Cap and Escape in Trade Agreements

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Abstract

We study trade agreements where there is uncertainty about future political-economy value of protection in each country. We assume that the prevailing state of the world is private information of the importing country but it may be verified publicly at a monitoring cost. The optimal trade agreement will be incomplete to save on the cost of implementation of the agreement. We interpret the GATT/WTO agreement as a cap-and-escape arrangement under which governments can increase their tariffs above a pre-determined cap only if they produce evidence that certain states of the world have prevailed. We provide comparative statics results to show how a country’s market power affects the use of the two forms of flexibility: the ability to unilaterally change tariffs when tariffs are below the binding and the access to an escape clause. In particular, find that tariff bindings are lower for countries whose preferences are less convergent with those of the world, in the sense that their protectionist bias increases as their private valuation of protection increases. We also show that contingent protection and tariff overhang are substitute and they may not coexist when preferences are sufficiently convergent.

1 Introduction

Some form of escape clause has been a long-standing feature of international trade agreements. The US-Mexico trade agreement of 1942, negotiated as part of the U.S. Reciprocal Trade Agreements Act (RTAA), included a clause indicating that trade concessions could

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be withdrawn "as a result of unforeseen developments and of trade concessions" that resulted in increased imports and damage to the domestic industry. When the RTAA came up for renewal in 1945, Congress exerted pressure on President Truman to include an escape clause in future agreements. This pressure resulted in an executive order by President Truman in 1947 agreements negotiated under the RTAA, and an escape clause with language very similar to that of the US-Mexico trade agreement was included as Article XIX of the GATT.

In order for a country to exercise its right under the escape clause, it must conduct an investigation that establishes that there has been an increase in the level of imports and that this increase has caused "serious injury" to the domestic industry. These safeguard actions are an example of contingent protection, which allows for tariff concessions to be withdrawn if an investigation establishes that certain conditions have been met. Antidumping duties, which allow for the imposition of tariffs in the event that imports are being sold at "less than fair value" and are resulting in injury to the domestic industry, represent another example of contingent protection in the WTO.

Contingent protection is not the only form of flexibility that is included in multilateral trade agreements. The fact that countries negotiate bindings, which are maximum tariff rates that can be applied on imports in a particular product classification, means that countries can raise tariffs unilaterally if they are below the binding. The difference between the bound tariff and the applied tariff rate, referred to as "tariff overhang," provides a measure of the amount by which a country can raise its tariff without violating its WTO commitments. Table 1 illustrates the amount of tariff overhang that exists for 66 WTO members that account for 76% of world imports in 2007. Tariff overhang exists in sixty percent of the tariff lines that are bound, and this overhang averages more than 20 percentage points. If unbound tariff lines are included, more than 30% of trade takes place in tariff lines where there is tariff overhang.

The presence of these forms of flexibility seem to undermine one of the basic objectives of a trade agreement, which is to commit countries to reducing tariff rates. Since increases in tariff rates have a negative effect on trading partners, trade agreements can be welfare

\[\text{Sykes (2006)}\] provides a good discussion of the history of the safeguard mechanisms.

\[\text{Under the Safeguards agreement to the WTO, a country imposing safeguards is not required to compensate exporting countries for three years following the imposition of safeguards if there has been an absolute increase in imports. However, compensation must be negotiated if there increase in imports is only relative. The imposition of antidumping duties does not require compensation of affected countries. Both forms of contingent are subject to dispute settlement if the rules are not followed in imposing protection.}\]
Table 1: Tariffs and Trade Summary Statistics

<table>
<thead>
<tr>
<th>Binding Status</th>
<th>Num. of sector</th>
<th>Share(%)</th>
<th>Import(bil.$)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Tariff below Binding</td>
<td>196,062</td>
<td>65.32</td>
<td>1,760</td>
<td>24.14</td>
</tr>
<tr>
<td>Strong Binding (Applied Tariff at Binding)</td>
<td>51,680</td>
<td>17.22</td>
<td>4,410</td>
<td>60.48</td>
</tr>
<tr>
<td>Applied Tariff over Binding</td>
<td>8,301</td>
<td>2.76</td>
<td>413</td>
<td>5.66</td>
</tr>
<tr>
<td>Unbound</td>
<td>44,136</td>
<td>14.70</td>
<td>709</td>
<td>9.72</td>
</tr>
<tr>
<td>Total</td>
<td>300,129</td>
<td>100</td>
<td>7,292</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Applied tariff data is from 66 WTO members in 2007.

improving for all trading countries by reducing the international externalities through mutual tariff reductions. Contingent protection, on the other hand, will be internationally inefficient because they will allow countries to continue to pursue protectionist policies. Thus, many economists have advocated eliminatin

An alternative interpretation of contingent protection and other forms of flexibility, and one that argues for their inclusion in trade agreements, is that they provide a safety valve that allows governments to deal with protectionist pressure. Politically motivated governments are reluctant to make commitments to bind tariffs at low levels because they are concerned about future events that may lead to a demand for a protectionism, and therefore want to have the flexibility to increase tariffs in those cases. In this view, the escape clause provides a safety valve for dealing with such protectionist pressure, and is the price that must be paid for countries to engage in significant trade liberalization.

The purpose of this paper is to develop a model of politically motivated governments that allows for the simultaneous use of both tariff overhang and escape clauses as part of a trade agreement. We work within a simple political-economy trade model in which governments are uncertain about their future preferences over trade policy, so that the country’s optimal tariff varies with the magnitude of a political shock. We adopt an incomplete contracting approach in which the magnitude of the political shock, and hence the importer’s preferred tariff, is the private information of the country. However, the importing country can make the value of its private information known to the rest of the world by incurring a monitoring cost.

Using this framework, we examine the optimal “cap-and-escape” agreement which has

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3Another type of flexibility may be provided through a remedy system in which a party is allowed to breach the contract if it provides appropriate compensations to the affected parties. For a discussion of breach remedies in trade agreements see Posner and Sykes (2011), Beshkar (2010a), and the papers cited in the next footnote.
features similar to that of the WTO trade agreement. The cap part of the agreement specifies a tariff binding that allows the country to unilaterally choose any tariff less than or equal to the binding. The escape portion of the agreement allows the country to exceed the binding if the magnitude of the political shock is verified to exceed a threshold level. The magnitude of the shock is verified through a costly state verification process. The threshold level of the shock at which the importer can escape its bound tariff, as well as the magnitude of the tariff that can be imposed when the value of the shock is revealed, are specified as part of the trade agreement. The monitoring that takes place when the importer escapes the tariff binding can be interpreted as the investigative processes required to approve and implement contingent protection under the GATT/WTO agreements. This model yields the result that the escape clause allows for a reduction in tariff bindings in an optimal trade agreement, and also allows predictions about the relative importance of tariff overhang and the use of escape clause mechanisms.

Our analysis is related to several strands of recent work that uses an incomplete contracts approach to modeling trade agreements. Bagwell and Staiger (2005) have shown that the use of a weak tariff binding, which allows a country to choose its tariff at or below the binding, can yield a higher expected welfare than can be obtained by an inflexible tariff rate. Subsequently, Amador and Bagwell (2011) derived conditions under which the use of a tariff binding will be the optimal incentive compatible agreement. Our work extends their analysis by in two ways. First, we use a model with asymmetric countries, which allows us to derive testable implications about the relationship between country characteristics and the optimal amount of tariff overhang. This is of interest because there is substantial variation across countries in the amount of overhang in tariff lines. Second, the existing work on tariff bindings does not allow for the potential interactions between tariff bindings and contingent protection. Nevertheless, contingent protection measures

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4 Other models, including Beshkar (2010b, 2011), Maggi and Staiger (2011), and Park (2011), examine state verification processes that generate only an imperfect, albeit informative, signal of the state of the world. However, these models do not imply a role for tariff overhangs in trade agreements.

5 The models we consider are closely related to the literature on optimal delegation (e.g., Holmstrom 1984, Melumad and Shibano 1991, and Alonso and Matouschek 2008), which has shown that it may be optimal for a principal to require a privately-informed agent to choose from a restricted set of actions when contingent transfers are not possible.

6 Almost 2/3 of the tariff lines of 69 WTO members are below their bound rates. The average level of tariff binding overhang, which is the difference between the bound rate and the applied rate, is 25 percentage points or more than a quarter of the bound rates. However, there is no overhang in more than 90% of tariff lines for the US, European Union, China, and Japan. Thus, the usage of tariff overhang as a flexibility mechanism varies widely across countries.
along with weak bindings are two important components of flexibility mechanisms in the WTO agreement. Our work is the first to allow for the use of both bindings and escape clauses as part of optimal agreements, and to relate the usage of the respective types of flexibility to country characteristics.

Our approach is also related to works that examine the effect of transactions costs on the optimal design of contracts. Shavell (2006) and Horn, Maggi, and Staiger (2010) have shown that when writing a contract is costly, it is optimal to craft an incomplete contract in order to save on the ex ante contracting efforts. Our analysis differs in that we emphasize the ex post costs of implementing the contract, which includes the costs of verifying the contingencies that are mentioned in the contract. We find that, due to the costs of implementing a contingent contract, it is optimal to write an incomplete contract that gives discretion to the parties in some contingencies.

Our approach, therefore, provides a distinct and novel rationale for writing an incomplete contract (such as tariff bindings) on the basis of the cost of implementing, rather than writing, the agreement. Implementing a complete agreement, which maps each possible contingency to a set of actions to be taken by the signatories, requires the parties to find a mutual agreement on the nature of the prevailing contingency in each period over the lifetime of the agreement. This requires establishing appropriate procedures for investigation of the contingencies in each member country as well as a dispute settlement process to handle potential disputes over the result of these investigations. Implementation of these procedures are potentially very costly as they involve hiring arbitrators, lawyers, and government representatives. To the best of our knowledge, the previous literature has not explored the impact of the implementation costs on the optimal design of a trade agreement.

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7 Between 1995 and 2010, a total of 216 safeguard actions and more than 2400 antidumping measures have been notified to the WTO. The importance of contingent protection measures as an element of trade agreements was highlighted in the Doha round of WTO negotiations in which most developing countries demanded the inclusion of a safeguard clause in the agreement as a condition to accept trade liberalization in agricultural sectors.

8 Note that in contrast to implementation costs, the cost of composing a contract is a one-time expense. The fact that the cost of state verification is a recurring cost over the lifetime of the agreement, multiplies the importance of designing a contract that saves on implementation costs.
analysis extends the approach in this literature by allowing for the possibility of costly state verification. Our approach to monitoring is similar to that in the seminal work of Townsend (1979), where an agent’s private information can be observed by the uninformed party through a costly monitoring. The optimal contracts in this literature typically involve two regions: a monitoring region in which the true type is revealed and the efficient action for that type is taken, and a non-monitoring region in which agents pool and all take the same action. A novel result of our cap-and-escape model is that optimality involves giving countries ‘discretion’ in choosing their policy in the non-monitoring region, such that different types may not pool in the equilibrium.

We begin by deriving the optimal tariff binding in the absence of contingent protection. We show that the cost of allowing flexibility through tariff overhang is greater for countries with a larger degree of market power. In order to provide flexibility when the magnitude of the shock is private information, the binding must be larger than the country’s optimal tariff when the shock is at its lowest level. Since this level is greater for countries with greater market power, countries with greater market power will have lower tariff bindings. We also introduce the concept of local convergence of preferences, which holds if the difference between the importer’s optimal tariff and the world’s optimal tariff gets smaller as the political weight increases, and show that a country will be provided less flexibility if the degree of convergence increases.

We then characterize the optimal cap-and-escape agreement in which the agreement can use both tariff bindings and contingent protection as flexibility mechanisms. We show that agreements with tariff bindings create an incentive to include an escape clause, because both importing country and world welfare will be raised by increasing tariffs for the highest realizations of the political shock. An escape clause in an optimal agreement will specify the first best tariff when monitoring occurs, although the threshold specified in the agreement to allow escape will exceed the level that is preferred by the importing country. We also establish that contingent protection is a substitute for tariff overhang, because it will result in a reduction in the tariff binding in the optimal trade agreement. In particular, the use of contingent protection will result in the elimination of tariff overhang if the importing country’s preferences converge monotonically to that of the world as the value of protection increases for the importing government. We use simulations to show that tariff overhang and monitoring may exist simultaneously in an optimal agreement if preferences are locally divergent. The simulations also indicate that monitoring will be most valuable for relatively large countries, for whom the use of tariff overhang to provide flexibility is very costly.
Kucik and Reinhardt (2009) find that countries that have antidumping laws in place are more likely to join the WTO and have lower tariff bindings. Since countries that have antidumping laws in place would be expected to have lower costs of undertaking the investigations, their empirical evidence is consistent with our theoretical results on the substitutability between binding overhang and contingent protection as monitoring costs are reduced.

Section 2 presents the trade model and characterizes the first best trade agreement when there is full information about the value of the political shocks. Section 3 characterizes the optimal tariff bindings when there is private information about political shocks. Section 3.2 introduces the possibility of contingent protection in the form of a binding agreement with an escape clause, and examines the interactions between tariff bindings and contingent protection in an optimal agreement. Section 4 offers some concluding remarks. Proofs are provided in the Appendix A.

2 The Basic Model

We examine a two-good, two-country trade model in which countries are asymmetric in size. We assume that industries are perfectly competitive, and that governments choose tariff policy to maximize a weighted social welfare function that reflects the political influence of producers in the import-competing sector. In this setting, the motivation for forming a trade agreement is to resolve the Prisoner’s dilemma created by the terms of trade externality from tariffs as in Bagwell and Staiger (1999). The asymmetry in country size is introduced in a manner similar to that in Bond and Park (2002).

The home country demand for good $i$ is given by $d_i = \lambda (1 - p_i)$ for $i = 1, 2$, where $p_i$ is the price of good $i$ and $\lambda \in (0, 1)$ is the relative size of the home country. Foreign country demands are $d_i^* = (1 - \lambda) (1 - p_i^*)$. Home supply is $x_1 = \lambda p_1$ for good 1 and $x_2 = \lambda \beta p_2$ for good 2, while foreign supplies are $x_1^* = (1 - \lambda) \beta p_1^*$ and $x_2^* = (1 - \lambda) p_2^*$. We assume that $\beta > 1$, so the autarky prices will satisfy $p_1 = p_2^* = 1/2 > p_1^* = p_2 = 1/(1 + \beta)$. Parameters $\lambda$ and $\beta$ can be interpreted, respectively, as the relative size of the home country, and the comparative advantage of the exporting country in its exportable sector.

Note that this model of comparative advantage can be derived from a general-equilibrium model with a third good that absorbs all income effects. Let the home country consist of a measure of $N$ identical households with each household having a utility function $U = \sum_{i=1,2} d_i (1 - .5 d_i) + d_0$. Households have an endowment of labor that can be allocated to production of the three goods. Letting $l_i$ denote the quantity of labor allocated to good $i$, the production functions are $x_0 = l_0$, $x_1 = (2l_1)^5$ and $x_2 = (2\beta l_2)^5$. Similarly,
In light of the separability and symmetry of markets, we can focus our analysis on the market for the home importable. The characterization of the market for the foreign’s importable follows immediately. Letting $t$ be the ad valorem tariff imposed by the home country on imports we have $p = p^*(1 + t)$. The respective country excess demands are given by $m = \lambda(1 - 2p_i)$, and $m^* = (1 - \lambda)(1 - (1 + \beta)p^*)$, which yields market clearing prices with trade of

$$p^*(t) = \frac{1}{2\lambda(1 + t) + (1 + \beta)(1 - \lambda)}, \quad p(t) = \frac{1 + t}{2\lambda(1 + t) + (1 + \beta)(1 - \lambda)}.$$ (1)

The relative size of the countries determines the magnitude of the terms of trade externality resulting from the home country tariff, with $dp^*/dt \to 0$ as $\lambda \to 0$ and $dp^*/dt \to -1$ as $\lambda \to 1$. The prohibitive tariff will be $t^{pro} = \frac{\beta - 1}{2}$.

We can use the inverse of the foreign elasticity of export supply,

$$\frac{1}{\varepsilon^*} = \frac{\lambda(1 + \beta - 2t)}{1 + \beta},$$ (2)

to characterize the home country’s market power in its import markets. Market power is positive for $t < t^{pro}$, and is increasing in the home country’s relative size, $\lambda$, and its degree of comparative disadvantage, $\beta$. Note however that the there is an important difference in the effect of these two parameters on market power. The marginal effect of country size on market power declines as $t$ increases, because market power goes to 0 as the tariff approaches the prohibitive level and the prohibitive tariff is independent of market size. In contrast, the marginal effect of increases in $\beta$ on market power increases as $t$ rises because the prohibitive tariff is increasing in $\beta$. This distinction in market power effects will play an important role in the analysis below.

### 2.1 Non-Cooperative and Cooperative Tariffs

We assume that the government’s preference over tariffs can be described by a ‘political’ welfare function, where the government puts a weight of $1 + \theta$ on the welfare of producers in the import-competing sector and a weight of 1 on the welfare of all other agents. We assume the foreign country is assumed to have $N^*$ households with the same preferences and production functions $x^*_0 = l^*_0$, $x^*_1 = (2\beta l^*_0)^5$, and $x^*_2 = (2l^*_0)^5$. Choosing good 0 as numeraire and letting $\lambda = N/(N + N^*)$, this structure yields the demand and supply functions in the text if the supply of labor is sufficiently large that good 0 is always produced.
that $\theta \geq 0$, and interpret $\theta$ as the political pressure that is exerted by the import-competing sector on the government. The political welfare function may be written as

$$ V(t, \theta) = S(t) + (1 + \theta) \pi(t) + tp^*m(t), \quad (3) $$

where, consumer surplus is given by $S(t) = \lambda(1 - p(t))^2/2$, producer surplus by $\pi(t) = \lambda p(t)^2/2$, and tariff revenue by $tp^*m(t) = tp^*\lambda (1 - 2p)$.

Increases in $t$ have a favorable effect on political welfare by improving the terms of trade and transferring income to domestic producers of import-competing goods (when $\theta > 0$). However, increases in $t$ also reduce trade volume, which is welfare reducing when the domestic price exceeds the world price for importables. As a result of these trade-offs, home country welfare is strictly quasi-concave in $t$ for $t \in [0, t^{\text{pro}}]$.

The unique optimal tariff that maximizes $V(t)$ is given by

$$ t^N(\theta) = \frac{\theta (1 + \beta) + 2 (\beta - 1) \lambda}{(2 - \theta) (1 + \beta) + 4\lambda}. \quad (4) $$

As a result of the separability assumption, this tariff is a dominant strategy for the home country and will be the Nash equilibrium tariff. We let $\theta^{\text{max}} \equiv 2(\beta - 1)/(1 + \beta) < 2$ denote the value of the political pressure, $\theta$, at which the home country’s optimal tariff eliminates trade, $t^N(\theta^{\text{max}}, \lambda) = t^{\text{pro}}$. We will assume that $\theta \in \Theta \equiv [\underline{\theta}, \bar{\theta}]$, where $\underline{\theta} \geq 0$ and $\bar{\theta} \leq \theta^{\text{max}}$.

The following characteristics of the importer’s optimal tariff function follow immediately from differentiation of (4) and will be useful in the analysis below.

**Lemma 1** For $\theta < \theta^{\text{max}}$ and $\lambda \in (0, 1)$,

(i) $t^N_{\theta}(\theta) > 0$, $t^N_{\beta}(\theta) > 0$, $t^N_{\lambda}(\theta) > 0$

(ii) $\left( \frac{\partial t^N(\theta)}{\partial \beta} / \frac{\partial t^N(\theta)}{\partial \lambda} \right)$ is increasing in $\theta$.

The importer’s optimal tariff is increasing in the magnitude of the political shock and the home country’s market power, as reflected in its size and degree of comparative disadvantage. Part (ii) highlights that the impact of $\beta$ relative to $\lambda$ is increasing in the magnitude of the political shock. This results from the fact that the effect of $\beta$ on market

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The impact of $t$ on home welfare is $V_t = \frac{\lambda(1+\beta)(1-\lambda)(\theta(1+\beta)+2(\beta-1)\lambda-(2-\theta)(1+\beta)+4\lambda))}{(2(1-\lambda)+\lambda(1+2\beta)+1)^2}$. Political welfare is increasing for $t < t^N(\theta)$ and decreasing for $t > t^N(\theta)$, so $V$ is quasi-concave in $t$ for $t \in [0, t^{\text{pro}}]$. 

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power is increasing in $t$ and the effect of $\lambda$ on market power is decreasing in $t$, as reflected in (2).

For the foreign country, welfare is the sum of consumer surplus and firm profits,

$$V^*(t) = S^*(t) + \pi^*(t),$$

(5)

where $S^*(t) = (1 - \lambda)(1 - p^*(t, \lambda))^2/2$ and $\pi^*(t) = (1 - \lambda)\beta p^*(t)^2/2$. Foreign welfare is decreasing and convex in $t$. An increase in the home tariff worsens the terms of trade for the foreign country, which reduces foreign welfare. The convexity of foreign welfare arises because the adverse terms of trade effect is proportional to the volume of foreign exports, and the volume of exports declines with increases in $t$.

World welfare in the home country importable sector is the sum of home and foreign country welfare, $W(t, \theta) = V(t, \theta) + V^*(t)$. World welfare will be quasiconcave in $t$ for $\theta \in [0, \theta_{\text{max}}]$, and achieves a maximum at $t^E$. The efficient tariff will be positive for $0 < \theta \leq \theta_{\text{max}}$ because world welfare incorporates the importing country’s preference to protect its producers. At $\theta = \theta_{\text{max}}$, the weight on producer interests is sufficiently high that the efficient tariff eliminates trade.

We assume that the home country’s political parameter has a distribution $f(\theta)$ on $\Theta$. Similarly, there is a distribution of foreign political shocks $f^*(\theta^*)$ and Nash equilibrium tariffs for the foreign country in the market for good 2, $t^N(\theta^*)$, derived as above for the home country. In the absence of a trade agreement, countries will impose state contingent tariffs $\{t^N(\theta), t^N(\theta^*)\}$. Since countries ignore the adverse terms of trade effect on the foreign country in setting their tariffs, gains from reciprocal trade liberalization will exist in each state of the world.

We will assume that countries can make lump sum transfers in the negotiations for the formation of a trade agreement. Countries will then negotiate a trade agreement whose tariff schedule maximizes expected world welfare, with transfers determining the split of the gains from the agreement between countries.\textsuperscript{12} The home country tariff schedule that

\textsuperscript{11} Derivative of the world welfare with respect to tariff is $W_t = \frac{\lambda(1+\beta)(1-\lambda)(\theta-\theta^*(2-\theta))}{(\beta(1-\lambda)+\lambda(1+2\theta)+1)^2}$. As is clear from this expression, world welfare is increasing for $t < \frac{\theta}{2-\theta}$ and decreasing for $t > \frac{\theta}{2-\theta}$. Therefore, $W$ is quasiconcave and $t^E(\theta)$ is the jointly optimal tariff.\textsuperscript{12} As discussed by Syropoulos (2002) the home country will prefer the Nash equilibrium to free trade for
maximizes world welfare will be the solution to
\[
\max_{t(\theta)} EW = \int_\Theta^\infty W(t(\theta); \theta) f(\theta) d\theta \tag{7}
\]

The solution to this problem will call for setting the state contingent efficient tariffs from (6) for the home country. Efficient foreign tariffs on imports of good 2 are derived in a similar fashion. This first-best outcome, however, cannot be implemented under asymmetric information. We will analyze tariff caps and cap-and-escape arrangements as incentive-compatible mechanisms under asymmetric information in Sections 3 and 3.2.

2.2 Convergence of Preferences

The difference between the Nash tariff and the efficient tariff, which we denote by \( \Delta(\theta) \equiv t^N(\theta) - t^E(\theta) \), is positive for \( \theta \in [0, \theta^{\text{max}}) \) and \( \lambda \in (0, 1) \) because the home country fails to internalize the terms of trade externality it imposes on the foreign country. Since \( t^E(\theta) \) is independent of the market power parameters, \( \Delta(\theta) \) is increasing in \( \beta \) and \( \lambda \) by Lemma 1 (ii). The Nash and efficient tariffs are only equal in the absence of market-power effects, which occurs when the country is infinitesimally small (since \( \lim_{\lambda \to 0} t^N(\theta) = t^E(\theta) \)) or trade is eliminated (since \( t^N(\theta^{\text{max}}) = t^E(\theta^{\text{max}}) \)). Although the market-power effect must go to zero as trade is eliminated, this does not guarantee that the preferences of the importing country and the world will become more aligned as the political shock increases in value on \( \Theta \). This point is illustrated in Figure 1 which shows the relationship between \( t^N(\theta) \) and \( t^E(\theta) \) for two different levels of \( \beta \) when \( \Theta = [0, 2/3] \) and \( \lambda = 0.3 \). When \( \beta = 2 \), \( \Delta'(\theta) < 0 \) for all \( \theta \in \Theta \), a property that we will refer to as ‘globally convergent’ preferences. In contrast, \( \Delta'(\theta) > 0 \) for all \( \theta \in \Theta \) when \( \beta = 10 \). The possibility that \( \Delta'(\theta) > 0 \) for some values of \( \theta \) is related to the observation in Lemma 1 (ii) that the impact of \( \beta \) on market power increases as the applied tariff rises.

Converging preferences imply that the protectionist bias of the importer’s tariff policy decreases as the political shock increases in value. This property will play an important role in determining the types of flexibility that arise in the optimal cap-and-escape agreement, 

\( ^{11} \)In particular, for the case where \( \beta = 2 \), the market power effect goes to zero as \( \theta \to \theta^{\text{max}} \equiv 2(\beta - 1)/(1 + \beta) = 2/3 \).

\( ^{14} \)Since \( \theta^{\text{max}} = 18/11 \) for \( \beta = 10 \), the Nash and efficient tariffs do not approach the prohibitive level on \( \Theta = [0, 2/3] \) in Figure 1.
Figure 1: Convergence of Tariffs with $\lambda = 0.3$ and $\Theta = [0, 2/3]$
so it will be useful to provide some conditions under which preferences converge. We say that the preferences of the importer and the world are ‘locally convergent’ at \( \theta \) if \( \Delta'(\theta) < 0 \).

**Lemma 2 (Convergence of Preferences)** Defining \( \hat{\beta}(\theta) \equiv \frac{2+\theta+4\sqrt{1+\lambda}}{2-\theta} \),

(i) The preferences of the importer and the world are locally convergent at \( \theta \) (i.e., \( \Delta'(\theta) < 0 \)) iff \( \beta < \hat{\beta}(\theta) \). For \( \beta < \hat{\beta}(0) = 1 + 2\sqrt{1+\lambda} \), preferences are globally convergent.

(ii) Consider \( d\beta > 0 \) and \( d\lambda < 0 \) such that \( \int_{\theta_0}^{\theta} \Delta f(\theta) d\theta \) remains constant for some \( \theta_0 \in [\hat{\theta}, \bar{\theta}] \). There exists some \( \theta_1 \in (\theta_0, \bar{\theta}) \) such that \( \Delta(\theta) \) decreases for \( \theta \in [\theta_0, \theta_1) \) and increases for \( \theta \in (\theta_1, \bar{\theta}] \).

Part (i) of this Lemma shows that for the preferences to be convergent, the comparative advantage parameter, \( \beta \), must be sufficiently small. Notably, if \( \beta > 1 + 2\sqrt{1+\lambda} \), there will exist a range of \( \theta \) such that the home country’s optimal tariff will increase more rapidly than the efficient tariff as the political shock increases. For the parameter values used in Figure 1, there will be global divergence on \([0, 2/3]\) for \( \beta > \hat{\beta}(2/3) = 5.42 \) and global convergence for \( \beta < 3.28 \). For \( \beta \in (3.28, 5.42) \), the tariff schedules will be locally divergent for \( \theta \in [0, \beta^{-1}(\beta)] \) and locally convergent for \( \theta \in (\beta^{-1}(\beta), 2/3) \).

Part (ii) of Lemma 2 shows that an increase in \( \beta \) and a corresponding reduction in \( \lambda \) that keeps the average difference between importer and world preferences constant for \( \theta > \theta_0 \) will “rotate” the \( \Delta(\theta) \) schedule around some point on the interval \( \theta \in [\theta_0, \bar{\theta}] \), making the preferences of the importer less convergent with that of the world as a whole on that interval. This result is due to the observation in Lemma 1(iii) that the market power effect of \( \beta \) rises relative to that of \( \lambda \) as \( \theta \) increases.

### 3 Optimal Cap and Escape Agreements

We now turn to the analysis of trade agreements in settings where the magnitude of the political pressure is the private information of the importing country. We will assume that the distribution of the political shock in each country is common knowledge, but the realization is observed only by the importing country. We model the optimal trade agreement as the solution to a principal/agent problem in which an uninformed principal (the WTO) is specifying the actions (tariff levels) to be taken by an informed agent (the importing country).
Our analysis proceeds in two steps. We first characterize the optimal tariff binding, $t^B$, in an agreement that allows the importer to choose any tariff rate $t \leq t^B$. The comparative statics results we obtain are useful for understanding how country characteristics determine the amount of flexibility that is provided to a country in setting its tariff, where a higher tariff binding provides greater flexibility. We also apply results from [Alonso and Matouschek 2008] and [Amador and Bagwell (2011)] to show that the tariff binding is the optimal form of trade agreement in this setting. The second step is to introduce the possibility of escape, which allows the country to exceed its tariff binding if it incurs a monitoring cost, $c$. In this case the efficient trade agreement specifies a monitoring region $(M \subseteq \Theta)$ and a tariff schedule tariff $t^M(\theta)$ that applies in the monitoring region, along with a tariff binding that applies when there is no monitoring. The cap and escape agreement allows two types of flexibility: unilateral changes in tariffs below the bindings and the use of escape clauses when monitoring costs are incurred. This allows us to examine the extent to which the availability of monitoring substitutes for the use of tariff overhang as a means of providing flexibility in the trade agreement.

3.1 Optimal Bindings Without Monitoring

Under a tariff binding $t^B$, the importing country can choose any tariff $t \leq t^B$ without violating the agreement. The importer’s welfare is increasing in $t$ for all $t < t^N(\theta)$, so the importer will choose an applied tariff of $\min\{t^N(\theta), t^B\}$ when the political shock is $\theta$. Since the optimal tariff is increasing in $\theta$, the importer will choose its optimal tariff for $\theta \leq \theta^B(t^B) = \max\{\theta, t^{N-1}(t^B)\}$. The importer’s choice of tariff under the binding can be represented by the state contingent tariff schedule

$$t(\theta) = \begin{cases} t^B, & \text{if } \theta \geq \theta^B(t^B) = \max\{\theta, t^{N-1}(t^B)\}, \\ t^N(\theta), & \text{if } \theta < \theta^B(t^B). \end{cases} \tag{8}$$

If $t^B > t^N(\theta)$, there will exist states of the world for which the tariff is strictly less than the binding. We refer to this as a tariff binding agreement with tariff overhang. If $t^B \leq t^N(\theta)$, the importing country’s tariff will be at the binding for all states of the world and there is no overhang. Note that a tariff binding is contained in the set of incentive compatible trade agreements since it satisfies

$$V(t(\theta), \theta) - V(t(r), \theta) \geq 0 \text{ for all } r, \theta \in \Theta \tag{9}$$
In state \( \theta \) the importer prefers its assigned tariff to that it would obtain by reporting a state \( r \neq \theta \).

We assume that transfers between countries are available ex ante, so that the objective for the trade agreement is to maximize expected world welfare. The optimal tariff binding agreement is obtained by maximizing (7) subject to (8), which can be expressed as

\[
\max_{t^B} E[W] = \int_{\theta^B(t^B)}^{\theta^*(t^B)} W(t^N(\theta); \theta) f(\theta) d\theta + \int_{\theta^B(t^B)}^{\bar{\theta}} W(t^B; \theta) f(\theta) d\theta,
\]

where,

\[
\theta^B(t^B) = \max\{\bar{\theta}, t^{N-1}(t^B)\}.
\]

An analogous expression can be derived for the tariff binding for the foreign country.

Noting that \( W(t; \theta) = W(t; 0) + \theta \pi(t) \), the necessary condition for optimality can be expressed as

\[
\pi_t(t^B) (1 - F(\theta^B(t^B))) \left[ \frac{W_t(t^B, 0)}{\pi_t(t^B)} + E[\theta | \theta > \theta^B(t^B)] \right] = 0.
\]

This expression will have two types of solutions: one in which the bracketed expression equals 0 and one where \( \theta^B(t^B) = \bar{\theta} \). It can be shown that the latter solution must be a local minimum if \( \bar{\theta} < \theta^{\max} \), so we concentrate on the former. The first term in the bracketed expression is the deadweight loss per dollar of profit obtained by an increase in the tariff binding, and can be interpreted as the cost of raising the binding. Evaluating this terms using (3), we have \(-W_t(t^B, 0)/\pi_t(t^B) = 2t^B/(1 + t^B)\), which is illustrated by the \( C(t) \) schedule in Figure 2. The cost of raising the binding is increasing in \( t^B \) because the marginal deadweight loss is increasing more rapidly than the marginal profit gain as the binding rises.\(^{15}\) The second term in the bracketed expression is the expected political gain from raising the binding. The \( B(t, \lambda, \beta) = E(\theta | \theta \geq \theta^B) \) locus in Figure 2 locus is the expected benefit of raising the binding, which is the expected value of the political shock for values at which the tariff is at the binding. This locus will be horizontal at \( E(\theta) \) for \( t^B < t^N(\bar{\theta}) \), because the binding applies for all \( \theta \). For \( t^B > t^N(\bar{\theta}) \) B locus is upward sloping,\(^{15}\)

\(^{15}\)It might seem surprising that the cost of raising the binding is independent of country size. The impact of market power arises through its impact on \( \frac{dp}{d\theta} \), which affects both numerator and denominator of the expression by the same proportion. For general demand and supply expressions, \( C(t) = \frac{t^\eta}{1 + t^\eta} \), where

\[ \eta \equiv -L_L \frac{\theta}{\bar{\theta}^2}. \]

With our linear specification, \( \eta = 2 \) for all \( t \).
\[
\frac{\partial E[\theta|\theta > \theta^B(t)]}{\partial \theta^B} = \left(\frac{\gamma}{1 + \gamma}\right) \frac{\partial \theta^B}{\partial \theta^B} > 0, \text{ because increase in } t^B \text{ reduce the fraction of states in which the tariff is at the binding. The necessary condition for an optimum will be satisfied at the intersection of these loci.}
\]

In order to simplify the analysis and obtain a closed form solution for the optimal binding, we will assume that the political pressure parameter has a power-function distribution given by namely,

\[
f(\theta) = \frac{\gamma (\bar{\theta} - \theta)^{\gamma - 1}}{(\bar{\theta} - \theta)^{\gamma}} \text{ for } \theta \in [\underline{\theta}, \bar{\theta}]. \tag{12}
\]

This formulation yields a uniform distribution for \( \gamma = 1 \), with \( f'(\theta) > 0 \) for \( \gamma < 1 \) and \( f'(\theta) < 0 \) for \( \gamma > 1 \). Under this distribution function, the expected political gain from raising the binding is given by

\[
E(\theta|\theta \geq \theta^B) = \frac{\bar{\theta} + \gamma \theta^B(t^B)}{1 + \gamma}. \tag{13}
\]

Utilizing (13) we obtain the following characterization of the optimal binding (see Appendix for proof):

**Proposition 1** Assume that \( \bar{\theta} < \theta^\text{max} = 2 \left(\frac{\beta-1}{\beta+1}\right) \) and the political pressure parameter has a power-function distribution as given by (12). The optimal binding will have the following properties:

(i) If \( \lambda < \tilde{\lambda} \equiv \frac{\bar{\theta} - \theta}{(1 + \gamma)\theta^\text{max} - \gamma \bar{\theta}} < \frac{1}{\gamma} \), the optimal binding will be \( t^B = \frac{\bar{\theta} - \gamma \lambda \theta^\text{max}}{2 - \bar{\theta} - 4\gamma \lambda/(1 + \beta)} \), which is decreasing in \( \lambda \) and \( \beta \). The agreement will exhibit tariff overhang.

(ii) If \( \lambda \geq \tilde{\lambda} \), the optimal binding agreement will involve a tariff binding \( t^B = \frac{E(\theta)}{2 - E(\theta)} = \frac{\bar{\theta} + \gamma \lambda \theta^\text{max}}{2(\gamma + 1) - (\bar{\theta} + \gamma \bar{\theta})} \) with no overhang.

Proposition 1 can be illustrated using Figure 2. An increase in market power (either through higher values of \( \beta \) or \( \lambda \)), will have a lower threshold value \( \theta^B \) and thus a lower benefit from raising the binding. This occurs because a larger country tends to use the maximum tariff more liberally by applying it even when the political pressure is relatively low, which generates a smaller political gain on average. Therefore, an increase in market power will result in a rightward shift in the \( B(t) \) locus as illustrated in Figure 2. The threshold value of country size, \( \tilde{\lambda} \), corresponds to the country size at which the horizontal segment of the \( B(t) \) locus intersects the \( C(t) \) locus. Increases in market power will have no effect
on the optimal binding for $\lambda > \tilde{\lambda}$.

For $\lambda < \tilde{\lambda}$, $B(t^N(\tilde{\theta})) > C(t^N(\tilde{\theta}))$ so the optimal binding must involve overhang. The assumption that $\tilde{\theta} < \theta^{\max}$ ensures that $C(t^{\pro}) > B(t^{\pro})$, so an interior solution with $t^{B} \in (t^N(\tilde{\theta}), t^{\pro})$ will exist. In order for an interior solution to represent a maximum, the $C(t)$ schedule must be steeper than the $B(t)$ schedule at an intersection point, which requires

$$\frac{2}{(1 + t^{B})^2} \geq \frac{\partial E[\theta | \theta > \tilde{\theta}^B(t)]}{\partial t^{B}} \left( \frac{\partial \theta^{B}}{\partial t^{B}} \right)$$

(14)

When expected value is given by (13), this condition simplifies to $\lambda \gamma < 1$. Note that the definition of $\tilde{\lambda}$ ensures that this condition will be satisfied, so there will be a unique binding with tariff overhang for $\lambda < \tilde{\lambda}$. Since increases in market power shift the $B(t)$ schedule rightward, the binding will be decreasing in $\beta$ and $\lambda$ for $\lambda < \tilde{\lambda}$.\[17\]

\[16\]Beshkar, Bond, and Rho 2011 find empirical evidence supporting the prediction that countries with greater market power have lower bindings and are more likely to be at the binding under the WTO.

\[17\]An unbound tariff, which provides the maximum flexibility to the importer, arises if $t^{B} = t^N(\tilde{\theta})$. The formula for the binding at an interior solution provides two limiting cases in which the tariff is unbound, $\lim_{\lambda \to 0} t^{B} = t^N(\tilde{\theta})$ and $\lim_{\gamma \to \gamma^{\max}} t^{B} = t^N(\tilde{\theta})$. The first is a case where the importing country is a small
A country’s market power affects the amount of flexibility provided in an optimal agreement because it affects the difference between the importer’s optimal tariff and the efficient tariff. However, the amount of flexibility will also depend on how the difference between the optimal tariff and the efficient tariff vary with the level of the political shock. Consider a perturbation of the preferences (as in Lemma 2(ii)) that raises $\beta$ and reduces $\lambda$ to keep the expected Nash tariff constant in the region where the tariff is at the binding. This change will reduce $t^N(\theta^B)$, which has the effect of raising $\theta^B$ at an interior solution and shifting the benefit schedule upward in Figure 2 at an interior solution. This yields

**Proposition 2** An increase in $\beta$ and reduction in $\lambda$ that keeps $\int_{\theta^B} t^N(\theta)f(\theta)d\theta$ constant will raise the tariff binding in an optimal agreement.

This result indicates that the level of the tariff binding depends not only on the home country’s market power, but also on how convergent the importer’s preferences are to those of the world as $\theta$ increases.

### 3.2 Optimal Agreements with Costly Monitoring

We now consider the possibility that by incurring a monitoring cost of $c$, the importing country is able to reveal the true value of $\theta$ to the rest of the world. We can then specify a trade agreement as consisting of two regions: a monitoring region ($M \subseteq \Theta$) and a non-monitoring region ($M^C$). A country reporting a state in the non-monitoring region is assumed to be subject to a tariff binding, as in the previous section. If the importing country incurs the monitoring cost and a state $\theta \in M$ is verified, then it receives the tariff $t^M(\theta)$ that is specified as part of the agreement. If the importer incurs the monitoring cost and the state is revealed to be outside the monitoring region, then it is subject to the binding. The monitoring region corresponds to the escape clause of a trade agreement, and represents the conditions that must be met in order for the country to be able to violate the binding. The importer’s announcement of a state in the monitoring region can be thought of as the initiation of an investigation and the incurring of the resource costs required to establish that the conditions required for violating the binding are met. 

If $\bar{\theta} > \theta^\max$, then $t^B = t^\pro$ can be a local maximum.
Once the true state is revealed, the importer can impose the tariff $t^M(\theta)$. In order for a tariff $t^M(\theta)$ in the monitoring region to be incentive compatible, the importing country must prefer the payoff it receives from undergoing monitoring to any tariff that it could choose in the non-monitoring region, namely

$$V(t(\theta), \theta) - V(t(r), \theta) \geq c \text{ for all } \theta \in M, r \in M^C. \tag{15}$$

For $\theta \in M^C$, there is no incentive to choose a report in the monitoring region because the assigned tariff will be the same as if no monitoring had occurred but the cost of monitoring will be incurred.

The potential for such an agreement to improve on the agreement with a tariff binding alone can be seen from the necessary condition for the optimal binding, \[11\], which shows that the binding will exceed the efficient tariff at $\theta^B$ and will be less than the efficient tariff in the neighborhood of $\theta$. For values of $\theta$ sufficiently high, an increase in the applied tariff would benefit both the importing country and the world as a whole. Offering a high tariff in the event that a high value of the political shock is verified has the potential to be both welfare improving and incentive compatible if $c$ is not too large. World welfare can also be improved if tariffs are reduced for low realizations of $\theta$, since the efficient tariff is below that specified under the binding. However, monitoring would not be incentive compatible in this case because the importer prefers the tariff offered under the binding to the efficient tariff.

In light of these observations, we will examine monitoring that takes the form of “cap-and-escape” agreements. A cap-and-escape agreement is one in which the monitoring region takes the form of an interval of the highest realizations of $\theta$, $M = [\theta^M, \bar{\theta}]$. These agreements are also of interest because they have features of the safeguards agreement in the WTO, which allows countries to raise their tariffs above the binding in extraordinary circumstances.

### 3.3 Optimal Cap-and-Escape Agreements

A cap-and-escape agreement can be characterized by a tariff binding, $t^B$, a threshold value, $\theta^M$, for the monitoring region, $M = [\theta^M, \bar{\theta}]$, and a tariff schedule for the monitoring region, $t^M(\theta)$. We begin our analysis by establishing the following Lemma, which characterizes the optimal escape rule $\{\theta^M, t^M(\theta)\}$ given $t^B$. 

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Lemma 3 Suppose that for a given \( t^B \), there exists a \( \hat{\theta} < \bar{\theta} \) such that \( W(t^E(\hat{\theta}), \hat{\theta}) - c = W(t^B, \hat{\theta}) \). Then given \( t^B \), the optimal escape rule is given by \( t^M(\theta) = t^E(\theta) \) for \( \theta \in M = [\hat{\theta}, \bar{\theta}] \).

Proof. For \( \theta \leq t^{N^{-1}}(t^B) \), the only incentive compatible tariff schedule is given by \( t^N(\theta) \) and, hence, monitoring in this region is not optimal. For \( \theta > t^{N^{-1}}(t^B) \), monitoring will be incentive compatible iff \( V(t^M(\theta), \theta) - V(t^B, \theta) \geq c \). Since \( W(t^M(\theta), \theta) - W(t^B, \theta) = (V(t^M(\theta), \theta) - V(t^B, \theta)) + (V^*(t^M(\theta)) - V^*(t^B)) \) and \( V^*(t) \) is decreasing in \( t \), any agreement with \( t > t^B \) that raises world welfare is also incentive compatible. Therefore, the monitoring region should consist of all \( \theta \) such that world welfare can be raised by monitoring. World welfare cannot be improved by monitoring for \( \theta > t^E_1(t^B) \), because \( \frac{\partial W(t^E(\theta), \theta) - W(t^B, \theta)}{\partial \theta} = \pi(t^E(\theta)) - \pi(t^B) > 0 \) for \( t^E(\theta) > t^B \). For \( \theta \geq \hat{\theta} \), world welfare is maximized at \( t^E(\theta) \). Therefore, since \( t^E(\theta) \) is also incentive compatible for \( \theta \geq \hat{\theta} \), the optimal escape rule is \( t^M(\theta) = t^E(\theta) \) for \( \theta \geq \hat{\theta} \).

Figure 3 illustrates the form of the tariff schedule under a cap and escape agreement as given by Lemma 3. For \( \theta < \theta^M \), the importer’s tariff is determined by the tariff binding. For \( \theta \geq \theta^M \), the importer incurs the cost of monitoring and receives the efficient tariff, with the boundary of the monitoring region chosen to make world welfare equal under monitoring and the binding. Lemma 3 shows that monitoring occurs less frequently than would be desired by the importing country, because \( \theta^M \) exceeds the value of \( \theta \) at which the importing country is indifferent between \( t^B \) and incurring the monitoring costs to obtain the efficient tariff.\(^{18}\) This is because the importing country’s tariff imposes negative externalities on the rest of the world and, hence, the threshold level of \( \theta \) for monitoring to raise world welfare is above the threshold for the importer to gain from monitoring. In particular we must have \( \theta^B < t^{E^{-1}}(t^B) < \theta^M \). As a result, an optimal cap and escape agreement will specify an efficient tariff for the entire monitoring region because the incentive constraint on monitoring is not binding. Note that this result would continue to hold if part of the monitoring costs were paid by the rest of the world, since this would only have the effect of further relaxing the importer’s reporting constraint.

The boundary of the monitoring region is the solution to

\[
W(t^E(\theta^M), \theta^M) - W(t^B, \theta^M) - c = 0. \tag{16}
\]

\(^{18}\)This result is reminiscent of the ‘serious’ injury condition under the WTO agreements on safeguards and antidumping, which precludes the use of contingent protection measures in cases where the magnitude of alleged injury to domestic industries is not sufficiently great.
Figure 3: Cap and Escape Tariff Schedule

Totally differentiating this condition and rearranging yields

\[
\frac{\partial \theta^M}{\partial t^B} = \frac{W_t(t^B, \theta^M)}{\pi(t^E(\theta^M)) - \pi(t^B)} > 0,
\]

and

\[
\frac{\partial \theta^M}{\partial c} = \frac{1}{\pi(t^E(\theta^M)) - \pi(t^B)} > 0,
\]

for \( t^B < t^{pro} \). Therefore, a higher binding reduces the benefit of monitoring and thus reduces the range of political parameters over which monitoring is optimal. Similarly, higher costs of monitoring will reduce the range of realizations for which monitoring is chosen.

Using (16), we can express the problem for designing the optimal cap-and-escape agreement as
The necessary condition for optimal choice of binding will be
\[
\pi_t(t^B) \left( F(\theta^M(t^B) - F(\theta^B(t^B)) \left[ \frac{W_t(t^B, 0)}{\pi_t(t^B)} + E \left[ \theta | \theta^M(t^B) > \theta > \theta^B(t^B) \right] \right] = 0. \tag{18}
\]

For cases in which monitoring takes place with \( c > 0 \), we have \( F(\theta^M(t^B)) > F(\theta^B(t^B)) \) and the necessary condition can only be satisfied if the bracketed expression equals 0. As in the case without monitoring, the bracketed expression requires that the deadweight loss per unit of profit generated by an increase in the binding equal the expected political benefit over the region of shocks where the tariff is at the binding.

The expected benefit of raising the binding when \( \theta^M < \theta^B, \mathbb{E} [\theta | \theta^M(t^B) > \theta > \theta^B(t^B)] \), will be less than the expected benefit when there is no monitoring, \( \mathbb{E} [\theta | \theta > \theta^B(t^B)] \). Let \( \tilde{c}(t^B) \) denote the level of monitoring cost satisfying \( \theta^M(t^B, c) = \tilde{\theta} \). Since \( \theta^M(t^B, c) \) is increasing in \( c \), the monitoring region will be empty for all \( c > \tilde{c}(t^B) \). For \( c < \tilde{c}(t^B) \), reductions in monitoring costs will expand the monitoring region and hence reduce the expected benefit of raising the binding. Since all of the equilibria identified in Proposition 1 have the property that \( C(t) > B(t) \) for values of \( t \) exceeding the optimal binding and \( B(t) \) is non-decreasing in \( c \), it follows that \( \frac{\partial \mathbb{E}[W]}{\partial t^B} < 0 \) for all values of \( t \) exceeding the optimal binding from Proposition 1 when monitoring is allowed. This observation, combined with the fact that that expected payoff is continuous in \( t \) on \( [0,t^{pro}] \), yields the following result.

**Proposition 3** If \( \tilde{\theta} < \theta^{max} \) and the distribution of political shocks is given by (12), there will exist a tariff binding \( t^B < t^{pro} \) that maximizes expected world welfare with monitoring. If \( \theta^M(t^B, c) < \tilde{\theta} \), \( t^B \) is less than the binding that maximizes world welfare without monitoring.

For countries sufficiently large that \( \lambda \geq \tilde{\lambda} \), there was no flexibility in the agreement without monitoring. The introduction of monitoring thus allows flexibility for countries with a sufficiently large degree of market power, and also results in a lowering of the
binding. For countries with a lower degree of market power, $\lambda < \tilde{\lambda}$, the agreement without monitoring included tariff overhang. For these countries, Proposition 3 shows that the introduction of monitoring substitutes for overhang as a source of flexibility because it must reduce the average amount of tariff overhang in the optimal agreement.

For countries that had overhang without monitoring, the introduction of monitoring may result in an optimal contract that involves both monitoring and overhang. However, it could also result in a complete switch to an agreement with no overhang and monitoring. This possibility is illustrated in Figure 4, which illustrates how reductions in monitoring costs affect the expected benefit locus, $B(t, c)$. Letting $c^{\max} = \tilde{u}(0)$, the $B(t, c^{\max})$ locus is the expected benefit of raising the binding when monitoring costs are sufficiently high that no monitoring takes place for any level of the binding. At $c_1 < c^{\max}$, the benefit of raising the binding is reduced for all levels of the binding at which monitoring takes place, $t < \tilde{u}(c_1)$. Note that since monitoring is most attractive when the binding is low, the reductions in the expected benefit are greatest at low levels of the tariff binding. With a low binding, it will be optimal to allow escape for a greater range of values of $\theta$. For the $B(t, c_1)$ locus illustrated in Figure 4, the necessary condition is satisfied at 3 values of the binding: the initial binding $t^B(c^{\max})$ at which there is no monitoring, a low binding with monitoring and no overhang, and an intermediate binding with both monitoring and overhang. Note however that the intermediate binding with both monitoring and overhang will not satisfy the second order conditions. Thus, the maximum in this case must be at a trade agreement in which only one form of flexibility is used. The $B(t, c_0)$ locus shows a level of monitoring costs at which the benefits of monitoring have fallen sufficiently that there is only on binding satisfying the necessary conditions. The binding in this case is denoted $t^B(c_0)$, which yields an agreement with no overhang. The example in Figure 4 illustrates that the optimal agreement could switch from one with overhang and no monitoring to one with no overhang and monitoring once a critical threshold is reached. Note also that this switch will result in a significant drop in the binding.

How likely is it that we obtain an agreement with both monitoring and overhang? In order for an agreement to include both monitoring and overhang, there must be an intersection of the $B(t, c)$ and $C(t)$ loci at which the $C(t)$ locus is relatively steeper. Differentiating
Figure 4: Benefit of raising binding for high ($c^{\text{max}}$), intermediate ($c^1$) and low ($c^0$) costs of monitoring.

As per equation (18), we obtain the requirement for an interior solution to be a maximum is that

$$\frac{2}{(1 + t^B)^2} > \frac{\partial E [\theta | \theta^M > \theta > \theta^B]}{\partial \theta^B} \frac{\partial \theta^B}{\partial t^B} + \frac{\partial E [\theta | \theta^M > \theta > \theta^B]}{\partial \theta^M} \frac{\partial \theta^M}{\partial t^B}.$$  \hspace{1cm}(19)

An increase in $t^B$ raises both the upper and lower thresholds of the region where the tariff is at the binding. This contrasts while in the case without monitoring an increase in $t^B$ only raises the lower threshold. Both of these effects increase the slope of the schedule of marginal benefit of raising the binding, making the conditions for an interior maximum more stringent than in the case without monitoring.

In order to address the existence of interior optima with both binding and overhang, we focus on the case where $\theta$ has a uniform distribution, which yields $E(\theta | \theta^M > \theta > \theta^B) = \frac{\theta^B + \theta^M}{2}$. The following Lemma establishes that if Nash and efficient tariffs are convergent at $\theta^M$, or equivalently if $\beta < \tilde{\beta}(\theta^M)$, the second order condition (??) is violated.

**Lemma 4** Suppose that $\theta$ has a uniform distribution with $\bar{\theta} < \underline{\theta} < \theta^{\text{max}}$ and the necessary condition is satisfied with $\bar{\theta} < \theta^B(t^B) < \theta^M(t^B) < \underline{\theta}$. This solution will fail to satisfy the second-order condition if $\beta < \tilde{\beta}(\theta^M)$. 

Lower values of $\beta$ have two effects that make it more difficult to satisfy (??). One is that it makes the Nash tariff schedule less responsive to political shocks, which raises $\frac{\partial \theta^B}{\partial \theta^M}$. A second is that it raises the tariff binding associated with an interior solution for given $\theta^M$, which reduces the left hand side of the inequality in (??). The proof of Lemma 4 establishes that these two effects are sufficiently strong that the a local maximum cannot exist at $\theta^M$ if $\beta < \tilde{\beta}(\theta^M)$.

The following is an immediate implication of Lemma 4:

**Proposition 4** If preferences are globally convergent (i.e., if $\beta < \tilde{\beta}(0) \equiv 1 + 2\sqrt{1+\lambda}$) then escape and overhang do not coexist under an optimal cap-and-escape agreement.

In other words, for a given country size, if the comparative advantage parameter is not too large, flexibility is provided either through overhang or an escape clause, but not both. The example illustrated in Figure ?? satisfies the condition for global convergence of preferences, so the agreement changes from one with overhang and no monitoring to one with no overhang and monitoring as monitoring costs are reduced. The two forms of flexibility are sufficiently close substitutes that only one will be used in an agreement. Note that this result is also consistent with Proposition 2, since it suggests that reducing convergence of preferences makes overhang less valuable as a flexibility mechanism.

### 3.4 Numerical Examples

Proposition 4 indicates that $\beta > \tilde{\beta}(\theta^M)$ is necessary for there to be an interior solution that is a maximum. However, it does not guarantee that there exist a parameterization for which a trade agreement with both overhang and monitoring is a global maximum. In this section we provide a numerical example to show that both overhang and monitoring may be part of an efficient agreement when $\beta > \tilde{\beta}(\theta^M)$. This example also provides some insights on how the use of monitoring and overhang varies with country size and the level of monitoring costs.

We consider an example with $\theta$ having a uniform distribution on $[0, 0.75]$. Since $\tilde{\beta}(\theta)$ is increasing in $\theta$ and $\lambda$, the preferences of the importing country will be locally divergent on $[0, 0.75]$ for all $\lambda \in (0, 1)$ if $\beta > 6.73$. The optimal trade agreement was obtained by doing a grid search over tariff bindings, given country size and the level of monitoring costs, to find the cap-and-escape agreement $\{t^B, \theta^M(t^B, c)\}$ that yields maximum expected world welfare. The results shown in Figures 5 and 6 are based on $\beta = 20$. Using the results of
Proposition 1: For the case where monitoring is not allowed, this parameterization yields an agreement with no overhang and a bound tariff of $t^B = 0.23$ for $\lambda \geq \lambda = 0.26$. For $\lambda < \lambda$, the agreement without monitoring will involve overhang and will have a binding that is decreasing in $\lambda$ and approaches a maximum of 0.6 as $\lambda \to 0$.

Figure 5 shows the level of the tariff binding in the optimal cap-and-escape agreement for relatively small countries, $\lambda \in \{0.1, 0.15, 0.2\}$, as the level of monitoring costs varies. The horizontal segment in each schedule corresponds to an agreement in which there is a tariff binding with overhang but no monitoring takes place. In this region the monitoring costs are sufficiently high that the monitoring region is empty. The fact that the horizontal segment decreases in country size in the absence of monitoring reflects the result of in Proposition 1.

The steeply increasing segments for each relationship in Figure 5 correspond to the values of monitoring costs for which the trade agreement uses both overhang and monitoring. The introduction of monitoring results in a sharp decline in the binding, as the use of monitoring is substituted for tariff overhang as a source of flexibility. This illustrates the strong degree of substitutability between monitoring and overhang, even in cases where $\beta$ is relatively high. Note also that the threshold level of monitoring costs at which monitoring is introduced into the optimal contract increases more than proportionally with the size of the country. The threshold monitoring cost for $\lambda = .2$ is approximately 8 times that for $\lambda = 0.1$. This suggests that overhang is relatively more useful as a means of introducing flexibility into a contract for countries that are small.

The slowly increasing segments in each locus in Figure 5 correspond to the region of monitoring costs where there is no overhang in the trade agreement. Reductions in monitoring costs in this region result in the use of more monitoring, but the effect on the tariff binding is smaller than in the region where the agreement has tariff overhang in some states of the world. Note that for all country sizes illustrated in Figure 5 a larger country size is associated with lower bindings both in agreements with and without monitoring. Overall, these results indicate agreements with overhang and no monitoring at high levels of $c$, agreements with both monitoring and overhang at intermediate levels of $c$ and no overhang at low levels of $c$.

Figure 6 depicts the relationship between monitoring costs and bindings for larger country sizes, $\lambda \in \{0.22, 0.27, 0.32\}$. For $\lambda = 0.22 < \lambda$, the pattern is similar to that in Figure 5. For $\lambda > 0.26$, there is no tariff overhang in the agreement when monitoring is not allowed and the binding is independent of country size as established in Proposition 1 (ii).
As monitoring costs fall, the optimal agreement moves directly from an agreement with no overhang and no monitoring to one with no overhang and monitoring as monitoring costs fall. For countries in this size range, market power is sufficiently large that it is never optimal to have overhang as part of the trade agreement. The threshold level of monitoring costs at which monitoring is introduced into the agreement is also increasing in country size for the examples illustrated in Figure 6, although the change in the monitoring cost with respect to country size is smaller.

For $\beta < 1 + 2 \sqrt{1 + \lambda}$, there will be no interior solutions for any $(\lambda, c)$ pairs. In this case there will be two different types of paths for trade agreements in response to reductions in monitoring costs. For $\lambda < \lambda^*$, the optimal agreement will switch from one with overhang and no monitoring to one with monitoring and no overhang as monitoring costs fall below the threshold level. These countries are sufficiently small that tariff overhang is used to provide flexibility when monitoring is not used. However, due to the local convergence in preferences between the importer and the world for these parameter values, the introduction of monitoring will completely eliminate the use of tariff overhang in the agreement. This will result in a discontinuity in the relationship between tariff bindings and monitoring costs at the point where the monitoring region is non-empty. This contrasts with the case in Figure 5 where the reduction in tariff bindings is more gradual over the region where
monitoring and overhang coexist. For $\beta < 1 + 2\sqrt{1 + \lambda}$ and $\lambda > \tilde{\lambda}$, there will be a threshold level of costs such that the agreement has no monitoring or overhang above the threshold and monitoring without overhang below. This outcome is similar to that illustrated in Figure 6 for $\lambda = \{0.27, 0.32\}$, because these countries are sufficiently large that overhang is not used as part of an optimal trade agreement.

One of the concerns expressed about the WTO mechanisms has been that small and developing countries face a disadvantage in participating in WTO contingent protection mechanisms due to the large fixed cost element involved in participation. This point has been made in the context of dispute settlement (e.g. Bown (2005) and Shaifer (2003)). Since one of the costs of contingent protection mechanisms is the possibility that a dispute is initiated as a result of the action, our results have the potential to provide some insight on this issue. Our simulations suggest that the threshold level of monitoring cost at which monitoring will be used is increasing in country size for small and medium-sized countries.\footnote{This result may be reversed for very large values of $\lambda$, since in this case the world efficiency gains from trade liberalization are relatively small.} In particular, the threshold may increase more than proportionally with country size. However, our analysis also shows that small countries have an advantage in the use of tariff
overhang, which serves as an alternative flexibility mechanism to contingent protection measures.

4 Conclusions

Our analysis has shown how tariff bindings and contingent protection provide alternative means of introducing flexibility into trade agreements. Tariff overhang allows countries to make unilateral policy changes in response to political shocks, but has the disadvantage that the importing country will always choose a tariff that is higher than the first best tariff. As a result, tariff overhang will be used most extensively for countries that have relatively little market power. In contrast, contingent protection allows the imposition of tariffs that are efficient from a world point of view. However, it has the disadvantage of requiring the use of resources to verify the state.

Our results indicate that allowing contingent protection will result in a substitution of monitoring for tariff overhang if monitoring costs are sufficiently low. In particular, we showed that agreements will never involve both the use of contingent protection and tariff overhang if the preferences of the importer and the world are everywhere locally convergent. However, monitoring and overhang may coexist if preferences of the importer and the world are locally divergent. Our simulations also indicated that contingent has the lowest value for relatively small countries, since the use of tariff overhang will be a relatively more efficient mechanism for providing flexibility when terms of trade externalities are small.

Our analysis has highlighted the role of both market power and the convergence of preferences as determining the relative importance of tariff overhang and escape clauses in providing flexibility. Our analysis is the first to emphasize the role of preference convergence, which refers to whether the protectionist bias of importing countries increases or decreases as the magnitude of political shocks increase. Models which rely on the terms of trade externalities as the source of externalities in trade agreements will necessarily result in the convergence of preferences if political shocks are sufficiently large that they result in the imposition of prohibitive tariffs. However, our analysis shows that divergences of preferences can occur for smaller magnitudes of the political shocks and may play an important role in determining the value of tariff overhang. The role of preference divergence in other types of political economy models remains an area for future work.
References


A Appendix

Proof of Lemma 1. Differentiation of (4) yields

\[
\frac{\partial t_N}{\partial \theta} = \frac{2(1+\lambda)(1+\beta)^2}{\Lambda} > 0 \quad \frac{\partial t_N}{\partial \beta} = \frac{8\lambda(1+\lambda)}{\Lambda} > 0
\]

\[
\frac{\partial t_N}{\partial \lambda} = \frac{2(1+\beta)(2(\beta-1) - (\beta+1)\theta)}{\Lambda} > 0 \text{ for } \theta < \theta_{\text{max}}
\]

where \(\Lambda = ((\beta+1)(2-\theta) + 4\lambda)^2\). Part (iii) follows from \(\left(\frac{\partial t_N}{\partial \beta}\right) / (\frac{\partial t_N}{\partial \lambda}) = \frac{4\lambda(1+\lambda)}{(1+\beta)^2((\theta_{\text{max}}-\theta)}\), which is increasing in \(\theta\) for \(\theta < \theta_{\text{max}}\).

Proof of Lemma 4. (i) Differentiation of (4) and (8) yields

\[
\Delta'(\theta) = \frac{2\lambda \left[\beta^2 (2-\theta)^2 - 2\beta (4-\theta^2) - 4 (3 + 4\lambda - \theta) + \theta^2\right]}{(2-\theta)^2 ((\beta + 1)(2-\theta) + 4\lambda)^2}
\]
The sign of this expression is determined by the sign of the bracketed expression in the numerator, which will be increasing in \( \beta \) because \( 2(2 - \theta)[2(\beta - 1) - (\beta + 1)\theta] > 0 \) for \( \theta < \theta_{\text{max}} \). The bracketed expression will equal 0 at \( \beta = \frac{2 + \theta + \sqrt{1 + \lambda}}{2 - \theta} \).

(ii) Let \( d\lambda = -kd\beta < 0 \), where \( k = \left( J_{\theta_0} t^N_{\beta}(\theta) f(\theta) d\theta \right) / \left( f_{\theta_0} t^N_{\lambda}(\theta) f(\theta) d\theta \right) > 0 \).

Since \( t^N_{\beta}(\theta)/t^N_{\lambda}(\theta) \) is continuous and increasing in \( \theta \) by Lemma 1, \( t^N_{\beta}(\theta)/t^N_{\lambda}(\theta) < k \). The necessary condition for optimal choice of binding, (11), will be satisfied if either

\[
\text{a) If } \gamma \lambda < 1, \text{ then } J'(t) < 0 \text{ and there exists a unique } t^B \in (0, t^N(\bar{\theta})) \text{ that maximizes expected welfare. If } \lambda \geq \bar{\lambda} \equiv \frac{\bar{\theta} - \theta}{(1 + \gamma)\theta_{\text{max}} - \bar{\theta} - \bar{\gamma} \bar{\theta}}, \text{ then } t^B = \frac{E(\theta)}{2 - E(\theta)} \leq t^N(\bar{\theta}, \lambda). \text{ If } \lambda < \bar{\lambda}, \text{ then } t^B = \frac{\bar{\theta} - \gamma \lambda \theta_{\text{max}}}{2 - \bar{\theta} - \bar{\gamma} \lambda/(1 + \beta)}(t^N(\bar{\theta}, \lambda), t^N(\bar{\theta}, \lambda))
\]

\[
\text{b) If } \gamma \lambda \geq 1, \text{ then there exists a unique } t^B = \frac{\bar{\theta} - \gamma \lambda \theta_{\text{max}}}{2 - \bar{\theta} - \bar{\gamma} \lambda/(1 + \beta)} \in (0, t^N(\theta)) \text{ that maximizes expected welfare.}
\]

Proof. From (A.1), \( J(t) \) is continuous in \( t \) with \( J'(t) = -\frac{2}{(1 + t)^{\gamma}} \) for \( t < t^N(\bar{\theta}) \) and \( J'(t) = \frac{2(\gamma \lambda - 1)}{(1 + t)^{\gamma}(1 + \gamma)} \) for \( t > t^N(\bar{\theta}) \).

(a) Since \( J(0) = E(\theta) > 0 \) and \( J(t^N(\bar{\theta})) < 0 \) as established above, there will exist a unique \( t^B \) such that \( J(t^B) = 0 \) if \( \gamma \lambda < 1 \). This solution will be a global maximum since
\( J'(t^B) < 0 \). A corner binding with no overhang will exist if 
\( t^B = \frac{E(\theta)}{2 - E(\theta)} \leq t_N(\theta, \lambda) \), which is shown to hold for \( \lambda \geq \hat{\lambda} \) using (4). For \( \lambda < \hat{\lambda} \), the optimal binding is obtained by solving 
\( J'(t^B) = 0 \).

(b) If \( \gamma \lambda > 1 \), \( J'(t) > 0 \) for \( t \in (t_N(\bar{\theta}), t_N(\bar{\theta})) \) and there cannot exist a local maximum on this interval. This yields two possibilities: a corner solution with no overhang or a corner solution with an unbound tariff (i.e. \( t^B \geq t_N(\bar{\theta}) \)). Since \( \lambda < \frac{1}{\gamma} \) when \( \bar{\theta} < \theta^{\max} \), \( \gamma \lambda > 1 \)
implies \( \lambda > \hat{\lambda} \) and there will exist a local maximum with no overhang, \( t^B \in (0, t_N(\theta)) \), by the arguments in (a). To show that there cannot be an optimum at a corner solution with an unbound tariff, we show that \( EW[t^B] \) is decreasing on \( (t_N(\theta), t_N(\bar{\theta})) \). Since sign \( EW'(t^B) = \text{sign} J(t) \), it is sufficient to show that \( J(t) < 0 \) on that interval. We have established that \( J(t) \) is continuous with \( J(t_N(\theta)) < 0 \), \( J(t_N(\bar{\theta})) < 0 \), and \( J'(t) > 0 \) for \( t \in (t_N(\theta), t_N(\bar{\theta})) \). Therefore we must have \( J(t) < 0 \) on the interval. 

**Proof of Proposition 2.** Recall that the first-order condition for optimal tariff binding is given by \( \frac{2t^B}{1+t^B} = E \left[ \theta | \theta > \theta^B(t^B) \right] \). The left-hand side of this condition is unaffected by changes in \( \lambda \) and \( \beta \). Therefore, it is sufficient to show that as a result of this perturbation in \( \beta \) and \( \lambda \), \( \theta^B(t^B) \) increases.

Now note that since \( \Delta(\theta) = t^N(\theta) - t^E(\theta) \), and \( t^E(\theta) \) is independent of \( \lambda \) and \( \beta \), an increase in \( \beta \) and reduction in \( \lambda \) that keeps \( \int_{\theta^B}^\infty t^N(\theta)f(\theta)d\theta \) constant will also keep \( \int_{\theta^B}^\infty \Delta(\theta)f(\theta)d\theta \) constant. Therefore, according to Lemma 2(ii), \( t^N(\theta^B) \) decreases as a result of this perturbation in \( \beta \) and \( \lambda \). But since \( \theta^B(t^B) = (t^N)^{-1}(t^B) \), this perturbation in \( \beta \) and \( \lambda \) results in an increase in \( \theta^B(t^B) \). QED.

**Proof of Proposition 3.** Let \( H(t) \equiv E \left[ \theta | \theta > \theta^M(t) \right] - \frac{2t}{1+t^M} \), where \( H(t) \leq J(t) \). \( H(t) \) will be continuous on \([0, t^{pro}]\), with \( H(0) > 0 \) and \( H(t^{pro}) \leq J(t^{pro}) < 0 \). Therefore, there will exist a solution \( t^B \in (0, t^{pro}) \) satisfying \( H(t^B) = 0 \). Lemma 5 established that for \( \bar{\theta} < \theta^{max} \), there will be a unique value \( t^B \) satisfying \( J(t^B) = 0 \). In addition, \( J(t^B) < 0 \) for \( t > t^B \), which ensures that \( t^B \leq t^B \). The inequality will be strict if \( \theta^M(t^B) < \bar{\theta} \).

**Proof of Lemma 4.** In the case of a uniform distribution, we have \( \frac{\partial E[\theta > \theta^B]}{\partial \theta^M} = \frac{1}{2} \). At an interior solution, \( \frac{\partial \theta^B}{\partial t} = \frac{2(1+\lambda)}{(1+t^B)^2} \) and the second-order condition for a maximum simplifies to

\[
\frac{1 - \lambda}{(1+t^B)^2} > \frac{1}{2} \frac{\partial \theta^M(t^B, c)}{\partial t}.
\tag{20}
\]
Differentiating the condition for determining the boundary of the monitoring region yields

\[
\frac{\partial \theta^M}{\partial t} = \frac{2G(\theta^M)^2}{[1 + \beta(1 - \lambda) + \lambda(1 + 2t)] \left[(4 - \theta^M)(\beta + 1)(1 - \lambda) + 8\lambda + t(G(\theta^M) + 4\lambda)\right]}
\]

where \(G(\theta^M) \equiv (\beta + 1) \left(2 - \theta^M\right)(1 - \lambda) + 4\lambda\).

If the necessary condition is satisfied at a given value \(\theta^M\), the binding must satisfy

\[
\frac{2t^B}{1 + t^B} = \frac{\theta^B(t^B) + \theta^M}{2}.
\]

Solving the necessary condition yields

\[
t^B(\theta^M) = \frac{\theta^M(1 + \beta) - 2\lambda(\beta - 1)}{(2 - \theta^M)(1 + \beta) - 4\lambda}.
\]

Differentiation of (22) establishes that \(t^B(\theta^M)\) is decreasing in \(\beta\). Substituting (22) and (21) into (20) yields the requirement for an interior solution to be a local maximum,

\[
\frac{\left((\beta + 1) \left(2 - \theta^M\right) - 4\lambda\right)^2}{2(\beta + 1)^2(1 - \lambda)} > \frac{\left((\beta + 1) \left(2 - \theta^M\right) - 4\lambda\right)^2 G(\theta^M)^2}{2(\beta + 1)^3(1 - \lambda)^2(2 - \theta^M)A(\theta^M)},
\]

where \(A(\theta) \equiv (\beta + 1) \left(2 - \theta^M\right)(2 - \lambda) + 4\lambda\). This condition will be satisfied if

\[
Z(\theta^M, \beta) = (\beta + 1)(1 - \lambda)(2 - \theta^M)A(\theta^M) - 2G(\theta^M)^2 > 0.
\]

It follows from (A.4) that \(Z\) is continuous in \(\beta\), with \(\frac{\partial Z}{\partial \beta} = 2\lambda(1-\lambda)(2-\theta)^2 > 0\), \(Z(\theta^M, 1) = -4\lambda \left(8 - 2(1 - \lambda) \theta^M \left(2 + \theta^M\right)\right) < 0\) and \(Z(\theta, \tilde{\beta}) = -16(1 + \lambda^2 + (1 - \lambda)\sqrt{1 + \lambda}) < 0\). The convexity of \(Z\) in \(\beta\) thus ensures that \(Z(\theta^M, \beta) < 0\) for all \(\beta \in (1, \tilde{\beta}]\). Therefore, there can be no interior optimum for \(\beta < \tilde{\beta}\).