Policy Choice:
Theory and Evidence from Commitment via International Trade Agreements*

Nuno Limão
University of Maryland,
NBER and CEPR

Patricia Tovar
Brandeis University

Abstract

Why do governments employ inefficient policies when more efficient ones are available for the same purpose? We address this puzzle in the context of redistribution towards special interest groups (SIGs) by focusing on a set of important policies: tariffs and non-tariff barriers (NTBs). In our policy choice model a government can gain by committing to constrain tariffs through international agreements even if this leads to the use of less efficient NTBs; commitment has political value because it improves the bargaining position of a government that is weak relative to domestic SIGs. Using detailed data we find support for several of the model's predictions including: (i) tariff commitments in trade agreements increase the likelihood and restrictiveness of NTBs but not enough to offset the original tariff reductions; (ii) tariff commitments are more likely to be adopted and more stringent when the government is weaker relative to a SIG. Thus, the results explain the use of inefficient policies for redistribution and suggest that the bargaining motive is an important source of the political value of commitment in international agreements.

JEL: C7; D7; F13; F5; H2

*Contact information: Limao@econ.umd.edu, tovar@brandeis.edu. Limão gratefully acknowledges the research assistance of Antoine Gervais and Shrayes Ramesh as well as the hospitality of the Kiel Institute for World Economy and Yale University (Leitner Program) where part of this research was conducted. We thank Stephanie Aaronson, Chad Bown, Peter Debaere, Allan Drazen, Andrei Levchenko, Horst Raff, Robert Staiger, Alan Sykes and participants at the American Economic Association Meetings, Stanford Law and Economics seminar, the George Washington University Seminar on Regionalism, Kiel University, International Economic Institutions Workshop in Seoul and Brandeis WTO and International Trade Conference for useful comments and discussions. Any remaining errors are ours

1 INTRODUCTION

Governments can use multiple policies to achieve a given objective, which raises basic questions such as how do policies interact and how is their mix chosen. Economists have addressed some of these questions in important specific cases such as the differential impact of tax cuts versus government spending in stimulating aggregate demand. However, many models still assume that a single policy is available and ignore why and how it is actually chosen, so they generally cannot provide positive predictions. Moreover, this type of partial policy equilibrium analysis can generate erroneous normative prescriptions given two basic features of policymaking. First, governments choose policies to maximize their own utility rather than social welfare. Second, some policies are much less efficient than others in achieving an objective, as stressed by the optimal targeting literature (c.f. Bhagwati and Ramaswami, 1963). Therefore, in order to predict and assess the full impact of government actions in any given issue we must explain their policy composition, both theoretically and empirically.

We analyze policy choice and interaction in the context of redistribution towards special interest groups (SIGs). There is considerable public concern and research about the amount of redistribution that SIGs obtain in exchange for lobbying politicians (c.f. Grossman and Helpman, 2001).[1] It is crucial to understand the composition of redistribution to SIGs because governments frequently use policies that are apparently inefficient for this purpose, i.e. policies that reduce the surplus that governments and SIGs can bargain over. There is a growing *theoretical* literature that addresses this inefficient redistribution puzzle and provides interesting motives for why a particular group may prefer redistribution via a "bridge to nowhere" instead of a lump-sum transfer, or via a complex trade regulation instead of a tariff. However, as we describe in section 2, these papers do *not* typically model the policy choice mechanism and thus fail to predict which policies are adopted in equilibrium and their resulting composition. This may explain the lack of empirical work on such an important issue.

[1] In 2007-8 alone SIGs spent $5 billion in lobbying the U.S. federal government (Center for Responsive Politics).

Our main contribution is to derive and test specific predictions about the choice of policies used for redistribution towards SIGs and their composition, i.e. relative levels. Our theory builds on Drazen and Limão (2008) who argue that a government can benefit from constraints on efficient policies. This can occur because, although the constraints reduce the *total* surplus available to the government and SIGs it bargains with, they actually increase the government's share of that surplus. We develop and test a model where the government has a bargaining motive for commitment and it explicitly decides whether to commit to certain rules and constraints via international agreements. Therefore, our paper also contributes to the general question of why governments commit to rules by analyzing a motivation for commitment that is conceptually distinct from the standard ones such as the time inconsistency of policy (c.f. Kydland and Prescott, 1977).

To tightly link the theory and estimation we must focus on a specific set of policies. Two key requirements for this choice are data availability and a reasonable efficiency ranking. These requirements are often satisfied by trade policies and this is also a setting where the inefficiency puzzle is prominent (c.f. Rodrik, 1995). Moreover, our theory requires an institution via which countries can credibly commit to policy constraints, which many argue is a central role of the World Trade Organization (c.f. Staiger and Tabellini, 1987). The policy constraints are also quite interesting in this setting. The WTO forbids production subsidies—a relatively more efficient redistribution policy than tariffs—but allows its members to negotiate and bind tariffs and, historically, it has placed even fewer constraints on several non-tariff barriers (NTBs). Many of these NTBs are highly trade restrictive[2]; they include technical regulations and many other measures that are often less efficient than a (trade equivalent) tariff. In sum, the setting we explore is a useful one for analyzing policy choice in general and to address other important questions such as (i) the value of trade agreements and (ii) whether tariff constraints increase protection via NTBs, as often claimed (c.f. Hillman, 1989, p. 76).

[2] According to the estimates in Kee et al (2009) if we ignore NTBs then the trade restrictiveness index for the typical country in the world is equivalent to a tariff of 14% on all goods, but this jumps to 27% when NTBs are included.

We show that a self-interested government can benefit from an international commitment to constrain its relatively more efficient policies (e.g. production subsidies and/or tariffs). The constraint improves the bargaining position of the government relative to the domestic SIG by limiting the maximum redistribution it can offer for a given "payment" made by that SIG. However, as we noted above, in practice these agreements do not constrain *all* policies, so SIGs can generally find some alternative one (e.g. some NTB) that is less efficient but still allows SIGs to exploit any political gains from trade.[3] Despite this increase in the use of inefficient policies the government can still benefit from the constraints. The model also predicts that tariff constraints increase the likelihood of NTBs and that there is imperfect policy substitution, i.e. tighter tariff constraints increase the restrictiveness of NTBs but not enough to offset the tariff reduction. By deriving the structural relationship between the policies we can also provide estimates of the average inefficiency of NTBs.

We then show that weak governments adopt policy constraints but strong ones do not. Briefly, a strong government, i.e. one with high (Nash) bargaining power relative to a domestic industry's SIG, already captures most of the total surplus, so reductions in that surplus due to the constraints cannot be offset by an increase in the share the government captures. Moreover, the model predicts that if a government commits then it chooses less stringent tariff constraints on products where it is stronger.

We find support for several of the model's predictions by using tariff and NTB data for about 5,000 products. To exploit the adoption and impact of tariff constraints using detailed data we focus on a single country, Turkey. We discuss several reasons for this choice in section 4; one of them is that it allows us to analyze two of the most common types of commitment in tariffs: those imposed via multilateral agreements such as the WTO and via preferential trade agreements (PTAs). We find that tariff constraints adopted by Turkey through the WTO and its PTA with the European Union increase the probability and restrictiveness of NTBs in this country. Moreover, the effects of these constraints

[3] There may be different reasons for this, one recently emphasized by Maggi et al (forthcoming) is that it is costly to agree on any single policy and thus trade agreements remain incomplete contracts in order to save on such costs.

are related to their actual implementation *dates,* suggesting that they are not simply a proxy for other product characteristics. The results are robust to alternative NTB measures and various other issues, including endogeneity concerns, which we address using an instrumental variables approach.

To analyze the policy choice predictions we construct a novel measure of government bargaining power relative to SIGs: their relative probability of survival—the measure directly suggested by theory. We find that Turkey is less likely to constrain tariffs in the WTO in industries where its government is relatively stronger. Moreover, we present parametric and nonparametric evidence that tariff constraints were less stringent in industries where the government was stronger. This result is significant only for industries where SIGs are organized, as the theory predicts, and it is robust to endogeneity concerns.

The estimated effects are also economically significant. For example, tariff constraints are about 20 percentage points tighter in industries against which the government is weaker. We estimate that this causes NTB *advalorem* equivalents to rise but not by enough to offset the tariff declines implied by the constraint. This suggests there is imperfect policy substitution, which is interesting for two reasons. First, it is a prediction of the model assuming that the NTB is inefficient; and we do provide an estimate that indicates this assumption is correct. Second, imperfect substitution is a necessary condition for tariff commitment to have an important *side* benefit: increase social welfare.

In sum, the results support key assumptions and predictions of the model. This, and the fact that the key theoretical insights apply to other policies that can be ranked in terms of efficiency, suggests that the model may prove to be a useful lens to analyze similar issues in other settings. The structure of the paper is the following. In section 2, we discuss the related literature. In section 3, we introduce the model and derive the predictions that we test in section 4. In section 5, we conclude.

2 LITERATURE

We first briefly discuss the relevant literature on the two main specific topics the paper spans: the inefficient policy puzzle and the value of commitment via international trade agreements.

2.1 Policy Choice

One argument for the use of relatively inefficient policies is that they make redistribution towards SIGs costlier and thus act like "sand in the wheels" of the redistributive process. This sand causes a reduction in the equilibrium amount of redistribution and thus relatively inefficient policies may be preferred from a social welfare perspective. This type of mechanism is employed by Becker and Mulligan (2003), Rodrik (1986) and Wilson (1990) for example. These papers provide important normative rather than positive theories of inefficient policies since they leave the government in the background and do not model the policy choice process. In contrast, in our approach the government is an active player, and by modeling the first-stage of policymaking we can provide a positive theory of inefficient policies. This is particularly important given that our main goal is to test the model.[4]

Another prominent argument is the "disguised" transfer idea put forward by Tullock (1983). Those who bear the costs of funding a certain policy may be ignorant of its redistributive effects to SIGs and are thus less likely to oppose it if the policy also has some social benefit. Coate and Morris (1995) formalize and extend this idea. They show that a "bad" politician—one who values social welfare *and* the utility of the SIG directly—may choose the inefficient transfer (a one-off project that favors the SIG) instead of a lump-sum transfer. That politician may be elected if there is asymmetric information relative to the voters about the social value of the project and the aims of politicians. Their model specifies the policy choice mechanism but testing its predictions is difficult for another reason. As Coate and Morris note, the requirements that the project be socially beneficial in some states of nature and that voters have imperfect information about its effect (ex-ante and ex-post) imply that their model is best suited to explain public projects rather than tariffs, subsidies, etc (p. 1228). [5] So, when testing their model one would need to (a) find systematic data on such projects and (b) determine if they were

[4] Grossman and Helpman (1994) and Dixit et al (1997), argue that competition among SIGs for government transfers can imply that more distortionary instruments improve the outcome for SIGs. They do not focus on the choice of redistribution policy per se and our analysis differs in other important ways, as we discuss in our working paper.
[5] This is one motive why we are not persuaded by arguments that NTBs are used simply because they are more disguised transfers than tariffs (c.f. Hillman, 1989) and tariffs more disguised than production subsidies (Magee et al 1989).

efficient. But if one is indeed able to determine that efficiency ex-post with any certainty then their model would predict inefficient policies would *not* be used. Our model on the other hand does apply to policies such as subsidies, tariffs and NTBs whose relative efficiency is easier to determine and where the ability to do so has no effect on the results, since we do not rely on asymmetric information.

Some authors argue that this "puzzle" is simply due to an incorrect *economic* ranking of policy inefficiency. For example, in our setting we will see that a tariff is generally at least as efficient as an NTB. However, there are less standard economic settings where NTBs can be more efficient (c.f. Kaempfer et al., 1989; Young, 1980; Young and Anderson, 1982). Such ranking reversals may be valid in certain circumstances but, as we argue further in the working paper, we doubt they are the norm for most goods. Moreover, these papers focus on specific policies—quantitative restrictions—that are no longer the prevalent type of NTB. Our interest is to test the validity of general arguments for inefficient policy choice and so we do not reverse the standard ranking of policies. Ultimately this ranking is an empirical question and our model provides an estimation equation to test if NTBs are inefficient.[6]

As we note in the introduction we build on Drazen and Limão (2008). The key theoretical differences are that (i) we model tariffs and NTBs whereas they focus on a lump-sum transfer and a production subsidy and (ii) we analyze trade agreements as the policy choice mechanism with a view to empirical implementation. More importantly, we derive and test several predictions of our model.

The work on this topic remains largely theoretical. An exception is Ederington and Minier (2006), who examine the determinants of the average tariff to production subsidy ratio, for a panel of countries. In the conclusion these authors note the difficulty in testing some theories since (at that time) "none of the theoretical models proposed a fully specified equation for the proper ratio of tariffs to other policy

---

[6] A broader argument that has been explored for the use of other inefficient transfers is that they can give political benefits to the government or SIG that lump-sum transfers do not. Some important theoretical contributions include Weingast, Shepsle, and Johnsen, 1981; Baron, 1991; Dixit and Londregan, 1996 and Acemoglu and Robinson, 2001. Roberson (2008) argues that more targeatibility of pork barrel spending can actually increase its efficiency.

instruments" (p. 27). Therefore, their approach is to test broad implications from these models using aggregate data, which according to them implies that "none of the results should be interpreted as an outright rejection of any model." (p. 27) our approach tackles these issues by specifically deriving such equations from a fully specified model and testing them using detailed product data.[7]

2.2 Value of Commitment via International Trade Agreements

There is a long standing view that trade agreements are valuable because they provide governments with a commitment mechanism to better withstand or mitigate import competing pressures.[8] This view has been formalized almost exclusively by appealing to specific time-inconsistency problems related to some form of investment. Staiger and Tabellini (1987) show how commitment to free trade helps avoid a time-consistent equilibrium where labor reallocation after an adverse terms-of-trade shock is reduced as people anticipate protection and the social welfare maximizing government fulfills those expectations with excessive protection levels. Maggi and Rodriguez-Clare (1998) extend Grossman and Helpman (1994), where a self-interested government places trade protection for sale, by allowing capital to be mobile in the long run. Maggi and Rodriguez-Clare show that the government may benefit from committing to free trade to avoid a distortion associated with the allocation of resources for which it may not receive compensation by the lobbies.[9]

The strategic interaction between international and domestic policy negotiations has long been known (c.f. Putnam, 1988). Similarly to the papers just described we also exploit the strategic interaction due to a government's ability to commit via trade agreements. But there are several key differences. First, the source of the gain from such commitment in our model is a government's improvement in its bargaining position relative to the lobbies rather than a standard time inconsistency

[7] Chandra (2007) studies the relationship between subsidy rules and tariffs and finds that China's tariff reductions upon entering the WTO were smaller in products where it was most likely to face retaliation if it used subsidies.
[8] Another important argument is that trade agreements allow countries to reduce tariffs and internalize terms-of trade effects (Bagwell and Staiger, 1999). Maggi and Rodriguez-Clare (2007) combine the terms-of trade and commitment motive.
[9] Mitra (2002) modifies Maggi and Rodriguez-Clare (1998) by modeling SIG organization and immobile capital.

problem. The underlying bargaining mechanism we exploit is thought to be important in negotiations.[10] Second, none of the papers above models the *choice* of policy and, with the exception of Staiger and Tabellini (1987), they do not even consider the possibility of alternative policies. This is important because no international agreement allows commitment in all policies, so to evaluate the value of such agreements we need to move away from partial political equilibrium models. Finally, all the papers above focus on the theoretical commitment value of agreements whereas we also provide evidence.[11]

3 THEORY

3.1 Setup

We consider a small competitive economy that takes world prices as given. Our economic structure is closely related to Grossman and Helpman (1994) but we model an additional policy. Each individual's factor endowments may differ but they have identical preferences described by

$$u = x_0 + \sum_{i=1}^{n} u_i(x_i)$$

where x_0 is consumption of the numeraire good; x_i denotes consumption of good i and the sub-utility functions $u_i(\cdot)$ are differentiable, increasing and strictly concave. An individual with income E consumes $d_i(p_i) = [u'_i(p_i)]^{-1}$ of each x_i, and $E - \sum_i p_i d_i(p_i)$ units of the numeraire. The indirect utility is thus given by $v(\mathbf{p}, E) = E + s(\mathbf{p})$, where $\mathbf{p}$ is the vector of domestic prices, and the consumer surplus derived from the non-numeraire goods is given by $s(\mathbf{p}) = \sum_i u_i(d_i(p_i)) - \sum_i p_i d_i(p_i)$.

The numeraire is produced using only labor with a marginal product equal to one. Assuming a sufficiently large labor supply ensures that in equilibrium this good is always produced and thus the wage equals unity. Each of the non-numeraire goods is produced using labor and a sector-specific factor, with constant returns to scale. The supply of the specific factors is fixed. Since the wage is

[10] Schelling (1960) states that "The power of a negotiator often rests on a manifest inability to make concessions and meet demands." He goes on to argue this is an advantage that domestic constraints can bring in an international negotiation but clearly, the effect can also run in the opposite direction.

[11] Staiger and Tabellini (1999) provide indirect evidence that GATT rules helped U.S. domestic trade policy commitments.

constant, we can denote the return to the specific factors as $\Pi_i(p_i)$ — a function of domestic prices. By Hotelling's lemma, output is then given by $y_i = \Pi_i'(p_i)$.

The government has tariffs and NTBs at its disposal.[12] We model NTBs that generate a wedge between the domestic and foreign price, as a tariff does, and can also generate rents. The NTBs here are less efficient than tariffs in a single dimension: a fraction ϕ of those rents is dissipated whereas in the tariff case they are available in the form of tariff revenues that can be consumed in the importing country. By allowing ϕ to range between zero and one we can capture different degrees of the inefficiency in a simple but clear way.[13]

In sum, the two key features required to characterize the NTB in the model are its inefficiency relative to the tariff and its impact on the domestic price, i.e. the NTB's *advalorem* tariff equivalent. The per capita rents from using an NTB with *advalorem* equivalent of τ and a tariff t is then given by

$$r(\mathbf{p}) = \sum_i \left[t_i p_i^* + (1-\phi)\tau_i p_i^* \right] \left[d_i(p_i) - y_i(p_i)/N \right]$$

where p_i^* is the world price and $t_i p_i^*$ measures the increase in the domestic price due to the tariff whereas $\tau_i p_i^*$ is the equivalent wedge due to the NTB. The domestic price is thus given by $p_i = (1+t_i+\tau_i)p_i^*$. The second term in brackets represents import quantity (N measures the total population). All the tariff rents (i.e., its revenue) are available for domestic consumption, but for the NTB that is the case for only a fraction $1-\phi \in [0,1]$. We make the standard assumption that the government rebates *these* rents uniformly to all individuals but the results would be similar if the government consumed them directly.

[12] This policy set is determined by the data available to test the model. If we instead included production subsidies and tariffs then the mechanism we explore predicts that the government gains by restricting subsidies and using tariffs.
[13] A specific example of such NTBs are quantitative restrictions where some of the licenses are given to foreigners. The key insight of the model applies to other NTBs that generate a wedge between the domestic and world price and are less efficient than the tariff in maximizing the political surplus, as defined below.

The policies also generate rents for the set of sectors, L, where the specific factors organize into SIGs that lobby the government. The joint gross welfare of lobby i is:

$$W_i = \Pi_i(p_i) + \alpha_i N[1 + r(\mathbf{p}) + s(\mathbf{p})]$$

where α_i is the fraction of the population that owns some of the specific factor in this industry and the terms in brackets are respectively those owners' wage, rebated rents, and consumer surplus. We analyze the case of highly concentrated factor ownership, i.e. $\alpha_i \to 0$, so each industry lobbies only for its own product. This allows us to focus on the interaction between the government and each SIG and abstract from lobby competition. Each SIG offers the government a "lobby good", represented by C_i and described below, in order to obtain an increase in the level of protection it receives. Thus, we denote the net welfare of the members of lobby i by $V_i = W_i - C_i$.

The government maximizes a weighted sum of lobby goods and social welfare:

$$G = \sum_{i \in L} \Psi_i(C_i) + aW(\mathbf{p}), \qquad a \geq 0 \tag{1}$$

where social welfare is given by the sum of indirect utilities over all individuals gross of contributions, including wage and specific factor income plus net taxes (or rents) from policy and consumer surplus:

$$W(\mathbf{p}) = N + \sum_{i=1}^{n} \Pi_i(p_i) + N[r(\mathbf{p}) + s(\mathbf{p})] \; .$$

Several models of SIGs, e.g. Grossman and Helpman (1994), assume that the lobby good is equally valued by the government and the lobby, i.e. that Ψ_i is linear and thus utility is transferable. This is a useful simplifying assumption that may be reasonable if, for example, C_i is cash and there are no contribution limits. However, in several countries— including the one we analyze in the empirical section—there are strict constraints on such contributions. Thus, SIGs can and do resort to other goods and services, which are not necessarily perfect substitutes. Moreover, as Drazen and Limão (2008) argue, politicians may have diminishing marginal utility for lobby goods such as getting out the vote in a district where a lobby's membership is concentrated; providing information about an issue; lending jets for campaigning or vacationing; etc. In sum, we think it is reasonable to assume, as we do, that Ψ_i is strictly concave. The resulting non-transferability of utility between government and lobbies will be key in generating the use of inefficient policies.[14]

There are two stages in the game. In the first, the government decides whether to commit to policy constraints via an international agreement. In the second stage, the government (Nash) bargains with each SIG over the level of lobby goods, C, and policies, (t,τ). We derive the subgame perfect Nash equilibrium for C, t and τ for given policy constraints and then which first stage constraints emerge.

3.2 Absence of Commitment and the Use of the Most Efficient Available Policy

We first show that, in the absence of policy constraints, the most efficient available policy is the only one used in equilibrium. This is a useful baseline for two reasons. First, it starkly illustrates the importance of having access to a commitment technology to generate inefficient policies. Second, as we subsequently show, the government does not always choose constraints even if it has access to a commitment technology; the policy values derived below also apply to the latter case.[15]

Intuitively, why should we observe only the tariff in the absence of constraints? Because the tariff is the politically efficient policy, i.e. it maximizes the joint payoff to the government and lobby for any given level of the lobby good. To see this note that for a given contribution, the lobby payoff, V is identical under a given level of protection whether implemented with a tariff or NTB. But the government payoff is lower under the NTB since it generates only a fraction of the rents. This implies that in equilibrium it is costlier for the lobby to compensate the government for an increase in τ that leads to the same change in imports as an equivalent change in t, and thus only the tariff is used.

[14] An additional, or alternative, motive for non-transferability would be for C to be produced by each lobby using the numeraire as the input into a diminishing returns production process.

[15] In our empirical work the goods where such constraints are absent will therefore be used as the counterfactual to test the model's prediction that constraints on a policy lead to the use of relatively less efficient ones.

To analyze the specific case of no commitment we employ the general Nash bargaining problem solved in the second stage but assume the first-stage tariff constraint is absent or not binding. In the following section we relax this. Formally, we write the problem as follows:

$$\max_{t,\tau,C} \quad U = \left(G(t,\tau,C) - G^0\right)^{\gamma} \left(V(t,\tau,C) - V^0\right)^{1-\gamma} \qquad \text{s.t. } t \le t^c; G \ge G^0; V \ge V^0 \qquad (2)$$

The first order conditions for t, τ and C when $V > V^0, G > G^0$ are given respectively by:

$$\frac{\gamma}{G - G^0} G_t + \frac{1-\gamma}{V - V^0} V_t - \lambda = 0 \qquad (3)$$

$$\frac{\gamma}{G - G^0} G_\tau + \frac{1-\gamma}{V - V^0} V_\tau \le 0 \qquad (4)$$

$$\frac{\gamma}{G - G^0} G_C + \frac{1-\gamma}{V - V^0} V_C = 0 \qquad (5)$$

$$t - t^c \le 0 \qquad (6)$$

along with the (omitted) complementary slackness conditions for (4) and (6). Here a subscript denotes a partial derivative and to ensure an interior solution we assume throughout that $\Psi'(0)\rightarrow\infty$. If the tariff cap is absent or not binding then its multiplier, λ, equals 0 and then from (3) and (5) we obtain:

$$\frac{G_t}{G_c} = \frac{V_t}{V_c} \Leftrightarrow \frac{a t_i (p_i^*)^2 m_i'}{\Psi_i'(C_i)} = \frac{y_i(p_i) p_i^*}{-1} \qquad (7)$$

Subsequently, we will determine the optimal constraint and whether it binds relative to the unconstrained, so it is useful to derive the (implicit) value of the unconstrained tariff from (7) as:

$$t_i^u = \frac{y_i(p_i)}{-a p_i^* m_i'(p_i)} \Psi_i'(C_i) \qquad (8)$$

If C entered the government's objective linearly then (8) would be similar to the expression in Grossman and Helpman (1994) for an organized industry under concentrated factor ownership.

To see that only the tariff is used we show that $\tau = 0$. This occurs if (4) is negative, which must hold whenever $\lambda = 0$ and (3) holds with equality, i.e. whenever there is an unconstrained positive tariff.

This is straightforward to show because $V_\tau = V_t$ —both policies have a similar effect on the domestic price and thus profit—and $G_\tau < G_t$ — since the NTB generates fewer rents than the tariff.

3.3 Commitment Tariff Caps in the Absence of NTBs

We now allow government access to commitment so it can *choose* whether it prefers to set a maximum cap on the tariff prior to negotiating with each SIG. To clearly illustrate the government's incentive to do so we first assume that no other redistribution policies can be used. In the next section we show the government's incentive is still present when less efficient policies are available.

The government sets the cap, t^c, in the first stage by maximizing its objective, in (1), taking into account the effect on the equilibrium tariff and contributions, which are found by solving the Nash problem previously defined but with $\tau = 0$ as an additional *constraint*. The first order condition for t^c is

$$\Psi_i'(C_i)\frac{\partial C_i}{\partial t_i} + a\frac{\partial W}{\partial t_i} = 0 \qquad \Rightarrow \qquad t_i^c = \frac{\partial C_i/\partial t_i}{-a(p_i^*)^2 m_i'}\Psi_i'(C_i) \tag{9}$$

If $t_i^c \geq t_i^u$ then the constraint does not bind; otherwise it binds and this would prove the government's benefit from constraining tariffs ex-ante. Given the independence of irrelevant alternatives in Nash bargaining, the government would actually be indifferent between $t_i^c = t_i^u$ and any higher constraint, so we can focus on determining if (9) is equal to (8) or lower. Omitting the product subscripts the condition for a non-binding constrain is

$$\frac{\partial C/\partial t}{-a(p^*)^2 m'(t^c)}\Psi'(C(t^c)) = \frac{y(t^u)}{-ap^* m'(t^u)}\Psi'(C(t^u)).$$

If $t_i^c = t_i^u$ then the equilibrium values of C, p, and thus y and m' would be identical in (8) and (9). Replacing these above we should then obtain $\partial C/\partial t = \partial \Pi/\partial t$. In the Appendix we derive $\partial C/\partial t$ by implicitly differentiating (5) and show that the equality above holds if and only if either (a) the government has all the bargaining power or (b) lobby goods are valued linearly so utility would be transferable. If the government does not have all the bargaining power and lobby goods have diminishing marginal utility, then $\partial C/\partial t < \partial \Pi/\partial t$, i.e. we have a contradiction that shows the government prefers a constraint. The intuition is the following: if the constraint binds then instead of the equality above we have $\partial(\Pi - C)/\partial t > 0$, which means that relaxing the constraint, i.e. increasing the tariff, would increase the payoff to lobbies with no first order cost to the government (since it is optimally setting *t*). The resulting increase in joint surplus could be collected via the bargaining in the second stage if the government has all the bargaining power. Alternatively, this increase would also be collected if contributions enter linearly so that they are used to share the joint surplus. But if contributions have diminishing marginal utility and the government cannot obtain the entire joint surplus then the increase in *joint* surplus from relaxing the cap is offset by a smaller government share of it. This decrease in the share is due to the deterioration in the government's political terms-of-trade. In other words, a binding cap improves the government's bargaining position thus generating a benefit for it that offsets the loss due to the decrease in joint surplus.[16]

3.4 Commitment and the Co-existence of Efficient and Inefficient Policies

In sections 3.2 and 3.3 we showed that, in the absence of a commitment technology, only the relatively efficient policy is used and commitment generates a benefit for the government. Thus, we may expect constraints on those policies to be the first ones to be pursued in agreements. But SIGs are notoriously creative in finding alternative redistribution policies and the government is not able to constrain all of them.[17] Therefore, we now show how constraints on tariffs lead to the emergence of

[16] Note that the government is able to extract contributions from the lobby under a tariff cap even in the absence of NTBs as long as it can credibly threaten to set a zero tariff. This is certainly the case with WTO commitments since they are defined as a maximum tariff so the analysis applies directly to this case. However, in the case of the customs union the government threat of a zero tariff is less credible since the customs union partner may not allow it to fulfill it. In practice, customs unions probably allow some flexibility for members to threaten to deviate down from the exact external tariff. However, in the extreme case where they do not, the only threat governments can use in bargaining with SIGs is the cap itself in which case the government can only extract contributions if additional unconstrained policies are available, as we analyze next.

[17] One reason for this is that defining, negotiating and enforcing such constraints on every potential policy is very costly. These costs can explain why agreements such as the WTO remain highly incomplete contracts. We take the availability of commitment technology across policies as given but conjecture that the model can be extended to predict that the governments would optimally choose to first commit in the most efficient policies if there is some fixed cost to committing.

less efficient policies. We first take these constraints as given, as they would be in the second stage, and derive their impact on NTBs. This is one of the relationships we estimate in the empirical section.

Let us first explain how tariff caps, $\overline{t}^c$, can lead to NTB use in the second stage. Clearly if that cap is equal to zero and the NTB were also set to zero there would be gains from trade between the lobby and government. This occurs since when t=τ=0 the lobby offers C=0 and the marginal benefit of increasing C is sufficiently large to the government— as is simple to verify using (4) and (5). Given the large gains from political trading at $t = \tau = 0$, it is also straightforward to show that an NTB will also be used for some strictly positive cap level. However, as the cap increases the NTB value must eventually decline since, as we have shown earlier, when $\overline{t}^c = t^u$ we have $\tau = 0$. So our model predicts that:

(i) a good with a sufficiently low tariff cap implies an NTB will be used and

(ii) the likelihood and the value of the NTB are eventually decreasing in the value of that cap, or more precisely the difference between that cap and the unconstrained tariff value.

Alternative models could predict similar relationships between tariffs and NTBs in *all* goods. One specific feature of our model, and one we will test, is that it predicts these relationships only in goods where a binding tariff cap exists. Before generating any additional predictions, we derive the precise NTB expression to show the results above and guide the estimation more precisely.

The interior NTB solution under a tariff cap equalizes the marginal rates of substitution across policies for the government and lobbies, as we can see from solving (4) and (5) to obtain:

$$\frac{G_\tau}{G_c} = \frac{V_\tau}{V_c} \qquad \Leftrightarrow \qquad \frac{a\left[\left(\tau_i(1-\phi)+\overline{t}_i^c\right)(p_i^*)^2 m_i' - \phi p_i^* m_i\right]}{\Psi_i'(C)} = \frac{y_i(p_i)p_i^*}{-1} \qquad (10) \quad ,$$

which we can re-arrange to obtain

$$\tau^c{}_i = \frac{1}{1-\phi}\left[\frac{y_i(p_i)}{-ap_i^* m_i'}\Psi'(C_i) - \overline{t}_i^c\right] - \frac{\phi}{1-\phi}\frac{1}{\varepsilon_i} \qquad (11)$$

where $\varepsilon_i = -m_i'(p_i)\left(p_i^* / m_i(p_i)\right)$ is a measure of the absolute value of import demand elasticity. We immediately see that if the tariff constraint was zero and the NTB was almost as efficient as the tariff, i.e. $\phi \to 0$, then the NTB level would equal the first term in the brackets, which is exactly the unconstrained tariff level in (8), t^u. More generally, the NTB level is increasing in the gap between the "unconstrained level" and the cap. This is one of the central predictions we will test.

3.5 Commitment Decision

We now derive the set of goods and the extent of policy commitment the government chooses. At the end we also discuss the impact of allowing SIGs to *directly* influence those commitments.

The government commitment decision in the first period can be modeled in two ways: (a) allow it to choose whether to commit to an exogenously given cap or (b) allow it to choose whether to commit *and* the optimal level of the cap that maximizes its objective in the first stage. It is important to show the result for the first alternative—commitment to an exogenous cap—since it may be the only available one. One example is when a country must adopt another's common external tariff and it can at most decide if a given good is subject to an exogenous cap level. Another example is if the government has *some* influence over the cap level but is unable to choose it to exactly maximize its objective as we represented it (e.g. if there are other constraints unobservable to us). Thus, we first derive sufficient conditions such that a government can benefit from a commitment to a cap even if it is not necessarily able to set its level optimally.

In the first stage, the government chooses to commit to an exogenously *given* cap in a product *i* if its payoff evaluated at the constrained equilibrium exceeds the unconstrained:[18]

$$G(\overline{t}_i^c, \tau_i^c(\overline{t}_i^c, \gamma_i), C_i^c(\overline{t}_i^c, \gamma_i), .) \geq G(t_i^u(\gamma_i), \tau_i^u(\gamma_i), C_i^u(\gamma_i), .) \qquad (12)$$

[18] Given the separability of *G* over goods *i*, we can treat the choice over *each* good independently of each other. If the government had to choose between entering an agreement with an exogenous cap on a *set* of goods and could not opt out of any given one then we would need to consider the aggregate effect and (13) would not necessarily hold for each *i.* In the WTO and in some PTAs the government has some discretion to opt out, which is why we focus on this formulation.

where the equilibrium values of the unconstrained and constrained variables are respectively determined in sections 3.2 and 3.4. If (12) holds then the government chooses to commit even if it cannot choose the optimal cap, thus it would also want to commit if it could choose the value of $\overline{t}^c$ that maximizes the left-hand side of (12). This means that a sufficient condition for (12) to hold is also sufficient to ensure that a government commits to an optimal cap level of its choosing.

We illustrate the result in Figure 1. The bold line represents the Pareto frontier of payoffs for the government and each SIG in the absence of commitment. No commitment yields a higher *joint* payoff than the alternative where the tariff is constrained and the NTB used. Note first that for a large enough bargaining power (12) never holds, that is the government always chooses *not* to commit to a cap. This is obvious for $\gamma = 1$, since then the government obtains the entire surplus and never wants it reduced. It is also simple to illustrate that the same is true for other sufficiently high γ that are still lower than 1. When the cap is sufficiently low the maximum *possible* government payoff is strictly lower than with no constraint. We can thus define γ^h such that $G^u(\gamma = \gamma^h) = G^{cM}(\gamma = \gamma^h)$, as shown in figure 1. Therefore, governments with sufficiently high bargaining power do not commit to a stringent cap.

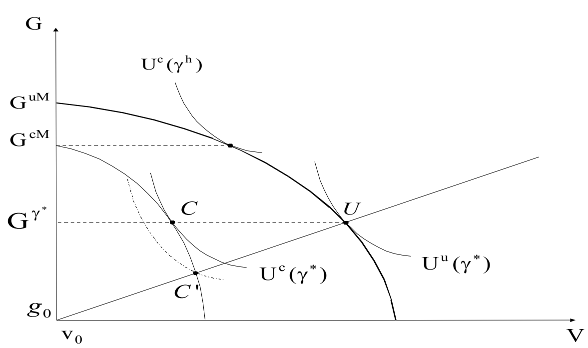
Governments with no bargaining power are indifferent between policies. When γ is zero, equation (12) must hold with equality since the government obtains its reservation payoff, which is the free trade equilibrium in good *i* and thus it is identical with or without commitment. Therefore, (12) holds with a strict inequality if as we increase γ from zero the government payoff increases faster under commitment than in its absence. When this is the case the government has a strictly higher payoff under commitment for some $\gamma \in (0, \gamma^*)$, where γ^* is defined as the lowest positive γ at which (12) holds with equality. More formally, the sufficient condition for this is

$$\lim_{\gamma_i \to 0} \frac{d}{d\gamma_i} G(\overline{t}_i^c, \tau_i^c(\overline{t}_i^c, \gamma_i), C_i^c(\overline{t}_i^c, \gamma_i), .) > \lim_{\gamma_i \to 0} \frac{d}{d\gamma_i} G(t_i^u(\gamma_i), \tau_i^u(\gamma_i), C_i^u(\gamma_i), .) \qquad (13).$$

This condition can be simplified and interpreted in an intuitive way that in our context requires the improvement in the government's bargaining position from committing to a tariff cap to exceed the loss arising from the reduction in bargaining surplus due to the constraint and subsequent use of the NTB. Drazen and Limão (2008) show this for a different set of policies and note that this condition need not always hold and must be checked in each policy setting. Thus in the Appendix we provide a numerical simulation showing this condition holds in our model if the cap is not too stringent relative to the unconstrained value. Very stringent caps make the *sufficient* condition less likely to hold because they destroy too much surplus, which cannot be offset by the government's increased share in it.

Figure 1 illustrates the role of bargaining power in the government's decision to commit. Consider a $\gamma \in (0, \gamma^*)$ so that point *U* is the solution under no commitment. Consider the ray from the origin that maintains the same ratio of payoffs at *C*' as at *U*. The dotted Nash iso-value line at *C'* has the same slope as U^U at *U* (since the Nash product is log linear) indicating an unchanged marginal rate of substitution of payoffs. But the Pareto frontier under commitment is steeper due to the inefficiency of the NTB and the fact that the government has diminishing utility for lobby goods. Thus the equilibrium under commitment entails a value of *G* above *C'*, which at the critical value γ^* is equal to the unconstrained level. For lower γ the government payoff is higher when it commits to a constraint.

Fig.1: Impact of Policy Constraints on Payoffs



In sum, the model predicts that a government is less likely to commit to a cap in products where its bargaining power is higher. If the government prefers to commit to an exogenous cap for some $\gamma \in (0, \gamma^*)$ then it also prefers to do so if it can optimally choose the cap *level*. Moreover, if γ is sufficiently high then it chooses not to commit even if it can optimally choose the cap level since, in the limit, when it has all the bargaining power any commitment constrains the overall surplus it receives.

When we examine the data, we will consider the role of bargaining power in determining if the government constrains the tariff in a given good. However, from that data alone it is not always obvious that the constraint will bind. In fact, in the absence of any other cost from committing, the government could always choose to commit to a tariff constraint for any bargaining power if that constraint was not binding. Thus bargaining power may not have a strong effect on the choice of goods a government binds, particularly if the government has some influence on the cap level. But in that case we can explore a related prediction: a positive relationship between bargaining power and the cap to unconstrained tariff difference. As noted before, when $\gamma<\gamma^*$, equation (12) holds strictly for an exogenous cap and thus it must also hold if that cap is optimally chosen. Therefore $t^{c*}(\gamma)$ - $t^u(\gamma)$ is negative for at least some $\gamma<\gamma^*$ but it must be non-negative for sufficiently large γ.

To sharpen the model's predictions we have thus far assumed that SIGs have a negligible ability to influence the first stage constraints. This absence of ex-ante lobbying is also used by others in the context of trade agreements, c.f. Maggi and Rodriguez-Clare (1998), and it would be satisfied for example in industries that are expected to organize but have not yet done so at the commitment stage (so they cannot lobby against constraints). It may also be a reasonable assumption for organized industries provided that the government is somewhat insulated from their pressure during the international negotiation stage. It is also important to note that we can relax this simplifying assumption. For example, we can show that policy constraints can emerge in equilibrium even if we allow the government and SIG to bargain over them during the first stage; this would occur provided the government has higher bargaining power during the first stage than the second.[19]

3.6 Social Welfare Value of Commitment

Before testing any predictions, we clarify a key normative implication of the model. The government joins an agreement if it improves its objective in (1) so, as shown, the agreement provides a *political* commitment value. We now ask if there is also a social welfare value of commitment.

A necessary condition for social welfare to increase with commitment is for total protection to fall. In the absence of NTBs, this reduction is both necessary *and* sufficient; so in this case the agreement has both a political *and* a social welfare commitment value since the new protection level is simply $t^c < t^u$, as shown in section 3.3. However, if we allow for NTBs to substitute for the constrained tariffs we must also determine if total protection falls by enough to offset the inefficiency of the NTB.

Total protection under commitment is $\tau^c + t^c$, for a given $t^c < t^u$. If the NTB is as efficient as the tariff, and thus a perfect substitute for it, then total protection should be unchanged, i.e. if $\phi = 0$ then $\tau^c + t^c = t^u$. Therefore, if an increase in ϕ reduces τ then total protection will be lower under commitment. In the appendix we describe how to employ the parameterized model to show this effect. As we report in the working paper, when $\phi = 0$ there is full substitution and so no change in total protection; but inefficient NTBs do lower total protection, e.g. we find that commitment causes total protection to fall by more than 5% if $\phi = 0.3$ —a value close to our subsequent inefficiency estimate. The exact magnitudes depend on other parameter values but the key point is that it is simple to find cases where the government chooses to commit and total protection falls by a non-trivial amount.

Even if total protection falls, a part of it is now done via a less efficient policy, which generates fewer rents. If those rents are consumed by the government, then social welfare, as measured by the

[19] This could be because the government has direct participation and control over the negotiations in an international trade agreement, or because some lobbies may have not yet formed, for example. If we assumed instead that the import SIGs have full control over any tariff constraints via international agreements then the model would predict that tariff commitments would never take place. Ultimately, whether such commitments occur and are affected by bargaining power is not a theoretical question but an empirical one, which we address in section 4.

sum of producer and consumer surplus, would still increase under the lower levels of protection achieved by commitment. However, if the rents are rebated to the citizens then we need to factor in this change, which may decrease welfare. Despite this ambiguity on the change in rents, we can show that if total protection fell sufficiently then the net effect of commitment on social welfare would be positive. The parameterized model in the appendix for example yields a 1.5 percent increase in social welfare if the government chooses to commit in a good where the degree of NTB inefficiency is $\phi = 0.3$.

To summarize, by allowing commitments to restrict tariffs the agreement leads to the use of less efficient policies. This imperfect policy substitution throws "sand-in-the-wheels" of the redistribution process and tends to improve social welfare to the extent that it reduces total protection. Thus in the empirical section we will try to estimate if there is policy substitution and it is imperfect. Finally, it is important to note that the social welfare effect is a positive side benefit rather than a sufficient or even necessary motive for the government to enter such agreements.[20]

4 EVIDENCE

We now investigate several predictions of the model. First, we examine the impact of tariff constraints on the use of the typically less efficient non-tariff barriers (NTBs). We then estimate the impact of bargaining power on governments' commitment choices in international trade agreements. Next, we quantify each of these effects and the impact of bargaining power via tariff commitments on NTBs and provide structural estimates of how inefficient these NTBs are.

4.1 Commitment and the Use of Less Efficient Policies: Data and Empirical Strategy

We exploit variation in tariff constraints generated by the two most common types of commitment in these policies: those in multilateral and preferential trade agreements. WTO members negotiate tariff "bindings" in certain products, which are essentially ceilings on applied tariffs. If countries set their

[20] We can see it is not sufficient since the government chooses not to commit if it has sufficient bargaining power even though commitment can increase social welfare. It is not necessary since the government would commit even if it placed no value on social welfare, e.g. if W in (1) represented only the policy rents and these were consumed by the government.

applied tariffs above that binding, they may be subject to costly dispute from foreign exporters.[21] When those costs are sufficiently high, the government can credibly constrain its maximum tariff and, according to the model, if that tariff constraint binds there is a higher likelihood of an NTB. Moreover, all else equal, the lower the tariff binding level relative to the unconstrained the higher the NTB *advalorem* equivalent. Given this, we exploit the cross-product variation in tariff binding status and binding level in the WTO to examine their effect on the use of NTBs.

In PTAs, countries agree to preferential tariffs between themselves and, in certain cases, to set a common external tariff. Non-enforcement of those tariffs can generate retaliation by other PTA members—a cost that provides an additional source of commitment. Moreover, when there is a large asymmetry in the size of members the common external tariff is determined by the existing tariffs of the larger partner. This can generate a large change in tariffs for the smaller partner that is likely to be "exogenous" in the sense that it is independent of other determinants of its trade policy. For example, the WTO's Trade Policy report for Turkey notes it had to adopt EU tariffs as they existed, except in some products that were temporarily excluded. If the common EU tariff constrains Turkey to lower its own tariffs then the model predicts additional Turkish protection via NTBs on non-EU exporters.

Background information on country selection

Several of the predictions of the model are better tested by exploring cross product rather than cross-country variation since the latter would contain considerable unobserved heterogeneity. Given this and the detailed data required for some variables, we focus on a single country. The template of the analysis can subsequently be applied to other countries for which such data is collected. Our country choice was guided by data and theoretical considerations. First, we require a country with NTB data and with variation in binding status in the WTO. Since the implementation of the Uruguay Round commitments many developed countries have bound most of their tariff lines. Thus we focus on

[21] These can range from the costs of legal defense to the loss of market access if the exporter retaliates by increasing tariffs.

Turkey, which has bound only about half. Second, the NTB data for this country is available for the year immediately after an important customs union with the EU that led to a substantial cut in Turkey's external tariff. Third, Turkey has strict laws on cash contributions to politicians, which suggests that industries must reward them using "lobby goods". These goods are more likely to be subject to diminishing returns than cash and thus Turkey fits our model better than a country where unlimited cash contributions are possible.[22] Moreover, the theory focuses on a small open economy, which rules out several alternative countries.

Below we discuss the different variables we employ. The data appendix provides more detailed information about their source and construction and Table 1 provides summary statistics.

To place the analysis in context, we note some basic facts. Turkey implemented a major trade liberalization in the 1980s that reduced tariffs and removed NTBs, such as quotas (Togan, 1995). Therefore, by 1994 only about 2% of all HS-6 lines were subject to any NTB, which implies there is little variation to exploit in that year. Moreover, there is no data on NTB *advalorem* equivalents that most closely match the theory's predictions; such data is only available for 1997.

In 1997 Turkey had considerably more NTBs than in 1994. They covered about 9% of all HS-6 products spread through at least a third of 97 different HS-2 industry classifications. The NTBs were almost exclusively classified as authorization for imports, e.g. requiring a product to satisfy specific criteria before being imported.[23] This increase in NTBs since 1994 could have been due to new tariff commitments, as our model predicts. In fact, by 1997, there had been two recent changes to Turkey's tariff constraints that may have caused the increase in NTBs. First, it had started to implement

---

[22] In the last election, the elected party's revenue share from private contributions was less than 0.1% whereas 92.5% was from state funding. Accessed at <http://www.akparti.org.tr/gelir_gider/haziran.htm>

[23] There were no safeguard measures or countervailing duties in Turkey in 1997. But there were a few anti-dumping barriers, which we do not account for in our main analysis because (i) they applied to specific countries whereas our theoretical model focuses on NTBs that apply equally to all exporters and (ii) the NTB advalorem equivalent measure available to us did not include anti-dumping. Incorporating these measures should not affect our main results since they apply to only 31 products, which is less than 1% of the products in our sample. As a robustness test we redefine the NTB indicator to reflect anti-dumping (from the *Global Antidumping Database* by Bown, 2009) and find that the results that use this new indicator as a dependent variable are identical to the ones that ignore anti-dumping in those 31 products.

additional WTO bindings, increasing the share of goods covered from 30% to about 47%, and reducing binding levels from about 41 to 30% on average. Second, the 1996 customs union led Turkey to adopt the EU external tariffs and thus generated a large reduction in the tariffs it applied to non-EU countries.

An interesting question is to what extent these Turkish NTBs were intended to protect the consumer and the environment—as Turkey claimed in a 1998 WTO report—or a relatively inefficient way of protecting importers, as required by our model. It is impossible to answer this for each product, but in our working paper we provide evidence that on average the NTBs were *not* used for consumer and environmental protection but rather for import protection motives. One piece of evidence that is worth mentioning is that *none* of Turkey's NTBs actually covered the products that are widely considered worthy of consumer and environmental protection by WTO members. Furthermore, our model can provide structural estimates that, as we will see, indicate NTBs are indeed less efficient than tariffs, particularly in organized industries where NTBs are most likely used for protectionist motives.

4.2 Impact of Commitment on NTBs: Baseline Results

We write the NTB econometric model for the population of products *i* in a given year as

$$NTB_i^* = \beta \,\mathrm{BIND_i} + \beta_c \,\mathrm{BIND\_TARIFF_i} + \beta_\varepsilon\, (\mathrm{BIND_i}/\varepsilon_\mathrm{i}) + \alpha + \theta\, z_\mathrm{i} + e_\mathrm{i} \qquad \text{(E1)}$$

where NTB_i^* represents a latent variable capturing the NTB, which maps into the observed NTB variable in different ways depending upon whether we estimate the likelihood of an NTB or its *ad valorem* equivalent (AVE). The first three terms in (E1) capture the determinants of the NTB AVE highlighted in eq. (11) of the theory. Thus the model predicts that $\beta > 0$, i.e. higher NTBs for products where a binding tariff commitment is present, i.e. goods where $\mathrm{BIND_i}=1$. For these goods, an increase in the commitment tariff, denoted by $\mathrm{BIND\_TARIFF_i}$, should lower the NTB; so $\beta_\mathrm{c} < 0$. Moreover, the NTB should be decreasing in $1/\varepsilon_\mathrm{i}$ —the import elasticity measure—so $\beta_\varepsilon < 0$. We follow the theory closely in our baseline estimates but in testing the robustness of the results we also allow for additional determinants for NTBs, which we include in z_i.[24]

We identify a product as having a tariff commitment, and set $BIND_i$=1, if it has a formal constraint in the WTO. We refer to such products as having tariff bindings, which is their common designation in the WTO.[25] We measure the level of tariff commitment, $BIND\_TARIFF_i$, in two alternative ways. We first employ the official binding level in the WTO, which corresponds to t^c in our model. We then augment this to capture the difference relative to the unconstrained tariff, i.e. $t^c - t^u$ (recall that the first term in the brackets in equation (11) is the unconstrained tariff, t^u). The model suggests we construct t^u as the applied tariff in the absence of a commitment in that product. This counterfactual is calculated as the average applied tariff over the products with no commitment. We do this using values for 1993 (thus pre-determined relative to the 1997 NTB) and averaging separately for each industry (to ensure that the counterfactual for each product *i* better matches the incentives for the unconstrained tariff in the industry it belongs to).

We first provide baseline results and then test their robustness, e.g. to endogeneity concerns.

Likelihood of inefficient policies

Table 2 presents Probit estimates based on (E1) where the dependent variable is equal to 1 if good *i* was subject to an NTB in 1997 and zero otherwise. In column 1 we find that a WTO tariff commitment increases the probability of an NTB, as the model predicts. In column 2, we also include the level of the tariff commitment and confirm that the higher it is the lower the probability of NTBs.

Using the tariff constraint alone to proxy for whether it binds implicitly assumes that the unconstrained tariff level is similar for all bound goods. But a commitment tariff of 20% may constrain one product and not another. Thus in column 3 we include the difference between the constrained and

[24] In the baseline results we do not interact our variables with lobby organization because there is no such data at the product level. Thus we implicitly assume that all products are organized; any resulting measurement error is likely to generate attenuation bias. Subsequently, we analyze the effect of lobby organization at the *industry* level.

[25] This correctly captures the goods for which there is no commitment as also not having a cap that binds but may misclassify some with a non-binding commitment. Any resulting measurement error should cause attenuation bias and thus make it less likely for us to find significant support for the model's predictions.

unconstrained tariffs, i.e. t^c - t^u , measured as described above. We find that increases in this tariff difference lower the probability of an NTB.

One potential concern is that the binding status proxies for an omitted variable that affects NTBs. Here, we address this in two ways. First, we confirmed that the results in columns 1-3 are robust to unobserved heterogeneity by including sector dummies defined at the HS-1 level (results are available on request). Second, we test if a more specific variable—the timing of tariff commitments—is insignificant; if that were the case and binding status on other goods remained highly significant this would be evidence that the latter simply captures an omitted variable. We find evidence *against* this hypothesis in column 4, where we include a dummy for the subset of products with new tariff commitments already being implemented by 1997. The probability of an NTB is higher for those products and in fact binding status for the remaining products is statistically insignificant. This strongly suggests that the variable is capturing the intended effect rather than an omitted factor.

We then test if the constraints from the customs union with the EU affected Turkish NTBs. We exploit the fact that, in 1997, only 85% of Turkish tariffs in our sample were constrained by the EU external tariff while the other 15% were phased in later. Thus, the dummy EU BIND equals one for those constrained products and, in columns 5 and 6, we find it increases the NTB likelihood, similarly to WTO BIND. In addition, the level of the constraint for the bound products is given by the EU external tariff, which is expected to have a negative effect on NTBs; this is what we find in column 5 and 6 (where the latter is adjusted by the Turkish unconstrained tariff, t^u, as measured as before). The results for the WTO variables remain unchanged so both types of commitment have similar qualitative effects. Throughout we will include the WTO and EU constraints separately and allow the data to determine if they are significant.

As part of the customs union, Turkey was required to harmonize its commercial policy in the textile sector with that of the EU. However, our data show no NTBs in textiles in 1997. Nonetheless, we test the robustness of the results to excluding textile *and* clothing products from the sample. The results appear in column 7 and they are very similar to the previous ones.[26]

Intensity of inefficient policies

In order to quantify the impact of tariff commitments it is necessary to know how restrictive an NTB is. Moreover, the structural equation (11) gives us specific guidance about the functional form and determinants of the NTB AVE. Estimates based on that structural equation will be our baseline estimate but before that we provide some basic results analogous to the Probit.[27]

In columns 1 through 7 of Table 3 we regress the NTB AVE on the same set of variables used in Table 2 and find qualitatively similar results. Binding the tariff of a product via the WTO or a customs union significantly increases the AVE. Tighter tariff constraints also increase the AVE significantly. This holds whether we use the tariff bindings in the WTO or the EU by themselves (column 5) or, as eq. (11) suggests, adjusted with the unconstrained Turkish tariff (column 6).

The similarity to the Probit results is partly explained by the large share of censored observations, which imply the binary effect of bindings on using an NTB is strong. But it is important to note that the constraints on tariffs also affect the restrictiveness of existing NTBs. Using column 6 for example we calculate the effect of binding a product in the WTO *if it already* has an NTB and find it is about 10 percentage points (p.p.) (i.e. E(NTB|**x**, NTB>0,WTO BIND=1)-E(NTB|**x**, NTB>0,WTO BIND=0)). Similarly, the NTB AVE is higher for tighter WTO tariffs. The effects for the EU are also significant and of the expected signs. We discuss their magnitudes and implication for imperfect policy substitution in section 4.8.

The estimation using AVEs provides interesting quantitative results and shows that the commitment effect also occurs on the "intensive" margin of NTBs and not just on their likelihood.

---

[26] Turkey was also required to incorporate EU legislation on technical barriers to trade by 2001. However, progress on this was rather slow and limited even by 2005 so they are not an issue for our 1997 sample (see Togan, 2005, and the EU reports at http://europa.eu/legislation_summaries/enlargement/ongoing_enlargement/community_acquis_turkey/e07113_en.htm).
[27] The *advalorem* equivalents are estimated by Kee et al (2009) at the HS6 level for several countries. In the data appendix we briefly describe their estimation and the adjustment we make to use this data.

Moreover, using AVEs will allow us to relate our estimates to the structural parameters in eq.(11). To do so we include the import demand elasticity measure in column 8. It has the predicted negative sign but it is imprecisely estimated, perhaps because it is imperfectly measured and affected by some outliers, as shown in Table 4. The results on the commitment variables remain essentially unchanged.[28]

One other piece of evidence suggests that the commitment effect is not simply capturing a correlation between all tariffs (bound and unbound) and NTBs. When we add the Turkish applied tariff for unbound products to a specification otherwise similar to column 5 in Table 3 we find that unbound tariffs are positively correlated with NTBs (result available on request). But the tariff effect via bound products remains negative and significant. A similar conclusion holds when we add this variable to the specifications in columns 6 or 8. This strongly suggests that the negative effect of tariffs on NTBs when the product is bound captures the channel highlighted by the model.

While our model predicts tariff bindings and NTBs are substitutes, alternative models predict the opposite. So our findings do rule out potentially interesting alternatives.[29]

4.3 Impact of Commitment on NTBs: Endogeneity and Other Robustness Tests

The baseline results in column 7 are robust to a variety of other issues, which we now describe.

We follow the theory closely and so are parsimonious in the inclusion of regressors. This raises the possibility that an omitted variable, e.g. some unobserved political economy motive in Turkey, may influence both its WTO binding decisions and NTB levels. We now address this in two ways. First, in column 2 of Table 4 we control for unobserved heterogeneity using sector dummies. The results are qualitatively similar to the baseline (replicated in column 1) with two caveats. First, the magnitude of the binding coefficients is lower (but still considerable). Second, the EU dummy effect can no longer be identified because it has essentially no variation within sectors since most of the exclusions were in

[28] We adjust this elasticity to match the form it takes in eq. (11) and instrument for it using the elasticities of other countries.
[29] In fact, the scant empirical evidence on this point indicates that in 1970 U.S. NTBs were more likely in industries with higher tariffs (Ray, 1981) and those where applied tariff cuts had been smallest (Marvel and Ray, 1983). The difference in results highlights the importance of carefully modeling and estimating the relationship between policies.

agricultural products. Thus the remaining variation in this variable is spurious (it is equal to 1 for 98% of the sample in column 2) and so we attach little weight to it.

To address any omitted variable bias and other sources of endogeneity we also instrument the WTO binding and tariff. As instruments we employ the mean of WTO BIND and WTO BIND TARIFF in each product over five WTO members that do not trade much with Turkey but are broadly similar to it, particularly in their overall fraction of bound products. These variables are positively correlated with their Turkish counterparts and yield reasonable first stage predictions. Moreover, these instruments pick up motives that are similar across countries for binding tariffs but *not* any Turkish-specific reasons for why it sets a particularly high (or low) binding in a given good, i.e. the instrument avoids the variation in Turkish bindings most likely to be correlated with how it sets its NTBs.[30]

Column 4 of Table 4 presents the estimates of the IV procedure just described. The instrumented variables have the same sign as in the baseline and remain significant. However, the most important point is that we fail to reject exogeneity at a very high probability: 0.88 as seen at the bottom of the table. Note that in Tables 4 and 5 we report a similar exogeneity statistic for all other specifications. This statistic is derived from running the specification in its respective column *but* instrumenting the WTO binding variables. We cannot reject exogeneity in any of the specifications and therefore we focus on the more efficient estimates where these variables are treated as exogenous.

The results are also robust to trimming 15 outlier observations with AVEs greater than 170%, which is several times larger than the median over positive AVEs. Trimming these values does not alter the baseline results in a substantial way except to increase the impact and precision of the import elasticity variable, as seen in column 3 of Table 4.

Our model's predictions are derived for industries that are organized, i.e. those that lobby for trade protection. In practice it is very difficult to identify these precisely, as is well known in the literature (c.f. Goldberg and Maggi, 1999). Nonetheless, using a reasonable proxy we can ask if the effects are

[30] The Turkish government had little or no saying on the EU commitment tariffs so we treat them as exogenous throughout.

stronger for those industries more likely to be organized. We do so in Table 5 where we use a standard measure of organization: if an industry in Turkey lists an organization in the World Guide for Trade Associations. We find that the marginal effects for the significant variables are stronger for industries more likely to be organized, in column 2, than for the others, in column 3. Those effects are even more pronounced if we calculate elasticities. Moreover, the sign of the coefficient on the import demand elasticity is negative, as predicted, for the likely organized but positive for the other industries. In sum, there is evidence that the results are stronger for the industries one would expect if the model is correct. We find even stronger evidence for the role of organization when we study a more specific model prediction regarding commitment.

Table 5 also provides evidence using a standard measure of NTB intensity when AVEs are unavailable. The coverage ratio measures the fraction of HS-8 sub lines within an HS-6 that are subject to an NTB. As we can see in columns 4-6, the coverage ratio results are qualitatively similar to the AVE ones (the magnitudes are obviously not comparable given they are not in similar scales).

In sum, the results in tables 2, 3, 4 and 5 indicate that international constraints on tariffs increase the probability and restrictiveness of NTBs. These effects are dampened if the tariffs are constrained at higher levels, as the theory predicts. In addition, the effects appear to be related to the actual implementation dates of caps, present only for bound tariffs and somewhat stronger in industries likely to be organized. Therefore these results support several key predictions of the model.

4.4 Impact of Bargaining Power on Policy Commitment: Data and Empirical Approach

The model also predicts which goods a government prefers to constrain tariffs in and the level of that constraint. We analyze the WTO commitments since in the EU case the Turkish government had little or no choice over the tariff levels. The basic econometric model is now given by

$$COMMIT_i = \alpha + \beta_\gamma \, g(BARG_I) + \mathbf{x}_i \boldsymbol{\theta} + e_i \qquad \text{(E2)}$$

where **x** is a set of control variables and $COMMIT_i$ captures how restrictive the desired commitment tariffs are. We focus on estimating if β_γ is positive, i.e. if the government prefers a less restrictive commitment when it has higher bargaining power relative to a SIG, which is captured by $BARG_I$.

We only observe commitment tariffs, t^c_i, for products that are bound. According to the theory this is not a random sample, which is something we will confirm in the data. So, we need to account for the selection effect. The theory provides specific guidance on how to econometrically model it. First, the binding decision and its level depend on similar factors. Second, if we do not observe the commitment tariff it is because it would not bind, i.e. the desired commitment would have been higher than t^u_i. This strongly suggests a model with right censoring for t^c_i equal to t^u_i for the products that are not bound.

Many variables could potentially proxy for bargaining power and if we searched enough for the "appropriate" measure, we could certainly confirm *any* theoretical prediction. To avoid this pitfall we constrain ourselves to measuring bargaining power in a way that captures the Nash parameter γ as closely as possible to the theory. Binmore et al (1986) show that Nash bargaining can be interpreted as a bilateral game of alternating offers, where the parameter γ reflects the relative discount factors of agents. Thus if we denote the discount factors of the government and the SIG in industry I by δ_g and δ_I respectively, then bargaining power should be measured as $BARG_I = \delta_g / (\delta_g + \delta_I)$.

The parameter δ_g (or δ_I) can be thought of as the product of the probability that the government (or industry) survives another period and the weight it places on next period's payoffs if it survives. In several contexts, the latter component is simply captured by a measure of the inverse interest rate that the government or industry have access to. In our baseline measure, we assume that all industries in a given country have access to the same rate and so the only relevant industry variation affecting $BARG_I$ arises due to differences in their probability of survival; the lower the probability of survival of an industry, the higher the bargaining power of the *government* ($BARG_I$) is.

We use (1-exit rate_I) to capture the probability of survival of firms in industry I. Given that we are considering a cross section for a single country, the government's probability of survival or interest rate does not affect the estimated sign of the parameter β_γ in the regression. Nonetheless, we also employ data on Turkish governments' tenure in power to measure their survival rate so that subsequent analysis could eventually exploit cross-country or time variation in it. It is not obvious what the exact period length should be; we focus on a one year horizon but find the results are robust to longer periods such as four years. Given the potential for measurement error we use g($BARG_I$) where g(.) transforms $BARG_I$ into categorical variables that divide industries into terciles.

4.5 Bargaining Power and Commitment: Baseline Results

The model predicts that a government is more likely to constrain tariffs in products where it has low bargaining power (henceforth low BP). The results in Table 6 confirm this: 59% of products in such industries are bound versus only 41% in industries relative to which the government has higher BP. The selection effect is stronger for the subset of organized industries where the probability of binding is 22 percentage points higher under low than high BP, a difference that is statistically and quantitatively significant. Moreover, for unorganized industries that difference is statistically equal to zero. Thus we only find a significant effect for the organized industries—exactly as the model predicts.

The results described above are robust to controlling for other regressors such as the number of exporters and exporter value concentration indices. As we noted in the theoretical section, a government can bind a product and then choose a high tariff, which effectively invalidates the impact of the commitment. Hence, rather than focusing on the probability of commitment separately we will consider it jointly with the restrictiveness of the commitment. Thus, in Table 7 we estimate the impact of BP on the desired WTO tariff commitment using the censoring procedure described above.

The first column of Table 7 shows that the government sets higher tariff bindings in industries where it has medium or high BP. The model predicts this relationship to be present in industries that are organized but not in unorganized, which is exactly what we find in columns 2 and 3 respectively.

To focus, as the theory does, on how restrictive the commitment is we also analyze t^c - t^u . The results above, which used t^c, provide direct evidence for the model's prediction only if t^u does not change much with BP. Rather than assuming this, we test it directly by employing $t^c_i - t^u_i$ as the dependent variable. The right censoring point suggested by the model is now zero, i.e. if we do not observe the commitment tariff it is because it would not bind. In the last three columns of Table 7 we confirm that the government sets more restrictive tariff bindings in those industries in which it has low BP and the effect is only significant for the organized ones.[31]

The theory assumes that Turkey is small in order to isolate the commitment channel. However, recent evidence by Broda, Limão and Weinstein (2008) suggests that even if the country is not large on aggregate its tariffs in *some* goods may still affect the prices received by foreign exporters. This generates an incentive for foreigners to lobby Turkey for lower commitments. To control for this incentive we include two additional regressors that are outside this model but featured in the tariff negotiation literature: the number of exporters and a Herfindahl index of export value in a given good. Ludema and Maya (2005) for example show that if the export sources of a good are highly concentrated then any given exporter is more likely to negotiate a tariff reduction; so we expect Turkey's tariff binding to be decreasing in the export Herfindahl index. Holding this concentration measure fixed, an increase in foreign exporters implies a larger pressure for Turkey to bind at lower levels. The results in Table 7 confirm the sign and significance of these effects.

4.6 Bargaining Power and Commitment: Non-parametric Evidence and Robustness Tests

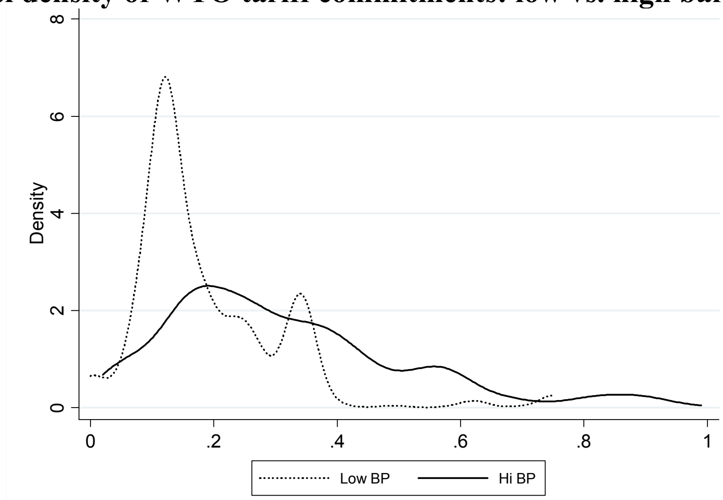
We now provide additional robustness checks and evidence for the model's predictions.

In the working paper we show that the results in Table 7 are robust to alternative censoring points. Furthermore, the model predicts that the difference in tariff commitments should be strongest when contrasting industries where the government has high BP versus those with low. We confirm this by including separate variables for high and medium BP and finding tariff bindings for high BP larger than both medium and low BP; the difference between high and low BP is at least 20 percentage points.

[31] We find similar effects if instead of splitting the sample according to organization we employ interactions with the organization indicator. We also obtain similar results using a Heckman selection model, which also shows that bargaining power lowers the probability to bind but only in organized industries. Both sets of results are available on request.

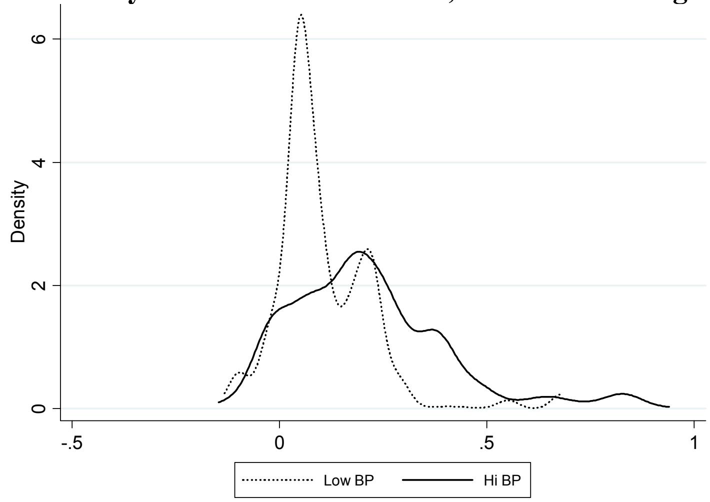
The evidence that high BP industries have higher commitment tariffs goes beyond the conditional means just discussed. Figure 3 presents a kernel density estimate of the observed WTO tariff commitments. The dark line represents the subset of goods where BP is high and it is clearly shifted to the right of the dashed one that represents the low BP goods. Thus high BP goods not only have higher mean commitment tariffs but also higher median, 75th percentile, etc.

Fig. 3; Kernel density of WTO tariff commitments: low vs. high bargaining power



To provide additional non-parametric evidence for the model we must also show that the bindings are more restrictive when BP is low. We confirm this in Figure 4 that plots the kernel density estimates for $t^c - t^u$. When BP is low there is a large share of goods (dashed line) centered around zero, indicating that they have commitments that actually bind. For high BP the median is over 20% indicating that a large share of these goods does not have binding commitments. In sum, there is evidence for the main prediction of the model across the whole distribution, not just the mean, and even if we focus only on the subsample of bound products, i.e. even if we ignore the selection effect.

Fig. 4: Kernel density of WTO commitments, $t^c - t^u$: low vs. high bargaining power



4.7 Bargaining Power and Commitment: Addressing Endogeneity Concerns

The specifications follow the model closely and are therefore parsimonious. Including the regressors described and controlling for organization mitigates the potential for omitted variable bias. Nonetheless, in this section we further address this possibility in three ways: (i) by providing some additional evidence that our measure captures bargaining power; (ii) testing if the results are unchanged after we control for plausible industry characteristics potentially correlated with this BP measure and bindings and (iii) by employing instrumental variables to directly address whether there is omitted variable bias or other sources of endogeneity.

To evaluate if the measure we employ generates a plausible bargaining power ranking we searched for industry redistribution outcomes unrelated to trade policy. Such data is rare, which is the reason we focused on trade policies in the first place. However, Mitra et al (2002) provide government subsidy data for some Turkish industries. If our measure of government bargaining power captures what it is meant to then we should find that when it is low the industry can obtain higher subsidies than the median or average. That is what we find for all but one of the industries that we can match to their data. This further suggests that our BP ranking is reasonable.

Even if our measure captured BP perfectly its correlation with tariff bindings could still be driven by omitted industry characteristics. One potentially important concern is that industries with higher exit rates (i.e. those where the government has higher BP) also have more volatile employment and/or value-added. Governments can try to minimize such volatility for welfare reasons by maintaining relatively high tariff bindings so they can adjust up their *applied* tariffs. While this is quite plausible, it cannot explain our results for two reasons. First, if our measure simply captured volatility and the government were setting bindings to minimize it for welfare reasons then in Table 7 we should also find that correlation for unorganized industries, which we do not. Second, what if the government only cares about volatility that affects its contributors, i.e. volatility in organized industries? To address this, we use variation in employment and value-added between 1990-96 to construct measures of volatility in each industry. When we control for these, in table 7b, we do find they have a positive but insignificant effect on the bindings. More importantly, the bargaining power effect remains unchanged.

It is impossible to control for all possible determinants of trade protection. However, there is one that is central in predicting higher protection in one of the leading models of trade protection, Grossman and Helpman (1994), and is also central in several other models. This determinant generally follows a specific functional form: the output to import ratio divided by import demand elasticity. We construct this ratio for 1993, i.e. prior to the setting of the bindings and include it in Table 7b. We find that this variable has a positive impact on bindings but its inclusion does *not* change the BP effect at all.

Next, we instrument for BP using a combination of industry level variables: gross fixed capital formation, the labor share of value added and measures of concentration (e.g. the inverse of the number of establishments and a Herfindahl index). There are plausible economic arguments why each of these should be correlated with BP.[32] These variables can also be thought of as affecting the subsequent probability of survival of firms in an industry (or 1-exit $rate_I$), which we used to construct BARG and they are indeed reasonably correlated with it (three out of the four instruments are individually

[32] Some studies of the determinants of a firm's bargaining power relative to its workers have related it to variables such as capital intensity (Doiron, 1992), industry concentration (Veugelers, 1989) and asset liquidity. Some of these should also be correlated with firms' bargaining power relative to the government. Industries with lower gross fixed capital formation have more flexibility in shifting resources to alternative uses and thus more bargaining power. More concentrated industries may have more bargaining power due to either larger profits and/or lower cost to organize and cooperate.

statistically significant in the first stage). According to our model there is no obvious reason why these instruments should directly determine the tariff binding. But, to further justify their exclusion from the second stage, we construct the instruments for the period prior to the bargaining period, i.e. prior to 1994, so they were not affected by the tariff commitments we analyze, which were adopted *after* that date. Moreover, the overidentification allows us to provide some evidence for this exclusion: each of the instruments is insignificant when included in the second stage.

Table 8 shows that the IV results are qualitatively similar to the baseline in Table 7. The magnitudes are similar, but we do not place much emphasis on this since we cannot reject exogeneity for any specification. The exogeneity and the fact that we are instrumenting for a dummy in a censored regression setting leads us to focus on the more efficient estimates where we do not instrument.

4.8 Policy Inefficiency, Imperfect Substitution and Quantification of Estimates

We conclude by tying the theory and evidence in three ways. First, we estimate if the NTBs are inefficient relative to tariffs—an assumption of our theory. Second, we examine if NTBs are imperfect substitutes for tariffs—an outcome of our theory. Third, we quantify the role of bargaining power on tariff commitments and, via this channel, on NTBs.

Recall that the structural eq. (11) is only defined for non-negative NTB AVEs and thus, at least for the purposes of quantification, we should focus on those marginal effects, i.e. on $\partial E(y|\mathbf{x},y>0)/\partial \mathbf{x}$. We report these in Table 9 for the full sample and for organized industries.

As we can see from eq. (11) the ratio of the parameters multiplying the elasticity and the tariff constraint terms yields ϕ, the average inefficiency of NTBs relative to tariffs. Thus we can estimate it as $\hat{\phi} = \hat{\beta}_{\varepsilon} / \hat{\beta}_{c}$ where $\hat{\beta}_{\varepsilon}$ and $\hat{\beta}_{c}$ are the estimated coefficients for the elasticity and tariff constraint variables respectively.[33] The estimates for ϕ, shown at the bottom of Table 9, are in the predicted

[33] Note that in table 9 we report $\partial E(y|\mathbf{x},y>0)/ \partial x_j$, which with Tobit yields $\beta_j \, \mu(\mathbf{x\beta}/\sigma)$ where β_j is the estimate of the structural parameter in (E1) and $\mu(\mathbf{x\beta}/\sigma)$ is the standard Tobit factor (between 0 and 1). Thus we cannot use the estimate for

range—between zero and one—even though we did not restrict the estimation to ensure this. The value for the specification closest to the theory is 0.25 (organized industries in column 4), which indicates that, on average, a quarter of NTB rents, as defined in section 3.1, are lost relative to an equivalent tariff. Interestingly, we also find a similar estimate if we use the coverage ratio as the NTB measure.

As we discuss in section 3.6, when the NTB is relatively inefficient it should be an imperfect substitute for tariffs, i.e. $d\tau / dt^c \in (-1,0)$. Our findings in Table 9 do suggest there is imperfect substitution. For example, tightening a WTO tariff constraint by about 20 percentage points (p.p.) increases the NTB AVE by 4 p.p. in organized industries (column 4). A similar tightening of the EU constraint generates a larger increase in the NTB but one that is still not enough to offset the initial decrease in protection. One may argue that to capture the total rather than partial effect we should instead estimate a reduced form where we do not control for the unconstrained tariff level. We do so in columns 1 and 2 and find even less policy substitution. Moreover, when we calculate 95% confidence intervals for all these estimates they lie precisely in the imperfect substitution range. This finding suggests that tariff commitments lead to a reduction in total protection—an important prediction of the model and a necessary condition for commitment to raise social welfare.

Given this evidence supporting a key theoretical assumption—the relative NTB inefficiency—and prediction—the imperfect policy substitution—it is important to also quantify the impact of the bargaining mechanism, both on tariff commitments directly and on NTBs. Table 7 shows that tariff constraints are stricter by about 20 p.p. in low BP industries. This is a significant amount, equivalent to the effect of adding pressure from about 12 extra exporters (=0.2/0.017)—almost a two standard deviation increase in that variable—or alternatively, an increase of almost three standard deviations in the export concentration index emphasized by other tariff theories.

---

any individual variable in Table 9 to back out ϕ. However, since $\mu(\mathbf{x}\boldsymbol{\beta}/\sigma)$ is common to all variables we eliminate it by using the ratio $\partial E(y|\mathbf{x},y>0)/\partial x_\tau / \partial E(y|\mathbf{x},y>0)/\partial x_\varepsilon = \hat{\beta}_\varepsilon / \hat{\beta}_c$.

Clearly, BP has a strong effect on tariff commitments. To estimate how it translates into higher NTBs we employ the following counterfactual: what is the change in the average NTB if the government treated all goods where it has medium or high BP as if it had low BP instead. To employ our existing estimates we approximate this effect by decomposing the impact of BP into two channels: tighter tariffs for goods with existing commitments and new tariff commitments. We summarize how BP affects NTBs via this intensive and extensive margin of commitment below and explain their calculation in more detail in Table 10.

As we noted, the tariff commitment is 20 p.p. tighter in organized industries where government BP is low. Because of the imperfect substitution shown in table 9 this tariff commitment increases NTBs by about 4 p.p. for each medium-hi BP product already bound. But there is an extra effect on NTBs since under low BP an additional fraction of products would be bound. If these products were bound at the average level of $t^c - t^u$ predicted for low BP then the NTB on them increases by 7 p.p.

We can weigh the intensive margin effect by the fraction of products with medium-hi BP that are already bound (0.38) and the extensive effect by the fraction of newly bound goods (0.22 from Table 6). This procedure yields an average increase of 3 p.p. for the NTB AVE caused by the bargaining power channel. This effect is significant relative to the average AVE over all the goods in the data, (about 3 p.p.), but it is modest relative to the average over the subset of products that already have a positive NTB AVE.

In sum, we find that bargaining power affects tariff commitments significantly and in that way increases the use of inefficient policies. However, we also find that NTBs are relatively inefficient and imperfectly substitute for tariffs, as the model suggests. Thus the increase in NTBs is unlikely to offset the decrease in tariff protection, particularly if the good's tariff was already bound.

5 CONCLUSION

Governments can use multiple policies to achieve a given objective. Moreover, in important cases, such as redistribution to SIGs, the observed policy composition includes policies that appear relatively inefficient for the purpose. This theoretical puzzle can have important implications, e.g. alternative policy mixes can lead to different welfare costs for a *given* amount of redistribution and alter the equilibrium level of redistribution itself. To tightly link the theory and estimation we focus on a specific model and a set of policies that are ubiquitous and economically important: tariffs vs. NTBs.

The model shows that a government bargaining with its domestic SIGs can gain by committing to limit its tariffs through international trade agreements. Moreover, we show that the NTB increases with the stringency of those tariff commitments. We also show how the decision to commit depends on the government's strength relative to SIGs. We test and find support for the main predictions of the model using detailed data for Turkey. Tariff commitments imposed via the WTO and the PTA with the European Union increase the likelihood and restrictiveness of Turkish NTBs. Moreover, we construct a measure of bargaining power and find that tariff commitments are less likely and less stringent in industries where the government is stronger. The results are robust to a variety of concerns, e.g. endogeneity, and particularly strong for organized industries, as predicted by the model.

The evidence is also economically significant in terms of its implications for partial versus general policy equilibrium approaches. We estimate that on average NTBs are less efficient than tariffs in organized industries. The model predicts imperfect policy substitution in this case and we find evidence supporting it. Policy substitution implies that the actual reduction in total protection due to tariff commitments was not as large as a partial policy equilibrium analysis would predict since some of it was offset by higher NTBs. However, since this substitution was imperfect the commitments may have still reduced total protection and thus improved social welfare. This suggests that (i) tariff commitments are not just politically but also socially valuable and (ii) that recent concerns with rising NTBs around the world are mitigated once we model them in a general policy equilibrium framework.

Future research could apply our approach to examine if similar results apply to other countries' policies, both in trade and possibly in other areas. More broadly, it is important to model and carefully test alternative motives for policy choice in order to better understand its composition and impacts.

REFERENCES

Acemoglu, Daron and Robinson, James, A., "Inefficient Redistribution." *American Political Science Review*, 2001, 95(3), 649-61.

Bagwell, Kyle and Staiger, Robert W., "An Economic Theory of GATT." *American Economic Review,* 1999, 89(1), 215-48.

Bhagwati, Jagdish and Ramaswami, V.K., "Domestic Distortions, Tariffs and the Theory of Optimum Subsidy." *Journal of Political Economy*, 1963, 71, pp. 44-50.

Baron, David, "Majoritarian Incentives, Pork Barrel Programs, and Procedural Control." *American Journal of Political Science*, 1991, 35(1), 57-90.

Becker, Gary and Mulligan, Casey, "Deadweight Costs and the Size of Government." *Journal of Law and Economics*, 2003, 56, 293-340.

Binmore, Ken; Rubinstein, Ariel and Wolinsky, Asher, "The Nash Bargaining Solution in Economic Modeling." *The RAND Journal of Economics*, 1986, 17(2), 176-188.

Broda, Christian; Limão, Nuno and Weinstein, David E., "Optimal Tariffs and Market Power: The Evidence." *American Economic Review*, 2008, 98(5), 2032-65.

Chandra, Piyush. "WTO Accession as Commitment," 2007, UMD dissertation.

Coate, Stephen and Morris, Stephen, "On the Form of Transfers to Special Interests." *Journal of Political Economy,* 1995, 103(6), 1210-35.

Dixit, Avinash and Londregan, John, "The Determinants of Success of Special Interests in Redistributive Politics." *Journal of Politics*, 1996, 58, 1132-55.

Dixit, Avinash; Grossman, Gene and Helpman, Elhanan, "Common Agency and Coordination: General Theory and Application to Government Policy Making." *Journal of Political Economy*, 1997, 105(4), 752-69.

Doiron, Denise, "Bargaining Power and Wage-Employment Contracts in a Unionized Industry." *International Economic Review*, 1992, 33(3), 583-606.

Drazen, Allan and Limão, Nuno, "A Bargaining Theory of Inefficient Redistribution." *International Economic Review*, 2008, 49(2), 621-657.

Ederington, Josh and Minier, Jenny A., "Why Tariffs, not Subsidies? A Search for Stylized Facts." *Contributions to Economic Analysis & Policy*, 2006, 5(1), Article 31.

Goldberg, Pinelopi. K. and Maggi, Giovanni, "Protection for Sale: An Empirical Investigation." *American Economic Review,* December 1999, 89(5), 1135-55.

Grossman, Gene and Helpman, Elhanan, "Protection for Sale." *American Economic Review*, 1994, 84,833-50.

__________, *Special Interest Politics*, Cambridge, MA, MIT Press. 2001.

Hillman, Arye L., *The Political Economy of Protection*. Hardwood Academic: New York. 1989.

Horn, Henrik, Maggi, Giovanni and Staiger, Robert W., "Trade Agreements as Endogenously Incomplete Contracts." *American Economic Review* (forthcoming).

Kaempfer, William H., McClure, Harold J. and Willet, Thomas D., "Incremental Protection and Efficient Political Choice between Tariffs and Quotas." *Canadian Journal of Economics,* 1989, 22(2), 228-36.

Kaya Seçil, and Üçdoğruk., Yeşim, "The Dynamics of entry and exit in the Turkish manufacturing industry." ERC Working Papers in Economics 02/02, 2002.

Kee, Hiao; Nicita, Alessandro and Olarreaga, Marcelo, "Estimating Trade Restrictiveness." *Economic Journal,* 2009, 119(534), 172-199.

Kydland, Finn E. and Prescott, Edward C., "Rules Rather than Discretion: The Inconsistency of Optimal Plans." *Journal of Political Economy*, 1977, 85(3), 473-91.

Ludema, Rodney D., and Mayda, Anna Maria, "Do Countries Free Ride on MFN?" CEPR DP 5160 2005.

Magee, Stephen; Brock, William, and Young, Leslie, *Black Hole Tariffs and Endogenous Policy Theory,* 1989, Cambridge, MA: Cambridge University Press.

Maggi, Giovanni and Rodriguez-Clare, Andres, "A Political Economy Theory of Trade Agreements." *American Economic Review,* 2007, 97(4), 1374-1406.

__________, "The Value of Trade Agreements in the Presence of Political Pressures." *Journal of Political Economy,* 1998, 106(3), 574-601.

Marvel, Howard and Ray, Edward, "The Kennedy Round: Evidence on the Regulation of International Trade in the United States." *American Economic Review*, 1983, 73(1), 190-97.

Mitra, Devashish, "Endogenous Political Organization and the Value of Trade Agreements.", *Journal of International Economics,* 2002, 57, 473-85.

Mitra, Devashish; Thomakos, Dimitrios and Mehmet Ulubasoglu, "'Protection for Sale' In A Developing Country: Democracy vs. Dictatorship." *Review of Economics and Statistics,* 2002, 84(3), 497-508.

Ray, Edward J., "The Determinants of Tariff and Nontariff Trade Restrictions in the United States." *Journal of Political Economy*, 1981, 89(1), 105-21.

Roberson, Brian, "Pork-Barrel Politics, Targetable Policies, and Fiscal Federalism." *Journal of the European Economic Association*, 2008, 6(4), 819-44.

Rodrik, Dani, "Political Economy of Trade Policy," in Gene M. Grossman and Kenneth Rogoff, eds., *Handbook of International Economics*, Vol. 3. Amsterdam: North-Holland, 1457-94, 1995.

__________, "Taxes, Subsidies, and Welfare with Endogenous Policy." *Journal of International Economics,* 1986, 21, 285-99.

Schelling, Thomas C., *The Strategy of Conflict.* Cambridge, MA.: Harvard University Press, 1960.

Staiger, Robert W. and Tabellini, Guido, "Discretionary Trade Policy and Excessive Protection." *American Economic Review,* 1987, 77(5), 823-37.

__________, "Do GATT Rules Help Governments Make Domestic Commitments?" *Economics and Politics*, 1999, 11(2), 109-44.

Togan, Sübidey, "Trade Policy Review of the Republic of Turkey." *World Economy,* 1995, 18(5), 107-120.

Tullock, G., *Economics of Income Redistribution* , Boston MA: Kluwer-Nijhoff, 1983.

Veugelers, Reinhilde, "Wage Premia, Price-Cost Margins and Bargaining Power in Belgian Manufacturing." *European Economic Review*, 1989, 33, 169-180.

Weingast, Barry; Shepsle, Kenneth, and Johnsen, Christopher, "The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics." *Journal of Political Economy*, 1981, 89, 642-64.

Wilson, John, "Are Efficiency Improvements in Government Transfer Policies Self-Defeating in Political Equilibrium?" *Economics and Politics,* 1990, 2(3), 241-58.

Young, Leslie and Anderson, James E., "Risk Aversion and Optimal Trade Restrictions." *Review of Economic Studies,* 1982, 49(2), 291-305.

Young, Leslie, "Tariffs vs. Quotas under Uncertainty: An Extension." *American Economic Review,* 1980, 70(3), 522-27.

DATA APPENDIX

Data sources and construction details

DESCRIPTION	SOURCE	CONSTRUCTION NOTES
NTB indicator	TRAINS	=1 if the HS-6 product had an NTB in 1997
NTB coverage ratio	TRAINS	Fraction of sub-lines in each HS-6 product with an NTB in 1997
NTB Ad-valorem equivalent (AVE)	Kee et al (2009)	Based on the trade value impact of an NTB indicator, converted into a price equivalent using a product specific import demand elasticity. We use their estimated AVE if NTB=1 in the TRAINS 1997 data and set it to 0 otherwise
WTO BIND (B)	WTO database*	=1 if HS-6 tariff is bound by a WTO commitment, 0 otherwise
WTO 1997 implementation	WTO database*	=1 if WTO commitment for this HS-6 product was scheduled for implementation by 1997, 0 otherwise
WTO TARIFF (t^c)	WTO database*	Binding tariff level
WTO BIND TARIFF	Authors	= t^c if B=1 and 0 otherwise
WTO BIND TARIFF ADJ.	Authors	= ($t^c - t^u$) if B=1 and 0 otherwise where t^u is calculated as 1993 average applied TRAINS tariff over the unbound products in the HS-2 industry to which the HS-6 line belongs to.
EU BIND	TRAINS	=1 if HS-6 tariff is bound by a EU commitment, 0 otherwise
EU BIND TARIFF	Authors	= EU tariff if EU BIND=1, 0 otherwise
EU BIND TARIFF ADJ.	Authors	= (EU tariff $- t^u$) if EU BIND=1 and 0 otherwise where t^u is calculated as above
Import demand elasticity	Kee et al (2009)	We divide their measure by 1+t+τ (the tariff and AVE in that HS-6) to obtain ε, as required by the model. We instrument this variable using their (unadjusted) import demand elasticity in each good averaged over 5 other countries**
Bargaining power of government relative to industry; (Medium bargaining, High bargaining, and Medium-high bargaining)	various	Construction of bargaining power is described in text. Industry survival rates = 1-exit rate. The exit rates are averaged to ISIC-3 level from ISIC-4 level census data on firms by Kaya and Üçdoğruk (2002), to minimize measurement error. Government tenure is measured as the average annual probability of remaining in power for an extra year at the start of an electoral cycle; calculated from publicly available data on government formation in Turkey (1996-1999). Medium/high bargaining =1 if bargaining power is in the middle/upper tercile, 0 otherwise; medium-high bargaining =1 if in either tercile, 0 otherwise
Organization	WGTA	An industry is classified as organized if it contains an organization listed for Turkey in the 4th edition of the World Guide to Trade Associations. Raw electronic data provided by Bonnie Wilson and Dennis Coates. We matched the description of organization entries to ISIC 3 industries
Number of exporters	TRAINS	Number of exporters per HS-6 to Turkey in 1997
Herfindahl of export value	TRAINS	Herfindahl index of exporter shares per HS-6 to Turkey in 1997
Herfindahl of number of establishments	Authors	Herfindahl of number of establishments in each subline of ISIC-3 industries (1990-1993 data from Kaya and Ucdogruk, 2002)
Gross fixed capital formation	World Bank TPP ***	Average over 1990-1993 of gross-fixed capital formation at the ISIC-3 level
Labor share of value added	World Bank TPP ***	Ratio of the wage bill to value added (average over 1990-1993) at the ISIC-3 level
Inverse of number of establishments	World Bank TPP ***	Average over 1990-1993 of the inverse of the number of establishments at the ISIC-3 level

* accessed via WITS (World Integrated Trade Solution). ** India, Malaysia, Philippines, Thailand and Tunisia, which are also used to construct instruments for WTO BIND and WTO BIND TARIFF by taking the average across them in each HS6 product. *** World Bank Trade, Production and Protection database.

Table 1
Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
NTB indicator	5112	0.086	0.281	0	1
NTB coverage ratio	5112	0.059	0.213	0	1
NTB Ad-valorem equivalent (AVE)	5080	0.029	0.175	0	2.286
WTO BIND	5112	0.473	0.499	0	1
WTO 1997 implementation	5112	0.433	0.496	0	1
WTO TARIFF (t^c)	2420	0.294	0.368	0	2.250
WTO BIND TARIFF	5112	0.139	0.293	0	2.250
WTO BIND TARIFF ADJ.	5112	0.095	0.272	-0.146	2.200
EU BIND	5112	0.853	0.354	0	1
EU BIND TARIFF	4930	0.046	0.038	0	0.250
EU BIND TARIFF ADJ.	4930	-0.038	0.042	-0.250	0.118
WTO BIND x 1/import elasticity	4632	0.718	1.684	0	47.340
Mean binding status for 5 other WTO members	5112	0.712	0.267	0	1
Mean binding tariff for 5 other WTO members	5035	0.325	0.186	0	1.650
Mean inverse elasticity for 5 other WTO members	4665	1.063	0.980	0.082	36.999
Medium-high bargaining	4598	0.700	0.458	0	1
Medium bargaining	4598	0.335	0.472	0	1
High bargaining	4598	0.364	0.481	0	1
Organization	5089	0.731	0.443	0	1
Number of exporters	5042	7.713	6.648	0	66
Herfindahl of export value	5042	0.437	0.294	0	1
Herfindahl of number of establishments	4513	0.496	0.283	0.173	1
Gross fixed capital formation	4598	238180	201374	4870	671517
Labor share of value added	4598	0.268	0.055	0.020	0.430
Inverse of number of establishments	4598	0.007	0.015	0.001	0.200

Table 2
Impact of Tariff Commitments on the Probability of NTBs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
WTO BIND	0.060***	0.127***	0.088***	0.013	0.112***	0.097***	0.092***
(β>0)	[0.008]	[0.009]	[0.007]	[0.021]	[0.010]	[0.008]	[0.009]
WTO 1997 implementation				0.051**			
(β>0)				[0.022]			
WTO BIND TARIFF		-0.369***			-0.236***		
(β_c<0)		[0.029]			[0.040]		
WTO BIND TARIFF ADJ.			-0.406***			-0.249***	-0.282***
(β_c<0)			[0.028]			[0.038]	[0.047]
EU BIND					0.076***	0.044***	0.061***
(β >0)					[0.006]	[0.010]	[0.012]
EU BIND TARIFF					-0.758***		
(β_c<0)					[0.121]		
EU BIND TARIFF ADJ.						-0.831***	-0.853***
(β_c<0)						[0.081]	[0.100]
Observations	5112	5112	5112	5112	4930	4930	4110
Log-pseudolikelihood	-1472	-1396	-1384	-1470	-1348	-1304	-1259
Pseudo R2	0.02	0.07	0.08	0.02	0.09	0.12	0.10

Notes: Marginal probit effects with standard errors in brackets. *,**,*** respectively significant at 10%, 5% and 1%.

Table 3
Impact of Tariff Commitments on NTB Ad-valorem Equivalent

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)[a]
WTO BIND	0.495***	1.053***	0.793***	-0.014	0.876***	0.794***	0.679***	0.923***
(β>0)	[0.072]	[0.102]	[0.079]	[0.200]	[0.101]	[0.079]	[0.078]	[0.264]
WTO 1997 implementation				0.540***				
(β>0)				[0.199]				
WTO BIND TARIFF		-3.082***			-1.890***			
(β_c<0)		[0.419]			[0.438]			
WTO BIND TARIFF ADJ.			-3.504***			-1.982***	-1.857***	-2.014***
(β_c<0)			[0.434]			[0.427]	[0.431]	[0.462]
EU BIND					0.935***	0.350**	0.421***	0.306*
(β >0)					[0.173]	[0.160]	[0.160]	[0.161]
EU BIND TARIFF					-5.691***			
(β_c<0)					[1.144]			
EU BIND TARIFF ADJ.						-6.887***	-5.885***	-6.858***
(β_c<0)						[0.838]	[0.829]	[0.846]
WTO BIND x 1/elasticity								-0.118
(β_ε<0)								[0.177]
Constant	-2.139***	-2.059***	-2.051***	-2.128***	-2.653***	-2.720***	-2.582***	-2.603***
	[0.124]	[0.118]	[0.118]	[0.123]	[0.211]	[0.211]	[0.207]	[0.210]
Observations	5080	5080	5080	5080	4898	4898	4078	4496
Log-likelihood	-1207	-1155	-1147	-1203	-1128	-1096	-1066	n/a
Pseudo R2	0.02	0.06	0.07	0.03	0.08	0.11	0.09	n/a

Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.
(a) All specifications except this one use Tobit. This one employs a two-step IVTOBIT where we instrument for the elasticity measure (adjusted to correspond our model) by using the average of inverse elasticity for five other WTO members: India, Malaysia, Philippines, Thailand and Tunisia. The lower number of observations is due to unavailable elasticity data. Imputing the missing elasticities using the mean leads to very similar results.

Table 4
Impact of Tariff Commitments on NTB AVE: Robustness Tests

	(1)	(2)[a]	(3)[b]	(4)[b,c,d]
Robustness	*Baseline*	*Sector effects*	*No outliers*	*IV WTO bindings*
WTO BIND	0.923***	0.633***	1.075***	0.779*
(β>0)	[0.264]	[0.226]	[0.258]	[0.437]
WTO BIND TARIFF ADJ.	-2.014***	-0.803*	-1.506***	-2.036*
(β_c<0)	[0.462]	[0.448]	[0.394]	[1.111]
EU BIND	0.306*	-0.326*	0.186	-0.096
(β >0)	[0.161]	[0.193]	[0.136]	[0.372]
EU BIND TARIFF ADJ.	-6.858***	-2.747***	-5.997***	-5.675***
(β_c<0)	[0.846]	[0.841]	[0.748]	[0.863]
WTO BIND x 1/elasticity	-0.118	-0.136	-0.318*	-0.316*
(β_ε<0)	[0.177]	[0.146]	[0.178]	[0.179]
Constant	-2.603***	-1.161***	-2.158***	-1.731***
	[0.210]	[0.211]	[0.179]	[0.491]
Observations	4496	3568	4481	4478
Wald exogeneity test: p-value[d]	0.93	0.58	0.88	0.88

Notes:
Specifications (1), (2) and (3) employ a two-step IVTOBIT where the elasticity variable is instrumented as in Table 3. Similar coefficients obtained using a ML IVTOBIT. We report two-step results for comparability (see note (c) below).
Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

(a) Sector effects captured by HS-1dummies defined in the harmonized tariff schedule. The difference in sample size relative to the baseline is due to the removal of observations without AVE variation in a given sector.
(b) Drops outlier observations with NTB AVE>170%.
(c) Specification (4) treats as endogenous not only the elasticity but also the WTO variables and instruments the latter two using the mean (in each given good) of WTO binding status and tariff across the same 5 WTO members used to calculate the instrument for the elasticity . Given the multiple endogenous regressors we employ a two-step IV TOBIT (Newey's minimum chi-squared estimator). There are three missing observations for these instruments. Despite the fact that one of the endogenous regressors is a dummy we can still test the null hypothesis of exogeneity, as reported on the bottom row.
(d) Probability at which we reject the null of exogeneity for the equivalent regression where the WTO variables are treated as endogenous. For example, in the case of (3) the equivalent regression is simply (4) and thus the Wald test values are identical, 0.88.

Table 5
Impact of Tariff Commitments on NTB: Lobby Organization and Alternative NTB Measures

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	*NTB Ad-valorem equivalent*			*NTB coverage ratio*[b]		
Sample	*Full*	*Organized*[a]	*Unorganized*	*Full*	*Organized*[a]	*Unorganized*
WTO BIND	0.923***	0.945**	0.532**	2.029***	3.238***	0.739**
(β>0)	[0.264]	[0.406]	[0.220]	[0.503]	[0.988]	[0.324]
WTO BIND TARIFF ADJ.	-2.014***	-2.084***	-1.592**	-3.286***	-3.963***	-2.120**
(β_c<0)	[0.462]	[0.629]	[0.649]	[0.829]	[1.395]	[0.980]
EU BIND	0.306*	0.065	0.213	0.856***	0.676	0.562
(β >0)	[0.161]	[0.187]	[0.315]	[0.301]	[0.435]	[0.516]
EU BIND TARIFF ADJ.	-6.858***	-7.329***	-5.274***	-12.98***	-14.25***	-12.54***
(β_c<0)	[0.846]	[1.092]	[1.382]	[1.615]	[2.571]	[2.287]
WTO BIND x 1/elasticity	-0.118	-0.204	0.05	-0.483	-1.209*	0.057
(β_ε<0)	[0.177]	[0.280]	[0.127]	[0.336]	[0.670]	[0.189]
Constant	-2.603***	-2.509***	-1.949***	-4.848***	-5.878***	-3.177***
	[0.210]	[0.268]	[0.335]	[0.432]	[0.713]	[0.571]
Observations	4496	3295	1186	4496	3295	1186
Wald exogeneity test: p-value[c]	0.93	0.77	0.83	0.65	0.53	0.91

Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.
All specifications employ a two-step IVTOBIT where WTO BINDx1/elasticity is instrumented as in Table 3.

(a) An industry is classified as organized if it contains an organization listed for Turkey in the 4th edition of the World Guide to Trade Associations. Raw electronic data generously provided by Bonnie Wilson and Dennis Coates. Authors matched the description of organization entries to ISIC 3 industries.
(b) Applies a two-limit maximum likelihood IV Tobit (at 0 and 1)
(c) Probability at which we reject the null of exogeneity for the equivalent regression where WTO BIND and WTO BIND TARIFF ADJ. are also treated as endogenous.

Table 6
Impact of Bargaining Power on WTO Commitments:
Product Binding Probabilities

Sample	*All*	*Organized*	*Unorganized*
Low bargaining power	0.59	0.60	0.58
Medium-High bargaining power	0.41	0.38	0.49
Difference	**0.18*** **[0.10]**	**0.22*** **[0.13]**	**0.09** **[0.11]**
Observations	4598	3255	1343

Notes: Standard errors in brackets clustered at isic 3 based on a maximum likelihood probit using the medium-high bargaining power dummy for each relevant sample.

Table 7: Impact of Bargaining Power on Desired WTO Commitment Tariffs
(7A) Organized vs. Unorganized Industries

Dependent variable	Tariff Binding Level[a]			Tariff Binding – Unconstrained[b]		
Estimation method	*Censor.*	*Censor.*	*Censor.*	*Censor.*	*Censor.*	*Censor.*
Sample	All	Organized	Unorganized	All	Organized	Unorganized
Medium-high bargaining (β_γ>0)	0.147*	0.230***	-0.046	0.127	0.199**	-0.043
	[0.084]	[0.084]	[0.070]	[0.083]	[0.087]	[0.065]
Number of exporters	-0.015**	-0.016**	-0.005**	-0.016**	-0.017***	-0.005*
	[0.006]	[0.007]	[0.003]	[0.006]	[0.007]	[0.002]
Herfindahl of export value	-0.168*	-0.232**	0.051	-0.169*	-0.234**	0.054
	[0.094]	[0.098]	[0.047]	[0.099]	[0.102]	[0.047]
Constant	0.498***	0.523***	0.308***	0.418***	0.456***	0.204***
	[0.135]	[0.140]	[0.078]	[0.138]	[0.145]	[0.070]
Observations	4546	3210	1336	4546	3210	1336
Pseudo R2	.03	.045	.026	.032	.047	.026

Notes: Standard errors in brackets clustered at isic 3, which is the level of variation of the bargaining variable. * significant at 10%; ** significant at 5%; *** significant at 1%. (a) Right censored at $t^c_i > t^u_i$ for goods not bound. (b) Right censored at $t^c_i - t^u_i > 0$ for goods not bound.

Table 7B Robustness to Alternative Organized Industry Characteristics

Dependent variable	Tariff Binding Level[a]			Tariff Binding – Unconstrained[b]		
Estimation method	*Censor.*	*Censor.*	*Censor.*	*Censor.*	*Censor.*	*Censor.*
Sample	Organized	Organized	Organized	Organized	Organized	Organized
Medium-high bargaining (β_γ>0)	0.243***	0.206**	0.211**	0.212**	0.168*	0.182**
	[0.093]	[0.087]	[0.083]	[0.096]	[0.091]	[0.086]
Number of exporters	-0.016**	-0.016**	-0.016**	-0.017**	-0.017***	-0.017***
	[0.007]	[0.006]	[0.007]	[0.007]	[0.006]	[0.006]
Herfindahl of export value	-0.235**	-0.233**	-0.232**	-0.237**	-0.236**	-0.234**
	[0.100]	[0.098]	[0.099]	[0.104]	[0.102]	[0.104]
Variance log employment	2.594			2.482		
	[3.868]			[3.890]		
Variance log value added		1.752			2.288	
		[2.762]			[2.757]	
Output-import ratio/imp. dem. Elasticity			0.001**			0.001**
			[0.000]			[0.001]
Constant	0.495***	0.496***	0.516***	0.430***	0.420***	0.449***
	[0.128]	[0.134]	[0.138]	[0.131]	[0.136]	[0.143]
Observations	3210	3210	3210	3210	3210	3210

Notes: Standard errors in brackets clustered at isic 3, which is the level of variation of the bargaining variable.. * significant at 10%; ** significant at 5%; *** significant at 1%. (a) Right censored at $t^c_i > t^u_i$ for goods not bound. (b) Right censored at $t^c_i - t^u_i$ >0 for goods not bound.

Table 8
Impact of Bargaining Power on Desired WTO Commitment Tariffs: Instrumental Variables

Dependent variable	Tariff Binding Level			Tariff Binding-Unconstrained		
Estimation method	*IV Tobit*	*IV Tobit*	*IV Tobit*	*IV Tobit*	*IV Tobit*	*IV Tobit*
Sample	All	Organized	Unorganized	All	Organized	Unorganized
	(2)	(3)	(4)	(6)	(7)	(8)
Medium-high bargaining (β_γ>0)	0.203***	0.261***	0.088	0.214***	0.259***	0.052
	[0.071]	[0.098]	[0.248]	[0.072]	[0.089]	[0.186]
Number of exporters	-0.016**	-0.017**	-0.005	-0.016***	-0.017***	-0.005
	[0.007]	[0.007]	[0.005]	[0.006]	[0.007]	[0.004]
Herfindahl of export value	-0.167*	-0.232**	0.051	-0.167*	-0.232**	0.053
	[0.095]	[0.099]	[0.049]	[0.097]	[0.101]	[0.046]
Constant	0.432***	0.476***	0.189**	0.363**	0.417***	0.144**
	[0.150]	[0.120]	[0.088]	[0.142]	[0.118]	[0.074]
Observations	4461	3183	1278	4461	3183	1278
Wald test exog. (P-value)	0.38	0.33	0.37	0.24	0.21	0.43

Notes: Standard errors in brackets clustered at isic 3, which is the level of variation of the bargaining variable.. * significant at 10%; ** significant at 5%; *** significant at 1%. Bargaining power instrumented using labor share of value added, the inverse of the number of establishments (a measure of concentration), gross fixed capital formation, and a Herfindahl index of the number of establishments between 1990-1993 via a maximum likelihood IV Tobit. The reduction in the number of observations is due to missing data for the number of establishments.

Table 9
NTB Inefficiency and Imperfect Substitution Estimates

	(1)	(2)	(3)	(4)
Sample	*Full*	*Organized*	*Full*	*Organized*
WTO BIND (β>0)	0.12***	0.13***	0.12***	0.11***
WTO BIND TARIFF (β_c<0)	-0.16***	-0.11*		
WTO BIND TARIFF ADJ. (β_c<0)			-0.20***	-0.19***
EU BIND (β >0)	0.086***	0.065***	0.02	-0.01
EU BIND TARIFF (β_c<0)	-0.78***	-0.49***		
EU BIND TARIFF ADJ. (β_c<0)			-0.79***	-0.80***
WTO BIND x 1/elasticity (β_ε<0)	-0.048*	-0.059	-0.04	-0.05
Observations	4481	3288	4481	3288
NTB Inefficiency: $\hat{\phi} = \hat{\beta}_\varepsilon / \hat{\beta}_c \in (0,1]$	0.30	0.54	0.21	0.25
Imperfect policy substitution: $\widehat{d\tau / dt^c} \approx \hat{\beta}_c \in (-1,0)$	-0.16	-0.11	-0.20	-0.19

Notes: (a) All specifications employ a ML IVTOBIT where we instrument for the elasticity measure as in Tables 3, 4, 5. (b) The reported marginal effect for each variable x_j is calculated as $\partial E(y|\mathbf{x},y>0)/\partial x_j$ and equals $\beta_j\, \mu(\mathbf{x\beta}/\sigma)$ where β_j is the structural parameter in E(1) and $\mu(\mathbf{x\beta}/\sigma)$ is the common Tobit factor evaluated at WTO BIND= EU BIND=1, EU tariff = WTO tariff = unconstrained and at mean of 1/elasticity. (c) * significant at 10%; ** significant at 5%; *** significant at 1%. (d) All specifications exclude outliers as defined before.

Table 10
Impact of Bargaining Power on NTB AVE via WTO Tariff Commitments

Channel (affected goods)	*Sample:* *All*	*Organized*
Existing tariff commitment	3 p.p.	4 p.p.
New tariff commitment	7 p.p.	7 p.p.
Average	2 p.p.	3 p.p.

Notes: Values represent the percentage point increase in the NTB advalorem equivalent if the government had low bargaining power instead of medium or high and changed tariff commitments as predicted by the model. The effect via existing commitments for organized industries is approximately 100*.04 =100*(-0.2)*(-.19) where -0.2 is the predicted tariff effect from switching to low (estimated from Table 7), -0.19 is the effect of that tariff commitment change on the NTB from Table 9 column 4. This affects the fraction of bound products with medium-hi BP, which is 0.38 (Table 6). The new tariff commitment effect is approximately 100*0.07=100*(0.11-0.19*0.22) where the marginal coefficients 0.11 and -0.19 are from Table 10 and 0.22 is the average level of t^c-t^u for low BP (estimated from Table 7). This applies to 0.22 of goods that would be newly bound where this extra probability of binding is from Table 6. The average change over all goods assumes the only NTB changes occur on the 0.38 of bound and 0.22 of newly bound so it equals .38*4+.22*7.