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 preëminent 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. However, in their empirical implementation of the Grossman-Helpman model, researchers have assumed the presence of multiple policy instruments and extraneous political factors. We argue that incorporating these assumptions into the theory significantly changes its predictions about the cross-industry pattern of protection. JEL classification: F1

Ré-examen des résultats empiriques à propos du modèle de protection endogène de Grossman-Helpman. L'émergence du modèle de protection endogène de Grossman-Helpman en tant que modèle le plus important dans la littérature sur l'économie politique du commerce international a été confirmée de manière significative quand on a découvert que ses prédictions quant au pattern de protection à travers les industries se trouvaient généralement confirmées par les données. Cependant, dans leur vérification empirique du modèle de Grossman-Helpman, les chercheurs ont postulé la présence de multiples instruments de politique publique et de certains facteurs politiques. On suggère que l'ajout de ces postulats change de manière significative les prédictions du modèle quant au pattern de protection dans les divers secteurs.

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 preëminent

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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), that 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 Grether, de Melo, and Olarrega (2001), McCalman (2004), Eicher and Osang (2002), Mitra, Thomakos, and Ulubasoglu (2002), Bombardini (2005), and Matschke and Sherlund (2006).

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 imply 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. Thus, since trade and domestic policy are alternative means by which a government can provide assistance to an industry, one must control for the costs and benefits of domestic policy when attempting to estimate the use of trade policy.

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.[1] Empirically, this second fact is typically dealt with by introducing a constant term and/or an additive error term into the trade protection

1 Of course, one potential explanation for these puzzles is that organized industries are simply consistently misclassified as 'unorganized' throughout the empirical literature. Indeed, in a recent paper, Mitra, Thomakos, and Ulubasoglu (2006) point out that treating all industries as organized results in more realistic estimates of the government's weight on welfare. However, the

equation. The inclusion of these terms is intended to capture 'other reasons' for trade protection outside the G-H framework. However, the inclusion of constant and/or error terms into a first-order condition (i.e., the trade protection equation) is equivalent to assuming deviations from welfare-maximizing behaviour. Thus, 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 (not the first-order condition), the sign of the correlation between trade protection and import penetration is no longer conditional on the classification of industries into organized and unorganized.

Basically, we argue 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 provide modified G-H models that include domestic policies and additional political factors, and we derive some predictions about the cross-sectional structure of both trade and domestic policy support. 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. We conclude in section 5.

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 groups 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

problem with classifying all industries as organized is that it conflicts with the empirics of the previous literature that consistently finds a set of industries where protection is negatively correlated with z_i/e_i (indeed, in both Goldberg-Maggi 1999 and Gawande-Bandyopadhyay 2000 this negative correlation is statistically significant, while the positive correlation for organized industries is not). In addition, empirical work on trade policy has typically found a positive correlation between protection and import penetration (e.g., see Leamer 1988; Trefler 1993; and Lee and Swagel 1997) that contradicts the assumption that all industries are organized (among organized industries, the correlation should be negative).

(1994) demonstrate that the equilibrium cross-industry pattern of protection is given by

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

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:

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

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

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

In either case, a common interpretation of the G-H model is that it predicts 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 $\delta_1 = -0.009$ and $\delta_2 = 0.0106$. 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. 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. Additional policy instruments

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 only 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) and show that such an assumption is not valid.

3.1. Domestic policy

Following Grossman and Helpman (1994), each individual maximizes a quasi-linear 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., $D_i(p_i) = -\partial\delta(p)/\partial p_i$).

Good x_0 is produced using labour alone at constant returns to scale (thus, the wage rate in this sector equals one). Production of the non-numeraire goods requires labour 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 is 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).[2]

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

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

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 utility function that depends on both voter welfare ($\sum_i \Omega_i$) and contributions from the organized lobbies ($\sum_{i \in L} C_i$):

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

2 It should be noted that there exists a universe of potential domestic policies over which industries can lobby. 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.

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

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

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, t_i^o is the ad-valorem subsidy/tax, 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. That is, the cross-sectional predictions about trade policy tested in the previous literature are valid *if* one controls for the cross-sectional pattern of domestic policy. This is an important point, since the empirical literature has treated the existence of domestic policy as purely an errors-in-variables problem in the empirical classification of industries into organized and unorganized. Equation (10) suggests that the existence of domestic policy also raises concerns about omitted variable bias (especially since domestic policy support is an endogenous variable

that is correlated with many of the same variables that influence trade policy). Specifically, either trade policy or domestic policy can be used to benefit the domestic industry. Therefore, one must control for domestic policy when attempting to estimate trade policy usage.

Of course, estimation of (10) is problematic, since industry-level data on domestic policies are hard to find. One means of dealing with this problem is to control for domestic policy usage by using predicted levels of domestic policy (given by (8)) instead of actual levels. That is, one can substitute the first-order condition for domestic policy, (8), into the first-order condition for trade policy, (9), so as to derive the *unconditional* expression for trade policy support. However, one then finds that the G-H model predicts free trade (i.e., $\tau_i = 0\ \forall i$). Thus, in the presence of domestic policy instruments, the G-H model really provides no predictions about the cross-sectional pattern of protection.[3] This result, that equilibrium trade policy involves free trade, is not particularly surprising: it was previously stressed by Dixit (1996) and is based on the well-known first-best principle that a direct production subsidy will be a more efficient means of transferring resources to an organized industry than a tariff or quota.[4] However, it creates a potential problem for empirically estimating and testing the G-H model using data solely on trade policy, especially in light of the fact that such tests explicitly assume the presence of alternate instruments. 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 the following section.

3.2. Costly domestic policy

The most straightforward explanation for the reliance on trade policy as a means of redistribution is the presence of some additional cost to domestic policy, $G(t)$, in the government's objective function. One can think of $G(t)$ as simply representing exogenous political or administrative factors that result in the government's preferring the use of trade policy to other policy instruments. Of course, a government's preference for trade policy as an instrument of redistribution remains an unanswered question in the political economy of trade literature (see Rodrik 1995 for a discussion). However, as an illustration of our approach, take the setting of section 3, in which governments have access to both trade and domestic policy, but assume, as in the marginal cost of funds literature (e.g., Slemrod and

3 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.

4 Dixit (1996) solves a G-H model in which the government has domestic policy instruments (i.e., consumption tax/subsidies and production tax/subsidies), but no explicit trade policy instrument. However, one can infer the absence of trade policy in the Dixit equilibrium from the fact that a tariff is simply a combination consumption tax/production subsidy.

Yitzhaki 2000) or in Heller and Shell (1974), that administering governmental policy is costly. To capture the idea that trade policy might be administratively less costly than domestic policy, we assume that trade policy is costless but the implementation of domestic policy results in an additional cost to the government of $G(t)$. Thus, we replace (4) with the modified government revenue function:

$$r(t, \tau) = \sum_i \{\tau^i \left[D_i(p_i) - X_i\left(p_i^s\right)\right] - t_i\left[X_i\left(p_i^s\right)\right]\} - G(t). \tag{11}$$

The hypothesis that the lower administrative costs of trade policy might explain a government's reliance on trade taxes is not unique to this paper. This assumption has appeared previously in the theoretical trade literature (e.g., see Gardner and Kimbrough 1992; Kubota 2005) and is consistent with both the empirical public finance literature and anecdotal evidence (including the observation that developing countries rely on trade taxes as a form of revenue, as did many industrialized countries in their early histories).[5] For analytical simplicity we assume that this cost is continuously differentiable and well behaved: $G_t \geq 0$ and $G_{tt} \leq 0$.[6] Repeating the calculations of section 3, the first-order condition for equilibrium trade policy, controlling for the endogeneity of domestic policy, can be expressed by[7]

$$\tau_i = G_{t_i} \frac{1}{D_i'(p_i)}, \tag{12}$$

which can also be expressed in ad-valorem terms as

$$\frac{\tau_i^o}{1 + \tau_i^o} = G_{t_i} \frac{1}{D_i(p_i)\eta_i}, \tag{13}$$

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 more efficient means of redistributing resources than direct production subsidies (i.e., if $G_{t_i} > 0$). 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

5 Sceptics might question whether differing administrative costs really has an impact on government policy choice. However, the empirical literature has consistently found robust relationships between the governmental policy mix and proxies for administrative costs even among developed countries (e.g., see Kenny and Winer 2001; Cukierman, Edwards, and Tabellini 1992; Riezman and Slemrod 1987; and Ederington and Minier 2006). In addition, Matschke (2008) finds that the inclusion of costly revenue raising can assist the Grossman-Helpman model in explaining the cross-sectional pattern of tariff protection.

6 The assumption that $G_t \geq 0$ even when $t < 0$ (i.e., taxes are beneficial to government) is more consistent with the costly revenue assumption than the administrative cost assumption. An alternative assumption is that $G_t > 0$ if $t > 0$ and $G_t < 0$ if $t < 0$.

7 This expression is derived by substituting the first-order condition for the equilibrium domestic policy into the first-order condition for equilibrium trade policy.

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 (rather than production subsidies) as a redistributive device 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).

The basic message of this section is that trade policy is one of many policy instruments that the government has at its disposal. Thus, since either trade policy or domestic policy can be used to provide benefits to a domestic industry, one has to control for the costs and benefits of domestic policy when attempting to estimate the cross-sectional pattern of trade protection. One implication of this is that the use of trade policy will be determined by the *relative* efficiency of trade policy (compared with other policy instruments), not the absolute efficiency of trade policy (see equation (13)). Thus, the presence of domestic policy as a substitute instrument has a profound impact on the estimating equation.

4. Additional political factors

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 are simply an indication that some extraneous factors also influence the equilibrium level of trade protection. Empirically, this 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.[8] 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.' However, the trade protection equation is derived from a first-order condition (from the maximization of the joint welfare of the lobbies and the government); thus, the inclusion of additional terms in the policy equation is technically equivalent to assuming deviations from welfare-maximizing behaviour. Basically, if additional political factors are to be introduced into the G-H model, they should be added into the welfare functions (not appended at the end into a first-order condition). However, this raises the

8 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.

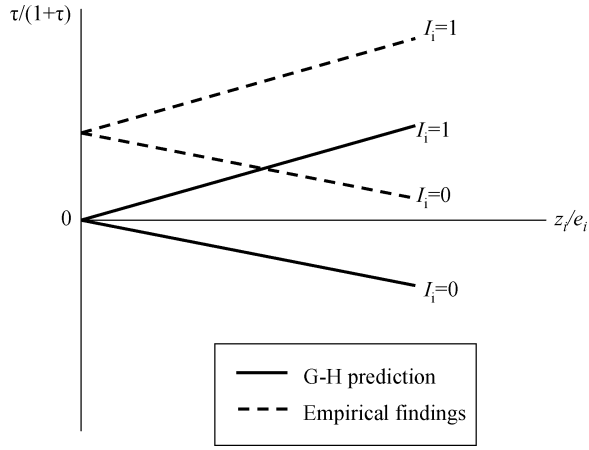

FIGURE 1 Theory vs data

question of whether this different treatment of extraneous political factors is actually consequential. In this section, we argue that it is consequential, and that appending additional terms into the trade policy equation can actually reverse some of the fundamental predictions of the G-H model.

Figure 1 provides some insight into why the treatment of extraneous political factors is important. In figure 1, the bold line provides the basic theoretical prediction of the G-H model, that deviations from free trade are positively correlated with z_i/e_i (i.e., positively correlated with the import penetration ratio and negatively correlated with the elasticity of import demand). Intuitively, this is because z_i/e_i represents the benefits to the affected industry of tariff protection relative to the costs borne by society. In contrast, the dotted line represents the empirical correlation consistently found in the data (where, as mentioned previously, all industries receive positive protection). On a superficial level, the empirical pattern appears to match the theoretical prediction, in that trade protection is increasing in z_i/e_i for organized industries and decreasing in z_i/e_i for unorganized industries. Indeed, the common interpretation of the empirical literature is that the empirical evidence is broadly consistent with the G-H model. However, on another level, the empirical evidence is inconsistent with the G-H model. Specifically, in figure 1, compare the theoretical prediction for unorganized industries (the bold line labelled $I_i = 0$) with the empirical pattern in the data (the dotted line labelled $I_i = 0$). The clear prediction of the G-H model is that, for unorganized industries, deviations from free trade are *increasing* in z_i/e_i, but the empirical evidence suggests that deviations from free trade are *decreasing* in z_i/e_i. This is potentially important, since the empirical pattern observed (that deviations from free trade are decreasing in z_i/e_i for unorganized industries) makes little economic sense, as it suggests that tariff protection is is increasing with the deadweight costs of such protection. Thus, in the following sections, we introduce additional political

factors into the government welfare function to investigate whether such treatment results in predictions similar to those when political factors are introduced into the trade policy equation.

4.1. Non-anonymous utilitarian welfare

The most obvious 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.[9] 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:

$$v_G = \sum_{i \in L} C_i + \sum_i a_i \Omega_i, \tag{14}$$

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 re-election prospects (where reëlection is partially dependent on the utility level achieved by a representative voter). However, in an electoral system it seems that geographic and locational considerations may be important in how much weight policy makers place on the utility of a voter. Thus, (14) replaces the utilitarian social welfare function of the G-H model with a generalized utilitarian social welfare function.[10]

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

$$\frac{\tau_i^o}{1+\tau_i^o} = \frac{(I_i - \alpha_L) + (a_i - A)}{\alpha_L + A} \frac{z_i}{e_i}, \quad i = 1, \ldots, n. \tag{15}$$

9 There exists 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 will have important implications for the pattern of trade protection across industries.

10 A potential justification for (14) can be found in the empirical work of Pincus (1975) and Busch and Reinhardt (1999), who argue that geographic considerations do play a role in how favourably the government treats industries. Thus, the a_i weights can be thought of as exogenous political factors related to the location of industry. Alternatively, one could interpret (14) as reflecting majoritarian bias (as in Grossman and Helpman 2005), where a_i reflects the degree to which the industry is located in majority districts (see Fredriksson, Matschke, and Minier 2007 for empirical evidence on the presence of majoritarian bias in U.S. trade policy).

This expression is similar to that of the unmodified G-H model, with the addition of two 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.[11] Note that equation (15) makes the standard G-H prediction that deviations from free trade are positively correlated with z_i/e_i. However, what is interesting about (15) is that is does *not* predict that non-negative trade protection is decreasing in z_i/e_i for unorganized industries (the prediction tested in the previous empirical literature). Thus, the predictions of a G-H model in which political factors are introduced into the government welfare function are different from the predictions of a G-H model in which political factors are appended to the equilibrium trade policy equation. Specifically, (15) suggests that among industries that are unorganized (i.e., $I_i = 0$) but receive positive protection (i.e., $I_i + a_i > \alpha_L + A$) trade protection is *increasing* in z_i/e_i. This result – that the degree of tariff protection is potentially increasing in 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 the treatment of extraneous political factors affects the predictions of the model.

4.2. Political function

A second means of integrating additional political factors into the G-H model is to simply append an additional term into the government's welfare function. In other words, assume the framework of G-H (again, with trade policy as the only policy instrument) but replace (6) with the modified government welfare function:

$$v_G = \sum_{i \in L} C_i + a \sum_i \Omega_i + G(\tau), \tag{16}$$

where L is the set of organized industries, a is the weight that the government places on aggregate welfare and $G(\tau)$ is a function that represents extraneous political factors. Thus, consistent with Goldberg and Maggi (1999), one can think of $G(\tau)$ as representing a 'composite of variables potentially affecting protection' that are not included in the G-H model. For analytical simplicity we assume that this cost is continuously differentiable and well behaved: $G_\tau \geq 0$ and $G_{\tau\tau} \leq 0$. Following the procedure of the previous section, we maximize the joint surplus

11 A nice aspect of (15) is that it is the traditional G-H expression (see equation (1)) with an additional term reflecting the differential weight the government places on different industries. Note that this additional term makes the G-H model a random coefficients model, which is readily applicable to empirical testing. Indeed, Swamy (1971) suggests a test for random coefficients based on the differences between equation-by-equation OLS estimates and a weighted average of the OLS estimates.

of all parties involved and derive the first-order condition for trade policy, which can be expressed as

$$\frac{\tau_i^o}{1+\tau_i^o} = \frac{(I_i - \alpha_L + g_{\tau_i})}{(\alpha_L + a)} \frac{z_i}{e_i}, \; i = 1, \ldots, n, \tag{17}$$

where g_{τ_i} represents the (scaled) marginal benefit to trade protection (i.e., $g_{\tau_i} = G_{\tau_i}/X_i$). Thus, as in the previous section, we derive the standard G-H prediction that deviations from free trade are positively correlated with z_i/e_i; however, we fail to derive the prediction tested in the empirical literature that non-negative trade protection is decreasing in z_i/e_i for unorganized industries. Specifically, (17) suggests that among industries that are unorganized (i.e., $I_i = 0$) but receive positive protection (i.e., $I_i - \alpha_L + g_{\tau_i} > 0$), trade protection is *increasing* in z_i/e_i. Thus, there is an apparent paradox inherent in empirical tests of the G-H model. Specifically, to empirically implement the model, researchers have commonly assumed the presence of extraneous political factors to explain why unorganized industries receive positive amounts of protection. From this assumption, researchers have derived the key testable predictions that tariff protection is decreasing in z_i/e_i for unorganized industries. What we have argued in this section is that this prediction is basically derived from assuming deviations from welfare-maximizing behaviour (i.e., appending an error term to the first-order condition). When additional political factors are introduced into the government's welfare function, either through non-anonymous utilitarian welfare or by adding a trade policy political support function, this is no longer a prediction of the model.[12]

5. 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. 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, these previous empirical tests also uncovered an empirical regularity that is at odds with the G-H framework: unorganized industries make positive lobbying contributions to the government and receive positive amounts of protection. To deal with this puzzle the traditional empirical approach has been to

12 This raises a second question: if an empirically consistent version of the G-H model does not predict that protection is increasing in import penetration for unorganized industries and decreasing in import penetration for organized industries, why are such correlations consistently found in the data? A potential answer is provided by Imai, Katayama, and Krishna (2006), who argue that the same result would arise from a model where protection occurred simply in response to import surges for organized industries.

assume the presence of multiple policy instruments and exogenous political factors. However, these assumptions have not been carried through to the theory. In this paper, we argue that incorporating these assumptions into the theory significantly changes the estimating equation. First, we show that the inclusion of domestic policy instruments results in trade policy usage being a function of its relative efficiency (measured by the scale and elasticity of consumer demand), not its absolute efficiency (measured by the scale and elasticity of import demand). Second, we show that when extraneous political factors are incorporated into the government's objective function, the sign of the correlation between trade protection and import penetration is no longer conditional on the classification of industries into organized and unorganized. These results are important, since the parameter estimates from unmodified G-H models have been used to analyze a whole host of issues, from environmental policy to the benefits of democracy. Our results suggest that we need to reconsider much of the empirical evidence emerging from this literature.

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