Market Access through Bound Tariffs

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Abstract

WTO negotiations deal predominantly with bound – besides applied - tariff rates. But, how can reductions in tariffs ceilings, i.e. tariff rates that no exporter may ever actually be confronted with, generate market access? The answer to this question relates to the effects of tariff bindings on the risk that exporters face in destination markets. The present paper formalizes the underlying interaction of risk, fixed export costs and firms’ market entry decisions based on techniques known from the real options literature; doing so we highlight the important role of bound tariffs at the extensive margin of trade. We find, that bound tariffs are more effective with higher risk destination markets, that a large binding overhang may still command substantial market access, and that reductions in bound tariffs generate effective market access even when bound rates are above current and long-term applied rates.

JEL: F12, F13, F15
Key Words: Bound Tariffs, Doha Round, WTO, Trade Costs, Integration, Tariff Bindings.

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1 Introduction

The lion’s share of tariff lines affected by WTO agreements are regulated in terms of bound tariffs, i.e. tariff ceilings on applied tariff rates. Bound tariffs are often substantially larger than applied tariff rates.\(^1\) Today, the unweighted average – across 153 current WTO members – of the binding overhang amounts to 23 percentage points and for some WTO members their binding overhang measures more than 100 percentage points.\(^2\) As a result WTO negotiations, including membership negotiations, may agree on bound rates that, even after implementing a newly agreed reduction, are above or at the current applied rates, see Evenett (2007) or Bchir et al. (2006).

The question that arises, is how such reductions in bound rates, even when ineffective in terms of lowering current applied rates, can generate market access, i.e. the fundamental goal of the WTO. Or put differently, why such tremendous effort is expanded on WTO negotiations that agree on bound tariffs that may be so substantially higher than applied rates, that hardly any exporter will ever face the agreed bound tariff in reality.\(^3\) The fundamental driver is that bound tariffs can reduce the risk that exporters face on destination markets. Reduced risk on export markets – through bound tariffs and other mechanisms – is known to have substantial effects on trade and country welfare, see for example Van Winncoop (1992), Francois (2001) or Francois and Martin (2004). In an uncertain policy environment with potential changes in the protectionist stance of a given country, tariff bindings reduce the risk that exporters face. Figure 1 illustrates the relation between risk and the size of the binding overhang (see footnote 2 for a discussion of the data). As the fundamental arguments concerning bound tariffs and risk would suggest, riskier countries appear to have larger gaps between bound rates and applied tariff rates.

A one sided reduction in the volatility of trade policy may in effect appear like a reduction in expected future tariffs. However, given that current applied tariffs stay unaltered, such risk reductions can in standard market environments have no direct effect on the current prices that exporters charge on their destination markets. Thus, from the perspective of destination market consumers, reductions

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\(^1\) Various reasons for this phenomenon have been identified, for example dirty tariffication, the value of unused protection, arbitrary ceiling bindings for developing countries, see Walkenhorst and Dihel (2003), Bchir et al. (2006), Anderson and Martin (2005) for detailed discussions.

\(^2\) The binding overhang is here calculated as the simple average of 2007 final bound ad valorem duties of all bound tariff lines minus the simple average of MFN applied ad valorem duties for the same tariff lines (defined at the HS six-digit level), the data used stems from the WTO’s World Tariff Profiles, 2007. See Bchir et al. (2006) for a detailed discussion and calculations of binding overhang.

\(^3\) See Evenett (2008) for an instructive account of the differences between the economic reasoning and political or legal reasoning in WTO negotiations. In fact, it might be the case that the focus on bound tariffs is justified by the mere fact that they are easier to negotiate compared to applied rates, see also Hoekman and Vines (2007).
in bound tariffs have no effect on prices and hence the demand for and sales volume of a given product, i.e. tariff bindings above applied rates are unable to generate market access via the intensive margin of trade. Accordingly, the effect of bound tariffs on market access must be sought at the extensive margin of trade, i.e. it must stem from the export market entry decision of firms. Here a risk reduction may alter the expected profit flows and thus affect the entry calculation of potential exporters. For example, within the well known Melitz (2003) model, an increase in profits from exports, via a reduction of the average tariff, would clearly affect firm entry via movements of the exporters productivity cut-off. Yet, the focus on steady-state equilibria and general equilibrium in this and related mainstream models of international trade makes it difficult to examine the inherently dynamic timing problems of export market entry and bound tariffs.

Against this background the current paper designs a dynamic, partial equilibrium model of export market entry, dealing with the timing of entry in dependence on risk of the trade policy path in the destination market, reduction in risk via tariff bindings, and firms’ fixed export market entry costs. The central driver is that potential exporters to a given destination market can delay market entry and react to the risk reductions generated by bound tariffs. We build our formal model on tools well rehearsed in the real options literature, following Dixit and Pindyck (1994). Finally, we include the feature of firm heterogeneity, in the tradition of Melitz (2003), to derive results for actual effects on market access, i.e. determining the movements of the export entry productivity cutoff in reaction to changes in the bound tariff rate and other market characteristics. In particular, the model is able to track the rescheduling (in fact a pre-ponement) of export market entry triggered by bound tariffs, i.e. the effect that bound rates influence market en-
try such that some firms access earlier into the export destination, compared to a situation without bindings.

From this model we are able to derive a series of findings concerning the effect of bound tariffs and reductions in bound rates depending on the size of the binding overhang and other market characteristics. We find, that bound tariffs are more effective with higher risk destination markets, that a large binding overhang may still command substantial market access, and that reductions in bound tariffs generate effective market access even when bound rates are above current and long-term applied rates.

The paper perhaps closest to the present work is Francois and Martin (2004), who are the only previous theoretical paper providing a model of the effect of bound tariffs. Yet their focus is on the cost of protection and not on the effects of bound tariffs on the timing of firms’ export market entry decisions, which are at the center of the present analysis. Also Francois and Martin (2004) operate from a country perspective and provide general equilibrium assessments, while we are able to consider the role of single firms in more detail, following the seminal contribution of Brander and Spencer (1984a,b), yet at the price of staying within a partial equilibrium framework.

The next section develops a basic single firm model of the timing of export market entry building on concepts from the real options theory following Dixit and Pindyck (1994). In Section 4 we extend this framework to include a continuum of heterogeneous firms and present our central results for the effects of bound tariffs on market access. Section 4 concludes.

2 The Model

In this section we model a single firm, having to decide upon entry into a new risky foreign market for its product. Competition among firms is not modeled explicitly, instead we follow Bertola (1998) and characterize the degree of competition in the potential export market through an iso-elastic demand function given by:

\[ p = Z y^{\mu - 1}, \quad 0 \leq \mu \leq 1 \]  

where \( p \) represents the price of a firm’s output \( y \) offered in the destination country. \( \mu \) is indexing the market power of the firm, as for \( \mu = 1 \) the demand curve is horizontal (i.e. the market is perfectly competitive), whereas for \( \mu \neq 1 \) the demand function is negatively sloped. \( Z \) is a shift factor, including for instance factors like the income or the size of a country.

An ad valorem tariff \( \tau \) is levied on the firm’s product, introducing a discrepancy between \( p^C \), the price paid by a foreigner consumer and \( p^F \), the price received by the firm, with

\[ p^F = \frac{p^C}{1 + \tau}, \quad \tau \geq 0. \]  

4
The firm maximizes the per-period cash flow (the time subscript \( t \) is omitted to save notation as all variables are at \( t \)),

\[
\pi = \max_{y \geq 0} \ p^F y - c(w, y) \tag{3}
\]

s.t. \( p^C = Z y^{\mu - 1} \) and \( p^F = \frac{p^C}{1 + \tau} \), \( \tau \geq 0 \)

where \( c(w, y) \) is a general cost function of a bundle of inputs describing the technology of the firm. For illustrative purposes and without loss of generality, we specify the cost function - similarly to Dixit and Pyndack (1994) - to be:

\[
c(w, y) = \frac{wy^\theta}{\phi}, \quad \theta \leq 1 \tag{4}
\]

where \( w \) is the wage prevailing on the labour market, \( \phi \) is the labour productivity and \( \theta \leq 1 \) indicates diminishing marginal return in the factor labour. Hence, the maximum per-period profit flow of the firm is,

\[
\pi(\tau) = B \left( \frac{Z}{1 + \tau} \right)^k \left( \frac{\phi}{w} \right)^{\mu k} \tag{5}
\]

with \( k = \frac{1}{1 - \mu \theta} \) and \( B = (1 - \mu \theta) (\mu \theta)^{\mu k} \). Note that it depends inversely on the ad-valorem tariff, \( \partial \pi / \partial \tau \leq 0 \), so that the trade policy in place in the foreign market will play an important role in the entry decision of the firm.

Given the time dynamics of the situation, \( \tau \) is regarded as the expected ad valorem applied tariff in the foreign market. The expected tariff is composed of a low currently applied tariff \( \tau_l \) (including a future liberalization path) to which the government commits and an alternative high tariff \( \tau_h \) (also including an associated future tariff path). Even though initially the country in question is at the low tariff path, the government could resort to the high tariff path in the future, such a shift towards a protectionist stance could for instance be caused by unfavorable market conditions, a lack of credibility, political pressures, new political elections, etc. We capture the well established argument of “time inconsistency” of trade policy and assume that such policy shift towards the protectionist tariff-path occurs with (an exogenous) probability of \( \gamma \), which is our measure of firm-risk into the new exporting market.\(^5\)

The gradual tariff liberalization process to which the local government commits is described by (7). Yet, the firm is uncertain on possible policy reversion toward

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\(^4\) This cost function corresponds to the technology \( y = (\phi l)^\theta \), \( \theta \leq 1 \). See also Dixit and Pindyck (1994).

\(^5\) See for example Staiger and Tabellini (1987).
a more protectionist policy in the future, implying $\alpha_h < \alpha_l$. Therefore, the two tariffs of interest can be modeled as follows:

$$\text{Applied Tariff} = \begin{cases} \frac{d\tau_l(t)}{dt} = -\alpha_l \tau_l(t), & \alpha_l \geq 0, \text{with probability } 1 - \gamma \\ \frac{d\tau_h(t)}{dt} = -\alpha_h \tau_h(t), & \alpha_h \geq 0, \text{with probability } \gamma, \end{cases}$$

(7)

and the Bound Tariff is given by

$$\frac{d\tau_\beta(t)}{dt} = -\alpha_\beta \tau_\beta(t), \quad \alpha_\beta \geq 0.$$  

(8)

Notice that the above tariff paths ultimately approach free trade, yet the framework can easily accommodate other scenarios as described in footnote (6). In the appendix A we find the solution to the homogenous differential equations (7) and (8) as:

$$\tau_j(t) = b_j e^{-\alpha_j t}, \quad j = l, h, \beta.$$  

(9)

The variable $b$ denotes the vertical intercept indicating the starting level of protection, so that $b = 1$ is an initial ad-valorem tariff of 100%.

The uncertainty of a protectionist tariff jump can be limited by the presence of a bound-tariff, $\tau_\beta$ - the maximum tariff level a government can legally impose - negotiated multilaterally or bilaterally at the WTO table. We focus on the empirical relevant case of $\alpha_\beta = 0$ in (8), a flat ceiling tariff or barrier tariff, while $\alpha_\beta > 0$ would also indicate a decaying reduction of the bound tariff with time.\footnote{In the terminology of the exchange rate literature, a positive $\alpha_\beta$ would be a “crawling peg”.}

Consistently with overwhelming recent evidence, the firm must occur a sizeable

\footnote{6 It is possible to model the different tariff paths by defining an

$$\text{Applied Tariff} = \begin{cases} \frac{d\tau_l(t)}{dt} = -\alpha_l \tau_l(t) + c_l, & \alpha_l \geq 0, \text{with probability } 1 - \gamma \\ \frac{d\tau_h(t)}{dt} = -\alpha_h \tau_h(t) + c_h, & \alpha_h \geq 0, \text{with probability } \gamma \end{cases}$$

and a Bound Tariff \( \frac{d\tau_\beta(t)}{dt} = -\alpha_\beta \tau_\beta(t) + c_\beta, \quad \alpha_\beta \geq 0. \)

Such a setting would allow us to model the tariff paths converging to any target tariff rate $c_l, c_h$ and $c_\beta$ including the possibility for the government to rely on export subsidies in the future, for $c_j < 0$ with $j = l, h, \beta$. Appendix A derives the solution to these tariff paths as

$$\tau_j(t) = \frac{c_j}{\alpha_j} + b_j e^{-\alpha_j t}. \quad \text{(6)}$$}

We restrict our focus to the case of a tariff path converging eventually to the free trade and assume henceforth $c_j = 0$.
upfront entry fixed cost \( F_e \) to enter into the new export market.\(^8\) As a consequence of forward looking behavior, it also anticipates that the per-period cash flow grows over time as the tariff rate decays at rate \( \alpha_j \) each year, while \( F_e \) is unchanged and incurred only in the investment period. Therefore, by postponing entry, the firm can achieve a greater profitability because of the announced tariff cuts. In this paper, we propose the firm can delay entry and choose the optimal timing of entry into the exporting market. After a waiting time of \( T \) periods, entry can only be optimal provided the value of the firm \( V \) exceeds the fixed cost of entry,\(^9\)

\[
V(\tau, T, t_0) = \int_{t_0+(T-t_0)}^{\infty} [(1-\gamma)\pi(\tau_l(s)) + \gamma \pi(\tau_j(s))] e^{-r(s-t_0)} ds \geq F_e e^{-r(T-t_0)}
\]

(10)

with \( j = h, \beta \).

Note that if \( T = t_0 \) (i.e. entry occurs in the initial period), equation (10) is the Marshallian entry condition simply implying entry if the expected present discounted value of the stream of profits at \( t_0 \) exceeds the fixed cost; if satisfied with equality, it is the standard free entry condition when firms have no option to postpone entry. However, if entry can be delayed, waiting extra periods turns valuable to benefit from further anticipated tariff cuts. The optimal waiting time is thus determined:

\[
\max_T W(T) \equiv V(\tau, T, t_0) - F_e e^{-r(T-t_0)}
\]

(11)

yielding the following FOC which makes use of the Leibnitz rule (see Appendix B):

\[
\frac{\partial W(T)}{\partial T} = -[(1-\gamma)\pi(\tau_l(T)) + \gamma \pi(\tau_j(T))] e^{-r(T-t_0)} + F_e e^{-r(T-t_0)} r = 0, \quad j = h, \beta.
\]

Rearranging it, we obtain the Jorgensonian rule, equating the marginal profit forgone with additional waiting to the per period fixed entry cost,\(^9\)

\[
E \pi(T) \equiv [(1-\gamma)\pi(\tau_l(T)) + \gamma \pi(\tau_j(T))] = F_e r, \quad j = h, \beta.
\]

(12)

This rule best balances the trade-off at the heart of the \textit{Real Option Approach} between benefiting by waiting (for further announced tariff cuts) on one hand, and the forgone profit opportunities in case of earlier entry into the market on the other hand. Substituting for (5) and rearranging we obtain an implicit equation for the

\(^8\) See for example Tybout et. al. (2007), Bernard et. al. (2003), Melitz (2003).

entry time \( t_0 + T \),

\[
BZ^k \left( \frac{\phi}{w} \right)^{\mu_b k} \left[ (1 - \gamma)(1 + \tau_l(T))^{-k} + \gamma(1 + \tau_j(T))^{-k} \right] = rF_e, \quad j = h, \beta. \quad (13)
\]

For the sake of convenience we define \( t_0 = 0 \) which leads to an entry time equal to the waiting time \( T \). The implications for the optimal entry time \( T \) are best explained with the help of figure 2. The \( \pi(\tau_l(T)) \) curve represents the highest possible per-period cash flow earnable only in the low-tariff scenario, while the \( \pi(\tau_h(T)) \) curve represents the lowest possible cash-flow occurring in the high-tariff scenario, i.e. reversion to a protections stance. The vertical distance of these two curves represents what we could define as the “risk band”, the potential deviation from the current tariff path. Note that the firm’s periodical cash-flow is increasing with time along these curves because of the declining tariff rate, i.e. continuing liberalization. The LHS of (13) is the expected periodical cash-flow among these two plausible scenarios and is depicted as the S-shape dashed curve denoted by \( E\pi(T) \). By definition, it lies necessarily within the risk band. The intersection of this curve with the flat curve \( rF_e \) (the RHS of (13)), determines the optimal entry time, \( T_\gamma \). Clearly, the optimal entry time will depend on firm and market characteristics; it will be earlier for higher productivity firms (higher \( \phi \)) and larger foreign income \( Z \) (both shifting the \( E\pi(T) \) curve up), or lower export market entry costs \( F_e \) (shifting the \( rF_e \) curve down). Finally, a reduction of the risk \( \gamma \) the firm is facing, results in an upward shift of the \( E\pi(T) \) curve and hence, earlier entry.

![Figure 2: Bound tariff and the timing of market entry](image)

Let us turn to the role of the bound tariff in reducing the firm’s risk. In pres-
ence of a bound tariff, \( \tau_\beta = b_\beta \) is the highest possible applied tariff a government could resort to. Such tariff-ceiling translates into a floor for the per-period cash flow, so that the lowest possible cash-flow in the protectionist tariff scenario is modified to be the envelope between the \( \pi(\tau_h(T)) \) curve and \( \pi(\tau_\beta(T)) \) dashed flat curve. For time \( T > \Theta \), the bound tariff loses its effectiveness, as it is above \( \tau_h \), the protectionist tariff level at that time. The first implication is that a fixed bound tariff can not possibly affect the entry decision of a firm when it is higher than the highest conceivable applied tariff. Second, a bound tariff has no role on the timing of entry if the market conditions are such that the optimal entry time \( T_\gamma > \Theta \) falls into the non-effectiveness region of a bound tariff. In other words, firms that are planning on market entry at a point in time in the future when even the protectionist tariff is below the bound tariff. The reason being that the tariff ceiling does not bound any risk of a policy reversion. However, a bound tariff affects positively the entry decision by a firm if \( T_\gamma < \Theta \). In this case, the cash-flow floor raises the expected per period cash-flow shifting upward the \( E\pi(T) \) curve and determining a shorter entry time into the market, \( T_\beta < T_\gamma \), because the bound tariff has bound the possible tariff increment.

These findings lead to the following

**Proposition 1.** A flat bound tariff \( \tau_\beta = b_\beta \) implies (i) \( T_\beta = T_\gamma \), if \( \tau_\beta \geq \tau_h \forall T \) (ii) \( T_\beta = T_\gamma \), if \( \tau_\beta \leq \tau_h \) and \( T_\gamma \geq \Theta \forall T \) (iii) \( T_\beta < T_\gamma \), if \( \tau_\gamma \leq \tau_\beta \leq \tau_h \) and \( T_\gamma \leq \Theta \forall T \) (iv) \( T_\beta < T_\gamma \), if \( \tau_\beta \leq \tau_\gamma \forall T \).

There are several contributions in this finding. First, we highlight firm entry as a channel by which the bound can be effective. Proposition 1 shows that a reduction in the bound tariff \( \tau_\beta \), which is not affecting the applied tariff directly, will generate market access even if \( \tau_\gamma \) is well below the bound. This appears to be in contrast to discussions taking place at WTO negotiations, where parties frequently deduce that only cuts in bound rates below current applied tariff rates can generate market access, see Evenett (2007) for an account of current negotiations. Second, the effectiveness region, here delimited by \( \Theta \), crucially depends on two factors, namely the design of the bound tariff and the width of the risk band. If the bound tariff were engineered as a “crawling peg”, decaying at positive rate \( \alpha_\beta \) instead of being just a ceiling tariff, its effectiveness would not be time restricted. This highlights why negotiations about reductions in bound rates might in fact be driven by reductions in applied rates and not the other way around. Third, to generate any market access, the bound tariff has to be below the highest possible applied tariff rate and, therefore, the larger the risk band (i.e. the riskier the country), the greater the likelihood that a particular bound tariff level results effective. It emerges an interesting positive relation between the risk level of a country and the level of bound tariff required to reduce uncertainty. This relation is best explained referring again to figure 2, and thinking of the area within the “risk band” as a
continuum of possible bound-tariffs. The risker a country - the higher $\gamma$ - the larger the area between the high bound of the risk band and the curve $E_\tau$. The larger this area, the greater the number of bound-tariffs that result binding. Or, the higher the risk of a country, the higher the level of bound tariff sufficient to limit uncertainty. In other words, contrary to countries characterized by a low degree of risk, risky countries can resort also to high bound tariffs to attenuate risk.

3 Implications for Market Access

While the above framework has derived results in terms of the decision of a single firm, we are now able to move towards the implications for actual market access. Consider a continuum of potential entries into the market in question, this may be already active exporters – exporting into alternative destination markets – or pure domestic firms from various foreign countries. Furthermore, assume that all the potential entries into the market from above (home) face identical fixed export market access cost, $F_e$, but have different and firm specific productivities $\phi$, as in Melitz (2003). Than for each point in time there exists a critical $\phi^*(t)$ such that firms with a lower productivity will not have accessed the market, while firms with higher productivity will have entered. Accordingly, changes in $\phi^*(t)$ are than a measure of market access.

Totally differentiating both sides of equation (13) with respect to $b_\beta$, $\phi$, $F_e$, and $Z$, gives the change in the optimal entry time for a small perturbation of the constellation of parameters:

\[
(1 - \gamma)k\alpha_1T(1 + T)^{-(k+1)}dT = \gamma k(1 + b_\beta)^{-(k+1)}db_\beta \\
- \Gamma Z^{-k}F_e\mu\theta k\phi^{-\mu\theta (k+1)}d\phi \\
+ \Gamma Z^{-k}\phi^{-\mu\theta}dF_e \\
- k\Gamma F_e\phi^{-\mu\theta}Z^{-(k+1)}dZ
\]

which is true for $T < \Theta$, implying $dT/d\phi \leq 0$ for $db_\beta = dF_e = dZ = 0$ and which defines in figure 3 a negative sloped iso-bound tariff curve in the $(T, \phi)$ space. We depict this curve dashed because we only know qualitatively its slope, yet not its exact shape. Nevertheless, this suffices for our purposes.

The outer right dashed level curve $T_\gamma(\phi)$ depicts the market entry time of firms with different productivity levels for a specific bound tariff $b_\beta$ higher than the highest possible applied tariff $\tau_h$ at any time. Therefore, all firms exhibiting a productivity level higher than $\phi^*_{\gamma h}$ enter the destination market immediately ($T = 0$), whereas companies with lower productivity postpone their entry into the future. As derived earlier, the effectiveness of a bound tariff (time during which the ceiled
bound tariff is strictly bigger than highest possible applied tariff) appears within a time range where the optimal market entry time $T_\gamma$ is smaller than $\Theta$. For a bound tariff e.g. $b^0_\beta < b_h$, its effectiveness will last until $\Theta^0(b^0_\beta)$, depicted as horizontal dotted line. Respectively, all firms with an optimal market entry time $T_\gamma < \Theta^0(b^0_\beta)$ anticipate a lower expected tariff, permuted into an earlier market entry time $T_\beta(\phi)|_{b^0_\beta}$, whereas for all firms with an optimal market entry time bigger than $\Theta^0(b^0_\beta)$ there is no bound tariff effect and they enter further on in $T_\gamma(\phi)|_{b_\beta \geq b_h}$.

As a result, the new iso-bound tariff curve for a given $b^0_\beta$ turns out to be kinked at point zero 0. The hatched area above the new iso-bound tariff curve represents the productivity range of firms which leads to a pre-ponement in the optimal market entry. The new productivity cut-off which determines the instantaneous market entry ($T = 0$) is $\phi^*_0$. It is worth noting that all firms with a productivity level between $\phi^*_0$ and $\phi^*_h$ would have delayed their market entry without the new bound tariff, therefore, the difference $\phi^*_0 - \phi^*_h$ corresponds to the new market access due to a bound tariff $b^0_\beta$. Figure 3 also shows the effect of a further reduction of the bound tariff e.g. to $b^1_\beta$ (ceteris paribus). This reduction results in a higher effectiveness range $\Theta^1(b^1_\beta) > \Theta^0(b^0_\beta)$ depicted by the central dotted line and in a new iso-bound tariff curve $T_\beta(\phi)|_{b^1_\beta}$ which is kinked at point 1.

Implicitly, there are three groups of firms which are differently affected by the reduced bound tariff. All firms with a productivity level between $\phi^*_1$ and $\phi^*_h$ pre-ponnle their entry decision by such an extent that they enter today (new market access). The second group of firms exhibiting a productivity level between $\phi^#_0$ and $\phi^*_1$ are also positively influenced by the bound tariff reduction resulting in a pre-ponement but entry is still delayed. The last group of firms with a productivity

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**Figure 3:** Market Access through Bound Tariff.
lower than $\phi^\#$, turn out to be unaffected by the introduction of $b_1^\beta$ as their initial market entry time $T_\gamma$ is above the respective effectiveness range $\Theta(1(b_1^\beta))$. Therefore, the iso-bound tariff curve for productivity levels smaller than $\phi^\#$ coincides with the level curve of a boundless situation ($T_\gamma|_{b_\beta \geq b_n}$).

The effectiveness of a reduction in the bound tariff to generate market entry is clearly limited. On one hand it is limited by a natural bound which is free trade, so that the horizontal intercept of the iso-curve defined by $T_\beta(\phi)|_{b_\beta = 0}$ gives the ultimate $\phi_n$, the lowest productive producer that will ever find it worthwhile to enter the market today. Analogously, we know from the previous section, no bound tariff higher than the worst-tariff rate can be effective. Therefore, the horizontal intercept of the level curve defined by $T_\gamma(\phi)|_{b_\beta \geq b_h}$ determines $\phi_h$, the productivity level exactly high enough, such that a firm will enter the market at $T = 0$ without delay.

Finally, the same exercise could be performed for $F_e$, i.e. heterogeneous fixed export costs across firms, or market size $Z$, and cutoffs for market entry in terms of fixed costs and market size analogously derived.

With the findings of this section and the previous results, it is worth referring to the empirical pattern depicted in figure 1, where the political risk on the horizontal axes can be interpreted as the $\gamma$ in our model and the overhang as the ceiled risk band since the bound tariff reduces the possibility of infinite tariff shifts. Obviously, riskier countries exhibit significantly higher overhangs and therefore larger risk bands. Following our last inference, there is still a potential use behind these relatively high bound tariffs in risky countries as the likeliness of market access control is bigger. In contrast, developed countries realize very low overhangs and seem therefore, to exhibit lower risk bands. Respectively, the importance of bound tariffs as a market access control plays a minor role.

4 Conclusion

Real world trade policy, as governed under WTO rules, deals at large with bound tariffs, besides applied tariffs. Economists have nominated the risk reduction – reductions in the risk of changes in the destination markets trade policy – as the main channel through which bound tariffs operate. Yet, by what mechanisms such risk reductions actually generate market access is largely unclear. In fact it is not at all obvious that a reduction in bound tariffs that remain above current applied and/or future applied tariff rates can generate additional trade. At the intensive margin, reductions in bound tariffs above applied rates have no price effect and hence can not increase the export volume of already export active firms. Accordingly, the effects of bound tariffs must be examined at the extensive margin of trade, i.e. via an increase in the number of exporters that chose to service a given destination market.
The present paper formalizes the underlying logic of firms’ market entry decisions, risk and fixed export costs based on techniques known from the real options literature (e.g. Dixit, 1993). In doing so we highlight the important role of bound tariffs at the extensive margin of trade. In our model, potential exporters to a given destination market can delay market entry and react to the risk reductions driven by bound tariffs. The central results of our analysis are that bound tariffs are more effective with higher risk destination markets, i.e. a large binding overhang can command substantial market access for high risk countries. Furthermore, we show that reductions in bound tariffs do generate effective market access even when bound rates remain above current and long-term applied rates.
References


Appendix

A First Order Differential Equation

\[
\frac{dx_t}{dt} = -\alpha x_t + c, \quad \alpha \geq 0 \tag{16}
\]

\[
\int e^{\alpha t} \left( \frac{dx_t}{dt} + \alpha x_t \right) dt = \int e^{\alpha t} c dt
\]

\[
\int \frac{d}{dt} (e^{\alpha t} x_t) dt = \int c e^{\alpha t} dt
\]

\[
e^{\alpha t} x_t + b_0 = c e^{\alpha t} + b_1
\]

\[
x_t = \frac{c}{\alpha} + (b_1 - b_0) e^{-\alpha t}
\]

\[
x_t = \frac{c}{\alpha} + b e^{-\alpha t} \tag{17}
\]

for a generic constant b of integration.

B Leibnitz rule

Let \( F(c) = \int_{a(c)}^{b(c)} f(c, t) dt, \)

\[
\frac{\partial F(c)}{\partial c} = \int_{a(c)}^{b(c)} \frac{\partial f(c, t)}{\partial c} dt + f(c, b(c)) \frac{\partial b(c)}{\partial c} - f(c, a(c)) \frac{\partial a(c)}{\partial c} \tag{18}
\]

C Derivation of (5) solving (3)

FOC:

\[
p^C(y) + \frac{\partial p^C(y)}{\partial y} y = (1 + \tau) \frac{\partial c(w, y)}{\partial y} \underbrace{\frac{\partial c(w, y)}{\partial y}}_{MR(y)} \underbrace{\frac{\partial c(w, y)}{\partial y}}_{MC(y)}
\]
which can be written as:

\[ p^C(y) = \frac{\epsilon_p(y)}{\epsilon(y)\rho - 1} (1 + \tau) \frac{\partial c(w, y)}{\partial y} \]
\[ = \frac{1}{\mu} (1 + \tau) \frac{w}{h\theta y^{1-\theta}} \quad (19) \]

where \( \epsilon_p(y) = -\frac{\partial y}{\partial p} \frac{p}{y} = 1/(1 - \mu) \) by (1). Substituting (1) for \( p^C \), gives the optimal output:

\[ y = \left( \mu Z \frac{h\theta}{(1 + \tau)w} \right)^{\frac{\theta}{1-\mu\theta}} \quad (20) \]

to be inserted in (3) to obtain (5).

We show \( \frac{dp^C}{d\tau} \geq 0, \frac{dp^F}{d\tau} \leq 0 \). Use (1), (20), and (2) to calculate:

\[
\begin{align*}
p^C &= Z^{\frac{1-\theta}{1-\mu\theta}} \left( \frac{\mu h\theta}{w} \right)^{\frac{\theta(\mu-1)}{1-\mu\theta}} \left( \frac{1}{1 + \tau} \right)^{\frac{\theta(\mu-1)}{1-\mu\theta}} \quad (21) \\
p^F &= Z^{\frac{1-\theta}{1-\mu\theta}} \left( \frac{\mu h\theta}{w} \right)^{\frac{\theta(\mu-1)}{1-\mu\theta}} \left( \frac{1}{1 + \tau} \right)^{\frac{1-\theta}{1-\mu\theta}} \\
\frac{dp^C}{d\tau} &= Z^{\frac{1-\theta}{1-\mu\theta}} \left( \frac{\mu h\theta}{w} \right)^{\frac{\theta(\mu-1)}{1-\mu\theta}} \theta(1 - \mu) \left( \frac{1}{1 - \mu\theta} \right)^{\frac{1-\theta}{1-\mu\theta}} \geq 0 \quad (23) \\
\frac{dp^F}{d\tau} &= -Z^{\frac{1-\theta}{1-\mu\theta}} \left( \frac{\mu h\theta}{w} \right)^{\frac{\theta(\mu-1)}{1-\mu\theta}} \frac{1 - \theta}{1 - \mu\theta} (1 + \tau)^{-2+\theta(\mu+1)} < 0 \quad (24)
\end{align*}
\]

Note that (23) and (24) together imply an incomplete pass-through to the foreign Monopolist following a change in tariff (like in Brander and Spencer (1984)), but for \( \mu = 1 \), in which case the pass-through is complete since \( \frac{dp^C}{d\tau} = 0 \) - as to be expected in a perfectly competitive market.
The $(1 + \tau_j)^{-k}$ curve

Using (9) with $c_j = 0$, we have:

$$f(t) = (1 + \tau_j(t))^{-k} = (1 + b_j e^{-\alpha_j t})^{-k}$$

$$\lim_{t \to \infty} f(t) = 1$$

$$\lim_{t \to 0} f(t) = (1 + b_j)^{-k}$$

$$\frac{\partial f(t)}{\partial t} = -k(1 + b_j e^{-\alpha_j t})^{-k-1} b_j e^{-\alpha_j t}(-\alpha_j)$$

$$= \frac{k\alpha_j b_j}{e^{\alpha_j t}(1 + b_j e^{-\alpha_j T})^{k+2}} \geq 0$$

$$\frac{\partial^2 f(t)}{\partial t^2} = k\alpha_j b_j e^{-\alpha_j t}(-\alpha_j)[1 + b_j e^{-\alpha_j t}]^{-(k+2)} - k\alpha_j b_j e^{-\alpha_j t}(k + 2)(1 + b_j e^{-\alpha_j t})^{-(k+2)-1} b_j e^{-\alpha_j t}(-\alpha_j)$$

$$= -\frac{k\alpha_j^2 b_j}{e^{\alpha_j t}(1 + b_j e^{-\alpha_j T})^{(k+2)}} + \frac{k\alpha_j^2 b_j^2 (k + 2)}{e^{2\alpha_j t}(1 + b_j e^{-\alpha_j T})^{k+3}}$$

$$= \frac{k\alpha_j^2 b_j}{e^{\alpha_j t}(1 + b_j e^{-\alpha_j T})^{k+2}} \left[-1 + \frac{b_j(k + 2)}{e^{\alpha_j T}(1 + b_j e^{-\alpha_j T})}\right] \leq 0$$

Note that the sign of $\frac{\partial^2 f(t)}{\partial t^2}$, depends on the term in the square bracket. We have:

$$\frac{\partial^2 f(t)}{\partial t^2} | \mathbf{T}^* = 0 \iff \left[-1 + \frac{b_j(k + 2)}{e^{\alpha_j T}(1 + b_j e^{-\alpha_j T})}\right] = 0$$

$$\iff \ln b_j + \ln(k + 2) = \alpha_j T^* + \ln(1 + b_j e^{-\alpha_j T^*})$$

and for $t > T^*$, $\frac{\partial^2 f(t)}{\partial t^2} < 0$, for $t < T^*$, $\frac{\partial^2 f(t)}{\partial t^2} > 0$. Therefore, $f(t)$ has a flex in $T^*$, it is concave for $t > T^*$, convex for $t < T^*$.