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Choosing Sensitive Agricultural Products in Trade Negotiations

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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ABSTRACT

The formula approach used in many trade negotiations involves large formula cuts in high tariffs, with flexibilities that allow smaller cuts for selected products. Difficulties in evaluating the effects of these exceptions can create major problems. We use a political-economy welfare function and detailed data on the current WTO agricultural negotiations to assess the implications of this approach for welfare and for market access. We find that some previous rules of thumb greatly underestimate the impacts of such exceptions. Indeed, treating even a small number of tariff lines as sensitive and subjecting them to reduced cuts has a sharply adverse impact on welfare, and a smaller but still negative impact on market access.

Keywords: agricultural trade, efficiency, trade negotiations, market access, sensitive products, tariffs, WTO

1. INTRODUCTION

Formula-based negotiations are widely believed to be the only way for making significant progress in cutting tariffs during negotiations involving large numbers of participants. The Framework Agreement (WTO 2004) and the subsequent Modalities (WTO 2008) guiding the WTO's Doha Agenda negotiations specify that reductions in agricultural tariffs should be undertaken using a tiered formula, in which larger cuts are made in higher tariffs, but all members are allowed exceptions from the formula. In non-agricultural market access (NAMA), an even stronger formula—the Swiss formula (Francois and Martin 2003) that brings all tariffs below an agreed ceiling is being used, with only developing countries allowed to introduce exceptions.

In the Doha negotiations, there have been widespread demands for exceptions from, or flexibility in, the application of the agricultural tariff formulas. The demands on behalf of certain "sensitive" products seem likely to result in agreement that all countries can subject a specified percentage of tariff lines to reduced tariff cuts. Most countries still maintain higher tariffs on selected commodities having strong domestic political support, in an effort to shelter these lines from trade liberalization. For instance, the average for the highest decile of Japanese agricultural tariffs is 18 times the median tariff. Switzerland is a similar case. For the European Union, the highest percentile has an average tariff 24 times the median. Even for the United States, this ratio is above 10. The scope of requests for flexibility can range, for example, from a limited request (such as 1% of tariff lines requested by the USA in the Doha negotiations to a larger request (20%) by the G-10 grouping that includes economies with relatively high agricultural protection, such as Japan, Switzerland, South Korea, Israel, and Taiwan (Laborde 2007). In addition, some developing countries have sought latitude to subject an additional set of products to significantly reduced or zero cuts on the grounds that they are "special" products (G-33 2006).

This situation, in which a rigorous rule for tariff reduction is combined with flexibility for particular products, broadly follows a pattern observed in the earlier Uruguay, Kennedy and Tokyo Rounds (Martin and Winters 1996; Baldwin 1986), where ambitious tariff reduction goals were combined with discretion for specific, politically-sensitive products. A similar problem arises in many preferential and bilateral trade agreements, where "substantially all trade" must be liberalized for consistency with WTO rules, and negotiations typically focus on the exceptions permitted on a relatively small number of products. One important advance—and one that facilitates *ex ante* analysis—is that the number and treatment of exceptions are frequently now negotiated in advance, rather than through *ad hoc* withdrawal of offers, such as those occurring in the Kennedy and Tokyo Rounds (see Baldwin 1986, p385-6).

In contrast with a specific tariff reduction formula, there is no mechanical way to identify, ex ante, the implications of allowing countries to designate a set of self-selected tariff lines as sensitive. Two key questions considered in this paper are how countries are likely to choose such sensitive products within an agreed framework of liberalization, and the implications of these choices for market access liberalization and the efficiency of their trade regimes. To answer them, we first propose a simple model reflecting the preferences of policy makers, and then use it to assess which products WTO members are likely to designate as sensitive when given the option to do so in negotiations on agriculture. Our approach focuses on policy choices within a single country, building on the framework developed by Grossman and Helpman (1994) and other authors in the political-economy literature.

One goal of this paper is to illuminate some of the choices involved in defining flexibilities in trade negotiations. The primary reason for providing flexibilities is the hope that a modest degree of flexibility will allow agreement to be reached on formulas that involve deeper cuts than would otherwise be the case. However, this raises key questions about how to moderate the use of such flexibilities. For example, can moderation be achieved by restricting the number of sensitive products; should the breadth of exceptions be specified using some other criterion such as the share of imports; or should attention focus on the depth of the cuts undertaken on the products that are selected as sensitive?

Another question we address is whether the effect of allowing sensitive products can be adequately approximated using relatively simple rules of thumb. One approach has been to assume that policy makers will exclude, or apply smaller cuts to, the highest bound tariffs (Sharma 2006) or the highest applied tariffs (Martin and Wang 2004; Vanzetti and Peters 2007). Another assumption is that

policy makers will use a combination of the importance of the good in imports and the depth of the cuts in applied rates required by the formula. Jean, Laborde and Martin (2006) characterize this as the loss-of-tariff revenue criterion. If one of these rule-of-thumb criteria were found to provide a reasonable indication of likely product selection, then this would allow greater confidence in the use of such shortcuts in the real-time environment in which trade policy makers must operate.

The current Doha negotiations on agriculture involve tiered-formula cuts with larger cuts on higher tariffs together with flexibilities that allow much smaller cuts on relatively high tariffs. From the point of view of economic efficiency, this seems an undesirable approach because the exceptions increase the variance of protection, and hence the efficiency cost of the trade regime. However, we know from the work of Anderson and Neary (2007) that increasing the variance of tariffs at any given mean level may lead to increased market access. Could it be that the mercantilist ethos of the WTO leads to a tariff-cutting approach that favors market access over efficiency? In this paper, we use the Anderson-Neary approach with the most disaggregated data available at the international level, to assess the implications of sensitive product exceptions for both welfare and market access.

The answers to the questions we examine will have potentially important informational value to policy makers in WTO negotiations, and other trade negotiations with flexible treatment for particular products. Individual WTO members will generally have access to information on the effects of a tariff-cutting formula on their own tariffs. Information on the implications for other countries' tariffs—and hence for market access opportunities—is much more difficult to obtain. In the absence of a method for assessing how such flexibilities might be used, negotiators face a black-box problem when evaluating offers from their partners. This issue is widely believed to have contributed to continuing difficulties in reaching agreement in the WTO's agricultural negotiations. A key purpose of this paper is to offer a potential approach to estimating these implications.

We make the fundamental assumption that demand for flexibility results from governments seeking to maximize the political-economy functions that gave rise to their original tariffs, while being willing to undertake international trade negotiations because of the potential for greater gains through international cooperation, as highlighted by Grossman and Helpman (1995), Bagwell and Staiger (2002) and Maggi and Rodríguez-Clare (2007). We recognize that this is not the only possible perspective on this issue. Alternative views might see demand for flexibility as a consequence of a lack of correspondence between current tariffs—inherited from history and past negotiations—and the current political-economy function. Our empirical analysis focuses on agricultural negotiations, for which we favor the first interpretation because these tariffs typically vary substantially over time, and have not been effectively disciplined by past multilateral agreements (Hathaway and Ingco 1996).

Our first step in this paper is to develop a framework for predicting the choices of national governments with regard to the products to be treated as "sensitive" and subjected to reduced disciplines. We then assess the implications of different types of sensitive product regimes for average tariff levels. Finally, we examine the implications of sensitive products for the distribution of tariffs, summarized using their generalized means and variances (Anderson and Neary 2007), which we use to assess the implications for economic welfare, both in the country utilizing the flexibility and for the market access opportunities of partner countries.

The Selection of Sensitive Products

In the spirit of Grossman and Helpman (1994), we begin by specifying an objective function for policy makers that takes into account the benefits to politicians from providing protection to particular sectors, while at the same time considering the costs to consumers and taxpayers of providing this protection. Our political economy objective function is expressed in monetary terms as:

$$W(\mathbf{p},u,\mathbf{v}) = -e(\mathbf{p},u) + g(\mathbf{p},\mathbf{v}) + \mathbf{h}'\mathbf{p} + \mathbf{z_p}'(\mathbf{p}-\mathbf{p^*}) \quad (1)$$

where e is the consumer expenditure function, defined over a vector of domestic prices, $\mathbf{p}$, and the utility level of the representative household, u; $g(\mathbf{p},\mathbf{v})$ is a net revenue or GDP function defined over domestic prices and a vector of specific factors, $\mathbf{v}$; $\mathbf{p^*}$ is the vector of foreign market prices for traded goods, so that $(\mathbf{p}-\mathbf{p^*})$ is a vector of specific tariff rates; $\mathbf{e_p}$ and $\mathbf{g_p}$ are vectors of first derivatives and, by the envelope

theorem, the demand and supply of each good; $z = e - g$ is the trade expenditure function; $\mathbf{z_p} = \mathbf{e_p} - \mathbf{g_p}$ is a vector of net imports; $\mathbf{z_p}'(\mathbf{p}\text{-}\mathbf{p}^*)$ is tariff revenues, which are assumed to be redistributed to the household; and the elements of **h** are the differences between the unitary weights on benefits to consumers, producers and taxpayers used in the Balance of Trade function (see Anderson and Neary 1992), versus those that motivate political decisions.

We assume that the initial protection level reflects unilateral optimization of this political economy objective function. The context under study is one in which the country is offered the opportunity to benefit from improved access to other markets, provided that it complies with the liberalization rule agreed upon in the negotiation. We focus on the country's implementation of its own commitments, which we postulate cause reductions in political welfare relative to the initially chosen optimum. The selection of sensitive products is therefore an opportunity for the policy maker to minimize the political costs of this move.

We focus on the sub-problem in which individual economies[1] choose their own sensitive products, taking as given the policy choices of other countries and the vector of world prices, $\mathbf{p}^*$. Solving this problem—both for the country itself and for its trading partners—is an essential prerequisite to solving the broader problem of whether political welfare exchanges of market access concessions of the type considered by Grossman and Helpman (1995) will lead to welfare gains. Solving for the country itself provides an indication about how the political "pain" associated with own-reforms can be managed. Solving for other countries helps determine whether the market access benefits will be large enough to warrant the residual political "pain."

Even within the sub-problem on which we focus, we recognize that treating $\mathbf{p}^*$ as exogenous is a strong assumption. Effectively, we assume that the impact of choosing a product as sensitive on its border price—either directly or through induced policy changes by others—is ignored by policy makers choosing the products to be designated as sensitive. This seems consistent with the choices made by policy makers dealing with product-specific issues such as the "tariffication" of non-tariff barriers (Hathaway and Ingco 1996), and is the approach used in the seminal paper by Grossman and Helpman (1994, Proposition 2) and in all empirical implementations of this model of which we are aware.

Our approach could be generalized in a number of ways, including by incorporating terms of trade impacts, or introducing other policy measures such as domestic and export subsidies. For large countries, world prices could be specified as functions of traded quantities, as in Neary (1995). However, we feel that this would increase complexity without necessarily providing a better indication of real-world behavior. While many countries are sufficiently specialized in their exports to be large suppliers of particular products, and hence conscious of the importance of liberalization for their market access in general, relatively few countries account for a large share of world imports of particular tariff lines. Domestic support and export subsidies are clearly related instruments that might need to be considered together with tariffs in some contexts, but in our WTO application, each is dealt with under a different "pillar" of the negotiations.

The **h** weights reflect a number of political-economy features identified by authors such as Anderson and Hayami (1986), Lindert (1991) and Grossman and Helpman (1994) that influence whether a particular agricultural sector will receive tariff protection, including: (i) the ability to overcome the barriers to effective organization created by free-rider problems and to lobby effectively (typically, the interests of producers are more influential than those of consumers, as observed by Smith, 1776); (ii) the impact of own output prices on the returns to specific factors in a given sector; (iii) the adverse impacts on the costs to other politically-influential groups of protecting a particular sector; (iv) the ratio of imports to total domestic consumption, which determines the balance of benefits between tariff revenues and transfers to producers; and (v) whether the sector is declining, in which case the benefits of protection are less likely to be shared with new entrants (Hillman 1982). Lindert (1991) and Anderson (2008) show that these factors contribute to the observed patterns involving high levels of agricultural protection in high-income countries and the low levels seen in the poorest countries.

[1] Note that, even when countries negotiate as part of broader coalitions such as the G-20 or the Cairns Group, they can choose their sensitive products individually unless they are members of a Customs Union, which we would treat as a single economy.

If we had access to a complete model of the economy, we could directly observe the impacts of changes in tariffs on sectoral profits, on the costs of other powerful sectors, and the relative importance of transfers and tariff revenues. Since we would like to work at a much higher level of disaggregation than the production and intermediate input data available to us, we must treat the elements of the **h** vector as reduced form coefficients incorporating all of the elements involved in the political-economy determination of protection.

To make progress, we need to replace the unobservable **h** vector with potentially observable values. Since we assume that equation (1) is being maximized in the initial equilibrium, we can use the first order conditions for maximization of this function to solve for **h**:

$$\mathbf{h} = -\mathbf{z}_{\mathbf{pp}}^{\mathbf{0}}(\mathbf{p}^{\mathbf{0}} - \mathbf{p}^{*}) \tag{2}$$

where $-\mathbf{z}_{\mathbf{pp}}^{\mathbf{0}}(\mathbf{p}^{\mathbf{0}}-\mathbf{p}^{*})$ is the marginal welfare cost of tariff changes around $(\mathbf{p}-\mathbf{p}^{*})$, and the superscript ^{0} refers to values at the initial equilibrium (since world prices are assumed to be constant, $\mathbf{p}^{*\mathbf{0}} = \mathbf{p}^{*}$). Equation (2) has a simple, intuitive interpretation. The **h** values for particular prices are revealed by policy makers' willingness to pay the marginal social costs of the tariffs on these commodities.[2] We can simplify (2) by noting that, in the neighborhood of any optimum, $\mathbf{z}_{\mathbf{pp}}\mathbf{p} = 0$ by the nature of the optimization process and net expenditure at domestic prices cannot be reduced further by changes in quantities at the optimum. In this situation, (2) may be rewritten:

$$\mathbf{h} = \mathbf{z}_{\mathbf{pp}}^{\mathbf{0}}\mathbf{p}^{*} \tag{2′}$$

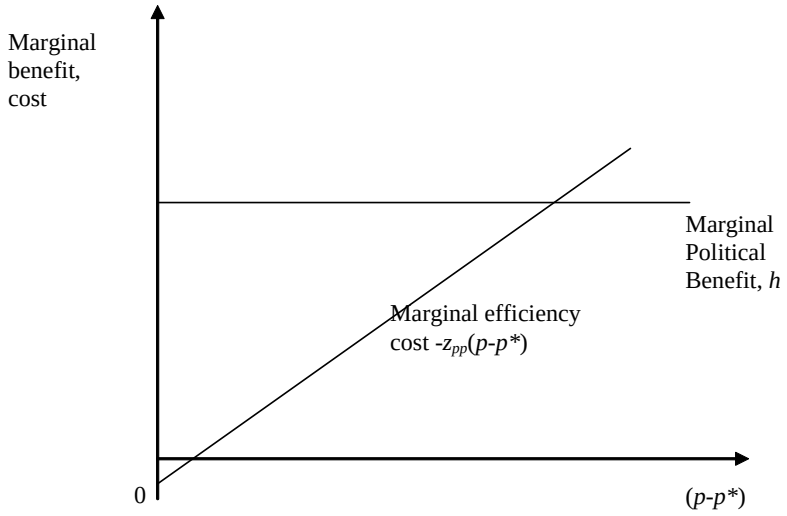
This allows us to rewrite (1) in potentially observable variables and parameters, permitting inferences about the effects of changes in tariffs using:

$$\mathbf{W} = -z(\mathbf{p},\mathbf{v},u) + \mathbf{p}^{*\prime}\mathbf{z}_{\mathbf{pp}}^{\mathbf{0}}\mathbf{p} + \mathbf{z}_{\mathbf{p}}(\mathbf{p}-\mathbf{p}^{*}) \tag{1′}$$

A potentially useful interpretation of equation (2) can be obtained by examining the changes in the marginal cost of protection for an economy with a single distortion. In this case, the relationship between $(\mathbf{p}-\mathbf{p}^{*})$ and the marginal welfare benefits and marginal efficiency costs of changes in **p** can be depicted graphically, as shown in Figure 1.

[2] Notice that the values of **h**, which are defined as differences from unitary weights, are not positive for all goods. In particular, from (2) it follows that the value of **h** must be negative for the numeraire good.

Figure 1. Political-economy marginal benefits and costs of protection



In the diagram, we assume that the marginal political benefit of protection to a particular commodity is a constant. In contrast, the marginal efficiency cost of protection is an increasing function of the level of protection. Under these circumstances, the level of protection observed allows us to infer the value of **h**. The greater is the slope of the import demand function, $\mathbf{z_{pp}}$, and the higher the initial level of protection considered, the greater the marginal cost of raising protection, and hence the lower the protection rate chosen for any given value of **h**. This result is consistent with that used in empirical tests of the Grossman-Helpman model (for example, see Mitra, Thomakos, and Ulubaşoğlu 2002, p. 499).

A second-order Taylor-Series expansion of equation (1) around the initial distorted equilibrium provides valuable insights into the qualitative nature of the solution. It also turns out to provide a basis for estimates consistent with the approximations used by Anderson and Neary (2007) of the welfare and market access implications of real-world trade reforms.

We begin by taking the first and second derivatives of (1′) with respect to prices:

$$\frac{\partial W}{\partial \mathbf{p}} = \mathbf{p^{*\prime} z_{pp}^{0}} + \mathbf{(p - p^{*})^{\prime} z_{pp}} \quad \text{and} \quad \frac{\partial^2 W}{\partial \mathbf{p}^2} = \mathbf{z_{pp}} + \mathbf{z_{ppp}(p - p^{*})} \tag{3}$$

Assuming that the third derivative of z is small relative to its second derivative:

$$\frac{\partial^2 W}{\partial \mathbf{p}^2} \approx \mathbf{z_{pp}}$$

As we observed above, the first derivatives of the political-welfare function are zero in the neighborhood of the welfare-maximizing solution. However, we are interested in discrete (and sometimes large) reductions in tariffs associated with tariff-reduction formulas, meaning that we need to consider higher-order derivatives if we are to adequately represent the effects of these changes. A second-order estimate of the implications of changing tariffs relative to their initial equilibrium values is provided by the Taylor-Series expansion:

$$\Delta W = \frac{\partial W}{\partial \mathbf{p}} \Delta \mathbf{p} + \frac{1}{2} \Delta \mathbf{p}^{\prime} \frac{\partial^2 W}{\partial \mathbf{p}^2} \Delta \mathbf{p} = \frac{1}{2} \Delta \mathbf{p}^{\prime} \mathbf{z_{pp}} \Delta \mathbf{p} \tag{4}$$

If we wish to compare the welfare impacts of two alternative degrees of liberalization, such as with-formula versus with a less-demanding sensitive product treatment, then equation (4) can be

generalized to compare two different tariff cuts. We can, for instance, compare the formula tariff cut, $\mathbf{\Delta p_f}$, with a sensitive-product cut, $\mathbf{\Delta p_s}$, using:

$$\Delta W_{fs} = \frac{1}{2}(\Delta \mathbf{p_f} - \Delta \mathbf{p_s})' \mathbf{z_{pp}} (\Delta \mathbf{p_f} - \Delta \mathbf{p_s}) \tag{4'}$$

To obtain insights into the effects of particular tariff changes, it is useful to rearrange (4) or (4') into a proportional change form, and to express welfare changes as a share of initial expenditure:

$$\frac{\Delta W}{e} = \frac{1}{2}\left[\frac{\Delta p_1}{p_1} \quad \frac{\Delta p_2}{p_2} \quad \ldots \quad 0\right]\begin{bmatrix} s_1\eta_{11} & s_1\eta_{12} & \ldots & s_1\eta_{1n} \\ s_2\eta_{21} & s_2\eta_{22} & & \\ \ldots & & & \\ & & & \end{bmatrix}\begin{bmatrix} \frac{\Delta p_1}{p_1} \\ \frac{\Delta p_2}{p_2} \\ \ldots \\ \end{bmatrix} \tag{4''}$$

where e is initial expenditure on <u>all</u> goods and services, including the non-distorted numeraire, n; s_i is the share of expenditure on good i; η_{ij} is the elasticity of demand for good i relative to the price of good j; and $\frac{\Delta p}{p}$ may refer to the price changes associated with applying the formula, as in equation (4), or deviations from that formula, as in (4'). The change in the price of the numeraire good is, of course, zero.

If we focus on the impact of sensitive product treatment for an individual commodity, i, where all other agricultural tariffs are being cut by a pre-determined formula, equation (4'') yields equation (5), where the proportional deviation of p_i from the formula cut is represented by $\tilde{p}_i$ and the formula cuts for p_j are represented by $\hat{p}_j$:[3]

$$\frac{\Delta W_i}{e} = \frac{1}{2} s_i \tilde{p}_i [\eta_{ii} \tilde{p}_i + 2\sum_j \eta_{ij} \hat{p}_j] \tag{5}$$

The factor 2 in front of the cross-product terms in equation (5) reflects the presence of the two cross-product terms in the matrix of elasticities and shares. Equation (5) suggests that the products likely to be chosen as sensitive are likely to be those: (i) with large expenditure shares at domestic prices, s_i; (ii) for which sensitive product treatment allows relatively large reductions in the required change in prices, $\hat{p}_i$; and (iii) for which the elasticity of import demand is large relative to the cross-price elasticities. However, equation (5) provides relatively little guidance on which specific products will be selected due to uncertainty about the relative magnitudes of the own and cross-price elasticities.

Equation (5) can also be formulated using expressions more familiar to trade negotiators, with the formula cuts given by $\frac{\Delta p_i}{p_i} = \hat{p}_i = \frac{f_i t_i}{(1+t_i)}$ where $\hat{p}_i \leq 0$ is the cut in the price of the imported good; t_i is the initial *ad valorem* tariff, and f_i is the proportional tariff cut implied by the formula. The cuts with flexibility are given by $\frac{\Delta p_i}{p_i} = (\hat{p}_i + \tilde{p}_i) = \frac{c_i f_i t_i}{(1+t_i)}$, where $\tilde{p}_i \geq 0$ is the increase in the price from the post-formula level allowed for sensitive products and c_i is the fraction of the standard formula cut required for sensitive products.

If we make the assumption of Constant Elasticity of Substitution (CES) preferences for tractability and consistency with Anderson and Neary (2007), the elasticity terms simplify, with the own-price elasticity given by $-(1-s_i).\sigma$, where σ is the elasticity of substitution, and the cross-price elasticities, η_{ij}, are given by $\sigma.s_j$. Equations (4'') and (5) can be rewritten as:

[3] The price change for a sensitive product, I, is thus $\hat{p}_i + \tilde{p}_i$.

$$\frac{\Delta W}{e} = \frac{1}{2}\sigma \sum_j s_j \frac{\Delta p_j}{p_j}\left(\sum_i \frac{\Delta p_i}{p_i} s_i - \frac{\Delta p_j}{p_j}\right) = -\frac{1}{2}\sigma VAR(\hat{p}) \tag{4'''}$$

with $VAR(\hat{p})$ the weighted (s_i) variance of price changes ($\frac{\Delta p_i}{p_i}$); and

$$\frac{\Delta W_i}{e} = \frac{1}{2} s_i \sigma \tilde{p}_i [-(1-s_i)\tilde{p}_i + 2\sum_j s_j \hat{p}_j] \tag{5'}$$

From Equation (4'''), the welfare cost of liberalization to policy makers increases with the distortion of the initial price and tariff distribution. Incidentally, if the magnitude of the welfare cost is dependent on the value of σ, in this CES framework under the Taylor expansion approximation the choice of sensitive products, aiming to minimize $VAR(\hat{p})$, will be independent of the elasticity of substitution assumed. Equation (5') provides additional insight into the likely choices of sensitive products. With this specification, the change in the price of good *i* can be compared with the weighted average of the changes of all other prices, including the numeraire. The fact that the cross-price effects are multiplied by 2 in the formula increases their relative importance, while they are substantially diminished by the inclusion of the term $s_n . \hat{p}_n$, because of the zero change in the numeraire commodity, which has a large share of expenditure in most economies. With over 5,000 potentially tariff lines being considered the (1-s_i) term is likely to be approximately one for virtually all traded goods.

Equation (5) provides a potentially very useful guide for identifying likely sensitive products. The products that are likely to be selected are those with large expenditure shares at domestic prices, s_i, and for which the reduction in the price change allowed for sensitive products is large both in absolute terms and relative to the price changes resulting from the formula on the composite of other traded goods and the numeraire.

Three features of Equation (5') allow us to simplify it to obtain a rule of thumb for selecting individual tariff lines: (i) since dutiable agricultural imports are a small share of total expenditure, it is likely that $\sum_j s_j \hat{p}_j \approx 0$; (ii) since sensitive products are likely to be associated with large tariff cuts, the price reduction resulting from the cut in a candidate for sensitive product treatment, $\hat{p}_i$, will likely be large compared to the average price change ($|\hat{p}_i| >> \sum_j s_j |\hat{p}_j|$); and (iii) with over 5,000 potentially traded goods plus the numeraire domestic good, which is typically a large percentage of consumption, the (1-s_i) term is also likely to be approximately one for virtually all traded goods. Accordingly, we can write a simplified expression for the political welfare cost of the tariff cut associated with the formula:

$$\frac{\Delta W_i}{e} \approx -\frac{1}{2} s_i \sigma \hat{p}_i^{\,2} = \frac{1}{2} s_i \sigma \left[\frac{f_i t_i}{(1+t_i)}\right]^2 \tag{4''''}$$

Equation (4'''') provides some important intuitive insights into the products for which the greatest political "pain" is likely to be felt following a formula cut. These products are those having large expenditure shares, s_i, at domestic prices, and large reductions in domestic prices relative to the initial, distorted equilibrium. The second (square-bracketed) expression shows that the declines in prices are determined by the height of the initial tariff, t_i, and the depth of the formula cut, f_i. Equation (4'''') shows that the price change associated with any tariff change enters in squared form as $\hat{p}_i^{\,2}$.

Using this simplified welfare criterion, we obtain a simple measure of the welfare change resulting from applying reduced disciplines to a particular product. We do this by comparing the welfare

impact using the formula, $\left.\frac{\Delta W}{e}\right|_f$ with the welfare impact allowing sensitive-product treatment for the product, $\left.\frac{\Delta W}{e}\right|_s$:

$$\left.\frac{\Delta W}{e}\right|_s - \left.\frac{\Delta W}{e}\right|_f \approx -\frac{1}{2}\sigma s_i((\hat{p}+\tilde{p})^2-\hat{p}^2) = \frac{1}{2}\sigma s_i\left[\frac{f_i t_i}{(1+t_i)}\right]^2\left(1-c_i^{\,2}\right) \qquad (6)$$

Equation (6) provides a simple measure that can be used for selecting sensitive products. It takes into account the key elements identified in the theory: the importance of the product in trade; the size of the formula cut; and the extent to which sensitive product selection allows a smaller cut in the tariff. The second formulation in (6) also shows that the political benefit from flexibility on product *i* is increasing in its initial tariff, t_i; and in the formula cut, f_i; but decreasing in the fraction of the formula cut, c_i, required for sensitive products. If c_i is constant across products, then the ranking of products will depend only on the terms identified in equation (4''').

Equation (6) permits comparison with the criteria for selecting products used in previous studies. Note that equation (6) includes elements of two of the previously used criteria: the height of the applied tariff, t_i, and the tariff revenue implications of the cut. It does not directly include the bound tariff. In fact, it clearly shows that the incentive to classify a product as sensitive is reduced as the bound rate increases relative to the applied rate, because the gap between the bound and applied rates reduces the cut in the applied rate for any given cut in bound rates. Three key differences between this decision rule and the highest-applied-rate rule are: (i) the inclusion of the s_i term for the importance of imports of the good in domestic consumption; (ii) the fact our criterion takes into account not just the tariff rate, but the extent of the required cut in the rate; and (iii) the fact that we consider not just the cut in prices, but the square of the cut in prices $\left[\frac{f_i t_i}{(1+t_i)}\right]^2$. The relationship with the tariff-revenue-loss criterion of Jean, Laborde and Martin (2006) is very clear, with the tariff revenue loss for a given formula cut given by:

$$s_i\left[\frac{f_i t_i}{(1+t_i)}\right]$$

which differs from (6) in using a price change term rather than a price change squared term. Whether the differences obtained using the price reduction squared, rather than the tariff-revenue-loss approach, will lead to sharply different results depends upon the nature of the reform, and can only be determined empirically.

2. EXPERIMENTS ON SENSITIVE PRODUCTS: IMPLICATIONS FOR AVERAGE TARIFFS

Analysis of tariff reduction formulas must confront some key data and methodological challenges.4 Due to the nonlinear nature of a tiered formula, analysis must be undertaken using information on tariffs at a disaggregated level. In order to reflect the true extent of protection, the analysis must take into account the following features of global agricultural protection: many important tariffs are not ad valorem; tariff-rate quotas (TRQs) can cause the protection provided to differ from tariff rates; and tariff preferences can cause the tariff applied on a product to differ between suppliers. To incorporate these factors, we use the MAcMapHS6v1.1 database on applied protection (see Bouët et al. 2008). The analysis is carried out at the finest level at which classifications are internationally compatible: the six-digit level of the Harmonized System.5

An important complication in the evaluation of agricultural tariff reform is the frequently wide divergences between the bound tariffs used in WTO tariff reduction formulas and the tariffs that are actually applied. This binding overhang means that reductions in bound tariffs will not always bring about corresponding reductions in applied rates and subsequent increases in market access. To deal with this problem, a detailed dataset on bound duties (see Bchir et al. 2006), conformable with the MAcMap applied rate data, is used to specify the cuts in bound rates. We use the very conservative approach of reducing applied rates, and hence observing economic benefits, only when the bound rate is reduced below the initial applied rate. Francois and Martin (2004) found very substantial benefits from bindings above historical applied rates, largely because agricultural protection varies substantially over time and bindings rule out the highest and most costly incidents of protection.

The analysis begins with the 2001 tariffs that are the basis for the current negotiations, and for quantitative modeling with the GTAP-6 database (www.gtap.org). Prior to the experiments proper, a pre-experiment was performed to introduce a number of commitments that will be implemented whether or not the Doha Agenda succeeds. These include the expansion of the European Union to the EU-25, the phase-in of remaining agricultural commitments by developing countries,[6] and the tariff reforms agreed upon by accession countries, and in particular by China.

As an attempt to capture the key elements of likely liberalization proposals, the analysis is based on the proposal for market access liberalization that has shaped the negotiations on market access, i.e. the proposal by the G-20 for a tiered formula with four bands and three inflexion points (G-20 2005). For the industrial countries, this proposal involves inflection points at 20, 50 and 75 percent, and tariff cuts within the bands of 45, 55, 65 and 75 percent. For developing countries, the inflexion points are placed at 30, 80 and 130 percent and the average cuts at 25, 30, 35 and 40 percent. Final tariffs are capped at 100% for developed countries and 150% for developing countries. Consistent with the negotiating framework (WTO 2004), least-developed countries are not required to undertake any reduction commitments. The cuts are applied to the bound tariffs, but the results are presented for impacts on applied tariffs, under the assumption that cuts in bound tariffs generate reductions in applied rates only when the bound rates drop below the applied rates.

While estimates of own-price elasticities of demand for imports at the six-digit level are now available (Kee, Nicita and Olarreaga 2006), we use a simpler CES approach for three main reasons.[7] The

[4] For more details on data and methodological issues, see Jean, Laborde and Martin (2006).

[5] While policy makers frequently think at a finer level of disaggregation than the six digit level, many important economies such as Japan have reported their tariffs at the six digit level and virtually none have reported at a higher level than 8 digits. Further, the effects of moving to a higher level of disaggregation are unclear. While the number of potential sensitive products increases, the number of these that are close substitutes for sensitive products also increases. Martin and Wang (2004) experimented with using tariff-line level data instead of six-digit data when evaluating sensitive products, and found that their broad results were not greatly affected.

[6] Developing countries had 10 years from 1994 to implement their Uruguay Round commitments, as did developed countries for a few products.

[7] With a very slight modification to our methodology, commodity-specific own-price elasticities such as those of Kee, Nicita and Olarreaga (2006) could be utilized in the analysis. This would involve replacing the Armington-style CES expenditure function, $z(\mathbf{p},\mathbf{v},u)$, in equation (1') with a semi-flexible formulation such as the normalized quadratic profit function used by Diewert and Wales (1988), the Constant Ratio of Elasticities of Substitution-Homothetic (CRESH) demand system (Hanoch 1971) or the Constant Difference of Elasticities (CDE) model (Hanoch 1975). In equation (5), a CRESH semi-flexible

first is that estimates of import demand elasticities for agricultural products at the six-digit level are "noisy", because of substantial changes in trade regimes in recent decades The second is that we are unsure whether lobbyists or governments have good information about these elasticities. A third reason is a desire to maintain consistency with the CES expenditure function approach of Anderson and Neary (2007), that allows us to use observable measures of generalized means and variances to analyze the effects of these flexibilities on economic welfare and market access.

Ideally, identification of sensitive products would be undertaken by solving equation (1) with a nonlinear, integer programming approach. However, our initial investigations using this approach with a utility function derived from a CES expenditure function encountered problems of multiple solutions, and provided generally unsatisfactory results. We then turned to a second-order approach based on equation (4'''). With this, we used two approaches to selection: The first is based on searching across all possible sensitive products using the SBB (Branch & Bound) GAMS® solver for Mixed Integer Nonlinear Programming (MINLP) models; the second uses a simpler, one-product-at-a-time rule suggested by equation (6).

The experiments proper, which are summarized in Table 1, begin with a set of scenarios designed to investigate the consequences of allowing 2 percent of the six-digit tariff lines to be treated as sensitive products, under different assumptions about the way these products are selected.

A key issue is the extent to which countries will reduce overall protection on sensitive products. The negotiating framework aims to improve market access for all such products, and envisages doing so through a combination of tariff reductions and expansion of tariff rate quotas (WTO 2004, paras 32-34). While some observers are optimistic that tariff-rate-quota expansion will succeed in achieving substantial improvements in market access, there seem to be good reasons for caution about such a conclusion given that most existing TRQs are unfilled—frequently because of the procedures used for quota administration (de Gorter and Kliauga 2006). As a very simple rule of thumb, we assume in most cases that bound tariffs on "sensitive" products are cut by half[8] the reduction driven by the formula. The sensitivity of the results to this assumption is assessed below.

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approximation would allow the single elasticity of substitution to be replaced by product-specific elasticities, σ_i, and the shares by s^*_i terms defined as $s_i^* = \frac{\sigma_i s_i}{\sum_j \sigma_j s_j}$. See Dixon et al. (1982, p86) for details. Any of these functional forms would allow us to take into account both the higher costs associated with tariffs on products with higher elasticities in the calculation of $\mathbf{z}_{pp}$, and the differential implications of trade reform on products with different elasticities.

[8] This assumption is much more optimistic than that used in Jean, Laborde and Martin (2006), where we assumed bound tariffs on sensitive products were cut by 15 percent of their initial levels.

Table 1. Summary of reform scenarios

Base	2001 applied protection
No sens	Application of the G20's tiered formula, without sensitive product designation
Sens 2	Tiered formula with designation of sensitive products not exceeding 2% of the number of HS6 products, selected according to political cost (eq. 4''')
Sens 2-simple	Tiered formula with designation of sensitive products not exceeding 2% of the number of HS6 products, selected according to political cost, simplified calculation (eq. 6)
Sens 2-highest bound	Tiered formula with designation of sensitive products not exceeding 2% of the number of HS6 products, selected according to bound duties
Sens 2-highest applied	Tiered formula with designation of sensitive products not exceeding 2% of the number of HS6 products, selected according to applied duties
Sens 2-tariff losses	Tiered formula with designation of sensitive products not exceeding 2% of the number of HS6 products, selected according to tariff losses
Sens 2-sin	*Idem* Sens 2, excluding sin products (alcohol and tobacco) from the list of sensitive products (eq. 4''')
Sens 4	Tiered formula with designation of sensitive products not exceeding 4% of the number of HS6 products, selected according to political cost (eq. 4''')
Sens 2-trade	Tiered formula with designation of sensitive products not exceeding 2% of trade, selected according to political cost (eq. 4''')
Sens 4-trade	Tiered formula with designation of sensitive products not exceeding 4% of trade, selected according to political cost (eq. 4''')
Sens 2-2/3	*Idem* Sens 2, except that duties on sensitive products are subject to two-third (instead of half) the cut indicated by the formula (eq. 4''')
Sens 2-1/3	*Idem* Sens 2, except that duties on sensitive products are subject to one-third (instead of half) the cut indicated by the formula (eq. 4''')

The benchmark against which we assess the impact of sensitive products is a scenario in which the formula is applied to all products, without exception (the "No sens" scenario). Even though the tiered formula used in this analysis appears extremely aggressive in more than halving the average bound tariff worldwide, the reductions in applied rates are smaller because of binding overhang. When no sensitive products are allowed, the worldwide average applied rate is cut by 6.0 percentage points from 14.6 percent to 8.6 percent (Table 2, column "No Sens"). Among the main economies shown in Table 2, only Canada, the European Union (EU), European Free Trade Area (EFTA), Japan and South Korea display more than a 5 percentage point cut in applied duties. Indeed, liberalization appears to be overwhelmingly concentrated in Japan and Korea, with very limited liberalization elsewhere.[9] For many countries, the applied duties change very little: 8 out of the 18 countries and groups shown in Table 2 experience a decline in applied duties of less than 2 percentage points. In Pakistan, for instance, the cut in applied rates is a mere 0.1 point even though average bound rates are cut by 39 percent. Given the extent of the binding overhang in developing countries (see Bchir et al. 2006 for details), the formula considered only narrows the binding overhang in many cases, without substantially changing the applied duties.

[9] Assessment of the effective consequences of the application of tariff-cutting formulae is complicated in the case of Japan and Korea by the existence of large tariff rate quotas with prohibitive out-of-quota tariffs, the *ad valorem* equivalent of which is difficult to gauge. *Ad hoc* assessments based on tariffs and observed price differentials are used to compute meaningful *ad valorem* tariff equivalents for rice in Japan and for rice and corn in Korea.

Table 2. Implications of sensitive products on reductions in countries' average applied tariffs

Country	Base level in %	No sens pctg point cut	Sens 2 pctg point cut	Sens 2-simple pctg point cut	Sens 2-highest bound pctg point cut	Sens 2-highest applied pctg point cut	Sens 2-tariff losses pctg point cut	Sens 2-sin pctg point cut
Industrial countries.	14.9	8.5	4.3	4.3	7.4	7.2	4.3	4.5
Australia	3.1	1.0	0.5	0.5	1.0	1.0	0.5	0.8
Canada	9.8	5.0	1.5	1.5	4.8	4.8	1.5	1.5
EFTA	28.9	14.2	7.6	7.5	14.1	14.1	7.5	7.8
European Union	13.4	7.5	4.4	4.4	6.4	5.9	4.4	4.4
Japan	35.6	22.4	11.2	11.0	19.1	19.1	11.0	11.2
USA	2.7	0.9	0.4	0.4	0.9	0.9	0.4	0.4
Developing countries.	14.2	2.5	1.2	1.6	2.1	2.0	1.2	1.9
ASEAN	8.9	2.3	0.8	0.8	1.2	1.0	0.8	2.2
China	10.2	2.7	1.8	1.8	2.2	2.6	1.8	1.8
India	55.4	3.6	1.9	1.9	3.6	3.4	1.9	2.0
Korea	27.7	10.4	4.2	4.6	8.6	8.7	4.2	9.5
Maghreb	19.0	3.3	1.7	1.7	3.3	2.8	1.7	2.2
Mercosur	12.8	0.2	0.0	0.0	0.1	0.1	0.0	0.1
Mexico	9.5	0.9	0.2	0.2	0.9	0.9	0.2	0.3
Other SSA	25.3	2.0	0.9	0.9	2.0	1.1	0.9	1.5
Pakistan	31.3	0.1	0.0	0.0	0.1	0.0	0.0	0.0
SACU	12.6	0.6	0.3	0.3	0.6	0.5	0.3	0.3
Turkey	14.1	1.1	0.5	0.4	1.1	1.1	0.4	0.5
ROW	10.3	1.8	1.0	1.0	1.4	1.3	1.0	1.4
Non-LDC WTO members	14.6	6.0	3.1	3.0	5.2	5.0	3.0	3.4

Notes: Numbers in the first column refer to the average agricultural tariff in 2001 adjusted for tariff reductions agreed to come into effect irrespective of the Doha Agenda outcome. Numbers in all subsequent columns are the reductions in percentage points from that level.

Table 3 displays the products most frequently selected as sensitive by developed and developing countries when the 2 percent of sensitive products are selected simultaneously according to the political cost measures defined by equation (4''') ("Sens 2" scenario). Table 4 shows a detailed list of these products for a few countries (European Union, USA, Japan, Brazil, China, and South Africa). The resulting implications for countries' own weighted-average tariffs are presented in Table 2 (column "Sens 2"). With 2 percent of products designated as sensitive, the cut in the average applied duty drops from 6 percentage points to 3.1 percentage points. Halving the tariff cut on 2 percent of products is thus enough to reduce the cut in applied duties by more than half overall, and by more than two-thirds in countries such as Korea and Canada. This results from the strong unevenness of protection across products in most countries, with a few tariff peaks on important traded goods accounting for a substantial part of total average protection.

Looking at the two-digit level of the Harmonized System for developed countries, we see that four Chapters, namely Meat and Meat Offal (Chapter 02), Cereals (10), Fruits (08) and Sugar (17), account for 27 percent of total imports and explain 67 percent of the tariff cut without exclusions; these chapters represent 80 percent of the reduction in tariff cuts when 2 percent of products are designated as

sensitive. For developing countries, four chapters (02-Meat, 10-Cereals, 12-Oil seeds and 24-Tobacco) account for 33 percent of total imports and explain 51 percent of the basic cut, but 64 percent of the effect of sensitive products.

Table 3. Products most frequently selected as "Sensitive"

	Industrial Countries	
1	0201 30	Fresh or chilled bovine meat, boneless
2	0202 30	Frozen bovine meat, boneless
3	0207 14	Frozen cuts and edible offal of fowls of the species Gallus domesticus
4	0406 90	Cheese (excl. fresh cheese)
5	0603 10	Fresh cut flowers and flower buds, for bouquets or ornamental purposes
6	0702 00	Tomatoes, fresh or chilled
7	1001 90	Wheat and meslin (excl. durum wheat)
8	1701 11	Raw cane sugar (excl. added flavoring or coloring)
9	2106 90	Food preparations, n.e.s.
10	2202 90	Non-alcoholic beverages (excl. water, fruit or vegetable juices and milk)
11	2204 29	Grape juice (including grape must)
12	2402 20	Cigarettes, containing tobacco
	Developing Countries	
1	2402 20	Cigarettes, containing tobacco
2	2208 30	Whiskies
3	2203 00	Beer made from malt
4	1701 99	Cane or beet sugar
5	2204 21	Wine of fresh grapes, incl. fortified wines in containers of <= 2 l (excl. sparkling)
6	2208 70	Liqueurs and cordials
7	2208 90	Ethyl alcohol < 80% by volume, not denatured
8	0207 14	Frozen cuts and edible offal of fowls of the species Gallus domesticus
9	2403 10	Smoking tobacco, whether or not containing tobacco substitutes in any proportion
10	2106 90	Food preparations, n.e.s.
11	2208 60	Grape juice (including grape must)
12	1006 30	Semi-milled or wholly milled rice, whether or not polished or glazed
13	1701 11	Raw cane sugar (excl. added flavoring or coloring)
14	1806 31	Chocolate and other preparations containing cocoa in blocks or bars of <= 2 kg
15	1806 90	Chocolate and other preps of cocoa, of <= 2 kg (not in blocks, bars or cocoa powder)

Note: Fifteen products are included in the list for developing countries because the last four products were selected the same number of times.

Table 4. Detailed list of the 2 percent of products most often chosen as sensitive by selected countries (ranked list)

Brazil		China	
2008 70	Peaches prepared or preserved	1003 00	Barley
1704 10	Chewing gum whether or not sugar coated	1201 00	Soya beans whether or not broken
2905 44	D glucitol `sorbitol`	1511 90	Palm oil and its fractions
1806 31	Chocolate and preparations of cocoa	0207 14	Frozen cuts and edible offal of fowls
2103 90	Preparations for sauces	1205 00	Rape or colza seeds
3302 10	Mixtures of odoriferous substances	0504 00	Guts, bladders and stomachs
3501 90	Caseinates and other casein derivatives.	2401 20	Tobacco partly or wholly stemmed
3504 00	Peptones and their derivatives.	2106 90	Food preparations n.e.s.
1806 32	Chocolate and preparations	2103 90	Preparations for sauces
3505 10	Dextrins and other modified starches	1516 20	Vegetable fats and oils
3501 10	Casein	2402 20	Cigarettes containing tobacco
3824 60	Sorbitol excl. subheading No 2	2009 11	Frozen orange juice
3301 24	Oils of peppermint	1508 10	Crude ground nut oil
0802 32	Fresh or dried walnuts shelled	1515 29	Maize oil and fractions thereof
Japan		**South Africa**	
1001 90	Wheat and meslin excl. durum wheat	0404 10	Whey whether or not concentrated
1006 30	Semi milled or wholly milled rice	2402 20	Cigarettes containing tobacco
0203 29	Frozen meat of swine excl. carcasses	1701 99	Cane or beet sugar
0203 19	Fresh or chilled meat of swine	0403 90	Buttermilk curdled milk and cream
0201 30	Fresh or chilled bovine meat boneless	1905 30	Sweet biscuits waffles and wafers
1701 11	Raw cane sugar excl. added flavouring	2202 90	Non alcoholic beverages
1005 90	Maize excl. seed	1701 11	Raw cane sugar
1003 00	Barley	1101 00	Wheat or meslin flour
0202 30	Boneless frozen meat of bovine animals	2002 10	Tomatoes whole or in pieces
1006 40	Broken rice	1905 90	Bread pastry cakes biscuits
0404 10	Whey	1806 31	Chocolate
1006 20	Husked or brown rice	0402 99	Milk & cream concentrated & sweetened
0713 32	Dried shelled adzuki beans `phaseolus	0402 91	Milk concentrated but unsweeted
1602 49	Prepared or preserved meat and offal	0703 20	Garlic fresh or chilled
United States		**European Union**	
1701 11	Raw cane sugar excl. added flavoring	0803 00	Bananas incl. plantains
0406 90	Cheese excl. fresh cheese incl. whey	1701 11	Raw cane sugar
2204 21	Wine of fresh grapes incl. fortified	2308 90	Maize stalks maize leaves
1704 90	Sugar confectionery not containing cocoa	0201 30	Fresh or chilled bovine meat boneless
1806 20	Chocolate and othr food preparations	0202 30	Boneless frozen meat of bovine animals
2106 90	Food preparations n.e.s.	1006 30	Semi milled or wholly milled rice
1701 99	Cane or beet sugar and chemically pure	0210 90	Meat and edible offal salted in brine
2008 11	Ground nuts prepared or preserved n.e.s	0405 10	Butter excl. dehydrated butter and ghee
1901 20	Mixes and doughs of flour meal starch	0207 14	Frozen cuts and edible offal of fowls
1202 20	Shelled ground nuts	1006 20	Husked or brown rice
2401 30	Tobacco refuse	2309 10	Dog or cat food put up for retail sale
2003 10	Mushrooms prepared or preserved	1701 99	Cane or beet sugar
0406 30	Processed cheese	1509 10	Virgin olive oil and its fractions
2204 29	Wine of fresh grapes incl. fortified	0703 20	Garlic fresh or chilled

Note: To save space, product labels are truncated.

The use of the simplified selection criterion proposed in equation (6) ("Sens 2-simple") instead of the full-blown calculation has very little effect on the aggregate results. This is reassuring, given that neither consistent estimates of cross-price elasticities nor algorithms for simultaneous product selection are likely to be available to policy makers.

An important question for our approach is how it compares with simpler, *ad-hoc* alternatives such as those used by Sharma (2006) and Martin and Wang (2004). One intuitively appealing alternative focuses on products with the highest tariffs, on the grounds that these products are likely to have the strongest political support. Scenario "Sens 2-highest bound" uses Sharma's (2006) rule of thumb of selecting as sensitive those products exhibiting the highest bound tariffs. This approach turns out to dramatically underestimate the impact of sensitive products on delivered liberalization relative to our political-economy approach: the cut in the average applied tariff is found to drop by just over 1 percentage point when sensitive products are identified in this way. This rule may be misleading because of binding overhang, i.e. the difference between bound and applied rates. Following Martin and Wang (2004) and selecting as sensitive those products with the highest applied tariffs ("Sens 2-highest applied") takes this difference into account. The impact of sensitive products on market access liberalization is indeed slightly higher in this case for developing countries, but it remains strongly understated. The problem with these two rules is that they neglect the importance of the products in trade, and instead identify a number of extremely minor products with high tariffs.

Jean, Laborde and Martin (2006) use a simple, intuitive criterion, i.e. that policy makers are likely to choose products that are important in trade, and for which large reductions in applied tariffs are required. "Sens 2-tariff losses" is computed following this intuition, assuming that sensitive products are picked to minimize tariff revenue losses based on initial trade volumes. At the aggregate level, the outcome using this intuitive alternative selection criterion differs very little from that found by "Sens 2." We must look at the disaggregated level, starting at the HS2 chapter level, to see the main differences. At this level, we find that the global sets of sensitive products differ by 12 percent, and that the political-economy criterion allows us to pick some products (e.g. virgin olive oil for the European Union) that seem, intuitively, to be likely candidates for exceptions, but are not identified using the tariff revenue loss criterion.

As is clear from Table 3, a number of the products included in the WTO agricultural negotiations and selected as "sensitive" using our political-economy approach are products such as cigarettes or alcoholic beverages (frequently termed "sin"- tax commodities). These products may be subject to high duties to raise revenues or to reduce negative externalities, as well as to provide protection. In this case, there is some question as to whether countries would use their limited sensitive product allocation to maintain these revenues, or instead replace these duties with consumption taxes. To guard against this possibility, "Sens 2-sin" examines the implications of excluding "sin" commodities such as alcohol and tobacco from the sensitive product category.

The results of "Sens 2-sin" should be compared with those for "Sens 2," since both involve allowing 2 percent of tariff lines to be treated as sensitive. Comparing these scenarios in Table 2 shows that excluding "sin" commodities increases the size of the cut in applied tariffs very slightly in developed countries (4.5 percent, rather than 4.3 percent) and overall (3.4 percent versus 3.1 percent), and somewhat more in developing countries (1.9 percent rather than 1.2 percent). This exclusion also changes the composition of the selected products. In developed countries, preparations of meat, fish, and dairy products become more important, while dairy products, fruits, meats and fats become more important in developing countries. However, from the viewpoint of the overall liberalization impact, the presence or absence of these sin-tax commodities does not appear to have a major impact.

3. ALTERNATIVE DISCIPLINES OVER SENSITIVE PRODUCTS

While the analysis so far has focused on allowing 2 percent of HS6 tariff lines, alternative disciplines are worth considering. This is done here based on the political economy criterion set out in equation (4'''). Raising the number of sensitive products to 4 percent ("Sens 4") does not change the broad picture a great deal in terms of the tariffs applied against exports (Table 5). The extent of delivered liberalization is only slightly reduced, because sheltering just 2 percent of products is enough to greatly limit the reduction in average tariffs.

Scenarios "Sens 2-trade" and "Sens 4-trade" shed light on the importance of the way in which policy makers specify the share of products allowed sensitive product treatment. Under the "Sens 2" and "Sens 4" scenarios, this is done by limiting the percentage of tariff lines to 2 and 4 percent, respectively. Under "Sens 2-trade" and "Sens 4-trade," the criterion is shifted to 2 percent and 4 percent of imports. Scenario "Sens 2-trade" is found to result in a global reduction in average applied tariffs of 5.8 percent, compared to 3.1 percent under "Sens 2." As compared to the "No sens" scenario, allowing 2 percent of imports as sensitive products causes the reduction in world average tariffs to decline from 6 percent to 5.8 percent, with limited reductions seen in the resulting tariff cuts in most cases. This contrasts rather sharply with the dramatic and unpredictable reductions in disciplines associated with restricting the impact of sensitive products by restricting the number of tariff lines.

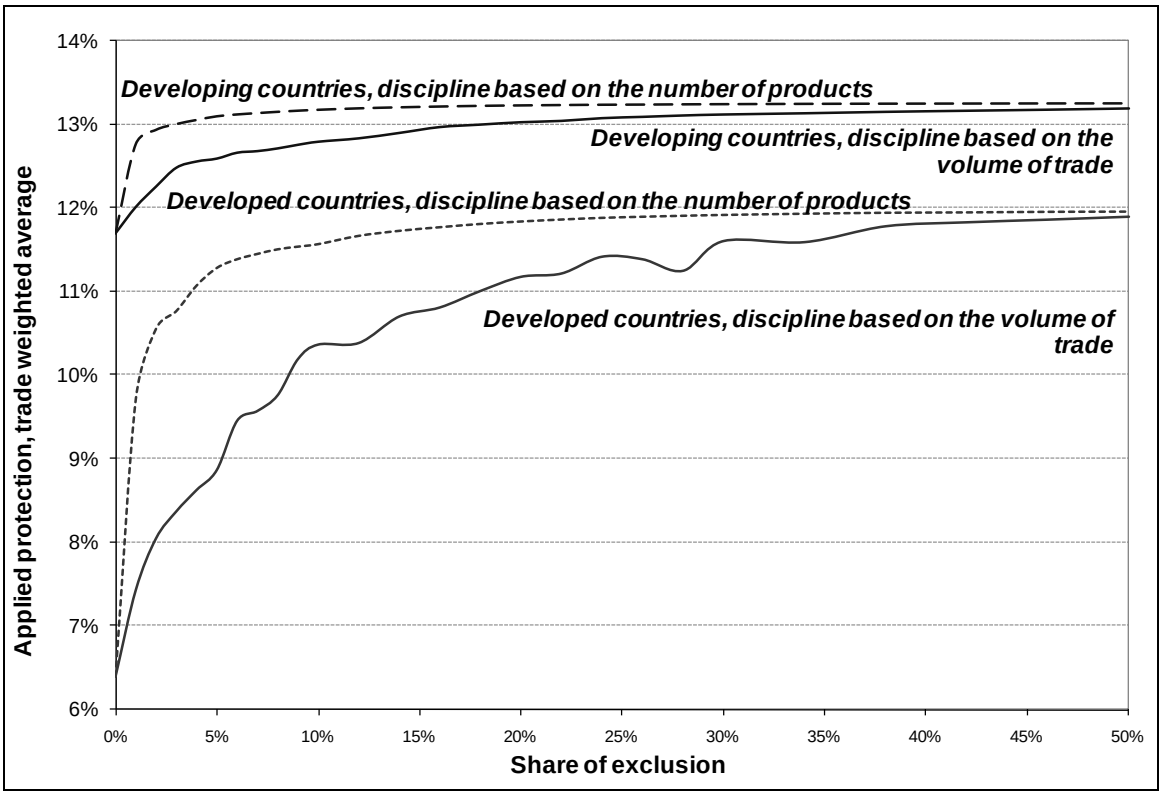
Comparing "Sens 2-trade" and "Sens 4-trade" shows that expanding the share of imports treated as sensitive to 4 percent diminishes the resulting discipline on market access: the world average agricultural tariff falls by 5.3 percent, rather than the 5.8 percent seen for "Sens 2-trade."

Figure 2 illustrates this in a more general way, by plotting the relationship between the number of sensitive products allowed and the average level of applied protection resulting from the application of the tiered formula. When the constraint is expressed in terms of number of products, the curve is indeed extremely steep near the y-axis: a very small share of sensitive products is enough to sweep out a significant part of the applied tariff cut. This is even clearer for developed countries than for developing countries. When defined as an import share, in contrast, the number of sensitive products has a far more gradual impact on tariff cuts. As far as developed countries are concerned, allowing 5% of initial imports to be defined as sensitive products reduces tariff cuts by approximately one fourth, while designating 10% of imports would reduce tariff cuts them by almost two-thirds.

While imports are also an imperfect criterion, since highly-restricted products are likely to have small imports, it seems clear that the deficiencies in using trade as a basis for allowing sensitive products are less serious than those associated with using the number of tariff lines as a criterion. There is an important underlying reason for this relatively better performance, in that external trade weights reflects the interests of the exporter rather than the political-economy interests that are responsible for protection in the importing country. In this sense, a trade-weighted average can be seen imposing a constraint akin to that imposed under the Mercantilist Trade Restrictiveness Index (Anderson and Neary 2003). If weakened disciplines associated with the type of "flexibility" envisaged through allowing sensitive products are to be permitted, it seems desirable to discipline them in terms of their impact on exporters' interests if a successful basis for negotiations is to be obtained.

When the number of tariff lines is used, a large and variable amount of trade can be sheltered from discipline. The results in "Sens 2" and "Sens 4" raise questions about whether a pure tariff-line criterion for sensitive products—especially with the 4-6 percent tariff lines now envisaged (WTO 2008)—will achieve the expansion of market access required in both the initial Doha Agenda (WTO 2001) and the subsequent negotiating Framework (WTO 2004). Use of a fraction of trade could potentially be made consistent with the focus on the number of tariff lines in the Framework Agreement. This would simply require defining that the number of tariff lines allowed as sensitive in each country is the number accounting for a specified volume of trade.

Figure 2. Average applied protection level resulting from the application of the tiered formula, depending on the criterion and threshold used to define sensitive products



Note: This graph plots the average applied protection level by group of non-LDC WTO member countries after application of the tiered formula. The share of sensitive products is reported on the x-axis based on the number of agricultural products or the share in import value.

An additional question of interest is whether the magnitude of the deviation from the formula matters. In the previous scenario, sensitive products were subjected to half the tariff cut implied by the formula; they are instead cut by two-thirds of the formula-driven cut in scenario "Sens 2-2/3," and by one-third in "Sens 2-1/3." These limited changes in the fraction of the formula cut applied to 2 percent of the products are enough to substantially modify the extent of liberalization. This is especially true for Japan and Korea, where the difference is spectacular. For industrial countries as a whole, applying one third of the formula cut to sensitive products lowers the cut in average applied rate to 3.5 percent, down from the 4.3 percent seen with the initial hypothesis of half the formula cut. On the other hand, raising the share of formula cut applied to sensitive products to two-thirds increases the cut in average applied rates to 5.3 percent. The difference is also significant in developing countries, particularly in relative terms (compare a 1.0 point cut under Sens 2-1/3 with the 1.5 points observed for Sens2-2/3). Beyond the question of scope, this shows that the depth of the flexibility allowed through sensitive product designation is also a potentially important question.

4. IMPLICATIONS FOR WELFARE AND MARKET ACCESS

The average tariff measures reported in Table 2 provide a broad—and widely understood—indication of the consequences of including flexibilities for economic welfare and market access. Clearly, when the cut in average tariffs falls from 6 percentage points to 3.1 percentage points after allowing 2 percent of tariff lines to be treated as sensitive, there is likely to be a dramatic reduction in the effectiveness of the reform. However, it is well known that the weighted average tariff is a flawed indicator of either the efficiency or market access impacts of reform. The weights on which the tariff is based are biased downwards for highly protected products, and vanish entirely for the most restricted products, i.e. those with prohibitive tariffs. As an indicator of the efficiency of a nation's trade regime, trade-weighted averages are doubly flawed in that they fail to recognize that the costs of individual tariffs rise with the square of the tariff, a fact that underlies the longstanding attention paid to the variance, as well as the mean, of a tariff regime.

Anderson and Neary (2007) propose an integrated treatment of the problems of aggregation and the implications of trade reforms for welfare and market access. Their results provide a rigorous link between the means and variances of the tariff (specifically, the generalized means and variances that reflect substitution relationships between goods) and key policy outcomes including economic welfare and market access. For the special model on which we have focused, in which the expenditure function over all goods (domestic and imported) takes the constant-elasticity of substitution form, and domestic and imported goods are imperfect substitutes, the needed measures of the economy-wide generalized mean and variance can be easily calculated.

Using these estimates of the generalized means and variances, we can assess the implications of the flexibilities considered in this paper for welfare in the importing countries, and for the market access available to their partners. A key finding of Anderson and Neary (2007) is that there are important differences in the impact of an increase in the variability of tariffs on welfare versus market access. Increases in the generalized variance of a tariff regime reduce welfare but will expand market access at a constant generalized mean. It seems likely that allowing designation of sensitive products will increase the variance of the trade regime. Some key questions for policy makers therefore arise: Will a policy of allowing sensitive products have a less adverse impact on partners' market access than it has on the welfare of the country using the flexibility? Furthermore, what are the magnitudes of these impacts?

As shown by Anderson and Neary (2007, p192), the domestic welfare effect of a trade reform that changes the generalized mean and variance of a tariff regime is given by

$$(\mu.\bar{s})^{-1} e_u du = -\bar{T} d\bar{T} - \frac{1}{2} dV \tag{7}$$

where μ is the shadow price of foreign exchange, which maps between compensation from outside the system and the value within the economy after income effects have influenced the cost of distortions;[10] e_u is the inverse of the marginal utility of income; $\bar{s}$ is a flexibility parameter related to the size of the elasticity of substitution; $\bar{T}$ is the generalized mean tariff; and V is the generalized tariff variance. In contrast, the impact on market access is given by:

$$\bar{s}^{-1} dM = -[1-(1-M_b)\bar{T}]d\bar{T} + \frac{1}{2}(1-M_b)dV \tag{8}$$

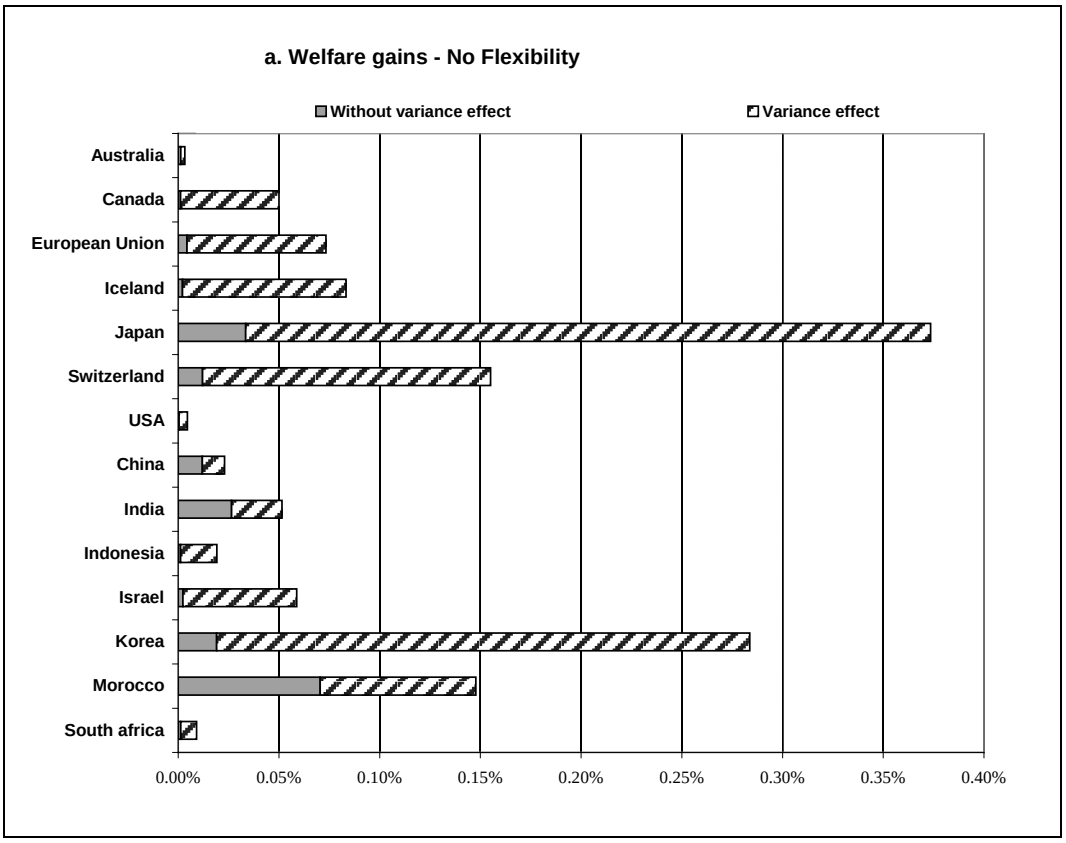
where M is the value of imports at world prices, and M_b is the marginal propensity to consume imports. Note that increases in the generalized variance expand market access, in contrast with their role in reducing welfare.

A key issue is the relative impact of changes in the mean and variance of tariffs for welfare and market access. For this, we focus on the right-hand sides of equations (7) and (8), since this decomposition is unaffected by the income effects contained in the shadow price of foreign exchange or the magnitude of the substitution effects contained in the flexibility parameter, $\bar{s}$. Figure 3 shows the

[10] See Anderson and Martin (2008) for a detailed treatment. For the purposes of this paper, it is probably best to focus on the external compensation, ignoring μ.

impact of using the tariff formula without exceptions on economic welfare, while Figure 4 shows the impact of the formula on market access. An important feature of Figure 3 is that, for most countries, and particularly in the industrial countries, most of the national efficiency gains from the formula arise from reductions in the variance of tariffs. This is because agricultural imports are typically a small subset of total imports, and agricultural tariffs are frequently much higher than other tariffs. When agricultural tariffs are reduced, the reduction in the overall average tariff is small, while the reduction in the variance of tariffs can be much larger. For economies such as Canada, the European Union, Japan, Switzerland, Israel and Korea, almost all of the gains from formula cuts come from reductions in the variance.

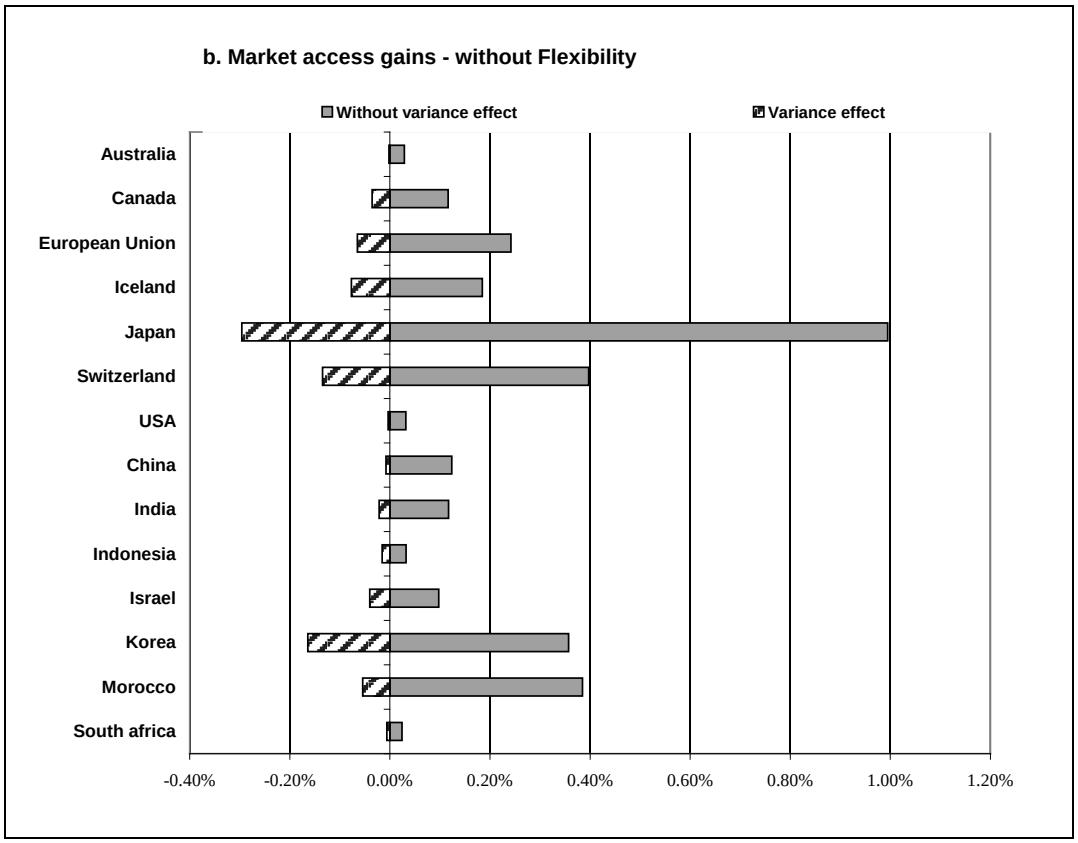
Figure 3. Welfare gains from the application of the tariff formula in agriculture



Note: These figures are based on equation 7 and show the welfare gains (in percent), with $(\mu.\bar{s})^{-1}e_u$ normalized to one.

Figure 4 shows that reductions in the average tariff are much more important for market access gains than for welfare. The market access gains in the graph are all due to the reductions in the average tariff. The reductions in the generalized variance of tariffs resulting from use of the formula actually reduce market access, since they imply reduction in tariffs on products with higher tariffs, but lower initial market shares.

Figure 4. Market access gains from application of the formula



Note: These are market access impacts (in percent) with the flexibility parameter, $\bar{s}^{-1}$, normalized to one.

When we turn to the impact of sensitive products on efficiency in Figure 5, we see that the resulting losses are almost entirely a consequence of the increase in the variance of the tariffs. This follows from the fact that relatively high tariffs are likely to be chosen as sensitive, and the costs associated with each tariff rise very rapidly. Figure 6 shows that market access losses associated with the exceptions for sensitive products are largely due to the increases in average tariffs following inclusion of sensitive products. The increase in the tariff variance offsets these losses of market access. In some countries, such as Japan and Korea, the increase in market access associated with the increase in the variance of tariffs is quite substantial relative to the loss associated with the increase in the mean.

These results, taken together, imply that it is important to look beyond average impacts when analyzing the impact of free trade on efficiency and market access. Reductions in tariffs resulting from the formula approach raise welfare both through the reduction in the generalized mean tariff and through reductions in the generalized variance. These results do not completely undermine the value of the sectoral tariff averages reported earlier in the paper, since the averages used for this calculation are economy-wide averages, rather than averages for the agricultural sector alone. However, they do reinforce the need to go beyond average impacts.

Figure 5. Welfare losses from inclusion of sensitive products, %

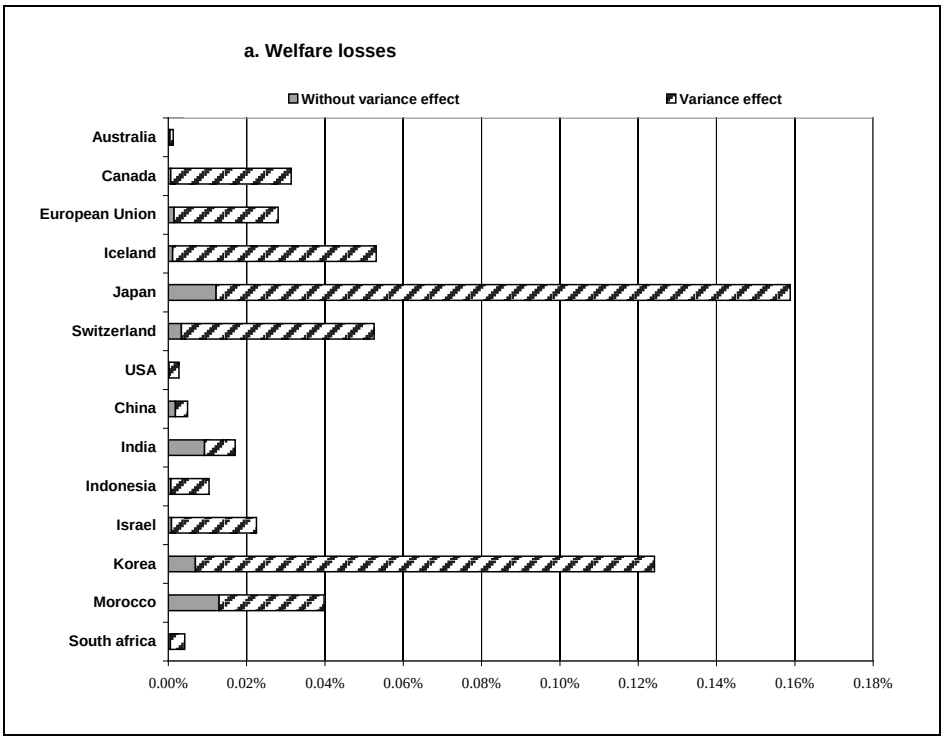
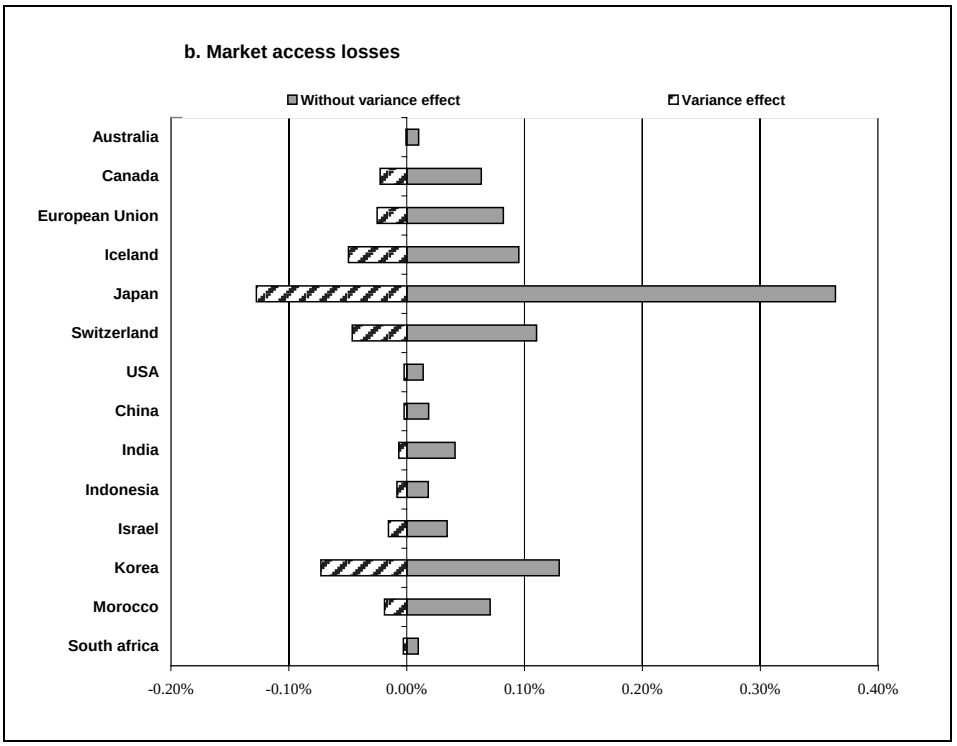


Figure 6. Market access losses from inclusion of sensitive products



5. CONCLUDING REMARKS

The sensitive-product exceptions in the current agricultural negotiations are widely seen as a minor deviation from the disciplines being discussed. However, we find that the discretion allowed for these products may greatly diminish the effect of the disciplines themselves. In fact, the way that the discretion for these sensitive products is used will likely be central in determining the actual outcome of formula-based negotiations for agricultural tariffs. A key problem is that in deciding whether to accept a proposed set of modalities for agreement, countries must make a prediction of the products that their partners will choose to treat as sensitive. Based on a carefully-developed theoretical framework, we show herein that the likely choices of these sensitive products can be predicted using a simple indicator based on the following: i) the value of the import at domestic prices; ii) the squared, proportional cut in the price of the import brought about by the formula; and iii) the extent to which sensitive product status reduces the size of this price cut.

We apply this model to the agricultural negotiations of the Doha Round, using our criterion to select sensitive products and assess their impacts on average tariffs, market access and welfare. Our approach is potentially applicable in a wide range of other contexts, such as *ex ante* proposals for regional and bilateral trade agreements.

A focus of the current WTO negotiations is on the number of products being allowed sensitive product treatment. We examine the effects of allowing an extremely small share of tariff lines (2 percent) and find that if these products are accorded relatively small tariff reductions, even this small number of tariff lines can have dramatic, adverse effects on the size of the tariff reductions achieved. With cuts equal to 50 percent of the formula, the cut in average industrial-country tariffs falls from 8.5 percent to 4.3 percent. Increasing the share of sensitive products to 4 percent reduces the cut in average tariffs only slightly more, to 3.8 percent.

Two standard rules of thumb frequently used to identify possible sensitive products hold that they are the products with the highest bound or applied duties. We find that these shortcuts severely understate the possible consequences of sensitive products because they overlook the trade weight of each product. The tariff revenue loss criterion used in our earlier work (Jean, Laborde and Martin 2006) appears to provide a better approximation of the results obtained with our political-economy framework at the aggregate level. In addition, we examine the potential impact of excluding “sin” tax commodities from the sensitive product group. While these products are prominent in the list defined as sensitive, particularly in developing countries, their exclusion appears to have relatively little impact on the resulting cuts in average tariffs.

One other finding is that the magnitude of the deviation from formula cuts allowed for sensitive products can matter a great deal, even when it is merely changed from half to two-thirds or one-third. This result suggests that the "depth" of flexibility is an important dimension, and appears more important than the much-discussed “breadth” in terms of the number of tariff lines covered.

A associated with allowing a certain number of tariff lines to be treated as sensitive is that this criterion does not take into account the importance of these tariff lines to the exporter. If the number of products is restricted on the basis of their share in total imports, we find a dramatic reduction in the loss of market access. With the tiered formula, the cut in average tariffs after allowing 2 percent of imports to be exempted is 5.8 percent, only 0.2 percentage points less than that seen in the absence of sensitive product designation.

Building on recent work by Anderson and Neary (2007), we examine the extent to which the exceptions considered in this paper adversely affect economic welfare in importing countries, as well as market access. In virtually all cases, both welfare and market access are reduced. However, since the exceptions increase the variance of tariffs relative to the formula outcome, their effects on economic welfare are much worse than their effects on market access. In this sense, the combination of steeply progressive tariff formulas and exceptions may be much more rational from a mercantilist point of view than when examined from the perspective of economic welfare and development. From this perspective, the apparent ability of these exceptions to divert the mercantilist horses of the WTO away from their underlying economic objective of pulling the welfare-increasing trade wagon is clearly an important source of concern.

REFERENCES

Anderson, J. and W. Martin. 2008. Costs of taxation and the benefits of public goods. Unprocessed, Boston College and World Bank.

Anderson, J. and P. Neary. 1992. Trade reform with quotas, partial rent retention and tariffs. *Econometrica* 60:57-76.

Anderson, J. and P. Neary. 2003. The mercantilist index of trade policy. *International Economic Review* 44(2):627-49.

Anderson, K. ed. 2008. *Distortions to Agricultural Incentives: A Global Perspective, 1955–2005*. Palgrave Macmillan and the World Bank, New York and Washington, D.C.

Anderson, J. and P. Neary. 2007. Welfare versus market access: the implications of tariff structure for tariff reform. *Journal of International Economics* 71:187–205.

Anderson, K., Y. Hayami et al. 1986. *The Political Economy of Agricultural Protection: East Asia* in International Perspective, Boston, London and Sydney: Allen and Unwin.

Bagwell, K. and R. Staiger. 2002. *The Economics of the World Trading System*. MIT Press, Cambridge.

Baldwin, R.E. 1986. Toward more efficient procedures for multilateral tariff negotiations. *Aussenwirtschaft* 41(Heft II/III):379-94.

Bchir, M., S. Jean, and D. Laborde. 2006. Binding overhang and tariff-cutting formulas. *Review of World Economics* 142(2):207-232.

Bouët, A., Y. Decreux, L. Fontagné, S. Jean, and D. Laborde. 2008. A consistent, *ad-valorem* equivalent measure of applied protection across the world: The MAcMap-HS6 database. *Review of International Economics.* Forthcoming.

Diewert, W. and T. Wales. 1988. A Normalized Quadratic Semiflexible functional form. *Journal of Econometrics* 37:327-342.

Dixon, P., B. Parmenter, J. Sutton, and D. Vincent, D. 1982. *ORANI: A Multisectoral Model of the Australian Economy.* Contributions to Economic Analysis 142, North Holland, Amsterdam.

Francois, J. and W. Martin. 2003. Formula approaches for market access negotiations. *The World Economy* 26 (1): 1-28.

Francois, J. and W. Martin. 2004. Commercial policy, bindings and market access. *European Economic Review* 48:665-79. June.

G-20. 2005. G-20 Proposal on market access. World Trade Organization, Geneva, 12 October, Mimeo, World Trade Organization.

G-33. 2006. Contribution on the proposed modalities for the designation and treatment of any agricultural product as a special product by any developing country member. World Trade Organization, Geneva, JOB (06)/189/Rev.1, 16 June.

de Gorter, H. and E. Kliauga. 2006. Reducing Tariffs versus Expanding Quotas in Liberalizing Agricultural Trade,' in Anderson, K. and Martin, W. eds. *Agricultural Trade Reform and the Doha Development Agenda*, Palgrave-Macmillan and the World Bank, New York and Washington D.C.

Grossman, G., and E. Helpman. 1994. Protection for sale. *American Economic Review* 84(4): 833-50. September.

Grossman, G., and E. Helpman. 1995. Trade wars and trade talks. *Journal of Political Economy* 103(4):675-708. August.

Hanoch, G. 1971, CRESH production functions. *Econometrica* 39:695-712. September.

Hanoch, G. 1975. Production and demand models with direct or indirect implicit additivity. *Econometrica* 43(3): 395-419, May.

Hathaway, D., and M. Ingco. 1996. Agricultural liberalization and the Uruguay Round. In *The Uruguay Round and the Developing Countries ed*, Martin, W. and Winters, L.A. eds. Cambridge and New York: Cambridge University Press.

Hillman, A. 1982. Declining industries and political support protectionist motives,' *American Economic Review* 72:1180-7 Dec.

Jean, S., D. Laborde, and W. Martin. 2006, Consequences of Alternative Formulas for Agricultural Tariff Cuts, In Anderson, K. and Martin, W. eds. *Agricultural Trade Reform and the Doha Development Agenda*, Palgrave-Macmillan and the World Bank, New York and Washington DC.

Kee, H., A. Nicita, A. and M. Olarreaga. 2006. Import demand elasticities and trade distortions. World Bank, October. Mimeo.

Laborde, D. 2007. Global overview of trade policies. *Lettre du CEPII*, 267, May.

Lindert, P. 1991. Historical patterns in agricultural policy. In C.P. Timmer ed. *Agriculture and the State*, Ithaca, NY: Cornell University Press.

Maggi, G. and A. Rodríguez-Clare. 2007. A political-economy theory of trade agreements. *American Economic Review* 97(4):1374-1406.

Martin, W. and Z. Wang. 2004, Improving Market Access in Agriculture. Mimeo, World Bank, Washington DC.

Martin, W. and L.A. Winters. 1996. *The Uruguay Round and the Developing Countries, Cambridge:* Cambridge University Press.

Mitra, D., D. Thomakos, and M. Ulubaşoğlu. 2002. Protection for sale" in a developing country: democracy vs. dictatorship. *Review of Economics and Statistics* 84(3): 497–508, August.

Neary, J.P. 1995. Trade liberalisation and shadow prices in the presence of tariffs and quotas. *International Economic Review* 36(3):531-554, Aug.

Sharma, R. 2006. Assessment of the Doha Round agricultural tariff cutting formulae. Paper prepared for the FAO workshop on WTO Rules for Agriculture Compatible with Development, 2-3 February 2006. Downloadable from http://www.faologe.ch/Tariff-cuts%20-%20Sharma%20-%20Jan%2006b.pdf

Smith, A. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*, Edinburgh.

Vanzetti, D., and R. Peters. 2007. Do sensitive products undermine ambition?' Mimeo, Australian National University and UNCTAD.

WTO. 2001. Ministerial Declaration: Adopted on 14 November 2001,' Ministerial Conference, Fourth Session, Doha, 9-14 November, WT/MIN (01)/DEC/1.

WTO. 2004. Doha Work Program: Decision Adopted by the General Council on 1 August 2004,' WT/L/579, Geneva: World Trade Organization, 2 August (the July Framework Agreement).

WTO. 2008. Revised draft modalities for agriculture, Committee on Agriculture, Special Session, World Trade Organization, Geneva, TN/AG/W/4/Rev.3, 10 July.

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