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

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Abstract

Why do governments use relatively inefficient policies to redistribute income towards special interest groups (SIGs) when more efficient ones are available? To empirically address this long-standing puzzle we extend a recent theoretical model and derive predictions for a specific set of policies: tariffs vs. non-tariff barriers. We show that a government bargaining with its SIGs can gain by committing to limit tariffs through international trade agreements even if this leads to the use of less efficient non-tariff barriers (NTBs). Such constraints improve the government's bargaining position relative to SIGs and thus increase its share of the surplus. Moreover, we show that the NTB restrictiveness increases with the stringency of the tariff binding. We also show how the decision to commit to constraints on any given good depends on the government's bargaining power relative to SIGs. Using detailed data, we test these predictions. In goods where Turkey committed to tariff constraints in trade agreements we find a higher likelihood and restrictiveness of NTBs. Furthermore, these effects are stronger for more stringent tariff constraints. There is also evidence that the higher the government bargaining power relative to a SIG the more relaxed the tariff constraint it chooses and the less likely it is to constraint it at all, as predicted by the model.

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Keywords: Inefficient transfers, lobbies, trade, tariff, non-tariff barrier

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1 INTRODUCTION

Many economic policies are enacted as a form of redistribution towards special interest groups (SIGs). This is not puzzling since politicians and governments are not social welfare maximizers. What is puzzling is that such redistribution is often done using policies that appear to be inefficient, i.e. policies that reduce the surplus that governments and SIGs can bargain over. Why are instruments such as geographically targeted public projects or production subsidies used for redistribution when, in the absence of specific externalities, lump-sum payments would be more efficient? Why are technical regulations used to restrict trade instead of tariffs or tariffs used instead of production subsidies? Most policy models focus on a single policy and ignore the existence, choice and use of multiple policies for a given objective. This use of “partial political equilibrium” models can lead to erroneous normative prescriptions and positive predictions.

As we discuss in the next section, there is a growing theoretical literature dealing with this puzzle. But despite the importance of this policy choice question there is almost no empirical work addressing it. One likely reason for this omission is that almost all theories addressing the issue model why a particular agent (or group) prefers the use of inefficient policies but they do *not* model the mechanism through which those preferences are channeled. Thus, they generally do not provide positive predictions of which policy is actually used in equilibrium. The two main contributions of this paper are the following. First, we extend recent work that does provide an explicit mechanism for the choice of inefficient redistribution policies, and use it to derive specific predictions. Second, we test these predictions using detailed product level data.

More specifically, we extend Drazen and Limão (Forthcoming) who provide a theory of policy choice where the government bargains with lobbies over the level of a lump-sum transfer or production subsidy. One of the model’s key insights is that the government can benefit from constraints on the relatively more efficient policy (the lump-sum transfer) because although such constraints reduce the *total* surplus available they increase the government’s share relative to the lobby. Importantly, they also show how the constraints on the efficient policy emerge under alternative first stage choice mechanisms provided the government has some ability to commit to such constraints.

In order to tightly link the theory and estimation we must focus on a specific set of policies. We do not know of any available detailed data on lump-sum transfers and production subsidies to directly test Drazen and Limão. Thus, we extend that model to examine a small country's choice of alternative trade policies. This is a setting that often allows an efficiency ranking of policies and one where the use of inefficient trade policies for redistribution is an important puzzle (c.f. Rodrik [1995]). More importantly perhaps, this is a setting where governments have access to a ubiquitous commitment mechanism for which detailed data is available: international agreements. Under the GATT/WTO for example, many production subsidies are forbidden and bindings on tariffs have been the traditional focus of negotiations.[1] In contrast, there are far fewer constraints on various non-tariff barriers (NTBs) that include quantitative restrictions, product standards, import surcharges, etc. These NTBs are often less efficient than tariffs and some argue that as the latter have fallen they have been replaced with NTBs.[2] In sum, this is an interesting setting for analyzing policy choice in general and one that also allows us to address the important specific question of why small countries constrain themselves in the use of tariffs and the effect this has on the use of NTBs.

We begin by showing that a self-interested government in a small competitive economy can benefit from an international commitment to constrain the most efficient available redistribution policy or policies (e.g. production subsidies and tariffs). Committing to these constraints in any given sector improves the bargaining position of the government versus the SIG in that sector, as it limits the maximum redistribution it can make for a given level of contribution provided by that SIG. However, these agreements do not constrain *all* policies so lobbies can generally find some other one (e.g. an NTB) that is less efficient but still allows them to exploit any political gains from trade.[3] We show that despite this the government can still benefit from the constraints.

Given the data availability on alternative policies, we focus on the impact of tariff constraints on NTBs and derive the precise structural relationship, which we estimate. In our model, a binding tariff cap increases the likelihood of an NTB but increases in that cap reduce

[1] In the last trade round for example, the percentage of industrial tariff lines subject to bindings increased from 22 to 72 in developing countries, and 18 to 100% in agriculture (Martin and Francois [1997]).
[2] Hillman (1989) states that "(…) because GATT negotiations have succeeded in securing substantial multilateral tariff reductions, non-tariff barriers have in many instances come to replace tariffs as the means for protection." (p. 76). Also, Marvel and Ray (1983) find that the tariff liberalization that resulted from the Kennedy Round led to substitution of non-tariff barriers for tariffs in the United States, and they argue that it may well be that in some industries overall protection actually increased. Kee et al (2006) provide advalorem equivalent estimates of NTBs for several countries that show they are very trade restrictive.
[3] There may be different reasons for this, one recently emphasized by Maggi, Horn and Staiger (2006) 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.

the advalorem level of the NTB. In products without a binding cap, the model predicts that tariffs and NTBs are uncorrelated.

We then show that governments choose *not* to constrain products in which they have sufficiently high (Nash) bargaining power relative to lobbies. The intuition is as follows: a government with high bargaining power captures most of the total surplus, so reductions in the surplus due to the constraints cannot be offset by an increase in the share the government captures. Moreover, if governments do choose to commit then we find less stringent caps on products where their bargaining power is higher.

We find support for several of the model's specific predictions by using tariff and non-tariff barriers for about 5,000 goods. To be able to exploit variation in tariff constraints across goods using detailed data we focus on a single country, Turkey. There are several reasons why we choose Turkey, as we explain in more detail in section 4.2. One of them is that the data available for it allows us to analyze the two most common types of commitment in tariffs: those imposed via multilateral agreements such as the World Trade Organization (WTO) and via preferential trade agreements (PTAs).

Goods with tariff constraints set through the WTO and the PTA with the European Union increase the probability and restrictiveness of NTBs in Turkey. These effects are smaller when the tariff constraint is relaxed and eventually disappear when the constraint is so high that it is effectively not binding, which is precisely what the theory predicts. Moreover, the effects of caps are related to their actual implementation *dates* suggesting that the existence of a cap is not simply a proxy for some other good characteristic. Also, in unbound goods the tariff cap levels are generally *not* correlated with NTBs, which is also a prediction of the model and rules out the possibility that we are simply picking up some substitution between policies due to some other motive, such as revenue-replacement.

We also analyze whether governments choose constraints as predicted by the model. To focus on the model's central mechanism we construct a novel empirical measure of government bargaining power relative to lobbies: their relative probability of survival, as suggested by the theory. We find that the government is somewhat less likely to constrain tariffs in the WTO in products where it has high bargaining power. There is stronger evidence for the related prediction that the government sets less stringent tariff constraints in goods where it has higher bargaining power. In sum, the preliminary results support key predictions of the model, which suggests it provides a useful lens to analyze other countries' commitments via international agreements on trade and possibly other policies used for redistribution.

The structure of the paper is the following. In section 2, we discuss the related literature on policy choice and commitment in trade agreements. In section 3, we introduce the model and derive testable predictions. We test these predictions in section 4 and then conclude.

2 LITERATURE

This paper spans three topics: the general policy choice puzzle, the value of commitment via trade agreements and the relative efficiency of trade policies. We now briefly discuss each.

2.1 Policy Choice

One general 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 relative to more efficient policies, which can explain why 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. However, these papers provide a normative rather than a positive theory of inefficient transfers since they leave the government in the background and do not model 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 transfers. This is particularly important given that our main goal is to test the model.[4]

Other papers, such as Grossman and Helpman (1994) and Dixit, Grossman, and Helpman (1997), do not focus on the choice of redistribution policy. But they do provide an argument as to why competition among SIGs for government transfers will imply that more distortionary instruments improve the outcome for SIGs. These papers do not model the first-stage policy choice and also differ from ours in other important ways. Competition among lobbies is not the driving force in our model, so in our setting the SIGs generally prefer efficient policies whereas the government may prefer the opposite. Another key distinction is that two basic modeling

[4] Moreover, in our model governments prefer the inefficient policies because they improve its bargaining position relative to SIGs, which is quite distinct from the “sand in the wheels” argument. In fact, in our model, the decrease in bargaining surplus from using the inefficient policy is costly for the government, so such policies are used in spite of acting like “sand in the wheels” not because of it.

assumptions in those papers—transferable utility and no government bargaining power—actually imply that inefficient policies would *not* be adopted in our setting.

The other 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 thus less likely to oppose it if the policy also has some social benefit. Coate and Morris (1995) formalize this idea and 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). They show 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 has the advantage of being fully specified in terms of the policy choice. However, testing its predictions is difficult for another reason. As Coate and Morris themselves 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). So when testing their model one would need to (a) find systematic data on such projects and (b) determine if they were efficient. But if one is indeed able to determine that efficiency ex-post with any certainty then the model would predict inefficient policies are *not* 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.

As we note in the Introduction we build on Drazen and Limão (Forthcoming). The key theoretical difference is that in this paper we model tariffs and NTBs whereas they focus on a lump-sum transfer and a production subsidy. Moreover, we analyze trade agreements as the policy choice mechanism with a view to empirical implementation. The most important contribution relative to their work is that we derive and test several predictions.[5]

The work on this topic remains largely theoretical. The exception thus far is Ederington and Minier (2006) who examine the determinants of tariffs as a share of tariff plus production

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[5] Another broad argument that has been explored for the use of inefficient transfers is that they can give political benefits to the government or SIG that lump-sum transfers do not (c.f. Shepsle and Weingast [1981] and Weingast, Shepsle, and Johnsen [1981], Fiorina [1981] and Baron [1991], Dixit and Londregan [1996], Dixit and Londregan [1995], Acemoglu and Robinson [2001]).

subsidy protection. They use aggregate data for a panel of countries and mostly find support for the revenue generation hypothesis, i.e. that because tariffs generate revenue they may be preferred to the typically more efficient production subsidies. The authors note in the conclusion 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 instruments”. Therefore, their approach is to draw broad implications from these models and then test them using aggregate data, which implies according to them that “none of the results should be interpreted as an outright rejection of any model.” We believe that our approach tackles these issues by specifically deriving such equations from a fully specified model and testing them using detailed product data.

2.2 Small Countries and the Value of 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.[6] Somewhat surprisingly, this view has been formalized almost exclusively by appealing to specific time-inconsistency problems related to some form of investment. Staiger and Tabellini (1987) consider a model in which the reallocation of labor after an adverse terms of trade shock is costly, and the government has an incentive to provide unexpected protection to redistribute income after the shock. Commitment to free trade helps avoid a time-consistent equilibrium in which labor reallocation is reduced as people anticipate protection and the government fulfills those expectation with socially excessive protection levels.[7]

Maggi and Rodriguez-Clare (1998) extend Grossman and Helpman (1994) by allowing capital to be fixed in the short run but mobile in the long run. They 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. The distortion can arise from overinvestment by a politically organized industry, a “bad” equilibrium in which an industry that would not produce under free trade becomes active, or a slower than optimal rate of exit from a declining industry.

6 The other main argument is that trade agreements allow countries with market power to reduce tariffs in a reciprocal way and internalizes terms-of trade effects (Bagwell and Staiger [1999]). Maggi and Rodriguez-Clare (2007) combine the commitment motive explored in their 1998 paper with the terms-of-trade motive.

7 Tornell (1991) also addresses time-inconsistency problems in trade policy.

Mitra (2002) also models the interaction between the government and the lobbies as a Nash bargaining game, but he removes capital mobility and instead introduces fixed costs of political organization. Besides finding that governments with low bargaining power will want to pre-commit to free trade agreements (as in Maggi and Rodriguez-Clare [1998]), he shows that for sufficiently high fixed costs of lobby formation the government will prefer not to commit.

The strategic interaction between international and domestic policy negotiations has long been known (c.f. Putnam [1988]). Similarly to the theory papers described above 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 problem. The underlying bargaining mechanism we exploit is thought to be important in negotiations.[8] 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.

2.3 The Relative Efficiency of Tariffs vs. Non-Tariff Barriers

In the setting we focus on—a small competitive economy with no uncertainty—a tariff is generally at least as efficient as an NTB that leads to the same traded quantities. However, some theoretical papers in trade provide counter examples where NTBs can be more efficient, economically or politically.

For example, the losses from some NTBs may be less transparent than those of a tariff since the latter provides an explicit expression of the increase in domestic price relative to the world (cf. Hillman (1989) for a discussion of these arguments). A similar argument has been applied to the use of tariffs vs. production subsidies (Magee, Brock, and Young [1989]). This simply applies the disguised transfer idea to this setting and is thus subject to the same comments as above. Moreover, Falvey and Lloyd (1991) for example argue that the importance of the

[8] 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.

transparency motives has decreased over time, as estimates of the costs of protection have become more available (p. 463). Information asymmetries are not needed in our model.

Most papers on this topic examine the relative efficiency of tariffs vs. a specific type of NTB: quotas; and provide a motive for which the quota's ability to control quantity becomes an advantage. In Kaempfer et al. (1989) this advantage is driven by the existence of a domestic monopoly such that if quotas are used as an additional source of protection they reduce the overproduction resulting from tariffs. Others have focused on the role of uncertainty about world prices under risk aversion where a quota may be preferred to a tariff because it stabilizes the import quantities and thus the domestic price (c.f. Young [1980], Young and Anderson [1982], Hillman [1989]).[9]

We do not dispute that there are instances when the ability to precisely control quantities generate an advantage of quotas over tariffs. We doubt that this reversal of efficiency between tariffs and quotas (and other NTBs) is the norm for most goods and if it were then our model would not apply and we should not find empirical support for it. Moreover, since the Uruguay Round many quantitative restrictions were actually outlawed and NTBs now take other forms such as product and technical standards and various forms of import charges (Michalopoulos [1999]).[10] Thus, the NTB we model can capture not only the effects of a quota but more generally of a measure that generates a wedge between domestic and world prices. More importantly, our model has the advantage that it can also explain why tariffs instead of even more efficient measures (e.g. production subsidies) will be used for redistribution and the way in which the choice across different policies occurs.

3 THEORY

3.1 Setup

We consider a small competitive economy that takes world prices as given. Individuals' factor endowments may differ but they have identical preferences described by

[9] Falvey and Lloyd (1991) focus instead on the relative efficiency of quotas and tariffs under domestic demand vs. supply shocks.

[10] While determining the relative efficiency of each type of NTB at each point in time relative to tariffs is nearly impossible, we now have evidence that the ones imposed are highly trade restrictive in a large set of countries. Using data and estimates from Kee et al (2006) we find that the overall trade restrictiveness index for the typical country is equivalent to a uniform tariff of 14% if we ignore NTBs, but it jumps to 27% when NTBs are included. Moreover, for about 35 countries that index doubles when NTBs are included.

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

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 $x_i = d_i(p_i) = [u'_i(p_i)]^{-1}$ of each *i*, and $x_0 = E - \sum_i p_i d_i(p_i)$ of the numeraire. The indirect utility is thus given by $v(\mathbf{p}, E) = E + s(\mathbf{p})$, where **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 good is produced using only labor with a marginal product equal to one. Assuming the supply of labor is large enough this good is always produced and thus the wage equals unity in equilibrium. 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 fixed, 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.[11] For concreteness, we consider NTBs that generate a wedge between the domestic and foreign price, as a tariff does, and can also generate rents. We model NTBs as 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. A specific example of such NTBs are quantitative restrictions where some of the licenses are given to foreigners or to residents that must "burn" resources in some rent seeking process. By allowing ϕ to range between zero and one we can capture different degrees of the inefficiency in a simple but clear way.[12]

[11] This policy set is determined by the data available to test the model in the empirical section. We could have instead included production subsidies and tariffs and the same mechanism we explore would imply that the government would gain by restricting subsidies and using tariffs. Alternatively, if we allowed subsidies, tariffs and NTBs we conjecture that the qualitative results would be similar to the ones we obtain as long as governments had a commitment technology to constrain subsidies and tariffs as occurs in the WTO.
[12] This does not imply that the model captures all the different types of NTBs, which would be impossible. As discussed in the literature review, certain NTBs have the same effects as tariffs in some economic environments but not in others. Nonetheless, the key insight of the model should apply to various NTBs as long as they generate a wedge relative to the world price and are less efficient than the tariff in maximizing the political surplus, as defined below.

The effect of the NTB can therefore be captured by its *advalorem* tariff equivalent, i.e. the percentage increase in domestic price due to it, which we denote by τ. The total per capita rents available domestically from using τ and an *advalorem* 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 $t_i p_i^*$ measures the difference between the domestic and world price, p_i^*, due to the tariff and $\tau_i p_i^*$ the equivalent wedge due to the NTB. 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 assume that the government redistributes these rents uniformly to all individuals.

In an exogenously given set of sectors L, the specific factors are able to organize into SIGs that lobby the government. The joint gross welfare of lobby i is:

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

where l_i is the labor income of the owners of the specific input used in industry i, and α_i is the fraction of the population that owns some of this factor. We analyze the case of highly concentrated factor ownership, $\alpha_i \to 0$, 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, which includes wage and specific factor income plus net taxes (or rents) from policy and consumer surplus:

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

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 when that lobby good is cash contributions and there are no limits on them. However, in several countries—including the one we analyze in the empirical section—there are 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 (Forthcoming) 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. Thus we think that in several settings it is reasonable to assume, as we do, that Ψ_i is strictly concave. As we will see the resulting non-transferability of utility between government and lobbies is key in generating the use of inefficient policies.[13]

There are two stages in the game. In the first stage, the government may set a cap on the tariffs it can choose. In the second stage, the government (Nash) bargains with each of the SIGs over the level of lobby goods and trade policies that will be implemented subject to the first stage constraints.

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

We first show that if the government does not set a cap on the most efficient available policy, then this is the only policy used in equilibrium. This will highlight the role of commitment by showing that in its absence our model predicts that only the most efficient available policy is used. The absence of a cap can either be due to no access to a commitment technology or a choice not to use it. [14]

Before showing the absence of relatively inefficient policies when no constraint is set on the other let us briefly explain the intuition. It is obvious that a tariff is more efficient from a *social welfare* perspective than the alternative policy in our setup. This is simply because if both policies lead to the same level of imports and prices then under τ a fraction of the rents are dissipated. But the relevant definition of efficiency in the context of the policy choice puzzle is *political* efficiency, i.e. which policy maximizes the joint payoff to the government and lobby for any given level of the lobby good.

It is straightforward to see that in our model the two inefficiency definitions (social and political) exactly match, since the government objective is a weighted value of social welfare and

[13] Alternatively, we could model non-transferability by allowing C to enter linearly in G but require it to be produced by each lobby using the numeraire as the input into a diminishing returns production process.
[14] In our empirical work the goods where such a commitment is absent will 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.

lobby goods. Therefore for a given level of imports and contributions, the lobby payoff, *V* is identical under *t* or *τ*, but government payoff is lower under *τ*. So *t* is both socially and politically more efficient in this setup. 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 latter is used.

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

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

Letting λ be the multiplier associated with the tariff constraint, the first order conditions for *t*, *τ* and *C* when $t, C > 0$ and $V > V^0, G > G^0$ are given respectively by:

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

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

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

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

and the (omitted) corresponding complementary slackness conditions for (4) and (6); here a subscript denotes a partial derivative.[15]

When the tariff cap is absent or not binding, then λ equals 0 and from (3) and (5) we get:

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

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:

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

[15] To ensure an interior solution we assume throughout that Ψ'(0)→∞.

Thus, organized industries receive tariff protection. Note that if C entered the government's objective linearly then this expression is similar to the well-known expression obtained by Grossman and Helpman (1994) for an organized industry when factor ownership is concentrated.

To show that only the tariff is used in the absence of a commitment note that $\tau = 0$ if (4) is negative. This inequality 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 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 welfare, in (1), taking into account the effect on the equilibrium tariff and contributions found by solving the Nash problem previously defined but with $\tau = 0$ as an additional constraint. The first order condition for t^c is

$$\Psi_i'(C_i)\frac{\partial C_i}{\partial t_i} + a\frac{\partial W}{\partial t_i} = 0 \tag{9}$$

which gives:

$$t_i^c = \frac{\partial C_i / \partial t_i}{-a(p_i^*)^2 m_i'}\Psi_i'(C_i) \tag{10}$$

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 (10) 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 (10). Replacing these above we should then obtain:

$$\partial C/\partial t = \partial \Pi/\partial t$$

In Appendix A 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, it 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 all the 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.

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

In practice lobbies can always find alternative policies and the government is not able to constrain all of them. [16] Therefore, we now show how constraints on tariffs lead to the emergence of 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. In the next section we provide testable predictions for which goods the government chooses to commit to such constraints.

[16] This can be either because of institutional constraints of the agreement (e.g. the traditional focus of WTO and PTAs to restrict certain production subsidies and tariffs but not other policies). 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 commiting.

Let us first consider under what situations a tariff cap $\bar{t}^c$ leads to the use of NTBs in the second stage. Clearly if that cap is equal to zero then *if* 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. This is simple to verify using the first order conditions in (4) and (5).

Given the strictly positive and 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 $\bar{t}^c = t^u$ we have τ = 0. So our model predicts that:

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

(2) 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 exists. Our model also provides specific predictions about which goods the government chooses to commit in. Before deriving these additional predictions, we derive the NTB level for a given binding tariff to show the results mentioned above.

The interior NTB solution when there is a binding cap requires the marginal rate of the substitution across policies for the government to be equal to the lobbies, as we can see from solving (4) and (5) to obtain:

$$\frac{G_\tau}{G_c} = \frac{V_\tau}{V_c} \qquad \Leftrightarrow \qquad \frac{a\left[\left(\tau_i(1-\phi) + \bar{t}_i^{\,c}\right)(p_i^*)^2 m_i' - \phi p_i^* m_i\right]}{\Psi_i'(C)} = \frac{y_i(p_i)p_i^*}{-1} \tag{11}$$

which we can re-arrange to obtain

$$\tau^c{}_i = -\frac{1}{1-\phi}\left[\bar{t}_i^{\,c} - \frac{y_i(p_i)}{-ap_i^* m_i'}\Psi'(C_i)\right] - \frac{\phi}{1-\phi}\frac{1}{\varepsilon_i} \tag{12}$$

where $\varepsilon_i = -m_i'(p_i)\left(p_i^*/m_i(p_i)\right)$ is a measure of the absolute value of the 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 second 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 proceed to the initial stage and ask under what conditions the government chooses to commit. More specifically, we derive predictions about which goods the government chooses to commit in and, when possible, the level of that commitment.

The government commitment decision in the first period can be modeled in two alternative ways. First, allow it to choose whether or not to commit to an exogenously given cap. Second, allow it to choose both whether to commit and the optimal level of the cap that maximizes its objective in the first stage. Clearly the conditions for the first alternative are more stringent since the government cannot optimally choose the cap.

It is important to show the result for the first alternative since it is often 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 (as in one of the cases in the empirical section). Another example is if the government has *some* influence over the level of the cap but is unable to choose it to exactly maximize its objective. Such a situation could occur when there are other constraints (unobservable to us) that prevent it from choosing the optimal cap level (e.g. a sectoral agreement of all WTO members on agriculture or Information Technology). Thus we derive sufficient conditions such that a government can benefit from a commitment to cap even if it is not necessarily able to set its level optimally. As will be clear, such conditions will also be sufficient for the government to commit if it could choose the optimal cap and will also allow us to generate a prediction about the level of that cap.

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:[17]

$$G(\overline{t}_i^c, \tau_i^c(\overline{t}_i^c, \gamma_i), C_i^c(\overline{t}_i^c, \gamma_i), .) \geq G(t_i^u(\gamma_i), \tau_i^u(\gamma_i), C_i^u(\gamma_i), .) \quad (13)$$

The NTB and contribution values under the tariff constraint are the equilibrium ones determined in the second stage as explained in the previous section. The unconstrained values are the ones

[17] Given the separability of *G* over goods, we can treat the choice over *each* good *i* independently of the values for other goods. If the government had to choose between entering an agreement with an exogenously given set of caps 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 have to 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.

determined in section 3.2, which we showed imply $\tau^u(\gamma)=0$. A sufficient condition for (13) to hold also implies that the government prefers to commit *and* choose the optimal cap, since that amounts to allowing it to choose the value of $\bar{t}^c$ that maximizes the left-hand side of (13), which confirms our assertion in the previous paragraph.

We illustrate the result graphically in Figure 1, which depicts payoffs in G-V space. The bold line represents the Pareto frontier in the absence of commitment. It yields a higher *joint* payoff than the alternative where the tariff is constrained, which we have seen in the previous section implies the less efficient NTB is used. Note first that for a large enough bargaining power (13) 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 all the 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 as the level at which $G^u(\gamma=\gamma^h)=G^{cM}(\gamma=\gamma^h)$, 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 (13) 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, (13) 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 (13) holds with equality. The formal sufficient condition for this is

$$\lim_{\gamma_i \to 0} \frac{d}{d\gamma_i} G(\bar{t}_i^c, \tau_i^c(\bar{t}_i^c,\gamma_i), C_i^c(\bar{t}_i^c,\gamma_i),.) \geq \lim_{\gamma_i \to 0} \frac{d}{d\gamma_i} G(t_i^u(\gamma_i), \tau_i^u(\gamma_i), C_i^u(\gamma_i),.) \quad (14)$$

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 (Forthcoming) show this for different policies and note that this condition need not always hold and must be checked in each policy setting. Thus in Appendix A 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 value of $\gamma \in (0, \gamma^*)$ so that point *U* is the solution under no commitment. The slope of the Pareto frontier reflects the rate at which government's payoffs can be traded for those of the lobby. The steeper it is, the more costly a given increase in *V* is and thus it becomes more efficient (in terms of the Nash product being maximized) to increase the government *share* of the payoffs. To see this 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 that in *C'*, which at the critical value γ^* is equal to the unconstrained. For some higher *γ* the government payoff is higher when it commits to a constraint.

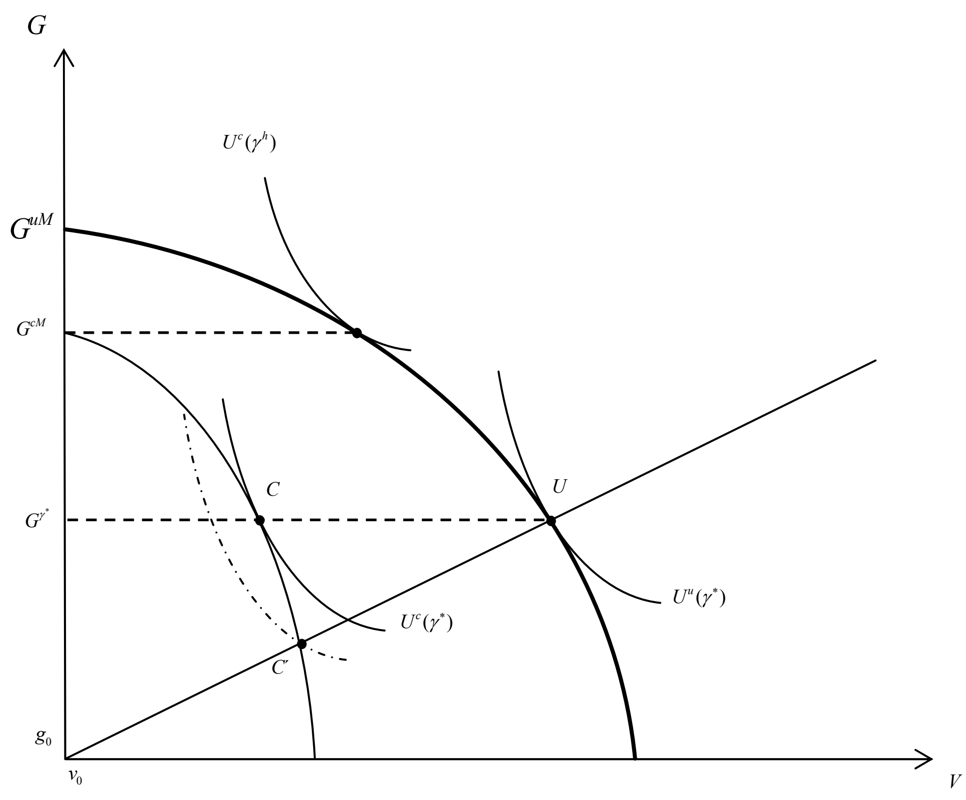

Figure 1

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, when the bargaining power is sufficiently high 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 affect 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 (13) 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 zero for sufficiently large γ.

4 EVIDENCE

4.1 Consistency with Known and Emerging Facts on Trade Policy [To add]

4.2 Specific Model Predictions

We now investigate the specific predictions of the model. First, we examine the impact of tariff constraints on the use of the typically (even) less efficient non-tariff barriers (NTBs). We then estimate the impact of bargaining power on the governments' choice of goods in which it constrains tariffs and the level of that constraint.

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. In the WTO countries negotiate tariff bindings, which are effectively ceilings on applied tariffs. If countries set their *applied tariffs* above that binding, they are subject to a dispute from the countries facing those higher tariffs. The cost of such disputes can range from the simple administrative costs of defense, e.g. providing information about why the tariff now exceeds the negotiated binding, to the loss of export market access if the plaintiff country retaliates by increasing its own tariffs.

Thus in goods with negotiated tariff constraints in the WTO there are additional costs to setting tariffs above a certain level. When those costs are sufficiently high, the government can credibly commit to a maximum tariff in negotiating with its domestic lobbies and then, according to the model, if the constrained tariff level 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. In sum, we exploit the cross-product variation in tariff bound status and level in the WTO to examine their effect on the likelihood and level of NTBs. For reasons that will be clear below we focus on Turkey.

In PTAs, countries agree to preferential tariffs between themselves and in certain cases to set a common external tariff. Non-enforcement of the preferential or common external tariff by a member can generate a cost from retaliation by the other members, which provides an additional source of commitment to a certain tariff level. This cost can be particularly large in some cases, e.g. if Turkey fails to enforce the tariffs specified in its customs union with the EU, then this may be used as an additional reason to deny it full EU membership. Moreover, when there is a large asymmetry in the size of members the common external tariff is mostly or fully 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. Turkey for example, had to adopt EU tariffs as they existed, except in some products that were temporarily excluded from that agreement.[18]

Several of the predictions of the model are better tested by exploring cross product rather than cross-country variation since the latter is likely to contain considerable unobserved heterogeneity. Because of this and the detailed data we require for some variables, our approach is to focus on a single country. The template of the analysis can subsequently be applied to other countries for which such data is collected.

Three important data considerations guided our country choice. First, the availability of NTB data and 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

[18] For details see the WTO's Trade Policy report for Turkey in 1998.

focus on 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.[19]

Below we discuss the different variables used and the data appendix (to be added) provides detailed information about their source and construction.

Commitment and the use of less efficient policies

For most countries, detailed NTB data is scarce and when available it is generally comparable only for a couple of years. Turkey is not an exception in this regard and its NTB data is available only for 1994 and 1997. Although the more recent data includes extra information, such as advalorem equivalents that most closely match the theory predictions, it is instructive to start with a brief look at the earlier period. To place the analysis in context, we note a few basic facts about this country's trade policy. Turkey moved away from an import substitution regime in the early 1980's. It implemented a major trade liberalization that reduced tariffs and removed most of its NTBs, such as quotas. Some of the tariffs were replaced by other types of duties in the 1980's, e.g. mass housing fund, infrastructure tax, which were still taxes on imports. But most of these taxes on imports had also been removed by 1993 (Togan, 1995). Due to this liberalization, by 1994 only about 2% of all HS-6 lines were subject to any NTB. These consisted of some quantity restrictions but mostly authorization licenses, product standards and embargos/ prohibitions.[20] This implies that there is only a relatively small amount of variation for us to use in 1994, but by 1997 that is no longer the case.

The main constraint on Turkish MFN tariffs in 1994 were the bindings in the GATT/WTO. About 30% of its HS6 lines were subject to a binding and they were on average set at 41%. The applied tariff for a few of these goods was close to the binding but for the typical bound good the applied tariff was 20 percentage points below it. So both the small variation in

[19] In the last election, the elected party's revenue share from private contributions was less than 0.0% whereas 92.5% was from state funding. Accessed at <http://www.akparti.org.tr/gelir_gider/haziran.htm>

[20] There were also anti-dumping barriers, each applying only to a single country, rather than all countries as the other NTBs did. We focus on the latter because explaining anti-dumping requires much finer data and a model that is tailored to the industry, so it may not fit as well with our general theoretical framework.

the NTB variable and the high value of the bindings suggest that we are unlikely to find a strong effect of these bindings on NTBs in this period.[21]

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

$$NTB_i^* = \alpha + B_i\, \mathbf{x}_i\boldsymbol{\beta} + \mathbf{z}_i\boldsymbol{\theta} + e_i \qquad \text{(E1)}$$

where NTB_i^* represents a latent variable capturing the NTB, which maps into the observed NTB variable in a slightly different way depending upon whether we estimate the likelihood of an NTB or its level, as we explain below. The theoretical model predicts the NTB advalorem to be given by eq. (12) in the presence of a binding tariff constraint and zero otherwise. Thus, the variable B_i is an indicator for whether a product is subject to a binding tariff cap and it is interacted with the set of variables in vector $\mathbf{x_i}$. According to the theoretical model, if we included only a constant, i.e. $\mathbf{x_i}=x^0_i$, then we should find a positive effect of B_i on NTBs if on average the products for which $B_i=1$ do have a binding tariff cap. Moreover, the higher the level of the constraint tariff, t_i^c, relative to its unconstrained level, the lower the NTB. The model also suggests we include the inverse import demand elasticity in $\mathbf{x}$.

Naturally, there may be additional reasons for NTBs that we may want to control for. The possible variables in $\mathbf{z_i}$ include sector-specific or product characteristics that affect NTBs. In some cases, they will include some of the variables in $\mathbf{x}$ as a way to test if the effects occur only through the bound products, as the model predicts.[22]

The first measurement issue to deal with is measuring B_i, i.e. determining which products there is a binding cap on. This is not as straightforward as it may seem since if the tariff on a product is subject to a cap, then we cannot simultaneously observe the unconstrained value of the tariff and hence we cannot *exactly* determine if the cap is binding or not. Our basic approach is to identify goods on which a formal constraint exists, e.g. if a country has a WTO tariff binding on a product then we set B_i equal to 1 and zero otherwise. This correctly captures the goods for which there is no cap as also not having a *binding* cap but misclassifies some where a

[21] Turkey was also supposed to be phasing in tariffs to eventually comply with the EU common external tariff. But this was a somewhat soft constraint until the Customs Union was actually signed in 1996, and after that point in time we will estimate their effect.

[22] In the baseline results we do not interact our variables with whether or not there is an organized lobby in the product because there is no available organization data at this detailed level. Thus we implicitly assume that all products are organized and any resulting measurement error is likely to generate attenuation bias. In the robustness section we will consider the effect of including a lobby organization variable at the *industry* level.

cap is present but still not binding. 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. As we explain below, we also extend our basic approach in order to better capture if a cap binds.

The tariff advalorem equivalent of NTBs is generally not known so we first examine the existence of NTBs. Table 2 presents the marginal effects of a probit estimation based on (E1) where the dependent variable is equal to 1 if good i was subject to an NTB in 1994 and zero otherwise. In column 1 we find that a binding increases the probability of an NTB by almost 2 percent, which is close to the mean in the sample. This is what the model predicts for goods with binding caps. In column 2 we also include the binding level, so $f(t^c_i) = t^c_i$, to test if when this level is sufficiently high it no longer constrains the government. We confirm that higher bindings lead to a lower probability of NTBs. The interpretation of the binding dummy is now the effect of a binding cap equal to zero and it increases the probability of an NTB unless the cap is relaxed beyond a high value.

Using the binding tariff level alone to proxy for whether a constraint is likely to bind implicitly assumes the unconstrained tariff level is similar for all bound goods, which may induce measurement error. A binding of 20% may constrain one product but not another since, as we show in the theory section, the unconstrained tariff level can vary across industries for other reasons, e.g. different import penetration ratios. In fact, (12) shows that, at least for the advalorem equivalent, we should include not only the constrained tariff but the difference between it and the *unobserved* unconstrained level, i.e. we should use $f(t^c_i) = t^c_i - t^u_i$.

The econometric issue we must address is how to measure t^u_i. We do so by constructing a counterfactual unconstrained level. For each bound product *i* in a given *industry I* we take the average of the applied tariff in 1993 (so it was pre-determined relative to the NTB) over the *unbound* products in industry *I* (which we define here as being in the same HS2 category).[23] Column 3 uses the difference between the binding level and this unconstrained variable and shows that the larger the binding relative to the unconstrained the lower the probability of an NTB.

Several other factors may affect the likelihood of an NTB and thus in columns 3-6 we include "sector" dummies (defined at the HS1 level of classification). The qualitative results are similar but the magnitudes of the effects decrease. Nonetheless, the effects remain significant at

[23] In some cases where no unbound products are available in that HS2 we use products in the same HS1.

the 5 or 10% level in the preferred specification in column 6 that most closely follows the model.[24]

By 1997, there had been two key changes on Turkey's tariff constraints. First, it had started to implement additional bindings in the WTO, increasing the share of goods covered from 30% to about 47%, and reducing binding levels from about 41 to 30% on average. Second, it had signed a customs union with the EU where it committed to implement the EU's external tariffs, which led to a large reduction in Turkish applied MFN tariffs.

In 1997 Turkey also had considerably more NTBs. They covered about 9% of all HS-6 products, with some NTB in at least a third of 97 different HS2 industry classifications. This increase in NTBs is of course what our model predicts if the new tariff constraints are indeed binding. The NTBs applying to all countries were almost exclusively authorization for imports. These can require for example a product satisfying certain criteria before being allowed into the country and are "intended to protect consumers or the environment" according to Turkish response to the WTO secretariat's TPR 1998.[25] These can be highly trade restrictive: the estimated advalorem equivalent for the typical good with an NTB in Turkey is over 30% and the average about 48%.

Table 3 presents probit results for the existence of NTBs in 1997. The first three columns present specifications similar to those in table 2. A tariff binding increases the probability of an NTB by as much as 13% (column 2) and the higher the binding level the smaller the probability. The results are robust to including sector dummies, as shown in columns table 3b.[26]

One potential concern is that the binding status variable is simply acting as a proxy for some omitted variable that affects NTBs. In that case we would expect more specific variables such as the agreed implementation date of a binding to be insignificant and for binding status to remain highly significant. We find evidence *against* this hypothesis in column 4, where we

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[24] Greene (2002) shows that Tobit estimates with fixed effects do not lead to biased estimates but they do for Probit *if* the number of observations per group is small (T=2) but the bias declines rapidly with larger T. The minimum T in our sample is over 200 (10 times higher than Greene considers). So we do not expect this to be an important issue. The reduction in the number of observations relative to table 2a is due to the exclusion of observations in HS 1 categories without any variation in the dependent variable.

[25] While this is likely to be the case for restrictions imposed on HS sublines of category HS2 84 (containing lines related to nuclear reactors, machinery boilers and parts) or certain chemicals, it is harder to explain why this rationale holds for HS2 94 (furniture, bedding, etc) 49 (books and printed materials) and others.

[26] Note that we use the unconstrained level constructed from 1993 applied data, which may be more appropriate than using the 1997 value since, as we discuss below, even applied Turkish tariffs that were not bound in the WTO were subject to the constraint imposed by the common external tariff. However, the result in column 3 is qualitatively similar if we use 1997 data for the unconstrained level.

include a dummy for the subset of bound products for which the implementation was scheduled to have already begun by 1997. As we see the probability of an NTB is higher for those products and in fact binding status for products where implementation had not yet begun is insignificant.[27]

We then test if the constraints on tariffs imposed by the customs union with the EU affected NTBs. In 1997, some of these commitments were still being phased in so we exploit this variation, i.e. the fact that at that time only 85% of products in our sample had to follow the common external tariff. Thus, the dummy variable for EU binding is the analogous to B_i for the WTO commitment and we expect it to also be positive. We confirm this is the case in columns 5-7. The level of the constraint for the bound products is given by the EU external tariff, denoted EU binding level. This variable is analogous to the WTO binding level and so it is expected to have a negative effect; this is what we find in column 5.

To follow equation (12) more closely we then adjust the EU tariff by the Turkish unconstrained level, measured in the way we previously described for table 2. We do this in column 6 and confirm that the higher the EU tariff that Turkey had to adopt relative to Turkey's unconstrained tariff, the less likely an NTB is. This result also holds when we control for sector heterogeneity using HS1 dummies (column 13 of table b) or other sector dummies (not shown).[28,29]

A simple falsification test that builds on the preferred specification in column 6 is to ask if EU tariffs also affect Turkish NTBs in products that were *not* yet covered by the customs union in 1997. In column 7 we find that is *not* the case, the effect is insignificant for unbound products but remains highly significant, at 1% level, for bound. This provides further support for the model.

While in 1994 if an HS6 product had an NTB that was true of all its sub lines at the HS8 level, in 1997 that is not always the case. Therefore, instead of using the variable defined for the probit estimation—an indicator for whether any HS6 sub line had an NTB— we can construct a

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[27] The two variables are jointly significant.

[28] The alternative sector classification is based on groups of HS4 classifications that fall into each of the following categories: Agriculture, Petroleum, Fish products, Wood, pulp and furniture, Textiles and clothing, leather, rubber, footwear and travel goods, metals, chemicals and photographic supplies, transport equipment, non-electric machinery, electric machinery, mineral product and precious stones and metals, manufactured articles not elsewhere specified.

[29] The main difference when we control for such heterogeneity is that the EU binding dummy becomes insignificant. The reason for this is that many of the exclusions occur in agriculture where Turkey had no NTBs since they had high tariffs (this explains the reduction in the number of observations). So there is insufficient variation in the EU binding dummy once we condition on industries that have NTBs.

coverage ratio, i.e. the fraction of sub lines in an HS6 with an NTB. This provides a crude measure of the intensity of NTBs.

In table 4, we use this coverage ratio variable and employ a two-limit Tobit (at zero and one). The specifications in each column match exactly those in table 3 and as we can see the results are qualitatively very similar. This is both because the Tobit will naturally pick up the probability effect estimated in table 3, but also because the marginal effects at the uncensored values (not shown) are generally also significant. That is, the independent variables also have a significant effect in determining how high the coverage ratio is in an hs6 where at least one NTB exists.

In order to quantify the impact of policy switches it is necessary to know how restrictive an NTB is. Moreover, the structural equation (12) predicts what exactly the advalorem equivalent of the NTB should be. Thus, in Table 5, we regress estimates of advalorem equivalents for NTBs on the variables discussed above for the NTB coverage ratio.[30] The results are similar, which is not surprising since a large share of observations is censored and thus the binary effect contributes strongly to the overall effects.[31] But the constraints on tariffs also affect the restrictiveness of the NTBs.

Using column 5, we calculate that the estimate of the marginal effect conditional on being uncensored imply that a tariff binding of zero in the WTO increases an NTB's restrictiveness by about 10 percentage points. Moreover, an increase in that binding level from 0 to 10 pp will reduce the restrictiveness of the NTB by about 2.5 percentage points. Equation (12) also suggests we include the inverse import demand elasticity for bound goods. If we augment the preferred specifications with that variable there is no significant change in the coefficients shown in columns (6) and (13). The sign of the elasticity variable is negative, as predicted but its effect is insignificant.[32]

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[30] The advalorem equivalents are estimated by Kee et al (2006) 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.

[31] The main difference is that the unbound value in columns 7 (table 5a) and 14 (5b) are now marginally significant (at 10%). This is likely due to outliers in the estimated advalorem equivalent since when we eliminate top decile of positive AVEs, i.e. those higher than 120%, the unbound variable is insignificant. This truncation does not affect the sign or significance of the other variables.

[32] These results are available on request. The reason we exclude this elasticity from the baseline results in table 5 is that its calculation requires positive imports and may introduce some selection issues (the sample falls by about 10%). Moreover, the elasticity is likely to depend on the value of NTBs, an endogeneity issue that we address via IV in the robustness section but one that does not affect the results just described.

In sum, the results in tables 2, 3, 4 and 5 indicate that constraints on tariffs via international agreements increase the probability of the use of NTBs in a given product. Moreover, they increase the restrictiveness of any given NTB used. These effects are dampened when the tariff is constrained at levels that are so high that they are effectively not binding, which is precisely what the theoretical model predicts. In addition, the effects appear to be related to the actual implementation dates of caps and the tariff level effects are generally not present in unbound goods, as seen for the EU. Thus the basic results provide support for theoretical model. In section 4.3 we provide further robustness checks. But, before doing so, we analyze the choice of bindings both because they are one of the model's predictions and also because in the robustness section we will build on this to instrument the binding variables in the NTB equations.

Commitment choice

The model also provides predictions regarding which goods a government prefers to constrain tariffs in and the level of that constraint. We analyze these in the case of the WTO commitments since in the EU case the Turkish government had little or no choice (at least for the level of the cap). The basic econometric model is now given by

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

where **x** represents a set of control variables (not necessarily the same as in (E1)) and the latent variable $COMMIT_i$ will be used to capture the binding commitment decision or level. That is, we will examine what determines whether the government commits to a binding in product *i*, the value it sets it at or that value relative to the unconstrained. In particular, we focus on the effect of the government's bargaining power relative to each industry's lobby, which is captured by $BARG_I$.

There are many potential variables that one could argue proxy for bargaining power. If we searched enough for the "appropriate" measure, we could certainly confirm the theoretical predictions. To avoid this pitfall we constrain ourselves to measuring bargaining power as closely as possible to theory. Binmore et al (1986) show that the Nash bargaining framework can be interpreted as a bilateral game of alternating offers, where the bargaining power parameter reflects the relative discount factors of agents.[33] Thus if we denote the discount factors of the

[33] It can also represent the probability of an exogenous breakdown in bargaining.

government and the lobby representing industry I by δ_g and δ_I respectively we can write bargaining power, i.e. the parameter γ from the theory section, as

$$BARG_I = \delta_g / (\delta_g + \delta_I)$$

The parameter δ_g (δ_I) can be thought of as the product of the probability that the government (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.[34]

We use (1-exit $rate_I$) to capture the probability of survival of firms in industry I.[35] Given that we are considering a cross section for a single country, the government probability of survival does not affect the estimated sign of the parameter γ in the regression, only its magnitude. Nonetheless, we employ data on Turkish governments' tenure in power to measure their survival rate so that the analysis can eventually exploit cross-country or time variation in it.[36] It is not obvious what the exact period length should be; we focus on a one year horizon and test if the results are robust to longer periods such as four years. Given the potential for measurement error we also use g($BARG_I$) where g(.) transforms BARG into categorical variables that divide industries into terciles.

The model predicts that a government is less likely to constrain tariffs in products where it has sufficiently high bargaining power. The results in table 6 show that the estimated coefficient, γ, is negative for the probability of binding. This is the case if we use the continuous bargaining variable (column 1) or its categorical counterparts for industries in either of the two top terciles combined (column 2) or separate (column 3). Since the bargaining measure varies only across ISIC 3 industries, we cluster the standard errors at that level.

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[34] We could use treasury interest rates to measure the government's cost of borrowing since this is the main source of deficit financing in Turkey. The difficulty is finding good measures of industry specific interest rates.

[35] The basic intuition why this is a useful proxy can be understood if we take the extreme case where the SIG is formed and contains two firms, the only in the industry. When that SIG, i.e. those two firms, negotiate at time t with the government it cares about whether or not those two firms will be present in the following period or exit. It places no value on new firms that may come in. So if the number of firms expected to exit were 2 that lobby would have very little bargaining power at time t independently of the number of firms that are expected to enter the following period.

[36] See the data appendix for details on the calculation of each of these.

The standard errors are small enough to ensure the effect is significant at conventional levels only in column 3. The large standard errors in other specifications may either be due to a measurement error in the bargaining variable or the fact that there is not enough variation in actual bargaining power so that the government's decision to bind is driven by other factors. If the latter is the case, we could still find that after choosing to bind the government takes even small variations in bargaining power into account when setting the *level* of the binding.

If a government does choose to bind then we expect it to set a higher binding in products in which $BARG_I$ is higher (so it does not constrain joint surplus by as much). We confirm that is the case in columns 4, 5 and 6 of table 6. The effects are significant even after clustering the standard errors. We find similar results if we employ a four year horizon in computing $BARG_I$.

Recall that the model's prediction was that $t^c_i - t^u_i$ is increasing in $BARG_I$. Thus the evidence above provides direct evidence for the model only if t^u does not change much with bargaining power. Rather than assuming this we can test the prediction directly by employing $t^c_i - t^u_i$ (the constructed regressor used in the NTB equations) as the dependent variable. We do this in columns 7-9 and confirm the model's prediction.

The specifications in table 6 include two determinants that vary at the product level: the number of exporters and a Herfindahl index of export value. We expect that the less concentrated the source of the exports the less likely any given exporter is to try to negotiate a tariff reduction with Turkey, as they will try to free ride on others. So the Herfindahl index is expected to have a positive effect on the probability of binding and a negative effect on the value of the binding, which is what we find. Holding this free riding incentive constant, an increase in the number of exporters implies a larger pressure for Turkey to bind at lower levels. The results confirm this.

Although the specifications are parsimonious they do explain a reasonable amount of the variation, about half for t^c_i and $t^c_i - t^u_i$. Nonetheless, there is the potential that the bargaining variable is capturing some omitted industry variable. We will address this more fully in the robustness section via instrumental variables. Here we note that some of this concern is alleviated by the fact that we include dummies to control for broad sector differences.

4.3 Robustness and Quantification [To add]

5 CONCLUSION

We analyze why relatively inefficient policies are used when more efficient ones are available to redistribute income towards SIGs. In order to tightly link the theory and estimation we focus on a specific model and set of policies: tariffs vs. NTBs.

The model shows that the government of a small country bargaining with its domestic SIGs can gain by committing to limit the tariff levels through international trade agreements. Moreover, we show that the NTB increases with the difference between the unconstrained tariff value and the tariff binding (i.e., the stringency of the binding). We also show how the decision to commit depends on the government's bargaining power relative to SIGs.

Using detailed data, we test the predictions of the model for the case of Turkey and find that both tariff constraints imposed via the WTO and the PTA with the European Union increase the likelihood and restrictiveness of NTBs in those goods. Furthermore, these effects are stronger for more stringent tariff caps. We also construct a measure of bargaining power of the government versus SIGs and find that the probability that the government will choose to commit to bind a tariff, and especially the tightness of the binding, decrease with its bargaining power, as predicted by the model.

Future research should test if similar results are present for other countries' trade policies by applying a similar template to ours. It would also be interesting to do so with respect to other types of policies. Finally, in order to obtain a more complete answer to the policy choice puzzle it is important to draw out specific testable equations from alternative theories (existing or new) and test them using detailed data.

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DATA APPENDIX

Variable Construction and Source Details [To add]

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Year: 1994					
Dummy for NTB	4962	0.021	0.144	0.000	1.000
Dummy for binding (B)	4962	0.294	0.456	0.000	1.000
Binding level (B x t^c)	4962	0.077	0.151	0.000	1.200
Binding level for products with binding	2214	0.407	0.424	0.000	2.500
Gap binding level-unconstrained tariff (B x (t^c- t^u))	4962	0.052	0.120	-0.120	1.130
Year: 1997					
Dummy for NTB	5112	0.086	0.281	0.000	1.000
NTB coverage ratio	5112	0.059	0.213	0.000	1.000
NTB AVE coverage ratio	5080	0.029	0.175	0.000	2.286
Dummy for binding (B)	5112	0.473	0.499	0.000	1.000
Dummy for implementation in 1997	5112	0.433	0.496	0.000	1.000
Binding level for products with binding	2420	0.294	0.368	0.000	2.250
Binding level (B x t^c)	5112	0.139	0.293	0.000	2.250
Gap binding level-1997 unconstrained tariff	5112	0.109	0.267	-0.151	2.130
Gap binding level-unconstrained tariff (B x (t^c- t^u))	5112	0.095	0.272	-0.146	2.200
Dummy for EU binding	5112	0.853	0.354	0.000	1.000
EU binding level	4930	0.046	0.038	0.000	0.250
Gap EU binding level-unconstrained tariff	4930	-0.038	0.042	-0.250	0.118
Gap EU tariff level for unbound -unconstrained tariff	4930	-0.005	0.040	-0.300	0.960
Bargaining	4598	0.410	0.002	0.407	0.421
Medium-high bargaining	4598	0.700	0.458	0.000	1.000
Medium bargaining	4598	0.335	0.472	0.000	1.000
High bargaining	4598	0.364	0.481	0.000	1.000

Table 2: Marginal Effects Probit Estimates of the Existence of an NTB (1994)

	Binary dependent variable = 1 if there is an NTB					
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for binding (B)	0.0186***	0.037***	0.034***	0.005	0.011*	0.011**
	[0.005]	[0.009]	[0.008]	[0.0037]	[0.006]	[0.005]
Binding level (B x t^c)		-0.052***			-0.021	
		[0.018]			[0.017]	
Gap binding level-unconstrained			-0.075***			-0.035*
tariff (B x (t^c- t^u))			[0.022]			[0.020]
Observations	4962	4962	4962	4017	4017	4017
no of parameters	1	2	2	8	9	9
Pseudo R2	0.0155	0.0215	0.0262	0.1407	0.1418	0.1414
HS 1 effects	No	No	No	Yes	Yes	Yes

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3a: Marginal Effects Probit Estimates of the Existence of an NTB (1997)

	Binary dependent variable = 1 if there is an NTB						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dummy for binding (B)	0.060***	0.127***	0.088***	0.013	0.112***	0.097***	0.096***
	[0.008]	[0.009]	[0.007]	[0.021]	[0.010]	[0.008]	[0.008]
Dummy for implementation in 1997				0.051**			
				[0.022]			
Binding level (B x t^c)		-0.369***			-0.236***		
		[0.029]			[0.040]		
Gap binding level-unconstrained tariff			-0.406***			-0.249***	-0.242***
(B x (t^c- t^u))			[0.028]			[0.038]	[0.037]
Dummy for EU binding					0.076***	0.044***	0.051***
					[0.006]	[0.010]	[0.010]
EU binding level					-0.758***		
					[0.121]		
Gap EU binding level-unconstrained tariff						-0.831***	-0.828***
						[0.081]	[0.081]
Gap EU tariff level for unbound							-0.186
Products- unconstrained tariff							[0.163]
Observations	5112	5112	5112	5112	4930	4930	4930
no of parameters	1	2	2	2	4	4	5
Pseudo R2	0.0194	0.0702	0.0783	0.0214	0.0923	0.1219	0.1214
HS 1 effects	No	No	No	No	No	No	No

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3b: Marginal Effects Probit Estimates of the Existence of an NTB (1997)

	Binary dependent variable = 1 if there is an NTB						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Dummy for binding (B)	0.052***	0.074***	0.063***	0.025	0.070***	0.064***	0.065***
	[0.009]	[0.012]	[0.010]	[0.020]	[0.012]	[0.010]	[0.010]
Dummy for implementation in 1997				0.028			
				[0.021]			
Binding level (B x t^c)		-0.130***			-0.103**		
		[0.039]			[0.046]		
Gap binding level-unconstrained tariff (B x (t^c- t^u))			-0.169***			-0.111**	-0.105**
			[0.044]			[0.047]	[0.048]
Dummy for EU binding					0.023	-0.002	0.018
					[0.020]	[0.023]	[0.024]
EU binding level					-0.174		
					[0.180]		
Gap EU binding level-unconstrained tariff						-0.460***	-0.467***
						[0.106]	[0.106]
Gap EU tariff level for unbound Products- unconstrained tariff							-0.272
							[0.284]
Observations	4012	4012	4012	4012	3959	3959	3959
no of parameters	7	8	8	8	10	10	11
Pseudo R2	0.1656	0.1687	0.1702	0.1662	0.1687	0.1775	0.1778
HS 1 effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4a: Tobit Estimates of the NTB Coverage Ratio (1997)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dummy for binding (B)	0.901***	2.145***	1.573***	0.268	1.774***	1.543***	1.544***
	[0.138]	[0.215]	[0.163]	[0.345]	[0.207]	[0.162]	[0.161]
Dummy for implementation in 1997				0.680**			
				[0.344]			
Binding level (B x t^c)		-6.749***			-4.023***		
		[0.860]			[0.869]		
Gap binding level-unconstrained tariff (B x (t^c- t^u))			-7.612***			-4.131***	-4.059***
			[0.899]			[0.841]	[0.844]
EU binding level					2.326***	1.154***	1.345***
					[0.367]	[0.326]	[0.415]
Gap EU binding level-unconstrained tariff					-11.099***		
					[2.159]		
Gap EU tariff level for unbound products-unconstrained tariff						-13.888***	-13.928***
						[1.675]	[1.677]
Gap EU tariff level for unbound products-unconstrained tariff							-2.633
							[3.177]
Constant	-3.939***	-3.793***	-3.773***	-3.935***	-5.455***	-5.498	-5.695***
	[0.272]	[0.262]	[0.260]	[0.272]	[0.478]	[0.472]	[0.547]
Observations	5112	5112	5112	5112	4930	4930	4930
no of parameters	1	2	2	2	4	4	5
Pseudo R2	0.0142	0.0525	0.0579	0.0154	0.0661	0.0882	0.0883
HS 1 effects	No	No	No	No	No	4930	No

Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4b .NTB Coverage Ratio Tobit (1997)

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Dummy for binding (B)	0.647***	0.869***	0.760***	0.43	0.821***	0.764***	0.767***
	[0.127]	[0.168]	[0.136]	[0.329]	[0.174]	[0.136]	[0.136]
Dummy for implementation in 1997				0.235			
				[0.327]			
Binding level (B x t^c)		-1.401**			-1.212		
		[0.687]			[0.778]		
Gap binding level-unconstrained tariff (B x (t^c- t^u))			-1.836**			-1.068	-1.00
			[0.739]			[0.770]	[0.795]
EU binding level					0.175	0.085	0.219
					[0.387]	[0.360]	[0.487]
Gap EU binding level-unconstrained tariff					2.626		
					[2.404]		
Gap EU tariff level for unbound products-unconstrained tariff						-5.333***	-5.404***
						[1.534]	[1.544]
Gap EU tariff level for unbound products-unconstrained tariff							-1.716
							[4.054]
Constant	-4.121***	-4.074***	-4.060***	-4.12***	-4.285***	-4.269***	-4.403***
	[0.323]	[0.321]	[0.321]	[0.323]	[0.476]	[0.466]	[0.574]
Observations	4012	4012	4012	4012	3959	3959	3959
no of parameters	7	8	8	8	10	10	11
Pseudo R2	0.1341	0.1355	0.1362	0.1343	0.1356	0.1397	0.1397
HS 1 effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5a: Tobit Estimates of the NTB Advalorem Equivalent (1997)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dummy for binding (B)	0.495***	1.053***	0.793***	-0.014	0.876***	0.794***	0.794***
	[0.072]	[0.102]	[0.079]	[0.200]	[0.101]	[0.079]	[0.079]
Dummy for implementation in 1997				0.540***			
				[0.199]			
Binding level (B x t^c)		-3.082***			-1.890***		
		[0.419]			[0.438]		
Gap binding level-unconstrained tariff (B x (t^c- t^u))			-3.504***			-1.982***	-1.898***
			[0.434]			[0.427]	[0.427]
Dummy for EU binding					0.935***	0.350**	0.580***
					[0.173]	[0.160]	[0.222]
EU binding level					-5.691***		
					[1.144]		
Gap EU binding level-unconstrained tariff						-6.887***	-6.920***
						[0.838]	[0.838]
Gap EU tariff level for unbound products-unconstrained tariff							-2.797*
							[1.558]
Constant	-2.139***	-2.059***	-2.051***	-2.128***	-2.653***	-2.720***	-2.951***
	[0.124]	[0.118]	[0.118]	[0.123]	[0.211]	[0.211]	[0.267]
Observations	5080	5080	5080	5080	4898	4898	4898
no of parameters	1	2	2	2	4	4	5
Pseudo R2	0.0219	0.0639	0.0703	0.0254	0.0779	0.1051	0.1064
HS 1 effects	No	No	No	No	No	No	No

Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5b: Tobit Estimates of the NTB Advalorem Equivalent (1997)

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Dummy for binding (B)	0.421***	0.524***	0.470***	0.035	0.520***	0.485***	0.496***
	[0.071]	[0.094]	[0.075]	[0.206]	[0.096]	[0.075]	[0.076]
Dummy for implementation in 1997				0.410**			
				[0.205]			
Binding level (B x t^c)		-0.682*			-0.722*		
		[0.406]			[0.433]		
Gap binding level-unconstrained tariff (B x (t^c- t^u))			-0.910**			-0.668	-0.6
			[0.420]			[0.424]	[0.431]
Dummy for EU binding					-0.132	-0.286	0.112
					[0.206]	[0.192]	[0.315]
EU binding level					-0.228		
					[1.396]		
Gap EU binding level-unconstrained tariff						-3.008***	-3.148***
						[0.836]	[0.840]
Gap EU tariff level for unbound products-unconstrained tariff							-4.348*
							[2.462]
Constant	-2.835***	-2.804***	-2.793***	-2.831***	-2.657***	-2.621***	-3.006***
	[0.220]	[0.219]	[0.219]	[0.220]	[0.275]	[0.269]	[0.374]
Observations	3980	3980	3980	3980	3927	3927	3927
no of parameters	7	8	8	8	10	10	11
Pseudo R2	0.1720	0.1734	0.1742	0.1740	0.1727	0.1793	0.1808
HS 1 effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Estimates of the WTO Tariff Bindings (1997)

Dependent variable	Tariff Binding indicator			Tariff Binding Level			Tariff binding-unconstrained		
Estimation method	*dprobit*	*dprobit*	*dprobit*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Herfindahl of export value	0.055	0.059	0.054	-0.146	-0.143	-0.145	-0.149	-0.147	-0.149
	[0.050]	[0.052]	[0.051]	[0.093]	[0.093]	[0.092]	[0.096]	[0.096]	[0.096]
Number of exporters	0.013***	0.013***	0.015***	-0.004*	-0.004*	-0.004*	-0.004**	-0.005**	-0.004**
	[0.003]	[0.003]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Bargaining	-0.126			10.340**			8.695***		
	[11.784]			[4.321]			[3.129]		
Medium-high bargaining		-0.203			0.117***			0.082***	
		[0.130]			[0.034]			[0.025]	
Medium bargaining			-0.324***			0.085**			0.053
			[0.083]			[0.035]			[0.032]
High bargaining			-0.074			0.130***			0.094***
			[0.147]			[0.033]			[0.026]
Constant				-2.971	1.152***	1.140***	-2.366*	1.117***	1.106***
				[1.745]	[0.055]	[0.057]	[1.254]	[0.061]	[0.064]
Observations	4546	4546	4546	2102	2102	2102	2102	2102	2102
Pseudo R2 / R-squared	0.1696	0.1797	0.1938	0.47	0.47	0.48	0.49	0.49	0.49
no of parameters	12	12	13	12	12	13	12	12	13
HS 1 effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in brackets clustered at isic 3. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix A

Proof: $t^c < t^u$ when NTB is unavailable.

From equation (8), the unconstrained tariff is given by:

$$t^u = -\frac{y\Psi'}{ap^*m'}$$

From (10), the constrained tariff (when there are no NTBs) is:

$$t^c = \frac{C_t}{-a(p^*)^2m'}\Psi'$$

Proof by contradiction: if $t^u = t^c$ this implies the same values for C, p and $m\prime$ under both equilibria. Using this we show that the RHS of the constrained tariff expression is actually lower than the RHS of the unconstrained tariff expression rather than equal, and hence the constraint binds.

$$\begin{aligned}
-\frac{C_t\Psi'}{a(p^*)^2m'} &< -\frac{y\Psi'}{ap^*m'} \\
C_t &< p^*y \\
C_t &< \Pi_t
\end{aligned}$$

If they are equal then we should use C_t from the unconstrained problem, which we obtain from implicitly differentiating the FOC for C in (5)

$$C_t = -\frac{\gamma V_t\Psi' - (1-\gamma)G_t}{\gamma(-\Psi' + [V - V_0]\Psi'') - (1-\gamma)\Psi'}$$

If the tariff is the same than under the unconstrained equilibrium then $G_t/G_C = V_t/V_C$, and therefore $G_t = -\Psi' V_t$. Replacing and simplifying

$$\begin{aligned}
C_t &= \frac{\gamma V_t\Psi' - (1-\gamma)(-\Psi' V_t)}{\Psi' - \gamma([V - V_0]\Psi'')} \\
&= \frac{\Psi' V_t}{\Psi' - \gamma([V - V_0]\Psi'')}
\end{aligned}$$

So the condition $C_t < \Pi_t$ (=V_t) is

$$\begin{aligned}\frac{\Psi' V_t}{\Psi' - \gamma([V - V_0]\Psi'')} &< V_t \\ \Psi' &< \Psi' - \gamma([V - V_0]\Psi'') \\ 0 &> \gamma[V - V_0]\Psi''\end{aligned}$$

which must hold because: (a) $\Psi'' < 0$ and (b) $V > V_0$ for all $\gamma < 1$. This makes it clear that as long as the government has some but not all the bargaining power and lobby goods have diminishing marginal utility so utility is not transferable at a constant rate, the government prefers to commit to a binding tariff constraint. If $\gamma = 0$ the government would be indifferent about setting a cap since it would receive the reservation payoff either way.

Simulation

The following simulation shows that the condition in section 3.6 can be satisfied so the government commits to a tariff constraint in this good if the cap is not too stringent.

Assumptions:

$\Psi \equiv C^n, n \in (0, 1)$

$y \equiv k^{1-\alpha} l^\alpha \Longrightarrow \pi(p) = (1 - \alpha)(p)k((p\alpha)^{\frac{\alpha}{1-\alpha}}$

$u(x) = Bx - \frac{b}{2}x^2 \Longrightarrow d(p) = \frac{1}{b}(B - p)$

$p^* = k = b = a = N = 1, n = \alpha = 0.5, \gamma = 0, B = 3$

The value of B was chosen to ensure positive import levels in equilibrium; the value of γ because we are evaluating a limit condition; and the remaining mostly for computational simplicity and to match the requirements of the model.

Slope condition for tariff

The unconstrained tariff level t^u is implicitly defined by the efficiency condition $G_t/G_C = V_t/V_C$ for a given contribution level

$$\Psi'(C^{mt}) = -a\frac{t^u(p^*)^2 m'(p^*(1 + t^u))}{p^* y(p^*(1 + t^u))}$$

where C^{mt} is is the minimum level of the good provided by the lobby required to maintain the government at the reservation utility.

We can define the Pareto frontier when t is used as $V^t - v^0 = \Omega^t(G^t - g^0)$. The condition we describe in the text can then be written as

$$\begin{aligned}\lim_{\gamma\to 0} -\Omega^t/\Omega'^t &= \lim_{\gamma\to 0}(V^t - v^0)\Psi'(C^t) \\ &= [(\pi(.) - \pi(p^*) - C^{mt})(-a\frac{t^u(p^*)^2 m'(.)}{p^* y(.)})]_{\gamma=0}\end{aligned}$$

where $\pi(.) \equiv \pi(p^*(1+t^u))$, similarly for $m'(.)$ and $y(.)$. The first equality is due to the definition of Ω, and the fact that the slope of the Pareto frontier in G-V space is -1/Ω'^t. It equals $\Psi'(C^t)$ at any given equilibrium as this is the ratio at which utility is traded as contributions are used, i.e. G_C/V_C. The expression for $\Psi'(C^t)$ in the second equality is derived from the efficiency condition given above. Using the definition of V we obtain $\lim_{\gamma\to 0}(V^t - v^0) = \pi(p^*(1+t^u(\gamma=0))) - C^{mt} - \pi(p^*)$. Using the definition of G and the condition $G(t=0, \tau=0, C=0) = G(t=t^u(\gamma=0), \tau=0, C^{mt})$ (recalling that in the unconstrained equilibrium $\tau=0$), we can write C^{mt} as:

$$C^{mt} = \lim_{\gamma\to 0} \Psi^{-1}(a[\pi(p^*) + Ns(p^*) - \{\pi(.) + Ns(.) + t^u p^* m(.\}])$$

Using the expressions derived above for $\lim_{\gamma\to 0} -\Omega^t/\Omega'^t$ and C^{mt}, and using the functional forms for $\pi(p)$, $d(p)$ and $\Psi(.)$ as well as the parameter values listed we obtain:

$$\lim_{\gamma\to 0} -\Omega^t/\Omega'^t = 0.187\,5(t^u)^2\frac{8+4t^u-9(t^u)^3}{1+t^u}$$

To evaluate this expression we require the equilibrium t, which is calculated by plugging in the expression for C^{mt} above and the functional form assumptions into the efficiency condition $G_t/G_C = V_t/V_C$ previously defined.

Slope condition for NTB

The equilibrium condition for the NTB is the one in equation (11) in the text:

$$\Psi'(C^{m\tau}) = -a\frac{(\tau(1-\phi)+t^c)(p^*)^2 m'(.) - \phi p^* m(.)}{p^* y(.)} \tag{1}$$

where now the relevant domestic price is $p = p^*(1+\tau+t^c)$ so $m'(.) \equiv m'(p^*(1+\tau+t^c))$ and similarly for m and y.

The ratio for the NTB is

$$\begin{aligned}\lim_{\gamma\to 0} -\Omega^{\tau}/\Omega'^{\tau} &= \lim_{\gamma\to 0}(V-v^0)\Psi'(C^{\tau}) \\ &= [(\pi(.)-\pi(p^*)-C^{m\tau})(-a\frac{(\tau(1-\phi)+t^c)(p^*)^2m'(.)-\phi p^*m(.)}{p^*y(.)})]_{\gamma=0}\end{aligned}$$

We can see that if the cap were zero and $\phi = 0$ (no NTB inefficiency relative to a tariff) then the expression collapses to the one above for the tariff. We also have:

$$C^{m\tau} = \lim_{\gamma\to 0}\Psi^{-1}(a[\pi(p^*)+Ns(p^*)-\{\pi(.))+Ns(.)+(\tau(1-\phi)+t^c)p^*m(.)\}])$$

Using the expressions derived above for $\lim_{\gamma\to 0} -\Omega^{\tau}/\Omega'^{\tau}$ and $C^{m\tau}$, and using the functional forms for $\pi(p)$, $d(p)$ and $\Psi(.)$ as well as the parameter values listed we obtain:

$$\begin{aligned}&\lim_{\gamma\to 0} -\Omega^{\tau}/\Omega'^{\tau} = \{-\frac{1}{4}(1-(1+\tau+t^c)^2) \\ &-\left(\left((\frac{1}{4}(1-(1+\tau+t^c)^2)+\frac{1}{2}\left((t^c+\tau)\left(4-\tau-t^c\right)\right)-\left(\frac{1}{2}\left(\tau(1-\phi)+t^c\right)\left(3-3(\tau+t^c)\right)\right)\right)\right)^2\} \\ &\times\frac{3(t^c-\phi t^c+\tau+\phi-2\tau\phi)}{1+\tau+t^c}\end{aligned}$$

Using $\phi = 0.1$ and a given value for t^c we solve for the equilibrium τ using (11) and replace it above to obtain the values in the table. The first row corresponds to a case in which the cap is half the equilibrium value of the unconstrained tariff under this set of parameters. The second row is for $t^c = 0.85t^u$.

	$\lim_{\gamma\to 0} -\frac{\Omega^x}{\Omega^{x\prime}}$		
t^c	$x=\tau$		$x=t$
$0.5t^u$	0.406	$<$	0.427
$0.85t^u$	0.430	$>$	0.427
Parameters			
$p^* = k = b = a = N = 1, n = \alpha = 0.5, \gamma = 0, B = 3, \phi = 0.1$			
Functions			
$\Psi = C^n; q = k^{1-\alpha}l^{\alpha}, u(x) = Bx - \frac{b}{2}x^2$			

Table 1: Simulation result for the choice of tariff versus NTBs