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### **ABSTRACT**

International disputes over subsidies are increasingly disrupting the world trading system. The creation of the WTO was nearly prevented by disputes in the Uruguay Round of GATT negotiations over the issue of negotiating disciplines on agricultural subsidies, an issue which continues to plague the ongoing Doha Round of WTO negotiations. Ongoing disputes over subsidies that violate existing WTO rules have led to the largest amount of authorized retaliation in GATT/WTO history. Yet the international rules that govern subsidies have received little attention in the form of systematic economic analysis. In this paper we provide a first formal analysis of the international rules that govern the use of subsidies to domestic production (as distinct from export subsidies). Our analysis highlights the impact of the new disciplines on subsidies that were added to GATT rules with the creation of the WTO. Our results suggest that, although GATT subsidy rules were typically viewed as weak and inadequate while the WTO subsidy rules are seen as representing a significant strengthening of multilateral disciplines on subsidies, the key changes introduced by the WTO subsidy rules may ultimately do more harm than good to the multilateral trading system, by undermining the ability of tariff negotiations to serve as the mechanism for expanding market access to more efficient levels.

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## I. Introduction

International disputes over domestic subsidies are increasingly disrupting the world trading system. The creation of the World Trade Organization (WTO) as a successor to GATT was nearly prevented by disputes in the Uruguay Round of GATT negotiations over the issue of negotiating disciplines on agricultural subsidies, an issue which continues to plague the ongoing Doha Round of WTO negotiations. And ongoing disputes over subsidies that violate existing WTO rules have led to the largest amount of authorized retaliation in GATT/WTO history. Yet despite their evident importance, the international rules that govern subsidies have received little attention in the form of systematic economic analysis.

Perhaps surprisingly, when viewed in the light shed by the existing theoretical literature on domestic subsidies in trading economies, the notion of international agreements that seek to limit the use of subsidies looks at one level immediately suspect. After all, a central message of the theory of distortions and welfare is the *targeting principle* (see Bhagwati and Ramaswami, 1963, and Johnson, 1965), under which the optimal intervention targets the affected margin directly. According to this principle, production subsidies are almost always a preferred policy instrument to tariffs. This is because a production subsidy distorts only one margin (i.e., producer decisions), and can therefore constitute a “first-best” instrument of intervention in the presence of production distortions, whereas it is well-understood that a tariff distorts *two* margins (i.e., producer *and* consumer decisions) and therefore almost never corresponds to first-best intervention. In this light, attempts to discipline the use of production subsidies appear misguided, if they simply redirect government interventions toward the use of “second-best” instruments of intervention such as tariffs.

Of course, tariffs themselves have long been the subject of international agreements, with tariff commitments comprising the traditional focus of GATT negotiations. And the concern that, if left unrestrained, the use of subsidies could thwart the impacts of negotiated tariff liberalization has been a long-standing motivation for the continuing attempts by GATT/WTO member governments to introduce “discipline” into the use of subsidies. But the subsidy disciplines that are increasingly leading to disputes are in many ways more constraining of governments than the tariff

commitments they negotiate within the GATT/WTO. At a basic level, this feature raises the concern that the search for effective subsidy disciplines may have gotten off track, since it is a feature that runs counter to what simple reliance on the targeting principle would suggest is warranted. In any event, to sort out these various concerns, what is needed is an analysis of the impacts of subsidy disciplines of various designs in a setting where governments may also negotiate over tariffs.

Elsewhere (Bagwell and Staiger, 2001a), we have examined the logic of GATT/WTO rules regarding the use of *export* subsidies. While GATT/WTO rules prohibit the use of export subsidies, we demonstrated there that it is difficult to interpret these rules as representing anything other than an inefficient victory of exporter interests over importer and world interests.<sup>1</sup> At a casual level, it might be thought that our export subsidy results should carry over to the case of production subsidies, and therefore that an independent analysis of the international rules governing production subsidies is not warranted. Export subsidies, however, are distinct from production subsidies, and it is well-known that the economic effects of the two forms of intervention are fundamentally different (export subsidies, like tariffs, distort both producer *and* consumer decisions). Hence, there is good reason to expect (as we confirm below) that our analysis of export subsidies bears little formal relation to an analysis of the international rules regarding subsidies to domestic production.

In the present paper, then, we provide a first formal analysis of the international rules that govern the use of subsidies to domestic production. Our analysis highlights the impact of the new disciplines on subsidies that were added to GATT rules with the creation of the WTO.<sup>2</sup> We work within a standard 2-country 2-good competitive general equilibrium trade model, augmented to include government choices of domestic production subsidies and also possibly domestic consumption taxes, in addition to tariffs. Our modeling of government objectives extends Bagwell and Staiger (1999) to allow for domestic production subsidies/consumption taxes, and is consistent

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<sup>1</sup>We provide an alternative interpretation in Bagwell and Staiger (1997), but this alternative arises only under very special circumstances.

<sup>2</sup>The WTO rules governing production subsidies are at the heart of the disagreements over agriculture that continue to plague the Doha Round, and individual subsidy disputes in the WTO frequently center on production (as opposed to export) subsidies as well.

with many possible underlying motives for the imposition of a production subsidy, including the pursuit of distributive goals in the presence of political economy motivations and the pursuit of allocative efficiency goals in the presence of local (i.e., not trans-border) non-pecuniary externalities. This is an important feature of the model, as the long history of GATT/WTO attempts to discipline domestic subsidies has taken place against the backdrop of explicit acknowledgment by member governments of the legitimate role of domestic subsidies in government policy programs.<sup>3</sup>

Within this economic environment, we first characterize the policy choices that attain points on the international efficiency frontier (defined with the objectives of each government), and follow Bagwell and Staiger (2001b) in interpreting the conditions that define these efficient points in terms of *market access*. Under this interpretation, international efficiency requires the attainment of appropriate levels of market access from each country (the “international” efficiency condition), and requires as well that each country deliver its market access level with an appropriate mix of policies (the “national” efficiency condition). We then characterize the non-cooperative Nash policy choices. Comparing the Nash policy choices to efficient policy choices, we show that the Nash policies are inefficient for a *single* reason: they deliver inefficiently low levels of domestic and foreign market access. This characterization of the Nash inefficiency allows in turn a succinct description of the “problem” that the GATT/WTO can solve, namely, how to enable its member-governments to reach efficient (higher) levels of market access, and thereby meet the international efficiency condition, without disrupting their national efficiency conditions.<sup>4</sup>

We next consider the possibility that governments might implement internationally efficient policy choices with negotiations over tariffs alone, when they face either of two distinct sets of “disciplines” on their unilateral choices of domestic subsidy/tax levels, one set corresponding to

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<sup>3</sup>For example, as Jackson (1989, p. 259) points out, the 1979 GATT Subsidies Code observes that domestic subsidies “...are widely used for the promotion of social and economic policy objectives,” and states that it is not the intent of the Code “...to restrict the right of signatories to use such subsidies to achieve these and other important policy objectives which they consider desirable.”

<sup>4</sup>Hence, at a broad level the fundamental “problem” faced by the GATT/WTO with regard to domestic subsidies is analogous to that identified in Bagwell and Staiger (2001b) for the case of domestic standards.

GATT subsidy rules and the other corresponding to WTO subsidy rules. In this way, we seek first to identify “weaknesses” in GATT subsidy disciplines that might prevent governments from reaching the international efficiency frontier under GATT tariff negotiations, and then to gauge the degree to which WTO subsidy rules might be seen as marking an improvement.

To represent the key features of GATT subsidy rules, we highlight the two central mechanisms by which a government could respond to the subsidies of a trading partner prior to the creation of the WTO: “countervailing duty” (CVD) measures, and “non-violation nullification-or-impairment” (NVNI) complaints. More specifically, if the subsidy was offered to exporting producers, then a government whose import-competing producers experienced material injury on account of the subsidy (and whose import tariff on that product was legally bound in a GATT agreement) could unilaterally impose a CVD against the subsidized imports. If the subsidy was instead offered to import-competing producers, then a government that had previously negotiated a tariff binding on that product with the subsidizing government would have a legitimate basis for making an NVNI claim concerning its market access rights, under which the subsidizing government would then be expected to make a policy adjustment that returned market access to its original level (though the government would be under no obligation to remove the subsidy).

A central question is whether governments have available a sufficiently rich set of domestic instruments that they enjoy a degree of *policy redundancy* which can be exploited under tariff negotiations. In particular, as is well known, the effects of a tariff can be duplicated by a combination production subsidy/consumption tax, and so a government that has access to tariffs as well as a full set of production subsidies and consumption taxes enjoys a degree of policy redundancy. Assuming that this rich set of domestic instruments is available, we show that GATT subsidy rules are sufficient to ensure that an internationally efficient policy combination will be implemented under GATT tariff negotiations. Moreover, we find that efficiency under GATT tariff negotiations is attained even when responding to subsidies under GATT rules is allowed to be quite costly. Intuitively, governments can position tariffs in their negotiations so as to imply a level of market access which yields an NVNI “trigger point” – a point beyond which further erosion of one

country's market access level would warrant initiation of a costly NVNI claim by its trading partner in order to reinstate the negotiated market access level – set equal to the efficient level of market access. Subsequent to these negotiations, the level of market access is then allowed to “slip” back to this trigger point through the unilateral choice of domestic subsidy and tax policies – and the redundancy of policy instruments ensures that the national efficiency condition is not disrupted in the process – but the threat of NVNI beyond this point keeps market access levels from falling below their efficient levels.

We turn next to the WTO subsidy rules, the main features of which are reflected in the Agreement on Subsidies and Countervailing Measures (SCM). When applied within the context of our model, we argue that the key innovation of the SCM Agreement relative to GATT subsidy rules is that, in addition to its rights under the GATT subsidy rules, any government now has the added right to challenge – and, in principle, force the removal of – any positive subsidy. Maintaining our assumption that governments have sufficient instruments to enjoy a degree of policy redundancy, an implication of our finding regarding the efficiency of GATT subsidy rules is of course that the subsidy rules of the WTO cannot possibly mark an improvement in this setting. Still, it might be conjectured that the WTO subsidy rules, in providing governments with the ability to challenge and remove a domestic instrument (subsidy) which is in any event redundant, will at least do no harm. We show, however, that this conjecture is incorrect: a range of efficient outcomes that were attainable under GATT subsidy rules are unattainable under the subsidy rules of the WTO. Intuitively, the redundancy of policy instruments is *utilized* to achieve efficient outcomes through tariff negotiations under the institutional constraints of the GATT subsidy rules, and by introducing the potential that this redundancy will be removed, the WTO subsidy rules interfere with the ability of governments to structure their tariff negotiations so as to achieve efficient policy combinations.

Finally, we consider a world in which the only domestic instrument is a production subsidy, and so the policy redundancy featured above does not arise. Because it simply eliminates redundancy, this instrument restriction, of course, does not alter the welfare combinations that correspond to the efficiency frontier, nor does it alter the Nash welfare levels. But as we

demonstrate, the elimination of policy redundancy has a number of important implications for the efficiency properties of negotiated tariff outcomes under GATT and WTO subsidy rules.

First, as can be anticipated from our description just above, in this limited-instrument world, the lack of policy redundancy interferes with the ability of governments to attain the efficiency frontier under GATT subsidy rules. In fact, if NVNI claims are costly, the lack of policy redundancy in this limited-instrument world prevents governments from attaining *any* point on the efficiency frontier under GATT subsidy rules, so that tariff negotiations under GATT subsidy rules are sure to lead to policy outcomes that are internationally inefficient.

Second, the fact that the outcome of tariff negotiations under GATT subsidy rules is sure to be internationally inefficient in this environment raises at least the possibility that WTO subsidy rules could then mark an improvement, and we show that this is indeed the case provided that the use of subsidies is of sufficiently minor importance on the efficiency frontier. In effect, if domestic subsidies have no legitimate reason to exist in an internationally efficient policy environment, then, by allowing these subsidies to be challenged and removed, the “more effective” discipline introduced under the WTO SCM Agreement is sure to be efficiency enhancing relative to the weaker subsidy disciplines embodied in GATT rules in a limited-instrument costly-NVNI environment. We observe, however, that these circumstances are strikingly at odds with the views expressed by GATT/WTO member governments concerning the legitimate role of subsidies in the pursuit of important public policy objectives (see note 3).

And third, we show that if the legitimate role for domestic subsidies is sufficiently pronounced, WTO subsidy rules can be seen to mark a “step backward” relative to GATT subsidy rules in a limited-instrument costly-NVNI world. In particular, we demonstrate that, at least in the case where the domestic government seeks to intervene on behalf of its import-competing producers, if the role for subsidies is sufficiently pronounced, then the WTO subsidy rules will *completely undermine* the ability of tariff negotiations to serve as the mechanism for expanding market access to more efficient levels, and governments will be resigned to their Nash payoffs. Intuitively, if

governments consider the use of domestic subsidies to be sufficiently vital in their pursuit of policy goals, they may be less inclined to negotiate tariff commitments under the subsidy rules of the WTO, since such commitments may increase the likelihood that their subsidies will be challenged under the SCM Agreement. In this way, the SCM Agreement may have a “chilling” effect on the desire of governments to take on further market access commitments through WTO negotiations.

When taken together, our results signal a note of caution about the direction in which the WTO is moving on the issue of domestic subsidies. GATT subsidy rules were typically viewed as weak and inadequate, while the WTO subsidy rules are seen as representing a significant strengthening of multilateral disciplines on subsidies. However, our results indicate that the key changes introduced by the WTO subsidy rules may ultimately do more harm than good to the multilateral trading system, by undermining the ability of tariff negotiations to serve as the mechanism for expanding market access to more efficient levels.

The rest of the paper proceeds as follows. Section II develops the model, and characterizes the efficient and Nash policies, and describes the GATT/WTO bargaining frontier. Section III evaluates the efficiency properties of the GATT subsidy rules, while section IV considers the WTO subsidy rules. Section V turns to a world of limited instruments, and re-evaluates the performance of GATT and WTO subsidy rules in this environment. Section VI offers a brief conclusion.

## **II. The Model**

Our starting point is the 2-country 2-good competitive general equilibrium trade model adapted to allow for the possibility of both tariff and production subsidy/consumption tax choices. To establish our main points simply, we introduce non-trade policies into the home country only, so that the home government may choose both a tariff level and a level for its production subsidy and its consumption tax, while the foreign government has only a tariff choice to make.

### **II.1: The Basic Trade Model**

We assume that the home country exports good  $y$  to the foreign country in exchange for

imports of good  $x$ . The home government can impose a tariff on imports of good  $x$ , and it can also choose to offer a domestic subsidy/tax to local producers of good  $x$  and possibly as well to tax/subsidize the local consumption of good  $x$ . In the home country, then, we must distinguish between local consumer prices (inclusive of the consumption tax/subsidy) and local producer prices (inclusive of the production tax/subsidy). As only the price of  $x$  relative to the price of  $y$  matters in our general equilibrium setting, it is immaterial whether these policy interventions take place in the import-competing sector or the export sector, and we concentrate all interventions in the import-competing sector. We assume that the foreign government has simply an import tariff at its disposal, and so a common set of prices is faced by both producers and consumers in the foreign country.

Beginning with the home country, let  $s$  denote one plus the ad valorem production subsidy offered to producers of good  $x$  in the home country (so that  $s > 1$  ( $s < 1$ ) reflects a production subsidy (tax)), and similarly let  $t$  denote one plus the ad valorem consumption tax imposed on consumption of good  $x$  in the home country (so that  $t > 1$  ( $t < 1$ ) reflects a consumption tax (subsidy)). We denote the domestic producer price of good  $x$  (inclusive of the producer tax/subsidy) by  $q_x$  and the domestic consumer price of good  $x$  (inclusive of the consumer tax/subsidy) by  $p_x$ . The domestic (producer and consumer) price of good  $y$  is denoted by  $p_y$ , with the ratio of domestic producer and consumer prices then given by  $q = q_x/p_y$  and  $p = p_x/p_y$ , respectively. The relationship between the domestic relative price faced by domestic producers and that faced by domestic consumers is given by  $q = [s/t]p$ . Finally, let  $\tau$  denote one plus the ad valorem tariff imposed on imports of good  $x$  into the home country (so that  $\tau > 1$  ( $\tau < 1$ ) reflects an import tax (subsidy)). All net (positive or negative) revenues generated by these instruments are distributed lump sum across domestic consumers.

Turning to the foreign country, our assumption that the foreign government has only a tariff at its disposal simplifies the description of the foreign economy. Let  $\tau^*$  denote one plus the ad valorem tariff imposed on imports of good  $y$  into the foreign country (so that  $\tau^* > 1$  ( $\tau^* < 1$ ) reflects an import tax (subsidy)), where here and throughout “\*” is used to denote foreign variables. We

denote the local (consumer and producer) price of good  $x$  relative to good  $y$  in the foreign country by  $p^*$ . All net (positive or negative) tax revenues from the use of the foreign tariff are distributed lump sum across foreign consumers.

Finally, the relative “world price” (i.e., the relative exporter price  $p_x^*/p_y$  or terms of trade) is denoted by  $p^w$ . Under the maintained assumption that tariffs are non-prohibitive, international arbitrage links each country’s local prices to the world price in light of its tariff according to  $q = s\tau p^w \equiv q(s, \tau, p^w)$ ,  $p = t\tau p^w \equiv p(t, \tau, p^w)$  and  $p^* = p^w/\tau^* \equiv p^*(\tau^*, p^w)$ .<sup>5</sup>

The foreign import demand and export supply functions may be written as functions of the local relative price in the foreign country and the world price, and we denote these functions by  $M^*(p^*, p^w)$  and  $E^*(p^*, p^w)$ , respectively. In an analogous fashion, the home-country import demand and export supply functions may be written as functions of the local relative producer price  $q$  and consumer price  $p$  in the home country and the world price  $p^w$ . We denote these functions as  $M(q, p, p^w)$  and  $E(q, p, p^w)$ , respectively. With the relevant functions defined, the home and foreign budget constraints may then be written as

$$(1) \quad p^w M(q, p, p^w) = E(q, p, p^w),$$

$$(2) \quad M^*(p^*, p^w) = p^w E^*(p^*, p^w).$$

The equilibrium world price,  $\tilde{p}^w(s, t, \tau, \tau^*)$ , is determined by the requirement of market clearing for good  $x$ ,

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<sup>5</sup>In the domestic country, for example, international arbitrage implies that the before-tax price of good  $x$  faced by domestic consumers,  $p_x/t$ , is equal to  $\tau p_x^*$ , the before-tax price of an imported unit of good  $x$ . This implies that  $p/t = \tau p^w$ , or  $p = t\tau p^w$  as stated in the text. Domestic producers of good  $x$  must meet the competition for domestic consumers from foreign suppliers, and so the before-subsidy price collected by domestic producers of good  $x$ ,  $q_x/s$ , must by international arbitrage be equal to  $\tau p_x^*$ , which implies  $q/s = \tau p^w$  or  $q = s\tau p^w$ , as stated in the text.

$$(3) \quad M(q(s, \tau, \tilde{p}^w), p(t, \tau, \tilde{p}^w), \tilde{p}^w) = E^*(p^*(\tau^*, \tilde{p}^w), \tilde{p}^w),$$

where we have made explicit the dependence of the local producer prices (consumer prices) on the producer subsidy (consumption tax) and tariffs and the world prices. Market clearing for good  $y$  is then implied by (1), (2) and (3).

Using the market-clearing condition (3), it may be confirmed that

$$(4) \quad \tau \frac{\partial \tilde{p}^w}{\partial \tau} = s \frac{\partial \tilde{p}^w}{\partial s} + t \frac{\partial \tilde{p}^w}{\partial t}.$$

In words, a given percentage increase in the tariff has the same impact on the market-clearing world price as does a combined increase in both the production subsidy and consumption tax by that same percentage. This, of course, reflects the basic equivalence between a tariff and a combination production subsidy/consumption tax.

We assume that the Marshall-Lerner stability conditions are met, so that an inward shift of the domestic (foreign) import demand curve results in a lower (higher) equilibrium world price. We also assume that Metzler/Lerner-type Paradoxes are ruled out, so that  $dq/d\tau = [s/t]dp/d\tau > 0 > dp^*/d\tau^*$ ,  $\partial \tilde{p}^w/\partial \tau < 0 < \partial \tilde{p}^w/\partial \tau^*$ ,  $\partial \tilde{p}^w/\partial s < 0$  and  $\partial \tilde{p}^w/\partial t < 0$ .

Finally, we represent the objectives of the home and foreign governments with the general functions  $W(q, p, \tilde{p}^w)$  and  $W^*(p^*, \tilde{p}^w)$ , respectively. We assume that, holding its local prices fixed, each government would prefer an improvement in its terms of trade:

$$(5) \quad W_{\tilde{p}^w}(q, p, \tilde{p}^w) < 0 \text{ and } W_{\tilde{p}^w}^*(p^*, \tilde{p}^w) > 0 .$$

According to (5), governments like transfers of revenue from their trading partners. We place no other restrictions on the objectives of each government, although implicitly our representation of government objectives rules out non-pecuniary trans-border externalities that could interact with the

choice of tariffs or production subsidies/consumption taxes.<sup>6</sup>

As we do not place restrictions on how a government feels about changes in its local prices, our representation of government preferences is very general, and is consistent with formal models of government policy determination in a wide variety of settings (see Bagwell and Staiger, 1999, for a discussion of this in the context of tariff determination). Of particular relevance for the present discussion is the fact that our model is consistent with many possible underlying motives for the imposition of a production subsidy in the home country, including the pursuit of distributive goals in the presence of political economy motivations and the pursuit of allocative efficiency goals in the presence of local (i.e., not trans-border) non-pecuniary externalities. As we observed in the Introduction (see especially note 3), this is an important feature of the model, as the long history of GATT/WTO attempts to discipline domestic subsidies has taken place against the backdrop of explicit acknowledgment by member governments of the legitimate role of domestic subsidies in government policy programs.

## II.2: Efficient Policies

We now define the *international efficiency frontier*. To this end, let  $\hat{W}^*$  denote any feasible level of foreign welfare, i.e, any level of  $\hat{W}^*$  for which there exists some  $(s, t, \tau, \tau^*)$  such that  $W^*(p^*(\tau^*, \tilde{p}^w(s, t, \tau, \tau^*)), \tilde{p}^w(s, t, \tau, \tau^*)) = \hat{W}^*$ . We define the international efficiency frontier by the combinations of  $(s, t, \tau, \tau^*)$  which, for each  $\hat{W}^*$ , solve:

$$\begin{aligned} \text{Max}_{s, t, \tau, \tau^*} \quad & W(q(s, \tau, \tilde{p}^w(s, t, \tau, \tau^*)), p(t, \tau, \tilde{p}^w(s, t, \tau, \tau^*)), \tilde{p}^w(s, t, \tau, \tau^*)) \\ \text{s.t.} \quad & W^*(p^*(\tau^*, \tilde{p}^w(s, t, \tau, \tau^*)), \tilde{p}^w(s, t, \tau, \tau^*)) \geq \hat{W}^* . \end{aligned}$$

Notice that the international efficiency frontier is defined with respect to the governments' own objective functions which, as we have observed above, may include political economy

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<sup>6</sup>We also assume throughout that these objective functions are everywhere differentiable and globally concave in the policy variables.

considerations. In what follows we evaluate various approaches to the treatment of subsidies in international trade agreements on the basis of whether these approaches allow governments to achieve a position on the international efficiency frontier so defined. As we discuss more broadly in Bagwell and Staiger (2002), this seems appropriate in the context of the GATT/WTO, as the GATT/WTO is an organization that facilitates the negotiation of trading arrangements that are mutually beneficial to its members (i.e., the member governments).<sup>7</sup>

After some manipulation, and utilizing (4), the first-order conditions that define the international efficiency frontier can be written as:

$$(6) \quad W_q \left[ \tau \frac{\partial \tilde{p}^w}{\partial \tau} - s \frac{\partial \tilde{p}^w}{\partial s} \right] = W_p \left[ t \frac{\partial \tilde{p}^w}{\partial s} \right],$$

$$(7) \quad \left[ 1 - A \left( \frac{s}{t} W_q + W_p \right) \right] [1 - A^* W_p^*] = 1, \text{ and}$$

$W^*(p^*(\tau^*, \tilde{p}^w(s, t, \tau, \tau^*)), \tilde{p}^w(s, t, \tau, \tau^*)) = \hat{W}^*$ , where

$$A \equiv \frac{(1 - \lambda t \tau)}{\left[ \left( \frac{s}{t} W_q + W_p \right) + \lambda W_{\tilde{p}^w} \right]}; \quad A^* \equiv \frac{(1 - \lambda^* / \tau^*)}{[W_p^* + \lambda^* W_{\tilde{p}^w}^*]}; \quad \lambda \equiv \frac{\partial \tilde{p}^w / \partial \tau}{dp / d\tau}; \quad \text{and} \quad \lambda^* \equiv \frac{\partial \tilde{p}^w / \partial \tau^*}{dp^* / d\tau^*}.$$

To interpret these efficiency conditions, we follow Bagwell and Staiger (2001b) and define the *market access* that a country provides to its trading partner by the volume of imports it would accept at a particular world price. This definition conforms to the notion of market access in the GATT/WTO, and it is therefore useful in building a bridge between negotiated outcomes in the

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<sup>7</sup>This is not to say that international subsidy agreements could not be evaluated on the basis of some alternative criterion. For example, a natural possibility would be to consider the potential role of subsidy agreements in allowing each government to make policy commitments with regard to its own private sector. In that case, international subsidy agreements might be valuable to governments as a way of altering their interactions with their own citizens, rather than as a way of altering their interactions with other governments as is the case in our analysis here. For a broader discussion of these two approaches to understanding the role of international trade agreements more generally, see Bagwell and Staiger (2002).

GATT/WTO and the formal conditions for international efficiency presented above.<sup>8</sup> Hence, for a particular world price  $\hat{p}^w$ , the market access that the domestic country provides to the foreign country under the domestic policy choices  $(s, t, \tau)$  is given by  $M(q(s, \tau, \hat{p}^w), p(t, \tau, \hat{p}^w), \hat{p}^w)$ . Similarly, for a particular world price  $\hat{p}^w$ , the market access that the foreign country provides to the domestic country under the foreign tariff choice  $\tau^*$  is given by  $M^*(p^*(\tau^*, \hat{p}^w), \hat{p}^w)$ .

With domestic and foreign market access defined, we may now interpret the efficiency conditions (6)-(7). If the domestic market access is evaluated at the market-clearing world price  $\hat{p}^w$ , then, by the market-clearing condition (3), changes in domestic policies will preserve the market-clearing world price if and only if they preserve domestic market access (evaluated at that market-clearing world price). Condition (6), then, may be interpreted as the domestic *national* efficiency condition, since it requires the domestic government to be indifferent to small changes in  $\tau$  and  $s$  which preserve the level of market access (evaluated at  $\hat{p}^w$ ) that it provides to the foreign country.<sup>9</sup> Condition (7) may then be interpreted as the *international* efficiency condition which ensures that the levels of domestic and foreign market access evaluated at  $\hat{p}^w$ , and hence the equilibrium trade volumes, are efficient.

We next observe that, if the policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  satisfies efficiency conditions

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<sup>8</sup>For example, Petersmann (1997, p. 168) quotes a GATT Panel report describing the nature of the market access commitments negotiated by member governments (“contracting parties”): “[T]he main value of a tariff concession is that it provides an assurance of better market access through improved price competition. Contracting parties...base their tariff negotiations on the expectation that the price effect of the tariff concessions will not be systematically offset.” GATT Panels have made a clear distinction between market access and export volume (Petersmann, 1997, p. 141), noting that market access refers to the “conditions of competition” between imported and domestic products. This is reflected in our formal definition of market access above by evaluating import volume at a particular world (i.e., exporter) price. We may think of the conditions of competition between imported and domestic products as remaining stable as long as a particular exporter price would continue to bring forth the same volume of import demand.

<sup>9</sup>To see this, note that changes in  $\tau$  and  $s$  which preserve the level of market access, evaluated at  $\hat{p}^w$ , that the domestic country affords to the foreign country – and hence which fix the market-clearing world price – must satisfy the condition  $d\tau/ds = (-\partial\hat{p}^w/\partial s)/(\partial\hat{p}^w/\partial\tau)$ . Efficiency requires that the domestic government must be indifferent to such changes, or that  $W_q[\tau + s(-\partial\hat{p}^w/\partial s)/(\partial\hat{p}^w/\partial\tau)] + W_p[t(-\partial\hat{p}^w/\partial s)/(\partial\hat{p}^w/\partial\tau)] = 0$ , which yields (6).

(6) and (7) and delivers  $W^*(p^*(\tau^E, \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})), \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})) = \hat{W}^*$ , then so too does the policy combination  $(s^E/\alpha, t^E/\alpha, \alpha\tau^E, \tau^{*E})$  for any  $\alpha > 0$ . By the market-clearing condition (3) and the definitions of  $q(s, \tau, p^w)$ ,  $p(t, \tau, p^w)$  and  $p^*(\tau^*, p^w)$ , these changes leave all (local and world) prices unaffected, and therefore leave government welfare levels unaffected as well. The national efficiency condition can then be seen to continue to hold at the new policy combination by substituting (4) into (6), while the international efficiency condition can be seen to continue to hold by inspection of (7) and the definition of  $A$  and  $A^*$ . Setting  $\alpha$  equal to  $s^E$ ,  $t^E$  or  $1/\tau^E$  then confirms that the domestic government possesses one *redundant* policy instrument: any one domestic instrument can be set at an arbitrary level (e.g., laissez faire), and the remaining two domestic instruments can be used in combination with the foreign tariff to achieve any efficient outcome that is feasible when all instruments are freely chosen. This again reflects the basic equivalence between a tariff and a combination production subsidy/consumption tax.

### II.3: Nash Policies

We now characterize the Nash policy choices of the two governments. To this end, we first describe the best-response policy choices of the domestic government, given any foreign tariff  $\tau^*$ , which we denote by  $(s^R(\tau^*), t^R(\tau^*), \tau^R(\tau^*))$ . The domestic government's best-response policy choices solve:

$$\text{Max}_{s, t, \tau} W(q(s, \tau, \tilde{p}^w(s, t, \tau, \tau^*)), p(t, \tau, \tilde{p}^w(s, t, \tau, \tau^*)), \tilde{p}^w(s, t, \tau, \tau^*)).$$

The associated first-order conditions are:

$$(8a) \quad \tau \tilde{p}^w W_q + [s\tau W_q + t\tau W_p + W_{\tilde{p}^w}] \frac{\partial \tilde{p}^w}{\partial s} = 0,$$

$$(8b) \quad \tau \tilde{p}^w W_p + [s\tau W_q + t\tau W_p + W_{\tilde{p}^w}] \frac{\partial \tilde{p}^w}{\partial t} = 0, \text{ and}$$

$$(8c) \quad s\tilde{p}^w W_q + t\tilde{p}^w W_p + [s\tau W_q + t\tau W_p + W_{\tilde{p}^w}] \frac{\partial \tilde{p}^w}{\partial \tau} = 0.$$

Using (4), it may be established that, if the three instruments are chosen to satisfy any two of (8a)-(8c), then the remaining first-order condition is automatically satisfied, reflecting again the basic equivalence between a tariff and a combination production subsidy/consumption tax. As a consequence, we may characterize the domestic government's best-response policies as corresponding to any triple  $(s^R(\tau^*), t^R(\tau^*), \tau^R(\tau^*))$  satisfying

$$(9) \quad \tau \tilde{p}^w W_q + [s\tau W_q + t\tau W_p + W_{\tilde{p}^w}] \frac{\partial \tilde{p}^w}{\partial s} = 0, \text{ and}$$

$$(10) \quad s \tilde{p}^w W_q + t \tilde{p}^w W_p + [s\tau W_q + t\tau W_p + W_{\tilde{p}^w}] \frac{\partial \tilde{p}^w}{\partial \tau} = 0.$$

Likewise, the best-response tariff choice of the foreign government, given any domestic policies  $(s, t, \tau)$ , which we denote by  $\tau^* R(s, t, \tau)$ , solves

$$\text{Max}_{\tau^*} \quad W^*(p^*(\tau^*, \tilde{p}^w(s, t, \tau, \tau^*)), \tilde{p}^w(s, t, \tau, \tau^*)).$$

The associated first-order condition is:

$$(11) \quad W_{p^*}^* + \lambda^* W_{\tilde{p}^w}^* = 0.$$

The set of Nash policy choices  $(s^N, t^N, \tau^N, \tau^{*N})$  are then the joint solutions to (9)-(11). Comparing (9)-(11) to the efficiency conditions (6)-(7), it may be confirmed that Nash policy choices satisfy the domestic national efficiency condition – that is, (9)-(10) imply (6) – but violate the international efficiency condition – that is, (9)-(11) violate (7). Therefore, the Nash policies are inefficient for a *single* reason: they deliver inefficiently low levels of domestic and foreign market access (see Bagwell and Staiger, 2001b, for a fuller development of this interpretation). This characterization of the Nash inefficiency allows in turn a succinct description of the “problem” that the GATT/WTO can solve, namely, how to enable its member-governments to reach efficient (higher) levels of market access, and thereby meet the international efficiency condition, without disrupting their national efficiency conditions.

#### II.4: The GATT/WTO Bargaining Frontier

In what follows we restrict attention to points on the international efficiency frontier at which, with its trading partner's policies fixed, each government would like to raise its own tariff. This restricted attention seems appropriate given our focus on the GATT/WTO, where governments evidently view their own tariff reductions as “concessions” to be offered only in exchange for something of value (such as concessions of a reciprocal nature) from their trading partners. Formally, we state this condition as:

$$(A1) \quad dW/d\tau > 0; \quad dW^*/d\tau^* > 0.$$

In subsequent sections, when we ask whether various negotiating games can deliver efficient outcomes, we will restrict attention to efficient outcomes which satisfy (A1).

Points on the efficiency frontier that satisfy (A1) exhibit as well two additional properties that will prove useful for our analysis, and so we record these properties in a pair of lemmas. To establish the first property, we begin by observing that, at efficient points satisfying (A1), we cannot have  $dW/d\tau^* > 0$  or  $dW^*/d\tau > 0$ : otherwise, governments would agree on the direction of movement in a tariff which each would strictly prefer, and the initial policies could not then be efficient. Moreover, as efficiency requires the tangency condition

$$\frac{d\tau}{d\tau^*} \Big|_{dW=0} = \frac{-dW/d\tau^*}{dW/d\tau} = \frac{-dW^*/d\tau^*}{dW^*/d\tau} = \frac{d\tau}{d\tau^*} \Big|_{dW^*=0},$$

at efficient points satisfying (A1), we cannot have  $dW/d\tau^* = 0$  or  $dW^*/d\tau = 0$ . Therefore, any efficient policy combination that satisfies (A1) must also satisfy

$$dW/d\tau^* < 0; \quad dW^*/d\tau < 0.$$

In addition, notice that  $dW^*/d\tau = [(1/\tau^*)W_p^* + W_{\tilde{p}^w}^*]\partial\tilde{p}^w/\partial\tau$ , and so with  $\partial\tilde{p}^w/\partial\tau < 0$  it follows that  $dW^*/d\tau < 0$  implies  $[(1/\tau^*)W_p^* + W_{\tilde{p}^w}^*] > 0$ . As a consequence, beginning from an efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  that satisfies (A1), any set of small changes in the policies of the

domestic government  $(s, t, \tau)$  that reduce  $\tilde{p}^w$  from its implied level  $\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$  will reduce the welfare of the foreign government. Under our global concavity assumption, we may therefore record:

**Lemma 1:** Let  $(s^E, t^E, \tau^E, \tau^{*E})$  denote an efficient policy combination that satisfies (A1), and let  $\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$ . Then it follows that  $W^*(p^*(\tau^{*E}, \tilde{p}^{w/}), \tilde{p}^{w/}) < W^*(p^*(\tau^{*E}, \tilde{p}^{wE}), \tilde{p}^{wE})$  for any  $\tilde{p}^{w/} < \tilde{p}^{wE}$ .

To establish the second property of efficient points implied by (A1), we use (4) and efficiency condition (6) to derive that, on the efficiency frontier:

$$\frac{dW}{ds} + \frac{dW}{dt} \left[ -\frac{\partial \tilde{p}^w / \partial s}{\partial \tilde{p}^w / \partial t} \right] = 0,$$

which says that the domestic government must be indifferent to small changes in  $s$  and  $t$  that preserve the market-clearing world price  $\tilde{p}^w$ . An implication is that, with  $\partial \tilde{p}^w / \partial s < 0$  and  $\partial \tilde{p}^w / \partial t < 0$ , starting from any point on the efficiency frontier  $sign(dW/ds) = sign(dW/dt)$ . But by (4), we also have that

$$\frac{dW}{d\tau} = \frac{s}{\tau} \frac{dW}{ds} + \frac{t}{\tau} \frac{dW}{dt},$$

and thus at a point on the efficiency frontier satisfying (A1), we must also have  $dW/ds > 0$  and  $dW/dt > 0$ . As a consequence, beginning from an efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  that satisfies (A1), it follows that

$$\frac{dW}{ds} + \frac{dW}{dt} \frac{dt}{ds} > 0 \text{ as } \frac{dt}{ds} > - \left[ \frac{\partial \tilde{p}^w / \partial s}{\partial \tilde{p}^w / \partial t} \right],$$

and therefore that *any* set of small changes in the domestic policies of the domestic government  $(s, t)$  that increase  $\tilde{p}^w$  from its implied level  $\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$  will reduce the welfare of the domestic government. Combined with our finding above that  $dW/d\tau^* < 0$ , we may therefore state under our

global concavity assumption:

**Lemma 2:** Let  $(s^E, t^E, \tau^E, \tau^{*E})$  denote an efficient policy combination that satisfies (A1), and let  $\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$  and  $\tilde{p}^{w'} \equiv \tilde{p}^w(s', t', \tau^E, \tau^{*'})$  for any  $s'$ ,  $t'$  and  $\tau^{*'}$ . Then it follows that  $W(q(s', \tau^E, \tilde{p}^{w'}), p(t', \tau^E, \tilde{p}^{w'}), \tilde{p}^{w'}) < W(q(s^E, \tau^E, \tilde{p}^{wE}), p(t^E, \tau^E, \tilde{p}^{wE}), \tilde{p}^{wE})$  for any  $s'$ ,  $t'$  and  $\tau^{*'}$   $\geq \tau^{*E}$  implying  $\tilde{p}^{w'} > \tilde{p}^{wE}$ .

Together, Lemmas 1 and 2 indicate that, beginning from an efficient combination of policies that satisfy (A1): (i) the foreign government is hurt by any change in domestic policies that reduces foreign access to domestic markets at the original world price; while (ii) the domestic government is hurt by (a) any change in its own domestic policies that increases foreign access to domestic markets at the original world price, and/or (b) an increase in the foreign tariff. These features will turn out to be useful in our subsequent analysis of subsidy agreements. We begin that analysis in the next section.

### III. The GATT Subsidy Rules

#### III.1 Institutional Background

Throughout GATT's history, subsidies have posed perplexing and difficult issues for international trade agreements. Jackson (1989, p. 269) describes the issues this way:

“...the whole area of subsidy activity in international law, including the rules designed to constrain the use of subsidies and the other rules designed to allow national governments the unilateral privilege of responding to subsidies with countervailing duties, is not only extremely complex but holds the potential, if misapplied, of undermining the basic policy goals of the post- World War II liberal trade system. On the one hand, governments can use subsidies to evade a liberal trade system by subsidizing so as to inhibit imports, or by subsidizing so as to enhance exports. On the other hand, responses to subsidies, particularly the unilateral national government response of countervailing duties, can be implemented in such a way as to undermine liberal trade policies...”

In essence, while several attempts (such as the 1979 GATT Subsidies Code) were made to strengthen GATT subsidy rules prior to the advent of the WTO, in effect governments remained essentially free under GATT to offer production subsidies to their producers as they wished (possibly subject to some reporting requirements). The allowable responses to these production subsidies from

other governments under GATT rules were more restricted, and could in effect take one of two forms, depending on whether the production subsidy was offered to *exporting producers* – and so enhanced exports – or instead to *import-competing producers* – and so inhibited imports.

If the subsidy was offered to exporting producers, then a government whose import-competing producers experienced “material injury” on account of the subsidy (and whose import tariff on that product was legally bound in a GATT agreement) could unilaterally impose an additional “countervailing duty” (CVD) against the subsidized imports. The magnitude of the CVD response was limited to be no larger than the amount of the subsidy.<sup>10</sup>

If the subsidy was instead offered to import-competing producers, then as Petersmann (1997, pp. 142-170) explains a government that had previously negotiated a tariff binding on that product with the subsidizing government would have a legitimate basis for making a “non-violation nullification-or-impairment” (NVNI) claim concerning its market access rights, under which the subsidizing government would then be expected to make a policy adjustment that returned market access to its original level (though the government would be under no obligation to remove the subsidy). More generally, in principle NVNI claims can be associated with any governmental measure (e.g., consumption taxes), not just the introduction of new production subsidies, though as Petersmann describes the role of NVNI claims has been most clearly established in GATT case law as these claims relate to production subsidies. Nevertheless, even when applied to subsidies, the legal ambiguities associated with the notion of “non-violation” complaints are considerable, and have made reliance on NVNI claims as a subsidy disciplining device controversial from the beginning. The resulting frustration has helped to fuel the long-standing attempts to reform subsidy disciplines in the GATT/WTO.

Against this institutional background, we now pose the following question: Could

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<sup>10</sup>If the importing country’s tariff on that product were unbound, then it could respond to the subsidy with any tariff level it wished, though in contrast to a countervailing duty (which would also be available to it) this tariff response could not discriminate against imports of the product coming from the subsidizing country.

governments who negotiate tariff commitments and are then free to set their domestic subsidy/tax instruments as they wish be expected to achieve policy outcomes on the international efficiency frontier, when they are permitted to respond to production subsidies (and in the case of NVNI claims, consumption taxes as well) as we have described these allowable responses just above? To answer this question, we next define a negotiation game that captures the features described above.

The general features of the *GATT Subsidy Game* are as follows:

*Stage 1:* The domestic and foreign governments negotiate tariff levels  $(\hat{\tau}, \hat{\tau}^*)$ , and a stage-1 market-clearing world price  $\tilde{p}_1^w \equiv \tilde{p}^w(s_0, t_0, \hat{\tau}, \hat{\tau}^*)$  is implied by  $(\hat{\tau}, \hat{\tau}^*)$  and the existing domestic subsidy and tax policies  $(s_0, t_0)$ .

*Stage 2:* The domestic government chooses domestic policies  $(\hat{s}, \hat{t})$ , and a stage-2 market-clearing world price  $\tilde{p}_2^w \equiv \tilde{p}^w(\hat{s}, \hat{t}, \hat{\tau}, \hat{\tau}^*)$  is implied.

*Stage 3:* If the conditions for an NVNI claim are met, then the foreign government chooses whether or not to make an NVNI claim; if the conditions for a CVD response are met, then the foreign government chooses whether or not to impose a CVD.

In effect, the GATT Subsidy Game has the two governments negotiating over tariffs, with the domestic government then free to set unilaterally its domestic production subsidy and consumption tax levels, and the foreign government free to respond to the domestic policy choices within the limits established by GATT rules.<sup>11</sup> In the next subsection, we further develop the specific features of the GATT Subsidy Game, and derive a benchmark result.

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<sup>11</sup>Governments negotiate *bindings* on their tariffs in the GATT/WTO, and these bindings represent maximum levels beyond which a government's applied tariffs cannot legally rise. For simplicity, and to focus on the main points, we make no distinction between the applied tariffs and the bindings negotiated in stage 1 of the GATT Subsidy Game, but this distinction can be introduced without altering our results. We observe as well that, owing to the policy redundancy noted above, if the foreign government had *no* ability to respond to the stage-2 domestic policy choices of the domestic government (i.e., if there were no stage 3), then the domestic government would attain a point on its best-response function with its stage-2 choices and an efficient combination of policies satisfying (A1) cannot be achieved.

### III.2 The Efficiency of Outcomes under GATT Subsidy Rules

We begin our analysis of the GATT Subsidy Game by considering in more detail the implications of GATT rules for the allowable responses of the foreign government in stage 3.

Consider first the condition for an NVNI claim. As described in the previous subsection, a legitimate basis for an NVNI claim by the foreign government arises whenever the domestic government has bound a tariff in a GATT negotiation with the foreign government, and then subsequently alters its domestic policies in a way that diminishes the market access implied by that original tariff negotiation.

To formalize this condition, let us define the *domestic market access implied by the stage-1 tariff negotiation* as the domestic import volume implied by the stage-1 tariff choice and the existing domestic subsidy and tax policies, evaluated at the market-clearing world price implied in stage 1, or  $M(q(s_0, \hat{t}, \tilde{p}_1^w), p(t_0, \hat{t}, \tilde{p}_1^w), \tilde{p}_1^w)$ . Next, we define the *domestic market access implied by the stage-2 policy choices* as the domestic import volume implied by the stage-1 tariff choice and the stage-2 domestic subsidy and tax policy choices, evaluated again at the market-clearing world price implied in stage 1, or  $M(q(\hat{s}, \hat{t}, \tilde{p}_1^w), p(\hat{t}, \hat{t}, \tilde{p}_1^w), \tilde{p}_1^w)$ . With these definitions of implied market access, it may then be said that a legitimate basis for an NVNI claim by the foreign government arises if and only if  $M(q(\hat{s}, \hat{t}, \tilde{p}_1^w), p(\hat{t}, \hat{t}, \tilde{p}_1^w), \tilde{p}_1^w) < M(q(s_0, \hat{t}, \tilde{p}_1^w), p(t_0, \hat{t}, \tilde{p}_1^w), \tilde{p}_1^w)$ . But using the market-clearing condition (3) and the Marshall-Lerner stability condition, this condition is equivalent to  $\tilde{p}_2^w < \tilde{p}_1^w$ .

To see when the foreign government would choose to exercise an opportunity to make a legitimate NVNI claim, we first observe that the domestic government would be expected under a legitimate NVNI claim to make a policy adjustment that returned market access to its original level.<sup>12</sup>

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<sup>12</sup>We model NVNI claims here as preserving the *level* of market access commitments implied by tariff negotiations. More accurately, in combination with renegotiation rights the NVNI claims operate to preserve the *balance* of market access commitments implied by tariff negotiations. We discuss the extension of our results to this more complicated setting in the concluding section.

Following a successful NVNI claim, then, we allow the domestic government to select its preferred  $(\hat{s}, \hat{t})$  consistent with the original market access level. But by (3), it may now also be observed that the effect of a legitimate NVNI claim is to return the market-clearing world price to its implied stage-1 level  $\tilde{p}_1^w$ . As a consequence, the foreign government gains from exercising a right to make an NVNI claim if and only if  $W^*(p^*(\hat{t}^*, \tilde{p}_1^w), \tilde{p}_1^w) > W^*(p^*(\hat{t}^*, \tilde{p}_2^w), \tilde{p}_2^w)$ .

We may therefore state:

**Lemma 3:** The foreign government makes an NVNI claim in stage 3 of the GATT Subsidy Game if and only if (i)  $\tilde{p}_2^w < \tilde{p}_1^w$ , and (ii)  $W^*(p^*(\hat{t}^*, \tilde{p}_2^w), \tilde{p}_2^w) < W^*(p^*(\hat{t}^*, \tilde{p}_1^w), \tilde{p}_1^w)$ .

Consider next the condition for a CVD response. As described in the previous subsection, under GATT rules the foreign government can unilaterally impose a CVD (up to the level of the domestic subsidy) on imports from the domestic country whenever it can establish that its import-competing industry suffers material injury as a result of a subsidy offered by the domestic government to domestic exporting firms. We formalize this by requiring that, for a foreign CVD response to be permissible, the domestic government must have with its stage-2 choice increased the production subsidy it offers to its exporting firms relative to the stage-1 level, and the implied output in the foreign import-competing sector must contract between stages 1 and 2 as a result. In our general equilibrium setting, a production subsidy offered to domestic exporting firms implies  $\hat{s} < 1$ , and a rise in the production subsidy offered to the domestic exporting firms implies  $\hat{s} < s_0$ , while the implied output of the foreign import-competing sector will contract between stages 1 and 2 if and only if  $p^*(\hat{t}^*, \tilde{p}_2^w) > p^*(\hat{t}^*, \tilde{p}_1^w)$ , which is equivalent to  $\tilde{p}_2^w > \tilde{p}_1^w$ .

To see when the foreign government would choose to exercise an opportunity to impose a CVD, we need simply observe that it will choose to do so if and only if its tariff is bound below its best-response level, or  $\hat{t}^* < \tau^{*R}(\hat{s}, \hat{t}, \hat{t})$ .

We may therefore state:

**Lemma 4:** The foreign government chooses to impose a CVD in stage 3 of the GATT Subsidy Game if and only if (i)  $\hat{s} < \min[1, s_0]$  and  $\tilde{p}_2^w > \tilde{p}_1^w$ , and (ii)  $\hat{\tau}^* < \tau^{*R}(\hat{s}, \hat{t}, \hat{\tau})$ .

With the foreign government's stage-3 responses in the GATT Subsidy Game characterized by Lemmas 3 and 4, we now ask whether the GATT Subsidy Game can deliver efficient outcomes. To explore this possibility, we follow Bagwell and Staiger (2001b) and ask whether points on the efficiency frontier can be reached with appropriate stage-1 outcomes, in light of the subsequent (stage-2 and stage-3) outcomes that may be anticipated. Given the existing production and consumption policies of the domestic government, we will say that a particular pair of payoffs for the domestic and foreign governments can be *implemented under GATT tariff negotiations* if there exists a pair of negotiated tariff levels  $(\hat{\tau}, \hat{\tau}^*)$  such that this payoff pair corresponds to a Subgame Perfect Nash Equilibrium (SGPE) of stages 2 and 3 of the GATT Subsidy Game.

Consider, then, any efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  that also satisfies (A1). As we observed in section II.2, the efficient payoffs associated with  $(s^E, t^E, \tau^E, \tau^{*E})$  can be equivalently delivered with the alternative (efficient) policy combination  $(s^E/\alpha, t^E/\alpha, \alpha\tau^E, \tau^{*E})$  for any  $\alpha > 0$ . Define  $\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$ , and define  $\hat{\tau}^E$  implicitly by  $\tilde{p}^w(s_0, t_0, \hat{\tau}^E, \tau^{*E}) = \tilde{p}^{wE}$ . In words,  $\hat{\tau}^E$  is the domestic tariff level that, in combination with the foreign tariff  $\tau^{*E}$  and the *existing* domestic subsidy and tax policies  $(s_0, t_0)$ , implies the market-clearing world price  $\tilde{p}^{wE}$ . Finally, let  $\hat{\alpha} \equiv \hat{\tau}^E/\tau^E$ . Then the efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  is equivalent to the alternative (efficient) policy combination  $(s^E/\hat{\alpha}, t^E/\hat{\alpha}, \hat{\tau}^E, \tau^{*E})$ .

Now suppose that stage-1 negotiations result in the tariff pair  $(\hat{\tau} = \hat{\tau}^E, \hat{\tau}^* = \tau^{*E})$ , so that the market access levels implied by these initial choices are efficient and the implied stage-1 market-

clearing world price is  $\tilde{p}_1^w = \tilde{p}^{wE}$ . Consider the domestic government's stage-2 problem. If it selects  $(\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha})$ , then it has selected an efficient mix of policies to deliver its efficient market access level, the implied stage-2 market-clearing world price is  $\tilde{p}_2^w = \tilde{p}^{wE} = \tilde{p}_1^w$ , and by Lemmas 3 and 4 there can be no stage-3 response from the foreign government. Hence, if the domestic government's stage-2 choice is  $(\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha})$ , then the welfare levels associated with the efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  will be implemented.

Suppose, though, that the domestic government's stage-2 choice is  $(\hat{s}, \hat{t}) = (s', t') \neq (s^E/\hat{\alpha}, t^E/\hat{\alpha})$ . Then there are three possibilities. A first possibility is that, under the alternative stage-2 choice, the domestic market access level remains unchanged so that it is still true that  $\tilde{p}_2^w = \tilde{p}^{wE} = \tilde{p}_1^w$ , and therefore by Lemmas 3 and 4 it is still the case that there can be no stage-3 response from the foreign government. But then the foreign government is indifferent between  $(\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha})$  and  $(\hat{s} = s', \hat{t} = t')$ , so that a strict preference for  $(\hat{s} = s', \hat{t} = t')$  by the domestic government would be inconsistent with the efficiency of  $(s^E, t^E, \tau^E, \tau^{*E})$ , i.e., it would be inconsistent with the national efficiency condition (6). A second possibility is that, under the alternative stage-2 choice, the domestic market access level is reduced, so that  $\tilde{p}_2^w < \tilde{p}^{wE} = \tilde{p}_1^w$ . But then by Lemmas 1 and 3, the foreign government will choose in stage 3 to make an NVNI claim, and the domestic government must then select its preferred  $(\hat{s}, \hat{t})$  consistent with  $\tilde{p}^w(\hat{s}, \hat{t}, \hat{\tau}^E, \tau^{*E}) = \tilde{p}_1^w = \tilde{p}^{wE}$ , and can do no better than to select the (efficient) combination  $(\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha})$ .<sup>13</sup> The third and final possibility is that, under the alternative stage-2 choice, the domestic market access level is increased, so that  $\tilde{p}_2^w > \tilde{p}^{wE} = \tilde{p}_1^w$ . Under this possibility, there can be no stage-3 NVNI claim by Lemma 3. By Lemma

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<sup>13</sup>In response to an NVNI claim, the domestic government could also adjust (reduce) its tariff, but the policy equivalence between the tariff and the domestic production subsidy/consumption tax policies allows us to focus on adjustments to  $(\hat{s}, \hat{t})$  with no loss of generality.

4 there might be a stage-3 CVD imposed by the foreign government, and with  $\partial \tilde{p}^w / \partial \tau^* > 0$  this would have the effect of increasing  $\tilde{p}^w$  further above  $\tilde{p}^{wE}$ . But in any event, by Lemma 2 the domestic government cannot achieve higher welfare under this (higher  $\tilde{p}^w$ ) possibility.

Hence we may state:

**Proposition 1:** Any point on the efficiency frontier that satisfies (A1) can be implemented under GATT tariff negotiations.

Proposition 1 asserts that the GATT-permissible responses to production subsidies (and consumption taxes) are sufficient to allow internationally efficient outcomes to be achieved with negotiations over tariffs alone.<sup>14</sup> Since, according to Proposition 1, any point on the efficiency frontier that satisfies (A1) can be implemented under GATT tariff negotiations, it follows that any (frictionless) stage-1 bargaining procedure over tariffs will achieve an internationally efficient policy outcome. Intuitively, the rules that delineate the permissible responses evidently strike the right balance between, on the one hand, providing governments with the responses necessary to prevent their trading partners from making domestic policy choices that would preclude attainment of the international efficiency frontier and, on the other hand, not being so permissive as to allow the responses themselves to become the impediment to efficient outcomes.

Interestingly, as the arguments leading up to Proposition 1 reveal, there is an important role for the possibility of NVNI claims in supporting efficient negotiating outcomes, but there appears to be no need for the possibility of CVD responses to guide governments to the efficiency frontier (that is, the possibility of a stage-3 CVD response could be made costly or even removed from the

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<sup>14</sup>Comparing Proposition 1 to the results of Bagwell and Staiger (2001b, Proposition 3), it may be seen that the NVNI claim is a more comprehensively effective tool for achieving international efficiency with tariff negotiations when governments make unilateral subsidy choices than when they make unilateral labor/environmental standards choices. The distinction arises because of the equivalence relation between tariffs and combination production subsidies/consumption taxes and the policy redundancy that follows. This policy redundancy is not present in the context of standards. As we observe in section V below, when this redundancy is removed, the comprehensive ability of NVNI claims in combination with tariff negotiations to deliver governments to the international efficiency frontier is weakened. (See also note 21 below).

GATT Subsidy Game entirely without altering the validity of Proposition 1). But in light of the role played by NVNI claims in supporting efficient outcomes in the GATT Subsidy Game, it is important to ask whether this role would be diminished or even eliminated once the costs of bringing a successful NVNI claim are introduced. After all, as we observed in section III.1, the many attempts to impose further disciplines on the use of subsidies which culminated in the WTO Agreement on Subsidies and Countervailing Measures can be interpreted as reflecting in large part the frustration associated with the high costs of using the legally ambiguous NVNI claim for this purpose. We therefore turn in the next subsection to consider the implications for Proposition 1 of introducing a cost to the NVNI claim.

### III.3 Costly NVNI and the Efficiency of Outcomes under GATT Subsidy Rules

We maintain our focus on the GATT Subsidy Game, but now introduce a cost to making an NVNI claim. We assume that the cost is borne by the claimant (i.e., the foreign government), and depict the welfare level of the foreign government as  $W^*(p^*, \tilde{p}^w; NVNI)$  when it makes an NVNI claim and faces local foreign prices  $p^*$  and market-clearing world price  $\tilde{p}^w$ . We will say that the NVNI claim is *costly* if and only if  $W^*(p^*, \tilde{p}^w) > W^*(p^*, \tilde{p}^w; NVNI)$  at all prices  $p^*$  and  $\tilde{p}^w$ . An NVNI claim is *costless* if and only if  $W^*(p^*, \tilde{p}^w) = W^*(p^*, \tilde{p}^w; NVNI)$  at all prices  $p^*$  and  $\tilde{p}^w$ .

The only limit we place on the magnitude of the NVNI cost is as follows. For any efficient combination of policies  $(s^E, t^E, \tau^E, \tau^{*E})$  which also satisfy (A1), and with  $\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$ , we assume that there exists a  $\bar{p}_1^w$  satisfying  $W^*(p^*(\tau^{*E}, \bar{p}_1^w), \bar{p}_1^w; NVNI) = W^*(p^*(\tau^{*E}, \tilde{p}^{wE}), \tilde{p}^{wE})$ .<sup>15</sup> Our assumption on the allowable magnitude of NVNI cost implies that the cost of NVNI cannot be so high that there is no level of  $\bar{p}_1^w$  that would make the foreign government indifferent between, on the one hand, paying the NVNI cost and trading at the terms of trade  $\tilde{p}^w = \bar{p}_1^w$ , and on the other hand,

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<sup>15</sup>If more than one value of  $\bar{p}_1^w$  exists, then we define  $\bar{p}_1^w$  to be the lowest such value.

not paying the NVNI cost but trading at the terms of trade  $\tilde{p}^{wE}$ . If NVNI is costless, then

$$W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w) = W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w; NVNI) = W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE}),$$

and so costless NVNI implies  $\bar{p}_1^w = \tilde{p}^{wE}$ .<sup>16</sup> When NVNI is costly, we have that

$$W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w) > W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w; NVNI) = W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE}),$$

and so costly NVNI implies by Lemma 1 that  $\bar{p}_1^w > \tilde{p}^{wE}$ .

In any event, recalling now that we also have  $W^*(p^*(\tau^E, \tilde{p}^{w/}), \tilde{p}^{w/}) < W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE})$  for any  $\tilde{p}^{w/} < \tilde{p}^{wE}$  by Lemma 1, it follows that, whether or not NVNI is costly,

$$W^*(p^*(\tau^E, \tilde{p}^{w/}), \tilde{p}^{w/}) < W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE}) = W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w; NVNI)$$

for any  $\tilde{p}^{w/} < \tilde{p}^{wE}$ . We may therefore state:

**Lemma 5:** Let  $(s^E, t^E, \tau^E, \tau^{*E})$  denote an efficient policy combination that satisfies (A1), let

$\tilde{p}^{wE} \equiv \tilde{p}^w(s^E, t^E, \tau^E, \tau^{*E})$ , and let  $\bar{p}_1^w$  be defined by  $W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w; NVNI) = W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE})$ .

Then  $W^*(p^*(\tau^E, \tilde{p}^{w/}), \tilde{p}^{w/}) < W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w; NVNI)$  for any  $\tilde{p}^{w/} < \tilde{p}^{wE}$ .

Introducing a cost to making an NVNI claim alters our previous analysis of the GATT Subsidy Game in only one way: the condition under which the foreign government gains from exercising a right to make an NVNI claim must be reconsidered. As before, the domestic government would be expected under a legitimate NVNI claim to make a policy adjustment that returned market access to its original level. Provided that the foreign export supply function is not

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<sup>16</sup>This follows from our definition of  $\bar{p}_1^w$  and Lemma 1.

altered by the costs of making an NVNI claim (by for example diverting resources from production of the export good to developing the NVNI claim), it again follows by (3) that the effect of a legitimate NVNI claim is to return the market-clearing world price to its implied stage-1 level  $\tilde{p}_1^w$ .

To simplify and focus on the main point, we assume that the foreign export supply function is indeed invariant to the filing of an NVNI claim, so that the effect of a legitimate NVNI claim is to return the market-clearing world price to its implied stage-1 level  $\tilde{p}_1^w$ . Hence, the foreign government gains

from making an NVNI claim if and only if  $W^*(p^*(\hat{\tau}^*, \tilde{p}_2^w), \tilde{p}_2^w) < W^*(p^*(\hat{\tau}^*, \tilde{p}_1^w), \tilde{p}_1^w; NVNI)$ . We may therefore state:

**Lemma 6:** The foreign government makes a costly NVNI claim in stage 3 of the GATT Subsidy Game if and only if (i)  $\tilde{p}_2^w < \tilde{p}_1^w$ , and (ii)  $W^*(p^*(\hat{\tau}^*, \tilde{p}_2^w), \tilde{p}_2^w) < W^*(p^*(\hat{\tau}^*, \tilde{p}_1^w), \tilde{p}_1^w; NVNI)$ .

As we continue to assume that a CVD response is costless, Lemma 4 continues to characterize the circumstances under which the foreign government chooses to impose a CVD in stage 3 of the GATT Subsidy Game. Armed with Lemmas 4, 5 and 6, we may now ask whether the GATT Subsidy Game can deliver efficient outcomes when the NVNI claim is costly.

Consider, then, any efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  that also satisfies (A1). Define  $\bar{\tau}^E$  implicitly by  $\tilde{p}^w(s_0, t_0, \bar{\tau}^E, \tau^{*E}) = \tilde{p}_1^w$ , and let  $\bar{\alpha} \equiv \bar{\tau}^E / \tau^E$ . In words,  $\bar{\tau}^E$  is the domestic tariff level that, in combination with the foreign tariff  $\tau^{*E}$  and the *existing* domestic subsidy and tax policies  $(s_0, t_0)$ , implies the market-clearing world price  $\tilde{p}_1^w$ . Then the efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  is equivalent to the alternative (efficient) policy combination  $(s^E / \bar{\alpha}, t^E / \bar{\alpha}, \bar{\tau}^E, \tau^{*E})$ .

Now suppose that stage-1 negotiations result in the tariff pair  $(\hat{\tau} = \bar{\tau}^E, \hat{\tau}^* = \tau^{*E})$ , so that the implied stage-1 market-clearing world price is then  $\tilde{p}_1^w = \bar{p}_1^w$ . Notice that when NVNI is costly,

$\bar{p}_1^w > \tilde{p}^{wE}$  and so these stage-1 negotiations result in the domestic government offering to bind its tariff at a level that implies a *greater* level of market access at  $\tilde{p}^{wE}$  than is efficient. Consider the domestic government's stage-2 problem. If it selects  $(\hat{s} = s^E/\bar{\alpha}, \hat{t} = t^E/\bar{\alpha})$ , then its domestic policy choices have *reduced* its market access to the efficient level at  $\tilde{p}^{wE}$ , and the implied stage-2 market-clearing world price is  $\tilde{p}_2^w = \tilde{p}^{wE}$ , with  $\bar{p}_1^w > \tilde{p}^{wE}$  and hence  $\tilde{p}_2^w < \tilde{p}_1^w$  when NVNI is costly. By Lemma 4, then, there can be no stage-3 CVD response from the foreign government. And by Lemma 6, while the foreign government has a legitimate NVNI claim, the definition of  $\bar{p}_1^w$  ensures that it will choose not to make an NVNI claim against the domestic government. Hence, if the domestic government's stage-2 choice is  $(\hat{s} = s^E/\bar{\alpha}, \hat{t} = t^E/\bar{\alpha})$ , then the welfare levels associated with the efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  will be implemented.

To see that the domestic government cannot do better with an alternative stage-2 selection, suppose that the domestic government's stage-2 choice is  $(\hat{s}, \hat{t}) = (s', t') \neq (s^E/\bar{\alpha}, t^E/\bar{\alpha})$ . Then there are three possibilities. A first possibility is that, under the alternative stage-2 choice, domestic market access remains at its efficient level, so that it is still true that  $\tilde{p}_2^w = \tilde{p}^{wE}$ . But then the foreign government is indifferent between  $(\hat{s} = s^E/\bar{\alpha}, \hat{t} = t^E/\bar{\alpha})$  and  $(\hat{s} = s', \hat{t} = t')$ , so that a strict preference for  $(\hat{s} = s', \hat{t} = t')$  by the domestic government would be inconsistent with the efficiency of  $(s^E, t^E, \tau^E, \tau^{*E})$ . A second possibility is that, under the alternative stage-2 choice, domestic market access is reduced below its efficient level, so that  $\tilde{p}_2^w < \tilde{p}^{wE}$ . But then by Lemmas 5 and 6, the foreign government will choose in stage 3 to make an NVNI claim, and the domestic government must then select its preferred  $(\hat{s}, \hat{t})$  consistent with  $\tilde{p}^w(\hat{s}, \hat{t}, \hat{\tau}^E, \tau^{*E}) = \tilde{p}_1^w > \tilde{p}^{wE}$ , which by Lemma 2 implies that the

domestic government then does strictly worse.<sup>17</sup> The third and final possibility is that, under the alternative stage-2 choice, domestic market access is maintained above its efficient level, so that  $\tilde{p}_2^w > \tilde{p}^{wE}$ . But whether or not there is a (NVNI or CVD) response from the foreign government, under this third possibility the domestic government must face a market-clearing world price higher than  $\tilde{p}^{wE}$ , and by Lemma 2 therefore does strictly worse.

Hence we may state:

**Proposition 2:** Whether or not NVNI claims are costly, any point on the efficiency frontier that satisfies (A1) can be implemented under GATT tariff negotiations.

According to Proposition 2, the costs of making an NVNI claim can potentially be quite high without interfering with the ability of governments to implement efficient policy combinations under GATT tariff negotiations. Intuitively, the redundancy of policy instruments indicated by the possibility of using tariffs, production subsidies and consumption taxes allows governments to position tariffs in their negotiations so as to imply a level of market access which yields an NVNI “trigger point” at the efficient level of market access. Subsequent to these negotiations, the level of market access is then allowed to “slip” back to this trigger point through the unilateral choice of domestic subsidy and tax policies – and the redundancy of policy instruments ensures that the national efficiency condition is not disrupted in the process – but the threat of NVNI beyond this point keeps market access levels from falling below their efficient levels.

An implication of Proposition 2's assertion that GATT subsidy rules can continue to deliver internationally efficient policy outcomes even when the (potentially very high) costs of NVNI claims are acknowledged is that the subsidy rules of the WTO cannot possibly mark an improvement in terms of international efficiency. Clearly, the redundancy of policy instruments implied by the

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<sup>17</sup>As in the case of costless NVNI analyzed in section III.2, in response to an NVNI claim, the domestic government could also adjust (reduce) its tariff, but the policy equivalence between the tariff and the domestic production subsidy/consumption tax policies allows us to focus on adjustments to  $(\hat{s}, \hat{t})$  with no loss of generality.

ability of the domestic government to choose tariffs, production subsidies and consumption taxes is important for the result of Proposition 2, and hence important for this implication. If it is assumed, for example, that the domestic government does not have a consumption tax at its disposal, then positioning tariffs to achieve an “efficient” NVNI trigger point will disrupt the national efficiency condition, and points on the international efficiency frontier will in general no longer be attainable under GATT subsidy rules as we have modeled them. We will return to consider this possibility in section V, and ask under what conditions the subsidy rules of the WTO might be interpreted as an improvement over the rules of GATT. However, before doing that, we turn in the next section to consider the impact of the WTO subsidy rules on policy outcomes when governments have available a sufficiently rich set of instruments to afford a degree of policy redundancy.

## **IV. The WTO Subsidy Rules**

### **IV.1 Institutional Background**

As described in section II.1, from early in its history, governments were dissatisfied with the treatment of subsidies within GATT. This dissatisfaction led to the negotiation of increasingly stringent rules in an attempt to discipline the use of subsidies. The 1979 GATT Subsidies Code negotiated in the Tokyo Round was an attempt to strengthen GATT rules on subsidies, and the WTO Agreement on Subsidies and Countervailing Measures (SCM) and the WTO Agreement on Agriculture represent attempts to bring further teeth to subsidy disciplines within the WTO. In light of our above findings, the WTO attempts to discipline domestic subsidies which are embodied in the SCM and Agriculture Agreements are particularly noteworthy, because these agreements depart in several important ways from the basic features that are associated with reliance on NVNI claims as a way to discipline subsidies, features that receive formal support under Propositions 1 and 2.

Focusing on the SCM Agreement, we may identify three key differences in the way domestic subsidies are treated under this agreement relative to their treatment in non-violation complaints.<sup>18</sup>

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<sup>18</sup>The ultimate goal of the WTO Agriculture Agreement with regard to subsidies is similar to the SCM Agreement, though the former adopts a more gradual and staged approach than the latter. The three new features that we emphasize in our discussion of the SCM Agreement are also present in the Agriculture Agreement.

First, a subsidy that is successfully challenged under the SCM Agreement must be removed to achieve compliance (i.e., subsidy complaints under the SCM Agreement are “violation” complaints), whereas under an NVNI claim the subsidizing government would simply be expected to make a policy adjustment that returned market access to its original level – it would be under no obligation to remove the subsidy.<sup>19</sup> Second, there is no distinction in the SCM Agreement between “new” subsidies and subsidies that were known to exist at the time of market access negotiations. And third, there is no requirement that a government challenging a subsidy under the SCM Agreement had previously negotiated a tariff commitment with the defendant government. Together, these three differences sever the link between subsidies that may be challenged within the WTO and the presence of previously negotiated market access commitments, and imply that any government has the right to challenge – and, in principle, force the removal of – any positive subsidy.<sup>20</sup>

To capture the additional features embodied in the WTO subsidy rules, we introduce into the GATT Subsidy Game the ability to challenge a subsidy afforded under the SCM Agreement. We accomplish this by inserting a new stage, between stages 2 and 3 of the GATT Subsidy Game, in which the foreign government may choose to challenge a domestic subsidy under the SCM Agreement.

The general features of this augmented game, which we refer to as the *WTO Subsidy Game*, are as follows:

*Stage 1:* The domestic and foreign governments negotiate tariff levels  $(\hat{\tau}, \hat{\tau}^*)$ , and a stage-1 market-clearing world price  $\tilde{p}_1^w \equiv \tilde{p}^w(s_0, t_0, \hat{\tau}, \hat{\tau}^*)$  is implied by  $(\hat{\tau}, \hat{\tau}^*)$  and the existing domestic subsidy and tax policies  $(s_0, t_0)$ .

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<sup>19</sup>Lawrence (2003, pp. 54-60) emphasizes the new “compliance” orientation of the WTO subsidy rules as marking a fundamental shift from the traditional “concession rebalancing” orientation of the GATT.

<sup>20</sup>A fourth important difference is the “specificity” requirement that a subsidy must meet to be challenged under the SCM Agreement. As the  $x$ -sector production subsidy that we consider would satisfy this requirement automatically, we do not emphasize this difference here, though in practice the requirement of specificity is considered to be the critical “gateway” to the SCM provisions.

*Stage 2:* The domestic government chooses domestic policies  $(\hat{s}, \hat{t})$ , and a stage-2 market-clearing world price  $\tilde{p}_2^w \equiv \tilde{p}^w(\hat{s}, \hat{t}, \hat{\tau}, \hat{\tau}^*)$  is implied.

*Stage 3:* If  $\hat{s} \neq 1$ , then the foreign government chooses whether or not to challenge the subsidy under the SCM Agreement. If the subsidy is challenged, then  $s=1$ , and the domestic government may choose again its domestic tax  $\hat{t}$ .

*Stage 4:* If the conditions for an NVNI claim are met, then the foreign government chooses whether or not to make an NVNI claim; if the conditions for a CVD response are met, then the foreign government chooses whether or not to impose a CVD.

In effect, as compared with the GATT Subsidy Game, the WTO Subsidy Game introduces an option for the foreign government to choose to have a positive domestic subsidy removed with an SCM challenge, rather than respond to the subsidy with an NVNI claim or a CVD. Clearly, if this option is not exercised, then analysis of stage 4 of the WTO Subsidy Game proceeds exactly as the analysis of the equivalent stage 3 of the GATT Subsidy Game, and each of the earlier Lemmas continues to apply. On the other hand, if an SCM challenge is brought in stage 3 of the WTO Subsidy Game, then with the elimination of the subsidy there will be no possibility for a CVD response in stage 4, though it is still possible that an NVNI claim could be made. We now turn in the next subsection to consider the impact of the WTO Subsidy Rules on negotiating outcomes.

#### IV.2 The (In)Efficiency of Outcomes under WTO Subsidy Rules

We continue to allow that an NVNI claim is costly, but we carry out our analysis of the WTO Subsidy Game under the assumption that there is no cost to challenging a subsidy under the SCM Agreement. In analogy with our analysis of the GATT Subsidy Game, given the existing production and consumption policies of the domestic government, we will say that a particular pair of payoffs for the domestic and foreign governments can be *implemented under WTO tariff negotiations* if there exists a pair of negotiated tariff levels  $(\hat{\tau}, \hat{\tau}^*)$  such that this payoff pair corresponds to a Subgame Perfect Nash Equilibrium (SGPE) of stages 2-4 of the WTO Subsidy Game.

We first consider whether the stage-1 negotiating outcome that implements an efficient policy combination under GATT tariff negotiations can implement this efficient policy combination under WTO tariff negotiations as well. Consider, then, any efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  that also satisfies (A1). Defining  $\bar{\tau}^E$  implicitly by  $\tilde{p}^w(s_0, t_0, \bar{\tau}^E, \tau^{*E}) = \bar{p}_1^w$ , recalling that  $\bar{p}_1^w$  satisfies  $W^*(p^*(\tau^{*E}, \bar{p}_1^w), \bar{p}_1^w; NVNI) = W^*(p^*(\tau^{*E}, \tilde{p}^{wE}), \tilde{p}^{wE})$ , and letting  $\bar{\alpha} \equiv \bar{\tau}^E / \tau^E$ , we observed previously that  $(s^E, t^E, \tau^E, \tau^{*E})$  is equivalent to the alternative (efficient) policy combination  $(s^E/\bar{\alpha}, t^E/\bar{\alpha}, \bar{\tau}^E, \tau^{*E})$ , and that the stage-1 negotiating outcome of  $(\hat{\tau} = \bar{\tau}^E, \hat{\tau}^* = \tau^{*E})$  would implement this efficient policy combination under GATT tariff negotiations (leading to Proposition 2).

Now suppose that stage-1 negotiations in the WTO Subsidy Game result in the tariff pair  $(\hat{\tau} = \bar{\tau}^E, \hat{\tau}^* = \tau^{*E})$ , so that the implied stage-1 market-clearing world price is then  $\tilde{p}_1^w = \bar{p}_1^w$ . Consider the domestic government's stage-2 problem. If it selects  $(\hat{s} = s^E/\bar{\alpha}, \hat{t} = t^E/\bar{\alpha})$  and the foreign government chooses in stage 3 *not* to challenge the subsidy under the SCM Agreement, then as with the GATT Subsidy Game the welfare levels associated with the efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  will be implemented. Moreover, any alternative stage-2 choice that does not elicit a stage-3 challenge under the SCM Agreement cannot be preferred by the domestic government, by arguments exactly analogous to those made in the context of the GATT Subsidy Game. Finally, the domestic government cannot gain from an alternative stage-2 choice that does elicit a stage-3 challenge under the SCM Agreement, since doing so simply restricts the level of  $s$  to 1, from which arguments exactly analogous to those made in the context of the GATT Subsidy Game again apply.

Hence, the key question is whether or not a stage-1 negotiating outcome of  $(\hat{\tau} = \bar{\tau}^E, \hat{\tau}^* = \tau^{*E})$ , followed by a stage-2 selection of  $(\hat{s} = s^E/\bar{\alpha}, \hat{t} = t^E/\bar{\alpha})$ , will elicit a stage-3 challenge of the subsidy under the SCM Agreement. If the foreign government chooses not to bring an SCM challenge in stage 3, then the efficient policies will be implemented and its payoff is  $W^*(p^*(\tau^{*E}, \tilde{p}^{wE}), \tilde{p}^{wE})$ . If the foreign government chooses to bring an SCM challenge in stage 3, then the efficient policies will

not be implemented, but its payoff will differ from  $W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE})$  only if the resulting market-clearing world price is greater than  $\tilde{p}^{wE}$ . This can be seen as follows: since the SCM challenge sets  $s = 1$ , there can be no CVD response in stage 4; if the resulting market-clearing world price is equal to  $\tilde{p}^{wE}$ , then there is no stage-4 (NVNI or CVD) response and the foreign payoff is  $W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE})$ ; if the resulting market-clearing world price is less than  $\tilde{p}^{wE}$ , then a stage-4 NVNI claim is triggered and foreign welfare is  $W^*(p^*(\tau^E, \bar{p}_1^w), \bar{p}_1^w; NVNI) = W^*(p^*(\tau^E, \tilde{p}^{wE}), \tilde{p}^{wE})$ .

Fixing  $(s^E, t^E, \tau^E, \tau^{*E})$  and noting that  $\bar{\alpha}$  varies with  $(s_0, t_0)$ , we observe first that, if  $\hat{s} = s^E / \bar{\alpha} > 1$  but small, then the restriction to  $s = 1$  implied by an SCM challenge will be met by an increase in  $t$  from the domestic government that *preserves* the implied market-clearing world price at  $\tilde{p}^{wE}$ , and the foreign government cannot gain from an SCM challenge in this circumstance. This follows because a reduction in  $s$  (from a small  $\hat{s} = s^E / \bar{\alpha} > 1$  to  $s = 1$ ) raises the implied market-clearing world price by  $\partial \tilde{p}^w / \partial s < 0$ , thereby causing a loss in domestic welfare by Lemma 2, but the national efficiency condition (6) ensures that the domestic government can avoid this (first-order) loss with an increase in  $t$  that maintains the market-clearing world price at  $\tilde{p}^{wE}$ . On the other hand, for  $\hat{s} = s^E / \bar{\alpha} > 1$  and sufficiently large, our global concavity assumption ensures that the restriction to  $s = 1$  implied by an SCM challenge will *not* be met by an increase in  $t$  from the domestic government that is sufficient to preserve the implied world price at  $\tilde{p}^{wE}$ , at least for  $(s^E, t^E, \tau^E, \tau^{*E})$  where the domestic government is positioned near its best-response policies: with  $\hat{s}$  sufficiently large, the increase in  $t$  required to preserve the implied market-clearing world price at  $\tilde{p}^{wE}$  when the restriction  $s = 1$  is imposed can be made arbitrarily large; and therefore under global concavity and with  $(s^E, t^E, \tau^E, \tau^{*E})$  placing the domestic government close to its best-response policies, a sufficiently large  $\hat{s}$  ensures that, when  $s = 1$  is imposed and beginning from a level of  $t$  that implies a market-clearing world price slightly above  $\tilde{p}^{wE}$ , the cost of raising  $t$  slightly to achieve  $\tilde{p}^{wE}$  is not worth incurring for the domestic government.

For  $\hat{s} = s^E/\bar{\alpha} > 1$  and sufficiently large, then, the market-clearing world price resulting from an SCM challenge is greater than  $\hat{p}^{wE}$ , at least for efficient policies that position the domestic government near its best-response policies. Provided the increase in  $\hat{p}^w$  is not too large, which is guaranteed provided that  $\hat{s} = s^E/\bar{\alpha}$  is not too large, the foreign government must then gain from the SCM challenge (as an implication of (A1)), and the efficient policies will not be implemented with a stage-1 negotiating outcome of  $(\hat{\tau} = \bar{\tau}^E, \hat{\tau}^* = \tau^{*E})$ .

Finally, we observe that, when the stage-1 negotiating outcome of  $(\hat{\tau} = \bar{\tau}^E, \hat{\tau}^* = \tau^{*E})$  fails to implement the efficient policy combination  $(s^E, t^E, \tau^E, \tau^{*E})$  in the WTO Subsidy Game, there can be no other stage-1 negotiating outcome that will work. This is because  $\hat{\tau}$  must be set so as to provide the appropriate NVNI trigger, tying down the unique combination of policies that yield the welfare levels implied by  $(s^E, t^E, \tau^E, \tau^{*E})$ , i.e., the requirements of NVNI imply that there is no policy redundancy that can be exploited to meet the demands for achieving efficiency. We therefore state:

**Proposition 3:** Whether or not NVNI claims are costly, there exists a range of outcomes on the international efficiency frontier satisfying (A1) that cannot be implemented under WTO tariff negotiations.

When viewed together, Propositions 2 and 3 suggest that the subsidy rules embodied in the WTO SCM Agreement represent a step backward relative to the GATT subsidy rules. In effect, the available policy instruments are just sufficient to allow governments to meet the demands for efficient outcomes in the GATT Subsidy Game. When the additional restrictions on the use of subsidies embodied in the SCM Agreement are introduced, the available instruments are insufficient to meet the added demands for efficient outcomes – at least over a range of outcomes on the international efficiency frontier – in the resulting WTO Subsidy Game.

## V. Limited Domestic Policy Instruments

Until now we have maintained the assumption that the domestic government possesses a set

of policy instruments that is sufficiently rich to exhibit a degree of redundancy, and we have observed that this policy redundancy plays a potentially important role in facilitating internationally efficient outcomes under GATT subsidy rules. We now consider a world in which the policy redundancy featured in the previous sections does not arise. Specifically, we assume in this section that the domestic government has a tariff and a domestic production subsidy at its disposal, but we now eliminate the domestic consumption tax (i.e., we set  $t=1$ ). This restriction on policy instruments can be interpreted as representing a limitation that governments may face when they attempt to offset – with adjustments in their domestic policies – the effects of international constraints on policy instruments imposed as a result of GATT/WTO commitments.

Owing to the initial policy redundancy, this restriction, of course, does not alter the welfare combinations that correspond to the efficiency frontier as characterized in section II.2, and it does not alter the Nash welfare levels as characterized in section II.3, though it does imply that a unique combination of policies will now be associated with each of these welfare combinations. Moreover, it is straightforward to confirm that Lemmas 1-6 continue to hold when  $t=1$ . But as we next demonstrate, the elimination of policy redundancy has important implications for the efficiency properties of outcomes under GATT and WTO subsidy rules.

### V.1 GATT Subsidy Rules in a Limited-Instrument Environment

We consider first the efficiency properties of the outcomes of the GATT Subsidy Game in the presence of limited domestic policy instruments, concentrating on the case in which NVNI is costly.<sup>21</sup> Obviously when NVNI is costly, the efficiency frontier cannot be attained if an NVNI claim is filed. Hence, we need only ask whether a point on the efficiency frontier satisfying (A1) could be implemented under GATT tariff negotiations when an NVNI claim is not triggered. Suppose, then,

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<sup>21</sup>When NVNI is costless it can be shown, arguing in an analogous fashion to Bagwell and Staiger (2001b, Proposition 3), that there exist some points on the efficiency frontier that can be implemented under GATT tariff negotiations by positioning negotiated tariffs appropriately and then triggering an NVNI claim with subsequent changes to the domestic subsidy, but there exist other efficient points that cannot be implemented under GATT tariff negotiations. By focusing on the case where NVNI is costly, we highlight that costly NVNI – in combination with limited domestic instruments – ensures that no efficient outcomes can be reached under GATT subsidy rules, and this focus therefore provides a natural benchmark from which to evaluate whether WTO subsidy rules mark an improvement.

that an efficient combination of policies satisfying (A1) has been reached as the outcome of the GATT Subsidy Game. There are two possible paths to this outcome, corresponding to whether a CVD response was triggered or not.

If a CVD response was triggered in the process of reaching an efficient outcome, then by Lemma 4 we have that  $\tilde{p}_2^w > \tilde{p}_1^w$ , and by Lemma 6 it then follows that a small increase in  $s$  above  $s^E$  would not trigger an NVNI response from the foreign government, and would lead to a reduction of  $\tau^*$  below  $\tau^{*E}$  under the permissible CVD response (i.e., letting  $\tau^{*CVD}$  denote the CVD response,  $d\tau^{*CVD}/ds < 0$ ). But then the domestic government gains from deviating to  $s > s^E$ , since at an efficient point satisfying (A1) we have  $dW/ds > 0$  and  $[dW/d\tau^*][d\tau^{*CVD}/ds] > 0$ . Therefore, an efficient combination of policies satisfying (A1) cannot be reached as the outcome of the GATT Subsidy Game in a limited-instrument costly-NVNI environment when a CVD response is triggered.

The remaining possibility is that a CVD response is not triggered. In this case, if an efficient combination of policies is to be reached as the outcome of the GATT Subsidy Game, the efficient tariffs  $\tau^E$  and  $\tau^{*E}$  must be chosen in stage 1. Moreover, owing to the lack of policy redundancy, as we observed above there is now a *unique* combination of policies associated with any point on the efficiency frontier. Hence, in light of the domestic production subsidy  $s_0$  that exists at the time of the stage-1 choices, a unique stage-1 market clearing price of  $\tilde{p}_1^w = \tilde{p}^w(s_0, \tau^E, \tau^{*E})$  is implied, with the unique stage-2 market clearing price then given by  $\tilde{p}_2^w = \tilde{p}^w(s^E, \tau^E, \tau^{*E})$ . Finally, recalling the definition of  $\bar{p}_1^w$  and observing that it is a function of  $s^E$ ,  $\tau^E$  and  $\tau^{*E}$ , it follows (generically) that the implied  $\tilde{p}_1^w \neq \bar{p}_1^w$ . But using Lemmas 5 and 6, we then have that either an NVNI response would be triggered along this path to the efficient policy combination, thereby precluding efficiency, or that the domestic government could deviate from the efficient policy combination to  $s > s^E$  without triggering an NVNI response from the foreign government and thereby gain. Therefore, an efficient

combination of policies satisfying (A1) cannot be reached as the outcome of the GATT Subsidy Game in a limited-instrument costly-NVNI environment when a CVD response is not triggered.

As a consequence of these arguments, we may state:

**Proposition 4:** In the presence of limited domestic policy instruments and costly NVNI claims, there does not exist (generically) a point on the efficiency frontier satisfying (A1) that can be implemented under GATT tariff negotiations.

In effect, as a comparison of Propositions 2 and 4 makes clear, a level of policy redundancy is required to achieve efficient outcomes under GATT tariff negotiations when NVNI is costly: when the set of domestic policy instruments is limited and this redundancy is not present (and NVNI is costly), there are too few instruments for governments to orchestrate a movement from inefficient Nash policies to a place on the efficiency frontier under GATT subsidy rules. Notice, too, that the inability to reach efficient outcomes stems from the ineffectiveness of the “disciplines” placed on the use of subsidies by costly NVNI claims in the presence of limited domestic policy instruments. This gives rise to the possibility that alternative disciplines on subsidies, such as those embodied in the SCM Agreement, could be “more effective,” and as such facilitate more efficient outcomes.

## V.2 WTO Subsidy Rules in a Limited Instrument Environment

We consider next the efficiency properties of the outcomes of the WTO Subsidy Game in the presence of limited domestic policy instruments and costly NVNI claims. More specifically, in light of the (generic) inability of GATT subsidy rules to permit governments to achieve efficient outcomes through tariff negotiations in this environment, we may ask whether WTO subsidy rules might mark an improvement under some circumstances. As we next demonstrate, WTO subsidy rules are sure to lead to more efficient outcomes than GATT subsidy rules in a limited-instrument costly-NVNI environment when the use of subsidies is of sufficiently minor importance on the efficiency frontier.

To see that WTO subsidy rules must lead to more efficient outcomes than GATT subsidy rules in this environment when the use of subsidies is of sufficiently minor importance on the

efficiency frontier, consider the extreme case in which there is *no* role for a domestic production subsidy at any point on the international efficiency frontier. This would be true, for example, if the domestic government's objective were simply to maximize the real value of national income, and there were no distortions in the domestic economy. In this case, any point on the efficiency frontier consistent with (A1) can be implemented under WTO tariff negotiations, by simply negotiating in stage 1 to the efficient tariffs  $\tau^E$  and  $\tau^{*E}$  associated with the desired point on the efficiency frontier: by challenging any  $s \neq 1$  under the SCM Agreement, the foreign government can guarantee that the efficient point will be implemented; and by the efficiency of  $s = 1$ , the domestic government cannot find a  $s \neq 1$  that is both preferred by it and preferred by the foreign government (and therefore not challenged under the SCM Agreement). Since (generically) no point on the efficiency frontier consistent with (A1) can be implemented under GATT tariff negotiations in this environment according to Proposition 4, we may state:

**Proposition 5:** In the presence of limited domestic policy instruments and costly NVNI claims, WTO subsidy rules must lead to more efficient outcomes than GATT subsidy rules when the use of subsidies is of sufficiently minor importance on the efficiency frontier.

In effect, if domestic subsidies have no legitimate reason to exist in an internationally efficient policy environment, then, by allowing these subsidies to be challenged and removed, the “more effective” discipline introduced under the WTO SCM Agreement is sure to be efficiency enhancing relative to the weaker subsidy disciplines embodied in GATT rules in a limited-instrument costly-NVNI environment. In this way, Proposition 5 identifies a set of circumstances under which WTO subsidy rules can be said to mark an improvement over GATT subsidy rules. It is notable, however, that these circumstances are strikingly at odds with the views expressed by GATT/WTO member governments concerning the legitimate role of subsidies in the pursuit of important public policy objectives (see note 3).

Whether WTO subsidy rules can be said to mark an improvement over GATT subsidy rules in this environment when subsidies are seen as legitimate instruments of public policy is more

difficult to establish, and presumably depends on circumstances. On the one hand, the heightened ability to challenge and remove subsidies that erode market access commitments can further the goal of international efficiency. On the other hand, where subsidies have a legitimate purpose in an internationally efficient policy environment, the ability to challenge and remove them can run counter to the goal of international efficiency. At a general level, then, whether or not the WTO subsidy rules mark an improvement over GATT subsidy rules in this limited-instrument costly-NVNI environment will depend on the relative importance of these two forces.

However, we next demonstrate that, at least in the case where the domestic government seeks to intervene on behalf of its import-competing producers, if the efficiency loss from the elimination of subsidies as a policy instrument is sufficiently important relative to the potential efficiency gain from international negotiations, then outcomes under WTO subsidy rules are surely less efficient than outcomes under GATT subsidy rules in this limited-instrument costly-NVNI environment. This is because, in these circumstances, and as a result of the imperfect substitutability between production subsidies offered to import-competing producers and tariffs, the WTO subsidy rules *completely undermine* the ability of tariff negotiations to serve as the mechanism for expanding market access to more efficient levels, the stage-1 negotiations in the WTO Subsidy Game must end in disagreement, and governments are resigned to their Nash payoffs.

To establish this point, it suffices to consider a case in which the Nash policy choices lead to a small but strictly positive Nash trade volume, and where each point on the efficiency frontier entails a sufficiently large domestic production subsidy offered to domestic import-competing producers (i.e.,  $s^E \gg 1$ ). When Nash trade volumes are small but positive, the Nash payoffs lie close to the efficiency frontier, and approach the efficiency frontier from below for Nash trade volumes that approach zero.<sup>22</sup> In this case, then, the potential efficiency gain from international

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<sup>22</sup>Intuitively, this reflects the fact that terms-of-trade manipulation is the source of international inefficiency in this setting, and the gains from terms-of-trade manipulation go to zero as trade volumes approach zero. Formally, this can be seen as follows. As noted in section II.1, our restriction on government preferences embodied in (5) reflects the assumption that governments like transfers of revenue from their trading partners. However, the revenue transfer implied by a small terms-of-trade improvement is given simply by the import volume, and so  $W_{p^w}$  and  $W_{p^w}^*$  approach zero as

negotiations is small. On the other hand, when  $s^E \gg 1$  at each point on the efficiency frontier, the *limited-instrument efficiency frontier* defined when  $s=1$  lies well below the unconstrained efficiency frontier. In this case, then, the efficiency loss from the elimination of subsidies as a policy instrument is large. Together, these two features imply that the limited-instrument efficiency frontier passes *below* the Nash point in these circumstances.

We now consider the possibility that the stage-1 negotiations in the WTO Subsidy Game might end without agreement. For simplicity, we assume that the stage-1 negotiations take the following form. The foreign government makes a take-it-or-leave-it offer of a domestic-foreign tariff pair, which the domestic government either accepts or rejects. Acceptance means that the offered tariff pair becomes the negotiated tariff levels  $(\hat{\tau}, \hat{\tau}^*)$  in stage 1, and that as before the domestic tariff cannot be altered from that level in any subsequent stage of the WTO Subsidy Game while the foreign tariff can only be altered with a CVD response in stage 4. We refer to this outcome as “agreement” in stage 1. Rejection means that the pair of Nash tariff levels becomes the tariff levels  $(\hat{\tau}, \hat{\tau}^*)$  in stage 1, and that each government is free to adjust its tariff in each subsequent stage of the WTO Subsidy Game.<sup>23</sup> We refer to this outcome as “disagreement” in stage 1.

It may now be seen that, if (i) agreement in stage 1 of the WTO Subsidy Game ensures that an SCM claim will be brought and therefore leads to payoffs on (or below) the limited-instrument efficiency frontier, and (ii) disagreement in stage 1 of the WTO Subsidy Game ensures that an SCM claim will not be brought and therefore leads to the Nash payoffs, then the outcome of the WTO Subsidy Game in these circumstances must be disagreement in stage 1, and each government receives its Nash payoff. In other words, in these circumstances, the WTO subsidy rules completely undermine the ability of tariff negotiations to serve as the mechanism for expanding market access

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trade volumes approach zero. With this, it may be confirmed that the Nash conditions (9)-(11) correspond to the efficiency conditions (6)-(7) in the limit when Nash trade volumes approach zero.

<sup>23</sup>In the case of rejection, there is also no longer an accompanying NVNI right for the foreign government, but this is not relevant for the argument that follows.

to more efficient levels, and governments are resigned to their Nash payoffs. That (i) holds follows from the fact that (a) each tariff must be set in stage-1 at a level below the respective government's reaction curve for both governments to gain from agreement, and (b) when the Nash trade volume is small neither government can be positioned very far below its reaction curve if it is to gain from agreement, so that (c) the foreign government must then gain from the terms-of-trade improvement implied by a subsequent SCM claim against the domestic subsidy.<sup>24</sup> That (ii) holds follows from the fact that, when the Nash trade volume is small, the foreign government must prefer its Nash payoff to the payoff it would receive in the non-cooperative equilibrium which would follow disagreement in stage 1 if the domestic government were denied access (by an SCM claim) to the less-trade-restrictive production subsidy and had to rely only on the more-trade-restrictive tariff to achieve its policy objectives.<sup>25</sup>

We may therefore state:

**Proposition 6:** In the presence of limited domestic policy instruments and costly NVNI claims, GATT subsidy rules must lead to more efficient outcomes than WTO subsidy rules when the domestic government seeks to intervene on behalf of its import-competing producers, provided that the efficiency loss from the elimination of subsidies as a policy instrument is sufficiently important relative to the potential efficiency gain from international negotiations.

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<sup>24</sup>With agreement implying that the stage-1 tariff levels of each government are necessarily fixed near their respective reaction curves when the Nash trade volume is small, the foreign government must gain from the additional access to the domestic market and consequent terms-of-trade improvement that would be generated by the SCM claim against the domestic subsidy, with one exception. In an extreme case, if the domestic subsidy were sufficiently large, it is possible that the foreign government might lose from the elimination of this subsidy with its tariff fixed near its Nash level, if it considered the implied movements in the foreign local price to be sufficiently costly. Hence, our argument above assumes that the role of domestic subsidies is sufficiently important to position the limited-instrument efficiency frontier well below the unconstrained efficiency frontier, but not so extreme as to generate this exceptional case.

<sup>25</sup>This can be seen as follows. With disagreement in stage 1, the Nash equilibrium must prevail provided that the domestic subsidy choice is not challenged under the SCM Agreement. But with sufficiently small Nash trade volume, if the foreign government were to bring an SCM claim and remove the domestic subsidy, it is easy to see that the domestic government's best-response tariff when deprived of its production subsidy would bring about autarky, owing to the additionally trade-restrictive effect of the consumption tax implied by the tariff, and therefore reduce the welfare of the foreign government below the Nash level. Hence, with sufficiently small Nash trade volume, disagreement in stage 1 ensures that no SCM claim will be made against the domestic subsidy.

We may also state the following:

**Corollary:** If the role of production subsidies in an internationally efficient policy environment is sufficiently important, the WTO subsidy rules can completely undermine the ability of tariff negotiations to serve as the mechanism for expanding market access to more efficient levels.

Intuitively, if governments consider domestic subsidies to be a sufficiently vital policy instrument, they may be less inclined to negotiate tariff commitments under the subsidy rules of the WTO, since such commitments may increase the likelihood that their subsidies will be challenged under the SCM Agreement. In this way, the SCM Agreement may have a “chilling” effect on the desire of governments to take on further market access commitments through WTO negotiations.

Proposition 6 and its Corollary provide some formal support for the view expressed by Jackson (1989, p. 269) and quoted above in section III.1, that “...the whole area of subsidy activity in international law, ...holds the potential, if misapplied, of undermining the basic policy goals of the post- World War II liberal trade system.” However, the implication of Propositions 5 and 6 taken together is also somewhat ironic, and may be stated as follows: although GATT subsidy rules may appear weak and inadequate while WTO subsidy rules are seen as representing a significant strengthening of multilateral disciplines on subsidies, the key changes introduced by the WTO subsidy rules may ultimately do more damage than good to the multilateral trading system, by undermining the ability of tariff negotiations to serve as the mechanism for expanding market access.

## **VI. Conclusion**

International disputes over subsidies are increasingly disrupting the world trading system. Yet the international rules that govern subsidies have received little attention in the form of systematic economic analysis. In this paper we have provided a first formal analysis of the international rules that govern the use of subsidies to domestic production (as distinct from export subsidies). Our analysis highlights the impact of the new disciplines on subsidies that were added to GATT rules with the creation of the WTO. Though GATT subsidy rules were seen as weak and inadequate while the WTO subsidy rules are viewed as a significant strengthening of multilateral

disciplines on subsidies, we find that the key changes introduced by the WTO subsidy rules may ultimately do more harm than good to the multilateral trading system, by undermining the ability of tariff negotiations to serve as the mechanism for expanding market access to more efficient levels.

The possibility that WTO subsidy rules could have a “chilling” effect on the desire of governments to make further market access commitments through WTO negotiations reflects a possible resolution of the tension between a system of rules that now places more stringent limits on subsidies than on tariffs and the basic message of the Bhagwati-Johnson-Ramaswami targeting principle. This tension arises because, according to the targeting principle, production subsidies are typically a better policy instrument for achieving production goals than are tariffs, but according to WTO rules, tariffs rather than production subsidies may be the only permissible instrument available to WTO-member governments. As we have observed above, one possible resolution of this tension is that governments may refrain from accepting negotiated limits on their use of tariffs, if their ability to utilize production subsidies without challenge under WTO subsidy rules is thereby enhanced.

This paper raises at least as many questions as it answers. Among the most important questions are: (i) A central efficiency-enhancing role is suggested for the right to bring NVNI claims, but we have modeled these claims stylistically (and perhaps unrealistically) as securing the level of negotiated market access. Does this central role survive when the nature of NVNI claims is modeled more precisely?; (ii) Our results do not indicate that any efficiency-enhancing role is played by the right to impose CVDs. What role, if any, do CVDs play in facilitating efficient policy outcomes in a richer setting?; (iii) Our results indicate that a crucial feature upon which the impacts of GATT and WTO subsidy rules hinges is the richness of the set of available domestic policy instruments. Are governments in fact better characterized as possessing redundant sets of policy instruments or facing more limited policy options?; and finally, (iv) Our results suggest that the WTO Subsidy rules may mark a step backward, in the sense that they may lead to less efficient outcomes than were possible under the GATT subsidy rules. If one accepts this suggestion, then the natural next question is, How could this (inferior) change have been agreed to by the GATT/WTO members? We leave these and other important questions to future work.

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