instruments; (2) it can explain why unorganized industries receive positive protection; and (3) it is consistent with the empirical evidence.

6 Concluding Remarks

The Grossman-Helpman framework is an important advance in the political economy literature, in that it provides clear predictions about the determinants of tariff protection in a fully specified model. However, given the simplicity of the original model, it is not surprising that researchers were initially pessimistic about the ability of the G-H model to match real world data. Thus, empirical evidence that the G-H model appeared to explain the cross-sectional pattern of U.S. NTB coverage ratios was striking, and has been very influential in the trade literature. However, this paper argues that the estimating equations of these previous empirical tests were misspecified, since these tests failed to account for the presence of domestic policy support to industries and extraneous political factors.

In this paper, we incorporate domestic policy and political factors into the G-H model and derive some testable predictions about the cross-sectional pattern of trade policy support. Strikingly, we find that even a very simple means of accounting for both factors finds general support in the data. Specifically, we find that the cross-sectional pattern of government support is broadly consistent with the presence of some additional exogenous benefit to the government of using trade policy (or, alternatively, some additional exogenous cost to using domestic policy).

This result is potentially important for two reasons. First, it suggests that the G-H is flexible enough that, with only slight modification, it is capable of matching the cross-industry pattern of protection. Second, it holds out the promise of providing insight into one of the fundamental puzzles of the political economy of trade literature: the question of why trade policy is used as a means of redistribution when alternative, more efficient, instruments are available. What this paper shows is that the simple inclusion into the government's welfare function of an additional

benefit to trade policy (or cost to domestic policy) can match the empirical evidence. However, the nature of this benefit (or cost) is not well understood, either theoretically or empirically. As can be seen in Table 1 and Figure 1, there is rich variation (across countries and possibly across industries) in G_τ that potentially could be used to determine its shape.[10] Of course, deriving some testable predictions on the shape of the $G(\tau)$ function would require developing the theoretical justifications for government preference for trade policy more fully.

[10]For example, if you believe that tariff protection is preferred to a production subsidy due to budgetary considerations (i.e., there is some marginal cost of funds that make government revenue valuable), then you might be interested in testing whether G_τ was higher in the years in which budget constraints were tighter.

A Data

All data are taken from Sullivan et al. (1989), which presents data for 22 agricultural commodities and 36 countries for the years 1984 and 1986. They describe their data more completely; what follows is a summary of their data descriptions and draws heavily on their work.

We use the countries classified by the authors as "developed": United States, Canada, European Community, Spain, Portugal, other Western Europe, Japan, Australia, New Zealand, and South Africa. They describe their commodity coverage as those "most important to U.S. trade for which adequate world data coverage exists:" beef and veal; pork; mutton and lamb; poultry-meat; poultry-eggs; dairy-fresh milk; dairy-butter; dairy-cheese; dairy-milk powder; wheat; corn; other coarse grains; rice; soybeans; soy meal; soy oil; other oilseeds; other meals; other oils; cotton; sugar; and tobacco.

Quantity data are from the Foreign Agricultural Service (FAS) supply and utilization database and are expressed in 1000s of metric tons. Government support and price data generally are taken from the Economic Research Service (U.S. Department of Agriculture, *Estimates of Producer and Consumer Subsidy Equivalents: Government Intervention in Agriculture, 1982-86*, Staff Report AGES0127, April 1988) and are expressed in dollars per metric ton. All elasticities are own-price elasticities.

Ad-valorem Tariff: the ad-valorem tariff is calculated as the difference between the consumer price and world price divided by the world price. For the consumer price we use the market price in the USDA database, and for the world price we use the trade price. In the database the market price is calculated as the sum of the trade price and the market component of the producer support rate. This market component is the common market support in both the producer and consumer subsidy equivalents (i.e., a combination production subsidy and consumption tax). Note that the common market support rate does not necessarily refer to a tariff, but is theoretically equivalent to the treatment of tariffs in our G-H model.

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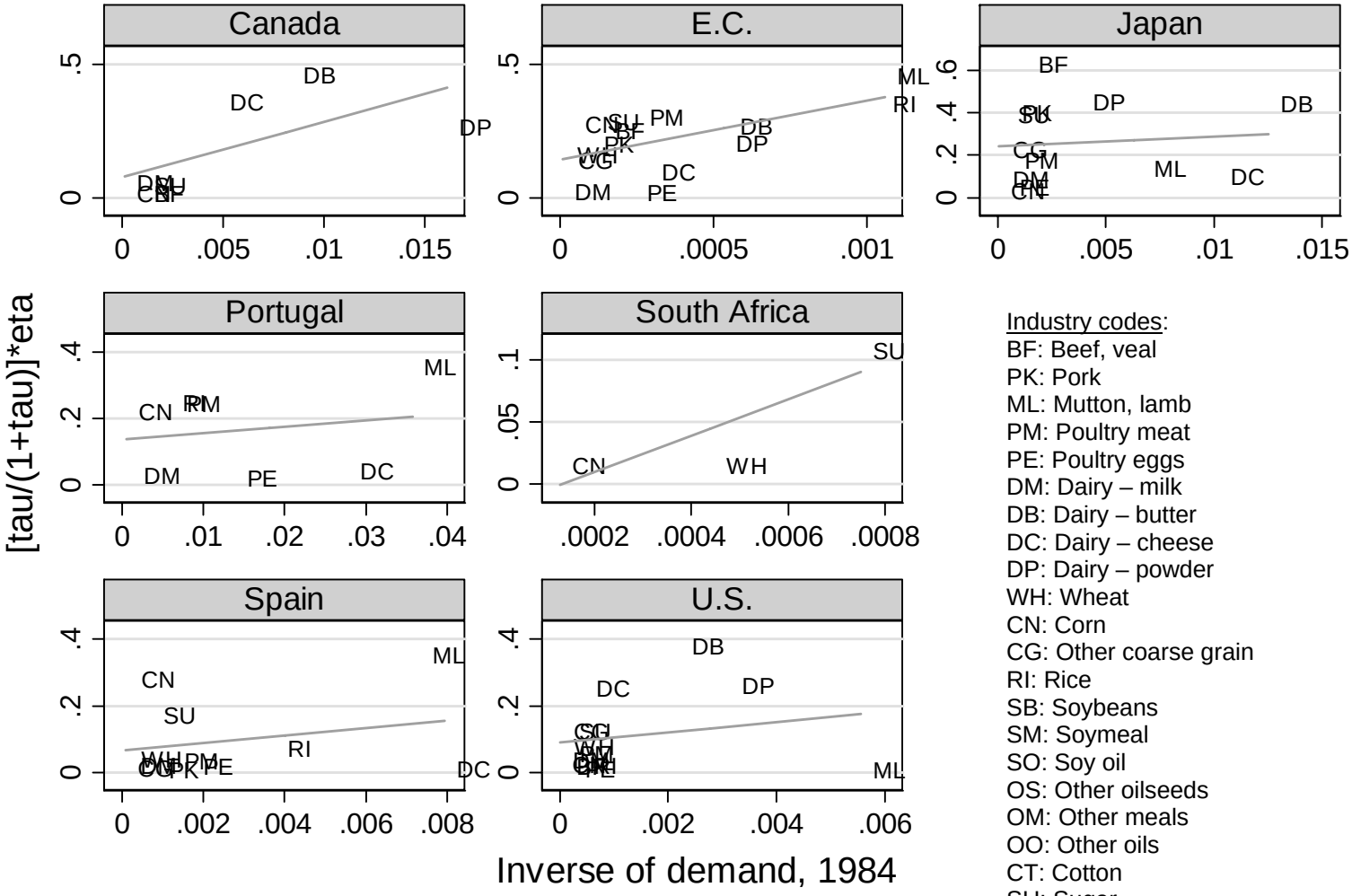
Figure 1



Industry codes:
BF: Beef, veal
PK: Pork
ML: Mutton, lamb
PM: Poultry meat
PE: Poultry eggs
DM: Dairy – milk
DB: Dairy – butter
DC: Dairy – cheese
DP: Dairy – powder
WH: Wheat
CN: Corn
CG: Other coarse grain
RI: Rice
SB: Soybeans
SM: Soymeal
SO: Soy oil
OS: Other oilseeds
OM: Other meals
OO: Other oils
CT: Cotton
SU: Sugar
TB: Tobacco