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## COMMERCIAL POLICY VARIABILITY, BINDINGS AND MARKET ACCESS

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# ABSTRACT

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Protection unconstrained by rules often varies substantially over time. Rules-based disciplines, such as WTO tariff bindings and bindings on market access in services, constrain this variability. We examine the theoretical effects of such constraints on the expected cost of protection and offer a formalization of the concept of 'market access', emphasizing both the first and second moments of the distribution of protection. As an illustration, we provide a stylized examination of Uruguay Round bindings on wheat.

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# Commercial Policy Variability, Bindings, and Market Access

Abstract: Protection unconstrained by rules often varies substantially over time. Rules-based disciplines, such as WTO tariff bindings and bindings on market access in services, constrain this variability. We examine the theoretical effects of such constraints on the expected cost of protection and offer a formalization of the concept of "market access," emphasizing both the first and second moments of the distribution of protection. As an illustration, we provide a stylized examination of Uruguay Round bindings on wheat.

## 1. Introduction

Trade negotiators have long recognized the importance of policy bindings in an otherwise uncertain world, and the introduction of constraints on countries' trade policies is at the heart of the multilateral trading system. The very structure of market access commitments under the GATT is centered on the concept of bindings. In policy discussions of market access, special emphasis is often placed on the perceived benefits of reductions in the uncertainty confronting exporters regarding commercial policy. This is manifested in trade negotiations, where negotiating credit is sometimes given even for tariff bindings at or above initial applied rates. Yet, economists have given relatively little attention to formal evaluation of the benefits of tariff bindings and other commitments in the context of time-varying underlying protection processes.[1]

During the Uruguay Round, the coverage of tariff bindings was greatly expanded, with the coverage of bindings on agricultural commodities increasing to almost 100 percent of relevant tariff lines. There were also large increases in the coverage of bindings on industrial product imports into developing countries. Negotiations on accession to the WTO have also involved the introduction of bindings in a number of new members, including China. While the range of trade covered by bindings has expanded, many of the new tariff and other instrument bindings introduced by the Uruguay Round agreements represent relatively loose

[1] The literature on trade under uncertainty emphasizes stochastic disturbances in preferences or technology. See, for example, Helpman and Razin (1978), Pomery (1984), and Falvey and Lloyd (1991). With the notable exceptions of Stockman and Harris (1986) and Barari and Lapan (1993), who examine asset markets under tariff uncertainty, and Stahl and Turunen-Red (1995), who examine tariff games, the formal implications of stochastic tariff regimes remain relatively unexplored. The formal literature on trade rules and institutions focuses instead on rules in the context of tariff games between governments. (In this regard, see the excellent survey by Staiger 1996).

constraints on policy, being set at or above the currently applied rates of protection. [2] To analyze the effects of these measures requires techniques that have not been widely used by trade policy analysts.

Our objectives in this paper are twofold: to push our notion of protection and trade liberalization further away from one based primarily on fixed policy instruments, and closer to one that involves policy regimes subject to variability; and to offer a relatively simple analytical framework for examination of the implications of rules-based commitments for relative security of market access in this context. [3] We first examine the impact of policy rules on the expected cost of protection in own markets, and for the conditions of market access in export markets. A simple stylized examination of Uruguay Round bindings on wheat is then provided as an illustration.

## 2. The welfare implications of commercial policy variability

We start with a simple general equilibrium representation of the welfare effects of protection that varies over time. Our emphasis in this section is on protection in import markets (i.e. own protection). This will be extended to a more general representation of market access conditions (i.e. uncertainty about protection by trading partners as well) in the next section.

A convenient approach to evaluating the welfare impacts of protection in general equilibrium is the Balance of Trade function (Lloyd and Schweinberger 1988; Anderson

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[2] In the nineteenth and first half of the twentieth century, U.S. tariffs ranged from a low of approximately 20 percent to a high of 60 percent. (Caves, Frankel and Jones, 1993). Since the establishment of GATT in 1947, average U.S. tariffs have fallen to less than 5 percent, while the variance of individual bound tariffs has been virtually eliminated.[2] However, the stochastic nature of protection has remained strongly evident across individual sectors and instruments free from, or lightly bound by, multilateral trade rules. This includes agricultural tariffs, industrial tariffs in developing countries, variable levies, import quotas, voluntary export restraints (VERs), import surcharges, and the various forms of contingent protection are widely used to generate time-varying rates of protection.

[3] A major thrust of trade policy research in recent decades has been the development of political economy models to represent the process of trade policy formulation. These models specify national trade policy measures as being determined by a set of explanatory variables operating through a political process, which introduces a wide range of additional shocks to protection rates. While the emphasis of this literature has been on explaining the level of protection at any time, it seems clear to us that the models used imply that unrestrained protection will typically be subject to uncertainty. In our view, this body of literature provides a rather convincing rationale for treating the rate of protection as inherently uncertain, with uncertainty arising both from the stochastic nature of the explanatory variables in the policy formulation process, and from the stochastic nature of the policy process itself. (See, for example, Magee, Brock and Young, 1989; Grossman and Helpman 1994; 1995. A survey is provided by Francois and Martin (1998).

and Neary 1992). Under this approach, a money measure of the change in welfare resulting from a tariff is obtained by evaluating the change in the balance of trade necessary to maintain constant utility (i.e. the net transfer needed to maintain welfare), given a change in policy. A policy distortion that reduces domestic efficiency increases the costs of achieving a given level of utility, and requires a transfer from the rest of the world to maintain that utility level. As will become evident, this approach, while fully general, can be used to illustrate general equilibrium welfare effects through familiar geometric tools normally associated with partial equilibrium models. (See Martin 1997; Francois and Hall 1997).

We start by defining general equilibrium for a small country in terms of dual expenditure and revenue functions. The value of output is defined by the function $g(\mathbf{p}, \mathbf{v})$, and the expenditure function by $e(\mathbf{p}, u)$:

$$(1) \qquad g(\mathbf{p},\mathbf{v}) = \max\{\mathbf{p}\cdot\mathbf{x} | (\mathbf{x},\mathbf{v})\text{feasible}\}$$

$$= \mathbf{p}\cdot\mathbf{x}(\mathbf{p},\mathbf{v})$$

$$(2) \qquad e(\mathbf{p},u) = \min\{\mathbf{p}\cdot\mathbf{c} | f(\mathbf{c}) \geq u\}$$

In equations (1) and (2), $e(\mathbf{p},u)$ is the expenditure required to achieve the level of utility $u$ at the vector of domestic, distorted prices $\mathbf{p}$, and $g(\mathbf{p},\mathbf{v})$ is the gdp function indicating the maximum production revenue which can be generated with resource endowments $\mathbf{v}$ at domestic prices $\mathbf{p}$. The vector of domestic demands for output is given by the vector of first derivatives of $e(\mathbf{p},u)$ with respect to $\mathbf{p}$, $e_{\mathbf{p}}$ , while the domestic output vector is represented by $g_{\mathbf{p}}$. The gap between the domestic and the world price, $(p-p^*)$, is the tariff on imports, so that tariff revenues are given by $(e_{\mathbf{p}} - g_{\mathbf{p}})(\mathbf{p} - \mathbf{p}^*)$. The balance of trade function for an economy subject only to trade distortions is then defined as:

$$(3) \qquad B = e(\mathbf{p},u) - g(\mathbf{p},\mathbf{v}) - (e_{\mathbf{p}}' - g_{\mathbf{p}}')(\mathbf{p} - \mathbf{p}^*)$$

It is convenient to rewrite (3) in terms of the net revenue function $z(\mathbf{p},u,\mathbf{v})=e(\mathbf{p},u)-g(\mathbf{p},\mathbf{v})$ and its derivatives. Thus:

(4) $$B = z(\mathbf{p},u,\mathbf{v}) - z_{\mathbf{p}}'(\mathbf{p}-\mathbf{p}^*)$$

To consider the effect of discrete changes in protection on the balance of trade function, we use a second-order Taylor Series expansion. This yields the following expression for the welfare effects of any set of tariff changes :[4]

(5) $$\Delta B = -(\mathbf{p}-\mathbf{p}^*)'\mathbf{z}_{\mathbf{pp}}\Delta\mathbf{p} - \frac{1}{2}\Delta\mathbf{p}'\mathbf{z}_{\mathbf{pp}}\Delta\mathbf{p} - \frac{1}{2}\Delta\mathbf{p}'(\mathbf{p}-\mathbf{p}^*)'z_{\mathbf{ppp}}\Delta\mathbf{p}$$

Note that the final term in (5) vanishes if the vector of excess demand curves, $z_p$ , is locally linear[5] or if the Taylor Series Expansion is about an undistorted equilibrium where (p-p*) is zero. To provide some intuition into equation (5), we evaluate the expected costs of a single tariff subject to uncertainty about a free trade equilibrium, and obtain::

(6) $$E(\Delta B) = -\frac{1}{2}z_{pp}E(\tau)^2 = -\frac{1}{2}z_{pp}\left(\mu_\tau^2 + \sigma_\tau^2\right)$$

where the first and last terms on the right hand side of (5) disappear because we are considering the change in the tariff from zero; $\Delta p$ can be replaced by $\tau = (p - p^*)$ following the introduction of the tariff; and where $\mu_\tau$ and $\sigma_\tau^2$ are the mean and variance of the tariff. Note that, in deriving equation (6), we have not made explicit assumptions about the type of distribution (e.g. normal or gamma) that best characterizes the distribution of protection. Note also that equation (6) can be used for comparison of alternative regimes when both are away from free trade. The basic approach (see Francois and Hall) involves comparing the implications of each regime vis-à-vis a free trade benchmark. This approach will be followed explicitly in the numeric example section.

[4] The reader can, of course, make alternative assumptions about the local properties of the excess demand curve. The present approach buys us a great deal of analytical clarity, without changing the qualitative message of this section.

From (6), we can see that our general equilibrium approximation of the cost of protection on imports, relative to a free trade benchmark where $(p\text{-}p^*)$=0, is determined by the second moment of the tariff about the origin, $E(\tau)^2$ , multiplied by 1/2 times the slope of the compensated import demand curve, $z_{pp}$. Since the second moment about the origin is equal to the sum of the mean squared and the variance, the expected cost of protection is given by one half the (absolute) slope of the compensated excess demand curve times the sum of the mean tariff squaredand the variance of the tariff . This implies that in a stochastic world, absolute reductions in the variance of protection and in the mean-squared rate of protection have the same qualitative impact on the costs of protection.

## 3. Some geometric interpretations

### *3.1 The costs of a country's own import protection*

We next turn to a geometric representation of the welfare implications of bindings on import protection. Although our underlying formulation is fully general equilibrium in nature, and completely general with respect to the number of tariff instruments, there are substantial expositional advantages that follow from focusing on the case where there is only a single distortion. Equation (6) can be given a graphical interpretation using Figure 1, which depicts the compensated import demand curve, $z_p$. If we first consider the case of a deterministic tariff of $(p\text{-}p^*)$, then our general equilibrium welfare measure is approximated by the Harberger triangle *cab* under the excess demand curve in Figure 1. This area is equal to $-\frac{1}{2}z_{pp}(p\text{-}p^*)^2$. To illustrate the nature of the higher costs associated with variable protection, consider symmetric variations around this tariff level, with a higher tariff yielding a higher domestic price of $p_h$ in one period, and a lower tariff yielding a lower domestic price, $p_l$ in another time period. In Figure 1, the higher tariff has a welfare cost represented by area *cfg*, while the cost of the lower tariff is represented by area *cde*. Clearly, the average cost associated with the varying protection is greater than area *cab* associated with the same average rate of protection. This asymmetry is a manifestation of the convexity of equation (6) in the tariff rate.

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[5] This will be the case if the underlying expenditure and revenue functions are quadratic.

Standard analysis of the welfare effects of a tariff is based on the assumption that a tariff remains fixed, such that the variance term is zero. Under this assumption, equation (6) collapses to:

$$\Delta B = -\frac{1}{2} z_{pp} \tau^2 = -\frac{1}{2} z_{pp} \mu_\tau^2 \tag{7}$$

Comparison of equations (6) and (7) makes it clear that the basic element missing under the assumption of a fixed rate of protection is the variance term, which maps directly into the welfare impact of protection.

Equation (6) provides a formal representation of the concept of market security so much emphasized in qualitative analysis of trade policy. By combining the impacts of changes in bindings on both the mean and the variance of protection into a single measure of welfare change, it allows us to provide a quantitative estimate of the extent to which protection policy restrained by GATT-type disciplines is to be preferred over protection which is free to vary in an uncontrolled manner. Early in the liberalization process, when tariff bindings may be high relative to the underlying mean of the distribution of protection, the gains from subjecting protection to multilateral disciplines may be due more to reductions in variability than to reductions in the mean level of protection. This implies that the near-universal omission of the beneficial impacts of reductions in the variability of protection in studies of multilateral trade liberalization may have greatly understated the gains, particularly in the early stages of the process. Of course, binding reductions in the extremes of the underlying distribution (like recent 500% or more bindings for some agricultural products) may have no discernable impact on the mean or variance of protection, being little different from infinite bindings.

The formula for the cost of variable protection given in equation (6) also provides us with a simple approach to estimating the relative reduction in the cost of protection associated with the introduction of a binding. This involves estimating the mean and the standard deviation of protection before and after the new binding. Squaring these and adding them yields the second moment of the rate of protection, $\tau$, about zero. Note that $z_{pp}$ can be replaced by $M_0\, \varepsilon$ where $M_0$ is the free trade level of imports, $\varepsilon$ is the (constant) import demand elasticity, and free-trade prices are normalized to 1. Taking $-\frac{1}{2}z_{pp}$ to be approximately constant, the proportional reduction in the second moment about zero will give the proportional reduction in the cost of protection.

If we index the base cost of protection at $I_o$=100, then we can define a welfare-weighted index of the expected cost of protection as follows:

$$(8) \qquad I_1 = (E(\Delta B_1)\,/\,E(\Delta B_0)) \times 100 = (z_{pp}E(\Delta p_1)^2\,/\,(z_{pp}E(\Delta p_0)^2) \times 100$$

We will revisit the application of equations (6) and (8) in the computational section of the paper.

### *3.2 Benefits of improved market access*

While as trade economists we often emphasize import protection when subjecting trade policy to formal analysis, political emphasis during negotiations is actually placed on protection in export markets. Improved market access, which to exporters means more restrictive bindings on protection in export markets, is the price demanded by governments for own-liberalization. This follows, in part, from the willingness of individual exporters to back initiatives that involve improved access to their export markets.[6] This is not the end of the story, however. We should also expect reduced general levels of uncertainty about trading conditions in export markets to have welfare implications for the economy as a whole. In this section, we offer a simple but formal representation of improved market access in the context of bindings.

There are similarities between the exercise undertaken here, and the literature on commodity price stabilization. There are also important differences, and it is the differences that we emphasize. One well-known result of the commodity price stabilization literature is that terms of trade volatility following from export price volatility (or identically in our framework volatility of foreign market access conditions) can be good compared to certainty with the same mean export price. This is because positive price shocks for exports can yield

[6] If one believes that own-liberalization is an important source of welfare gains, then the GATT/WTO can be viewed as a very successful trick. By pressing for mutual liberalization in export markets, Member countries are actually, on net, acting as if they were jointly pursuing import liberalization (as one's own imports are another's exports). Therefore, own liberalization is advanced by the harnessing of mercantilist interests.

benefits that outweigh the losses from negative shocks. It is important to recall that, in the present context, bindings act asymmetrically on the volatility of market access. They are designed to target the "bad episodes" only. As such they limit the magnitude of negative market access shocks that can follow from policy volatility. Hence they result in a situation where the bad variations are limited, and consequently the mean market access condition is improved. Because of this asymmetry, bindings on trading partners are good for an exporter as they skew volatility toward "good episodes" and lead to an improvement in the mean level of market access as a consequence.

At a general equilibrium level, terms-of-trade shocks following from changes in market access conditions imply a shift in the relative price of exports to imports. In a standard two-good model, this means we can illustrate the welfare impact through either the export or import market. For consistency with the previous section, we maintain our representation in terms of the import market. Formally, we start by again assuming a small country. Its terms of trade are taken as given, and its structure is again represented by equations (1)-(2). While the country is small, its trading partners are not, and their import protection (collectively) influences the price that the home country pays for its imports, in terms of its exports. Note that we are now working in broader terms than in the previous section. It helps here to think in terms of a single import good and single export good (as in the Heckscher-Ohlin model, for example). Our market in Figure 1 then represents the market for the composite import good. When it clears, the export market also clears. Taking the export good as the numeraire, $p$ again represents the price of our import good (though this is now a single or composite import good), and the term $z_p$ represents net import demand. Since it is relative prices that matter, terms-of-trade shocks translate into changes in the ratio of import to export prices (where the export price is arbitrarily set at unity). Focusing now on foreign market access, and ignoring the second-best impacts of world price changes on the costs of the home country's own policy distortions (see Martin 1997 for a graphical interpretation), such that $p$=$p*$ we take a second order Taylor Series expansion of equation (4), to obtain:

(9) $$\Delta B = -z_p \Delta p^* + \frac{1}{2} z_{pp} (\Delta p^*)^2$$

Within this framework, how do we represent market access in export markets in a stochastic context? We will assume that the absence of protection in export markets defines full market access. Like the case of import protection, higher degrees of protection in export markets, which mean worse conditions of market access, are characterized by a probability density function. Taking expectation of equation (9), we obtain:

$$(10) \qquad E(\Delta B) = -z_p \eta_x + \frac{1}{2} z_{pp} \left(\eta_x^2 + \sigma_x^2\right)$$

Where $\eta_x$ is the mean expected deterioration in the terms of trade resulting from partner protection, and $\sigma_x^2$ is the associated variance term. Note the strong similarities between the form of equation (6) and the second part of equation (10). The only difference is sign, which follows from the fact that one focuses on import tariffs, and the other on import prices (following from protection in export markets). Critically, equation (10) contains a terms-of-trade effect that is absent in equation (6). Basically, with increases in protection in export markets, our small exporter will register a deterioration in its expected terms of trade as reflected by a rise in its relative import prices $p^*$. This is a first-order effect, and so is likely to be larger than the second-order impacts identified in equation (10). In addition, equation (10) contains one second-order term involving the mean-squared level of protection in export markets, and one involving variations in this access to partner markets. This is the formalization of terms-of-trade uncertainty.

Like equation (6), equation (10) can also be given a graphical interpretation. Returning to Figure 1, the second term in equation (10) again relates to the expected value of the welfare triangle in the figure. The critical difference is the first term, which does not appear in equation (6). This term measures the expected value of the relevant rectangles in Figure 1, those that involved tariff revenue in the case of own protection, but that now represent the expected change in the cost of imports relative to full market access. Comparison of equations (6) and (10) shows that, in the present context, the variance component of expected interventions accounts for a relatively more important share of the welfare impact of own liberalization than it does in the case of improved market access.

## 4. An illustration: Uruguay Round agricultural bindings on wheat

Clearly, our approach is somewhat more complex than standard approaches assuming deterministic protection. Whether it is worthwhile to introduce this additional complexity will depend in large measure on whether it makes a substantial difference in practical applications. Our examination of the approach in the previous section suggested that the variance impacts are likely to be relatively larger in the case of own-protection, so we focus on that case in the illustrative calculations presented in this section. We provide an application to protection of a key agricultural commodity, wheat, in seven OECD countries for which *ad valorem measures* of the final tariff bindings resulting from the Uruguay Round are available from analysis undertaken by Ingco (1996). Under the Uruguay Round Agreement on Agriculture, developed countries agreed to establish tariff bindings for previously unbound agricultural products with a protective effect equal to the combined effects of tariffs and nontariff barriers in a base period (1986-88), and to subsequently reduce them by an average of 36 percent in developed countries (24 percent in developing countries) and by at least 15 percent (10 percent in developing countries) for each tariff line. This tariffication process affected roughly 13 percent of agricultural trade by value, though it was concentrated in the most heavily protected sectors. Its implications for potential welfare effects are therefore greater than suggested by the trade weights.

The procedures used to estimate the protective effects of nontariff barriers (to facilitate conversion to tariffs) allowed considerable scope for discretion.[7] As a result, many of the new tariff bindings in developed and developing countries for products subject to tariffication have been set above their levels in the reference period.. This means that many of the tariff cuts following from tariffication were from levels well above the average rates prevailing prior to the Round. Developing countries also had the option to set their tariff bindings even higher through the use of ceiling bindings (Hathaway and Ingco, 1997). Hence, even for sectors not subject to tariffication, developing countries often entered tariff bindings significantly above applied rates. In this situation, simple approaches to evaluating the liberalizing effects of agricultural tariff bindings are likely to tell us very little. If the tariff

[7] The tariff equivalents were generally to be calculated at the 4-digit level of the Harmonized System, while tariffs are applied at the individual national tariff line level, which may involve 10 or 12 digits.

bindings are simply compared with the previous average rates of protection, it may even appear that the agreement resulted in an increase in protection.

The approach we take here is to estimate the mean and variance of the underlying distribution of protection, and to evaluate the impact of bindings on the mean level and cost of protection. Comparison of the mean level of protection with the mean of the data during the sample period provides an initial indication of the extent of expected liberalization. We take the world price of wheat as exogenous to each individual country, and the rate of protection as distributed independently of this world price. In a short run context of sticky internal support prices, it is clear that the protection rate is not completely independent of the world price on a year to year basis. In fact, once the domestic price is set for a season under arrangements such as the European Union's variable levy system, the protection rate and the world price are perfectly negatively correlated. Over the longer term, however, there is evidence that domestic prices tend to follow world prices of agricultural products, except for a stochastic margin term that includes the effects of protection policy (Mundlak and Larson, 1992).

We use data come from the OECD, which has calculated the annual *ad valorem* equivalents of agricultural trade barriers in OECD countries (OECD 1994). We used data made available in electronic format by the Agriculture Directorate of the OECD for the period 1979-93, that is before the announcement of the provisions of the Uruguay Round agreement. They provide a sample large enough to make a rough calculation of the standard deviation of protection for each commodity under the policy regime applying during this period. For illustrative purposes, our calculations are based on the assumption that the implied functional distribution of protection over the 1979-93 period would continue to apply in the future in the absence of a tariff binding.[8]

Table 1 provides estimates of the mean and the standard deviation of protection prior to the Round in the first and second rows. The basic data are summarized in Figure 2. To

[8] At this stage, we remind the reader that these calculations are largely for illustration. The assumption we just made is clearly important. If protection rates are increasing, then this assumption may understate the degree of liberalization which has been achieved. Importantly, we also assume that the balance between those seeking and resisting protection will be unchanged by the presence of a binding. If, however, both parties are fully rational in their understanding of the system, it is possible that the suppliers and demanders of protection would understand that a higher level of protection during unbound periods is required to achieve any given level of average protection. In this super-rational case, our results may overstate the degree of liberalization actually achieved.

ensure that our results are not influenced excessively by choice of functional form for the distributions, we use two different approaches to specifying the distribution: a normal distribution, and a non-parametric approach based on the observed distribution. In the table, we provide estimates of the mean and standard deviation of (bound) protection applying after the Round. In one case, this was done by assuming that the underlying *distribution* function is normal. In the other case, the observed distribution was Winsorized without making any explicit assumption about the distribution. For the Normal distribution, the Winsorized distributions were estimated using Monte Carlo simulations with 1,000 replications. The estimated means and variances of the unrestricted distributions, combined with the bindings themselves, were the parameters used for the simulations.[9] Finally, the last rows show the estimated relative reduction in the expected cost of protection resulting from the introduction of the bindings, calculated using equations (6) and (7). These are decomposed into the reduction due to limits on variance, and that due to the reduction in mean rates. Figure 2 provides a comparison of the bound rates with recent history on the variability in applied rates.

The results in Table 1 and the data in Figure 2 highlight the very substantial variation across regions and across time in the rates of border protection. Further, it is clear that the final bindings are often well above the average rates of protection applying in the pre-Uruguay Round era, despite the commitment in the Round to lower protection relative to previous average levels. Does this imply that the Uruguay Round "liberalization " actually resulted in increases in protection rates? Not necessarily. When we look at the mean protection rates in the table, it is clear that even these generally high bindings can be expected to lead to some liberalization in some major markets. This liberalization is particularly important in Japan, where the expected level of protection declines by almost 300 percentage points from the 1979-93 average.

A striking feature of the results is just how large are the estimated reductions in the costs of protection resulting from the introduction of bindings on wheat, despite the frequently substantial slippage in the settings of the bindings relative to the objectives of the Round. In the case of the EU, roughly one-half of the gains are derived from the reduction in variability alone, as opposed to the one-half that derive from the reduction in the average rate of

[9] The data and related Excel and Maple notebooks are available upon request.

protection. In the case of Japan, the reduction in the mean is much larger than that in the standard-deviation, implying that the reduction in the mean level of protection is the dominant influence in reducing the welfare costs of protection. In this case, so much of the probability mass is concentrated at the binding that it effectively becomes a deterministic rate of protection. The size of these reductions highlights the very large gains associated with initial reductions in rates of protection, and the importance of measuring the effects on both the mean and the variability of protection. Measures of protection which are based on methods like equation (7), and which therefore focus only on the reduction in observed protection, will only capture reductions related to the mean rate itself.[10]

## 5. Summary and conclusions

A key feature of multilateral liberalization in recent years has been the introduction of tariff bindings which constrain the range and variability of protection rates. While tariff bindings allow tariff rates to vary below the level of the binding, they reduce both the average applied tariff and the variability of the applied rate of protection. We have argued that protection rates can vary in response to a wide range of pressures for protection, and that these pressures are likely to continue to generate varying rates of protection even after the introduction of new tariff bindings. Accordingly, we characterize trade policy in the presence of a tariff binding as generating uncertain rates of protection subject to the limit imposed by the binding.

As a basis for examining the liberalization of stochastically varying protection, we develop a conceptual framework based on the expected cost of protection. In our basic set of examples, involving a single price-based instrument, this cost can be shown to depend on the second moment of protection about the origin (or, equivalently, the sum of the squared mean and the variance of protection) and the slope of the import demand function. This approach highlights the fact that the cost of protection rises with the square of the mean and the standard deviation of the rate of protection. Within this conceptual framework, we discuss the

[10] There is also an apparent time trend in some markets. Simple regression analysis (as well as visual checking of the data in Figure 2) supports this idea. Statistically, the strongest time trends are in Japan and Norway, where rates of protection have increased over 20 percent per year for these sectors. To the extent these represent an underlying secular trend toward permanently higher protection (and not just part of a broader swing in protection rates), we have underestimated the impact of bindings on the combined mean and variance of protection.
of protection.

possibility of assessing the relative impact of tariff bindings on the total costs of protection through calculation of welfare-weighted cost of protection indexes. As illustration we have provided examples, based on such indexes, for the effect of tariff bindings on imports of wheat. Even though tariff bindings on this commodity were typically set at levels substantially higher than the average rates of protection previously applied, it seems likely that the introduction of tariff bindings will yield substantial reductions in the costs of protection.

The analytical approach followed here has also allowed us to provide a formal representation of the concept of "improved market access" following from tariff bindings. This is the basic objective of trade negotiations (with zero tariffs being a subset of bound tariffs), and so in our view it merits formal analysis. We have shown that improved market access, in terms of reduced terms of trade uncertainty related to export market protection, has welfare implications that follow not only from the expected level of market access, but also from the stability of those conditions of access.

A basic objective of this paper has been to push the notion of protection away from one based primarily on fixed policy instruments, closer to one that involves policy regimes subject to uncertainty and variability. While the importance of the security and certainty of market access has long been recognized in the policy process, little attention has been devoted to these issues in the formal economic literature. As has been demonstrated, the stochastic aspect of policy variables can have important implications for the effects of negotiated bindings and rules-based policy constraints, beyond those suggested in frameworks built around fixed policy regimes. This implies that the near-universal omission of the impact of improved stability of market access in studies of multilateral liberalization may have greatly understated the potential gains from the process.

While we have addressed a number of issues related to bindings and trade policy uncertainty, we have also raised a number of questions that we have left unanswered. In our view, further research is called for not only on rules-based liberalization and the distribution of protection for particular sectors and regions, but also on the impact of bindings given linkages in the distribution of protection across instruments and sectors. While we have worked with an analytical and computational example involving a single trade policy instrument, governments are not so limited in reality. They actually have a broad array of instruments available to choose from in order to limit imports (or exports) and to otherwise intervene in trade. One interpretation of the role of the GATT/WTO is that it seeks to restrict the application of these instruments through rules-based disciplines, and an explicit goal of requiring that all intervention (at least in manufacturing) involve tariffs. However, the continued success of this endeavor hinges on the coverage of the rules keeping up with the development and application of new instruments. As grey-area measures have demonstrated, this is not a simple task. Limiting the application of one set of instruments (such as voluntary export restraints) may simply lead to the application of alternative instruments. For example, when U.S. steel quotas lapsed in March 1992, they were followed by a series of dumping cases. To be general, an assessment of limiting a particular trade policy instrument, such as steel VERS, through the application of rules, may need to include the availability of alternative instruments and limitations on those instruments. As long as the degree of substitutability between instruments is not perfect, limiting a particular instrument should in itself be trade liberalizing. However, the extent of liberalization will hinge on the possibilities for substitution toward other instruments, a process we call *instrument switching*. (See Francois and Martin 1997). In addition, it should also be evident that reductions in the uncertainty that characterizes the commercial policy landscape could have significant effects related to investor uncertainty, and hence to the size and allocation of the capital stock, suggesting a second line of research.

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Figure 1. The welfare impact of expected protection
(with reference to the import market)

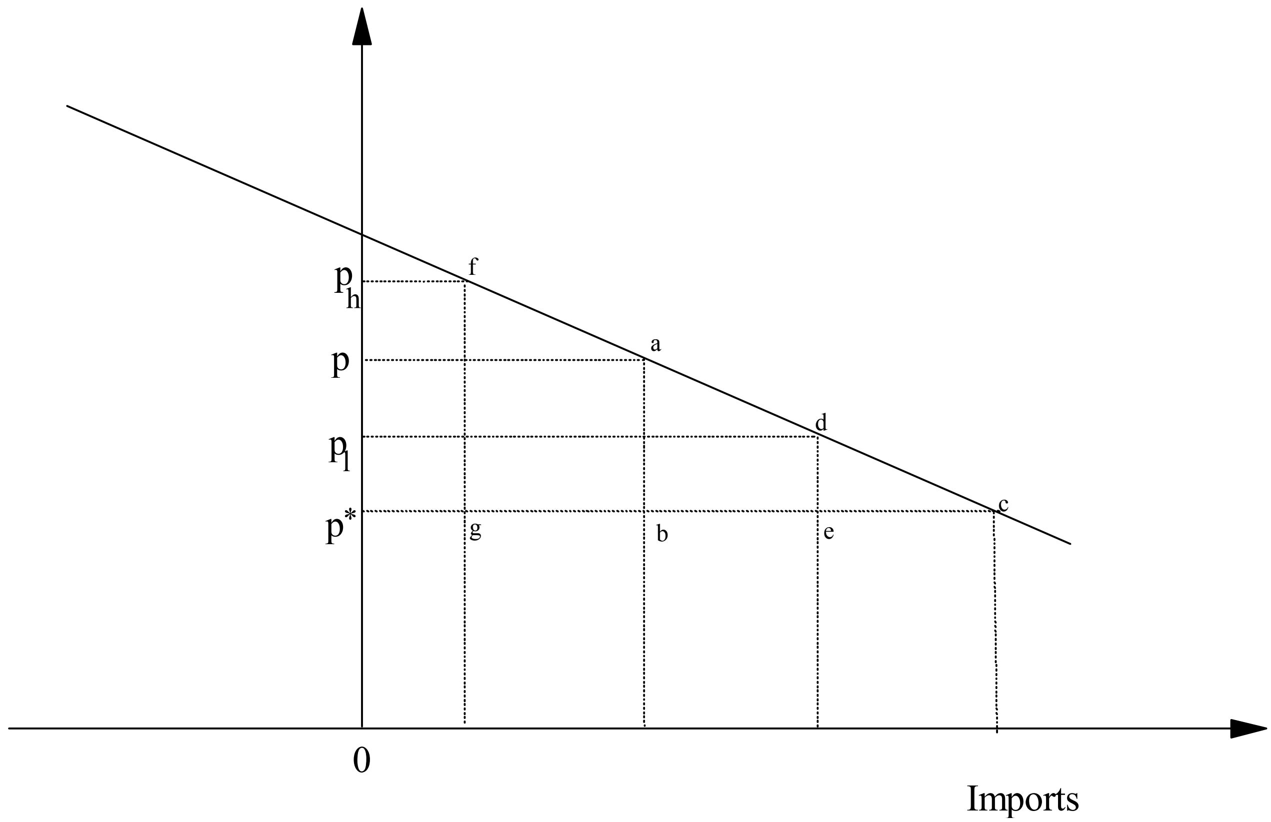


Figure 2.
Patterns of Protection

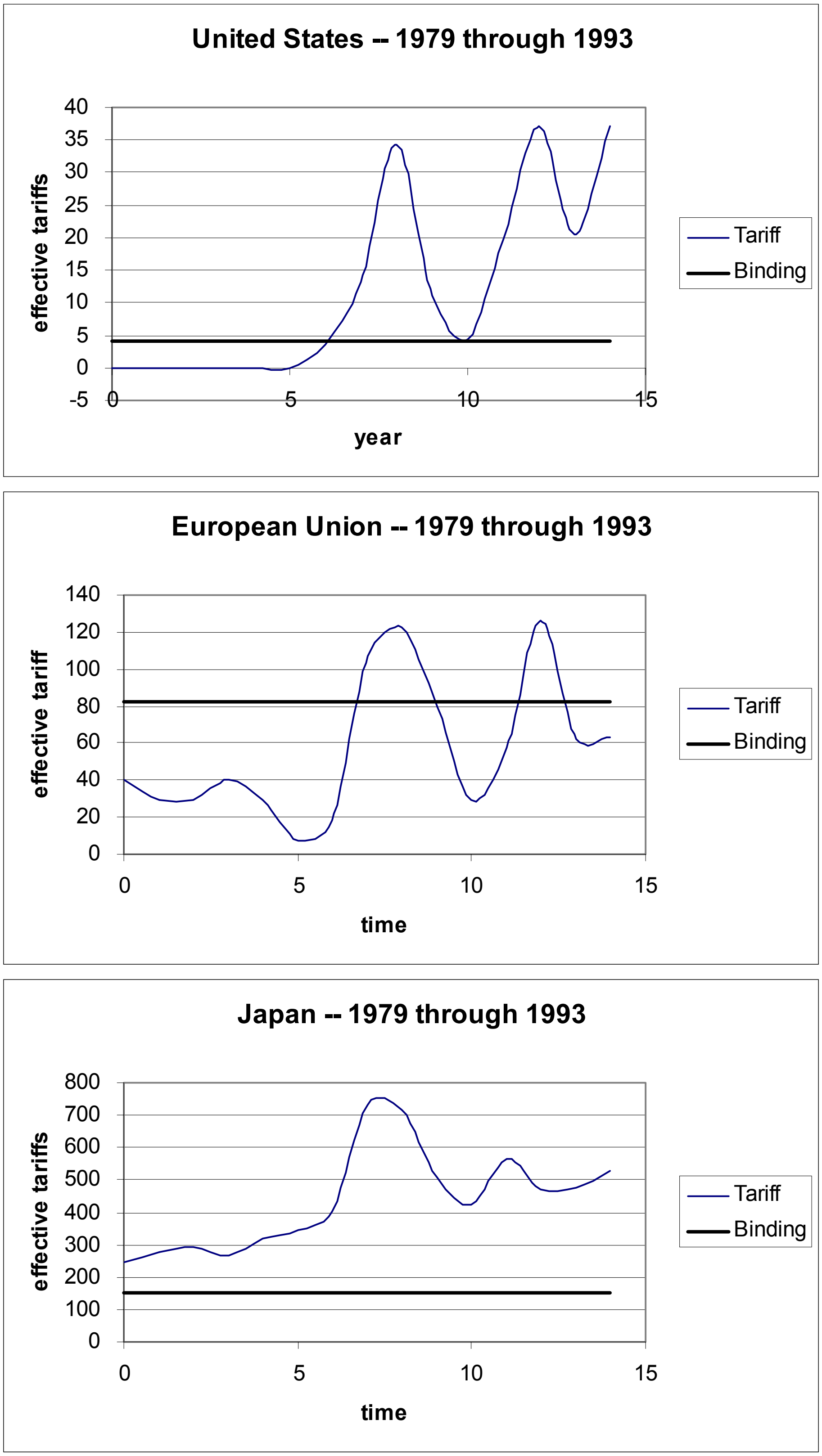
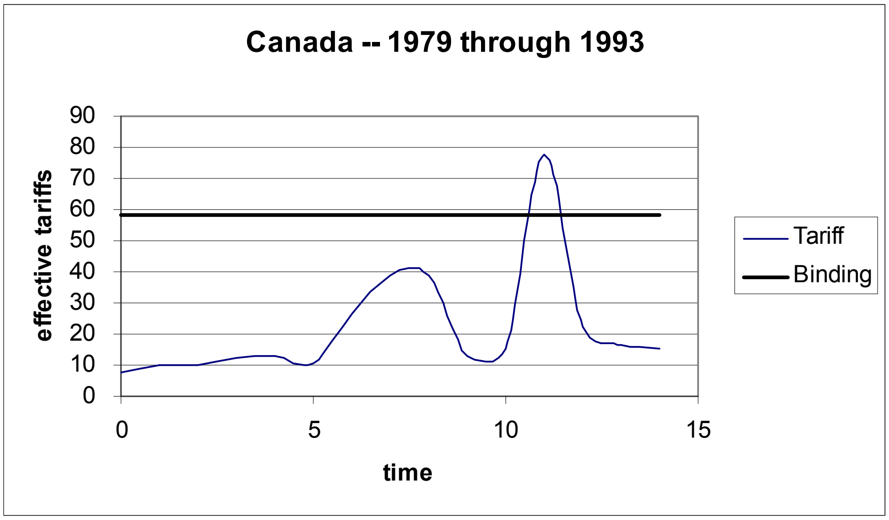
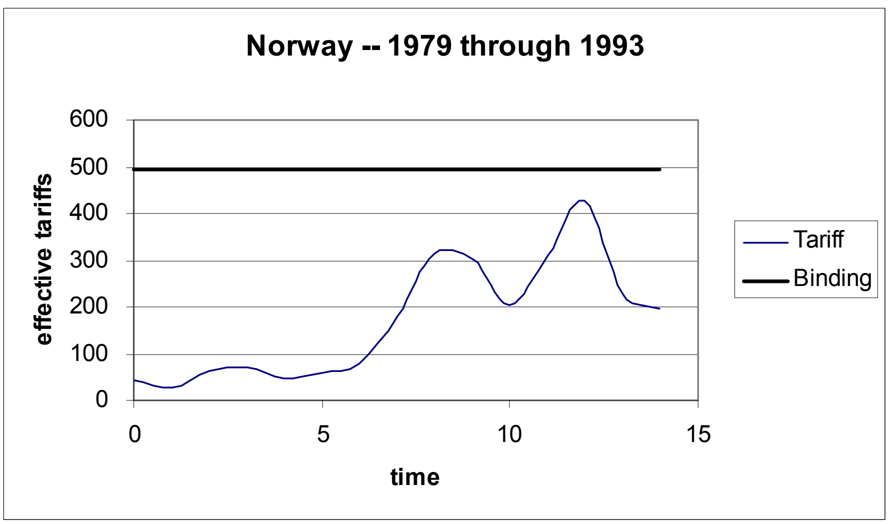


Figure 2.
Patterns of Protection



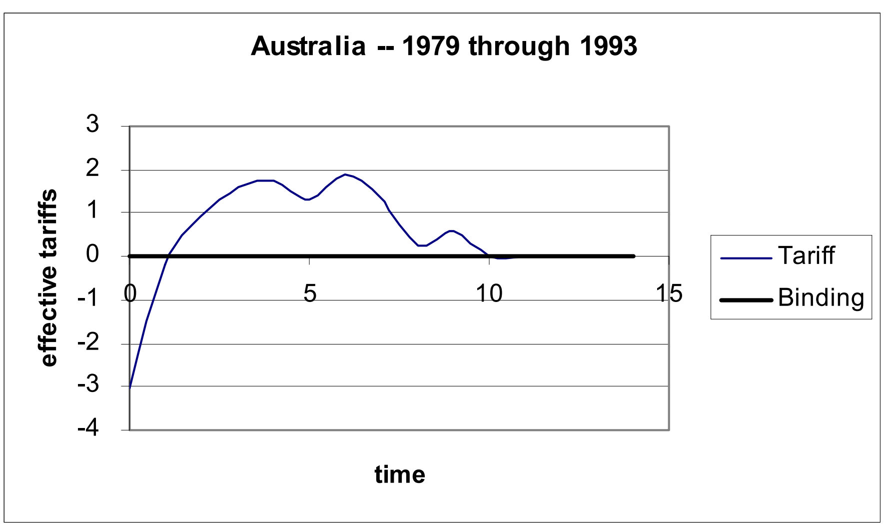



Figure 2.
Patterns of Protection

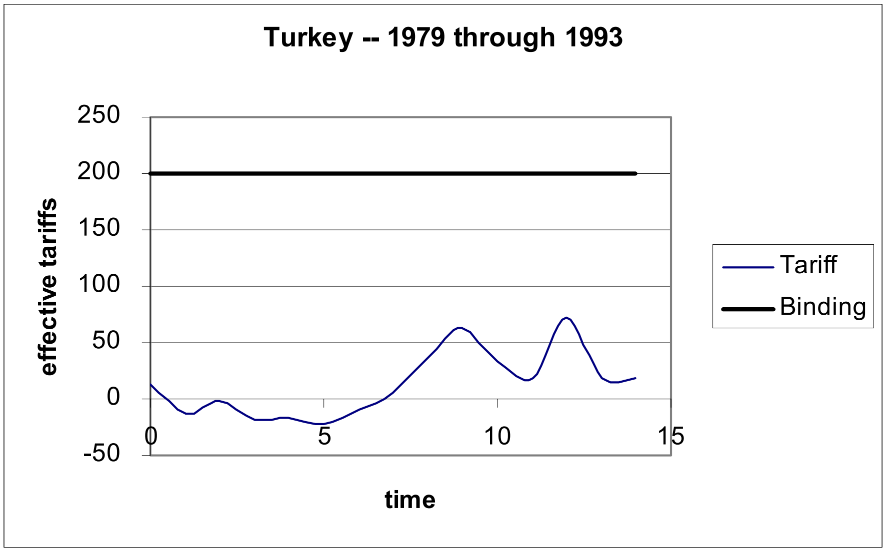


**Table 1.** **Implications of Uruguay Round agricultural bindings on Import protection for wheat**

Effects of Bindings

| | EU | US | Japan | Canada | Norway | Australia | Turkey |
|---|---|---|---|---|---|---|---|
| Old mean | 0.56 | 0.12 | 4.38 | 0.22 | 1.70 | 0.00 | 0.13 |
| Old SD | 0.37 | 0.14 | 1.53 | 0.18 | 1.26 | 0.01 | 0.29 |
| Normal | | | | | | | |
| New mean | 0.49 | 0.01 | 1.50 | 0.21 | 1.67 | 0.00 | 0.13 |
| New SD | 0.30 | 0.06 | 0.19 | 0.18 | 1.26 | 0.01 | 0.28 |
| Non-parametric | | | | | | | |
| New mean | 0.49 | 0.02 | 1.52 | 0.21 | 1.70 | 0.00 | 0.13 |
| New SD | 0.25 | 0.02 | 0.00 | 0.14 | 1.26 | 0.01 | 0.29 |

Estimated reduction in the cost of protection(relative to free trade)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Non-parametric | 33.50 | 97.38 | 89.28 | 23.28 | 0.00 | 60.23 | 0.00 |
| reduction due to mean reduction | 16.81 | 39.88 | 78.36 | 6.91 | 0.00 | 8.42 | 0.00 |
| reduction due to variance reduction | 16.69 | 57.50 | 10.92 | 16.36 | 0.00 | 51.81 | 0.00 |
| Winsorized normal | 26.72 | 90.53 | 89.45 | 2.86 | 2.12 | 73.51 | 6.06 |
| reduction due to mean reduction | 15.57 | 40.79 | 78.70 | 1.96 | 2.10 | 5.41 | 0.57 |
| reduction due to variance reduction | 11.15 | 49.74 | 10.76 | 0.90 | 0.02 | 68.10 | 5.50 |

Note: numbers have been rounded to the nearest percent.