International disputes over subsidies have become a prominent feature of the world trading system. The creation of the World Trade Organization (WTO) as a successor to the General Agreement on Tariffs and Trade (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 formal attention.

Perhaps surprisingly, when viewed in the light shed by the existing theoretical literature, international agreements that seek to limit subsidies look immediately suspect. After all, a central message of the theory of distortions and welfare is the targeting principle (see Jagdish Bhagwati and V. K. Ramaswami, 1963; Harry G. 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. In this light, attempts to discipline 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 members to “discipline” the use of subsidies. But these disciplines are now 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 appears to run counter to what the targeting principle would suggest. 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.

We provide a first formal analysis of the international rules that govern the use of subsidies to domestic production (see Kyle Bagwell and Robert W. Staiger, 2001b, for an analysis of the logic of GATT/WTO rules regarding 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. 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 and consumption taxes, and is consistent with many possible underlying motives for the imposition of a pro-
duction 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 transborder) nonpecuniary externalities.1

Within this economic environment, we consider the possibility that governments might implement internationally efficient policy choices (defined according to the objectives of each government) 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 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 “nonviolation” (NV) nullification-or-impairment complaints. More specifically, if the subsidy were offered to exporting producers, then a government whose import-competing producers experienced material injury on account of the subsidy could unilaterally impose a CVD against the subsidized exports. If the subsidy were 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 NV 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. 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 quite costly. Intuitively, governments can position tariffs in their negotiations so as to imply a level of market access which yields an NV “trigger point”—a point beyond which further erosion of one country’s market access level would warrant initiation of a costly NV claim by its trading partner—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 conditions for domestic efficiency are not disrupted in the process—but the threat of an NV claim keeps market access from falling below this efficient level.

We turn next to the WTO subsidy rules. When applied within the context of our model, we argue that the key WTO innovation 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—virtually any positive subsidy. Maintaining our assumption that governments enjoy a degree of policy redundancy, an implication of our findings regarding 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

1 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. For example, as John H. 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.”
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. In this limited instrument world, we show that tariff negotiations under GATT subsidy rules are sure to lead to policy outcomes that are internationally inefficient. This raises at least the possibility that WTO subsidy rules could then mark an improvement, and we show that this is indeed possible provided that the use of subsidies is of sufficiently minor importance on the efficiency frontier. If, however, the importance of domestic subsidies is instead sufficiently pronounced on the efficiency frontier, then we show that WTO subsidy rules mark a “step backward” relative to GATT subsidy rules. In fact, we describe circumstances in which the WTO subsidy rules completely undermine the ability of tariff negotiations to provide an avenue of escape from the noncooperative (Nash) equilibrium.

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. Our results indicate that the new WTO subsidy rules may ultimately do more harm than good to the multilateral trading system.

The paper proceeds as follows. Section I develops the model and characterizes the GATT/ WTO bargaining frontier. Section II evaluates the efficiency properties of the GATT subsidy rules, while Section III considers the WTO subsidy rules. Section IV reevaluates the performance of these subsidy rules in a world of limited instruments. Section V concludes.

I. 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 nontrade 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.

A. The Basic Trade Model

We assume that the home country exports good $y$ to the foreign country in exchange for imports of good $x$. Beginning with home country magnitudes, 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 $q \equiv q_x/p_y$ and $p \equiv p_x/p_y$, respectively. 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 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 foreign imports of good $y$ (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 tax revenues from the use of the foreign tariff are distributed lump sum across foreign consumers.

The relative “world price” (i.e., the relative exporter price \( p^*/p \)) or terms of trade) is denoted by \( p^w \). Under the maintained assumption that tariffs are nonprohibitive, international arbitrage links each country’s local prices to the world price in light of its tariff according to \( q = sp^w = q(s, \tau, p^w), p = t\tau p^w = p(t, \tau, p^w) \) and \( p^* = p^w/\tau^* = p^*(\tau^*, p^w) \).

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. The home and foreign budget constraints are given by

1. \( p^w M(q, p, p^w) = E(q, p, p^w) \), and
2. \( M^*(p^*, p^w) = p^w E^*(p^*, p^w) \).

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

3. \( M(q(s, \tau, \bar{p}^w), p(t, \tau, \bar{p}^w), \bar{p}^w) = E^*(p^*(\tau^*, \bar{p}^w), \bar{p}^w) \).

Market clearing for good \( y \) is then implied by (1), (2), and (3).

Using the market-clearing condition (3), it may be confirmed that an 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 the same percentage. This, of course, reflects the equivalence between a tariff and a combination production subsidy/consumption tax. As we will see, the implied policy redundancy for the home government—that any one of its three policy instruments is redundant in light of the other two—plays an important role in what follows.

We assume that the Marshall-Lerner stability conditions are met, so that an inward shift of the home (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 \( dq/d\tau = [\partial q/\partial \tau] - \partial q/\partial \tau > 0 > dp^*/d\tau^* \), \( \partial \bar{p}^w/\partial \tau^* < 0 > \partial \bar{p}^w/\partial s < 0 \) and \( \partial \bar{p}^w/\partial t < 0 \).

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

(4) \( W(q, p, \bar{p}^w) < 0 \) and \( W^*(p^*, \bar{p}^w) > 0 \).

According to (4), 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 nonpecuniary transborder externalities that could interact with the choice of tariffs or production subsidies/consumption taxes.\(^2\)

Nevertheless, 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).

B. The GATT/WTO Contracting Frontier

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

We define the international efficiency frontier

\(^2\) We also assume throughout that these objective functions are everywhere differentiable and globally concave in the policy variables.
by the combinations of \((s, t, \tau, \tau^*)\) which, for each \(W^s\), solve

\[
\max_{s, t, \tau, \tau^*} \ W(q(s, \tau, \tilde{p}^{w}), p(t, \tau, \tilde{p}^w), \tilde{p}^w) \\
\text{s.t.} \ W^s(p^s(\tau^s, \tilde{p}^{w}), \tilde{p}^w) \geq W^s.
\]

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 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 an appropriate criterion 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).

It is straightforward to show that the noncooperative (Nash) policy choices of the two governments do not achieve a point on the international efficiency frontier. Hence, there are potential gains to the home and foreign government from international negotiations. 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

\[
(C1) \quad \frac{dW}{d\tau} > 0; \quad \frac{dW^s}{d\tau^*} > 0.
\]

In subsequent sections, when we ask whether various negotiating games can deliver efficient outcomes, we will restrict attention to efficient outcomes which satisfy (C1). We refer to this restricted portion of the international efficiency frontier as the Contracting Frontier.

Points on the Contracting Frontier exhibit two important properties that prove useful for our analysis, and so we record these properties in a pair of lemmas, which we prove in the Appendix:

**Lemma 1:** Let \((s^{E}, t^{E}, \tau^{E}, \tau^{*E})\) denote a point on the Contracting Frontier, and let \(\tilde{p}^{wE} \equiv \tilde{p}^{w}(s^{E}, t^{E}, \tau^{E}, \tau^{*E})\). Then for any \(\tilde{p}^{w'} < \tilde{p}^{wE}\),

\[
W^s(p^s(\tau^{*E}, \tilde{p}^{w'}, \tilde{p}^{w'})) < W^s(p^s(\tau^{*E}, \tilde{p}^{wE}, \tilde{p}^{wE})).
\]

**Lemma 2:** Let \((s^{E}, t^{E}, \tau^{E}, \tau^{*E})\) denote a point on the Contracting Frontier, 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 \(s', t', \tau^{*'}\). Then for any \(s', t', \tau^{*'}\), and \(\tau^{*E} \geq \tau^{*E}\) implying \(\tilde{p}^{w'} > \tilde{p}^{wE}\),

\[
W(q(s', \tau^{E}, \tilde{p}^{w'}), p(t', \tau^{E}, \tilde{p}^{w'}), \tilde{p}^{w'}) < W(q(s^{E}, \tau^{E}, \tilde{p}^{wE}), p(t^{E}, \tau^{E}, \tilde{p}^{wE}), \tilde{p}^{wE}).
\]

Together, Lemmas 1 and 2 indicate that, beginning from a point on the Contracting Frontier: (a) the foreign government dislikes any changes in the trade and/or domestic policies of the home government that reduce \(\tilde{p}^{w}\), while (b) the home government dislikes any changes in its own domestic policies combined with a weakly higher foreign tariff that together increase \(\tilde{p}^{w}\).

**II. The GATT Subsidy Rules**

**A. 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 ....”

As Alan O. Sykes (2005) describes, there were several attempts made to strengthen GATT subsidy rules prior to the advent of the WTO, but 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 were offered to exporting producers, then as Sykes (2005) describes a government whose import-competing producers experienced “material injury” on account of the subsidy could unilaterally impose an additional CVD against the subsidized imports. The magnitude of the CVD response was limited to be no larger than the amount of the subsidy. If the subsidy were instead offered to import-competing producers, then, as Sykes explains, a government that had previously negotiated a tariff binding on that product with the subsidizing government would have a legitimate basis for making an NV nullification-or-impairment claim concerning its market access rights (provided that it could claim that its market access expectations had been upset by the new subsidy). In response to such a claim, 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, as Petersmann (1997, pp. 142–170) explains, in principle NV claims can be associated with any governmental measure (e.g., consumption taxes), not just the introduction of new production subsidies.

Against this institutional background, we now pose the following question: Could governments that negotiate tariff commitments and are then free to set their domestic subsidy/tax instruments as they wish be expected to achieve internationally efficient policy outcomes, when they are permitted to respond to production subsidies (and in the case of NV claims, consumption taxes as well) as we have described these allowable responses just above? To answer this question, we next define the GATT Subsidy Game:

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

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

Stage 3: If the conditions for a successful NV claim are met, the foreign government chooses whether to make an NV claim; if the conditions for a CVD response are met, the foreign government chooses whether to impose a CVD.

In effect, the GATT Subsidy Game has the two governments negotiating over tariffs, with the home 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. In the next subsection, we further develop the specific features of the GATT Subsidy Game, and derive a benchmark result.

B. The Efficiency of Outcomes under GATT Subsidy Rules

We begin our analysis of the GATT Subsidy Game by considering in more detail the impli-
cations of GATT rules for the allowable responses of the foreign government in stage 3. Consider first the condition for a successful NV claim. As described above, a legitimate basis for an NV claim by the foreign government arises whenever the home 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, we follow Bagwell and Staiger (2001a) 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. In particular, 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 policy choices, evaluated at the market-clearing world price implied in stage 1, or \( M(q(s^0, \hat{\tau}, p_{1}^n), p(t_0, \hat{\tau}, p_{1}^n), p_{1}^n) \). 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 \( M(q(s, \hat{\tau}, p_{1}^n), p(t, \hat{\tau}, p_{1}^n), p_{1}^n) \). With these definitions, it may then be said that the condition for a successful NV claim by the foreign government is met if and only if \( M(q(s, \hat{\tau}, p_{1}^n), p(t, \hat{\tau}, p_{1}^n), p_{1}^n) < M(q(s_0, \hat{\tau}, p_{1}^n), p(t_0, \hat{\tau}, p_{1}^n), p_{1}^n) \). But using the market-clearing condition (3) and the Marshall-Lerner stability condition, this condition is equivalent to \( p_{1}^n > p_{1}^n \).

Having formalized the condition for a successful NV claim, we next ask when the foreign government would choose to make an NV claim, if the condition for success were in place. To answer this question, we first observe that the home government is obliged under a successful NV claim to make a policy adjustment that returns market access to its original level. Following a successful NV claim, then, we allow the home government to select its preferred \((\delta, \bar{i})\) consistent with the original market access level. But by (3), it may now also be observed that the effect of a successful NV claim is to return the market-clearing world price to its implied stage-1 level \( p_{1}^n \).

As a consequence of these observations, we may conclude that the foreign government gains from an NV claim if and only if \( W^s(p^s(\hat{\tau}^s, p_{1}^n), p_{1}^n) > W^s(p^s(\hat{\tau}^s, p_{1}^n), p_{1}^n) \). We may therefore state:

**Lemma 3**: The foreign government makes an NV claim in stage 3 of the GATT Subsidy Game if and only if \( (a) \ p_{1}^n < p_{1}^n \), and \( (b) \ W^s(p^s(\hat{\tau}^s, p_{1}^n), p_{1}^n) < W^s(p^s(\hat{\tau}^s, p_{1}^n), p_{1}^n) \).

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 on imports from the home 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 home 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

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4 This definition conforms to the notion of market access in the GATT/WTO (see WTO, 2004, for a recent and illuminating discussion of the concept of market access). 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.

5 In response to an NV claim, the home government could also adjust (reduce) its tariff, but the policy redundancy for the home government allows us to focus on adjustments to \((\delta, \bar{i})\) with no loss of generality. We model NV claims here as preserving the level of market access commitments implied by tariff negotiations. More accurately, in combination with renegotiation rights the NV claims operate to preserve the balance of market access commitments implied by tariff negotiations. We discuss the extension of our results to this setting in the concluding section.
domestic exporting firms implies $s < s_0$, and a rise in the production subsidy offered to the domestic exporting firms implies $s > s_0$, while the output of the foreign import-competing sector contracts between stages 1 and 2 if and only if $p^*(\hat{\tau}^*, \hat{\beta}^*) > p^*(\hat{\tau}^*, \hat{\beta}^*)$, which is equivalent to $\hat{\beta}_1 > \hat{\beta}_1$.

Observing that the foreign government will exercise an opportunity to impose a CVD if and only if its tariff is bound below its best-response level, or $\hat{\tau}^* < \tau^R(s, \hat{\tau})$, 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 (a) $s < \min\{1, s_0\}$, (b) $\hat{\beta}_1 > \hat{\beta}_1$, and (c) $\hat{\tau}^* < \tau^R(s, \hat{\tau})$.

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 internationally efficient outcomes. To explore this possibility, we follow Bagwell and Staiger (2001a) 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 home government, we say that a particular pair of payoffs for the home 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. The candidate equilibrium entails home government stage-2 choices of ($\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha}$), and no stage-3 claims/responses by the foreign government.

To establish that this candidate equilibrium is indeed a SGPE of stages 2 and 3 of the GATT Subsidy Game when stage-1 negotiations result in the tariff pair ($\hat{\tau} = \tau^E, \hat{\tau}^* = \tau^E$, consider the home 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 $\hat{\beta}_1 = \hat{\beta}^E$. We then show that this payoff pair corresponds to a SGPE of stages 2 and 3 of the GATT Subsidy Game. The candidate equilibrium entails home government stage-2 choices of ($\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha}$), and no stage-3 claims/responses by the foreign government.

Consider, then, any policy combination ($s^E, t^E, \tau^E, \tau^E$) on the Contracting Frontier. As we observed in Section IA, any one of the government’s three policy instruments is redundant in light of the other two. This implies that the efficient payoffs associated with ($s^E, t^E, \tau^E, \tau^E$) can be equivalently delivered with the alternative policy combination ($s^E/\alpha, t^E/\alpha, \alpha\tau^E, \tau^E$) for any $\alpha > 0$. Define $p^E = p^E(s, t, \tau, \tau)$, and define $\hat{\tau}^E$ implicitly by $p^E(s_0, t_0, \tau, \tau) = p^E$. 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 $\hat{p}^E$ (and the efficient domestic market access level). Finally, let $\hat{\alpha} = \hat{\tau}^E/\tau^E$. Then the efficient policy combination $(s^E, t^E, \tau^E, \tau^E)$ is equivalent to the alternative (efficient) policy combination $(s^E/\hat{\alpha}, t^E/\hat{\alpha}, \hat{\tau}^E, \tau^E)$.
efficiency of \((s^E, t^E, \tau^E, \tau^*E)\). A second possibility is that, under the alternative stage-2 choice, the domestic market access level is reduced, so that \(p_2^w < p^wE = p_1^w\). But then by Lemmas 1 and 3, the foreign government makes an NV claim in stage 3, and the home government must then select its preferred \((\hat{s}, \hat{t})\) consistent with \(p^w(\hat{s}, \hat{t}, \tau^E, \tau^*E) = p_1^w = p^wE\), and can do no better than to select \((\hat{s} = s^E/\alpha, \hat{t} = t^E/\alpha)\). The final possibility is that, under the alternative stage-2 choice, the domestic market access level is increased, so that \(p_2^w > p^wE = p_1^w\). Under this possibility, there can be no stage-3 NV claim by Lemma 3. By Lemma 4 there might be a stage-3 CVD imposed by the foreign government, and with \(\partial p^w/\partial \tau^* > 0\) this would have the effect of increasing \(p^w\) further above \(p^wE\). But in any event, by Lemma 2 the home government cannot achieve higher welfare under this (higher \(p^w\)) possibility. Hence we may state:\(^6\)

**PROPOSITION 1:** Any point on the Contracting Frontier 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. Since, according to Proposition 1, any point on the Contracting Frontier 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.\(^7\)

Interestingly, as the arguments leading up to Proposition 1 reveal, there is an important role for the possibility of NV claims in supporting efficient negotiating outcomes, but there appears to be no need for the possibility of CVD responses to guide governments to the Contracting Frontier (that is, the possibility of a stage-3 CVD response could be made costly or even removed entirely from the GATT Subsidy Game without altering the validity of Proposition 1). Especially in light of the long-standing frustrations with the legally ambiguous concept of nonviolation complaints, frustrations that have helped fuel the many attempts to reform subsidy disciplines in the GATT/WTO, it is therefore important to ask whether the role played by NV claims in supporting efficient outcomes in the GATT Subsidy Game would be diminished or even eliminated once the costs of bringing a successful NV claim are introduced.\(^8\) We therefore turn in the next subsection to consider the implications for Proposition 1 of introducing a cost to the NV claim.

\(^6\)As our proof of Proposition 1 demonstrates, it is possible to implement any point on the Contracting Frontier without altering the implied domestic market access between stages 1 and 2 and thus without triggering an NV claim along the equilibrium path. Hence, while we have appealed to GATT rulings (see footnote 3) and treated as unexpected any \((\hat{s}, \hat{t}) \neq (s_0, t_0)\) that diminishes the implied domestic market access between stages 1 and 2, this treatment would also be consistent with a more game-theoretic approach of defining unexpected as “off-equilibrium.”

\(^7\)A potential concern is that the home government might manipulate its domestic policy choices prior to the start of the GATT Subsidy Game for strategic effect, and that this could overturn the result reported in Proposition 1. Notice, though, that Proposition 1 is proven for any “existing” domestic subsidy and tax policies \((s_0, t_0)\), and so allowing the home government to choose its initial subsidies and taxes prior to the initiation of the GATT Subsidy Game has no effect on our proposition. The reason is that the stage-1 tariff negotiations secure tariff levels that imply the desired equilibrium world price, given \((s_0, t_0)\), and the initial subsidy and tax levels are then inconsequential to the later stages of the game.

\(^8\)An additional limitation of GATT subsidy disciplines which is emphasized by Sykes (2005) was their inability to address third-country issues. These issues do not arise in our 2-country model, but we return to consider them further in the concluding section.
C. Costly NV Claims 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 NV 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 \( W^*(p^*, \hat{p}_w^v; \text{NV}) \) when it makes an NV claim and faces a local foreign price \( p^* \) and a world price \( \hat{p}_w^v \). We say that the NV claim is costly (costless) at prices \( p^* \) and \( \hat{p}_w^v \) when \( W^*(p^*, \hat{p}_w^v) > W^*(p^*, \hat{p}_w^v; \text{NV}) = W^*(p^*, \hat{p}_w^v; \text{NV}) \).

The only limit we place on the magnitude of the NV cost is as follows. For any combination \((s^E, t^E, \tau^E, \tau^*E)\) on the Contracting Frontier, and with \( \hat{p}_w^E = \hat{p}_w^v(s^E, t^E, \tau^E, \tau^*E) \), we assume that there exists a \( \hat{p}_w^v \) satisfying \( W^*(p^*(\tau^*E, \hat{p}_w^v), \hat{p}_w^v; \text{NV}) = W^*(p^*(\tau^*E, \hat{p}_w^v), \hat{p}_w^v) \). Our assumption on the allowable magnitude of NV cost implies that the cost of the NV cannot rise so high that there is no level of \( \hat{p}_w^v \) that would make the foreign government indifferent between, on the one hand, paying the NV cost and trading at the terms of trade \( \hat{p}_w^v = \hat{p}_1^w \), and on the other hand, not paying the NV cost but trading at the terms of trade \( \hat{p}_w^v \). Recalling now by Lemma 1 that, for any \( \hat{p}_w^v < \hat{p}_w^E \), we also have \( W^*(p^*(\tau^*E, \hat{p}_w^v), \hat{p}_w^v) < W^*(p^*(\tau^*E, \hat{p}_w^v), \hat{p}_w^v) \), it follows that, whether or not NV is costly at prices \( p^*(\tau^*E, \hat{p}_w^v) \) and \( \hat{p}_w^v \), \( W^*(p^*(\tau^*E, \hat{p}_w^v), \hat{p}_w^v) < W^*(p^*(\tau^*E, \hat{p}_w^v), \hat{p}_w^v) \).

Introducing a cost to making an NV claim alters our previous analysis of the GATT Subsidy Game in one way: the condition under which the foreign government gains from exercising a right to make an NV claim must be reconsidered. As before, the home government is obliged under a successful NV claim to return market access to its original level. To simplify and focus on the main point, we assume that the foreign export supply function is invariant to the filing of an NV claim. With this, it again follows by (3) that the effect of a successful NV claim is to return the market-clearing world price to its implied stage-1 level \( \hat{p}_1^w \). Hence, the foreign government gains from a successful NV claim if and only if \( W^*(p^*(\tau^*, \hat{p}_2^w), \hat{p}_2^w) < W^*(p^*(\tau^*, \hat{p}_1^w), \hat{p}_1^w; \text{NV}) \). We may therefore state the analogue of Lemma 3 when NV claims are costly:

**LEMMA 6:** The foreign government makes a costly NV claim in stage 3 of the GATT Subsidy Game if and only if (a) \( \hat{p}_2^w < \hat{p}_w^v \), and (b) \( W^*(p^*(\tau^*, \hat{p}_2^w), \hat{p}_2^w) < W^*(p^*(\tau^*, \hat{p}_1^w), \hat{p}_1^w; \text{NV}) \).

As we continue to assume that a CVD response is costless, Lemma 4 continues to apply. Armed with Lemmas 4, 5, and 6, we may now ask whether the GATT Subsidy Game can deliver efficient outcomes when the NV claim is costly.

Consider, then, any policy combination \((s^E, t^E, \tau^E, \tau^*E)\) on the Contracting Frontier. Define \( \tau^E \) implicitly by \( \hat{p}_w^v(s_0, t_0, \tau^E, \tau^*E) = \hat{p}_1^w \), and let \( \alpha = \frac{\tau^E}{\tau^*E} \). In words, \( \tau^E \) 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 \( \hat{p}_w^v \). Then the efficient policy combination \((s^E, t^E, \tau^E, \tau^*E)\) is equivalent to the alternative (efficient) policy combination \((s^E/\alpha, t^E/\alpha, \tau^E, \tau^*E)\).

Now suppose that stage-1 negotiations result in the tariff pair \((\hat{\tau}, \hat{\tau}^*) = (\tau^E, \tau^*E)\), so that the implied stage-1 market-clearing world price is then \( \hat{p}_w^v = \hat{p}_1^w \). Notice that when NV is costly, \( \hat{p}_w^v > \hat{p}_w^E \) and so these stage-1 negotiations result in the home government offering to bind its tariff at a level that implies a greater level of market access at \( \hat{p}_w^E \) than is efficient. Consider the home government’s stage-2 problem. If it selects \((s = s^E/\alpha, t = t^E/\alpha)\), then its domestic policy choices have reduced its market access to the efficient level at \( \hat{p}_w^E \), and the implied stage-2...
market-clearing world price is \( p_2^w = \tilde{p}^w_E \), with \( \tilde{p}_1^w > \tilde{p}^w_E \) and hence \( \tilde{p}_2^w < \tilde{p}_1^w \) when NV is costly. By Lemma 4, then, there can be no stage-3 CVD response from the foreign government. And by Lemma 6 and the definition of \( \tilde{p}_1^w \), there will be no NV claim against the home government. Hence, if the home government’s stage-2 choice is \((\tilde{s}/\tilde{t}, \tilde{t}/\tilde{t})\), then the welfare levels associated with the efficient policy combination \((s^E, t^E, \tau^E, \tau^*E)\) will be implemented. From here, the argument that the home government cannot do better than this candidate equilibrium with an alternative stage-2 selection proceeds in an analogous fashion to the proof of Proposition 1, with the roles of Lemmas 1 and 3 now being played by Lemmas 5 and 6. Hence we may state:

**PROPOSITION 2:** Whether or not NV claims are costly, any point on the Contracting Frontier can be implemented under GATT tariff negotiations.

According to Proposition 2, the costs of an NV 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 NV “trigger point” at the efficient level of market access. Subsequent to these negotiations, the level of market access is then allowed along the equilibrium path 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 conditions for domestic efficiency are not disrupted in the process—but the threat of NV beyond this point keeps market access levels from falling below their internationally 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 NV claims are acknowledged is that the subsidy rules of the WTO cannot possibly mark an improvement in terms of international efficiency in this environment. Still, perhaps WTO subsidy rules “do no harm.” We assess this possibility in the next section.

### III. The WTO Subsidy Rules

#### A. Institutional Background

As described in Section IIA, from early in the GATT’s history, governments were dissatisfied with the treatment 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 findings above, the WTO attempts to discipline domestic subsidies embodied in the SCM and Agriculture Agreements are noteworthy, because these agreements depart in several important ways from the basic features that are associated with reliance on NV claims as a way to discipline subsidies.

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 NV claims. First, 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. Second, there is no requirement that a government challenging a subsidy under the SCM Agreement had previously negotiated a tariff commitment. And third, a subsidy that is successfully challenged under the SCM Agreement must in effect be removed to achieve compliance. Together, these three differences sever the link within the WTO between subsidies that may be challenged—and in principle

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10 These three new features are also present in the Agriculture Agreement.
11 In fact, according to Article 7.8 of the SCM Agreement, the subsidy need not be withdrawn if its “adverse effects” can be removed. What is important for our purposes, however, is that the pressure that governments face to remove their subsidies is far greater under the WTO subsidy rules than was the case under the GATT subsidy rules, and so we capture this difference in a stylized way by assuming that SCM compliance requires removal.
removed—and market access expectations that are upset (see Sykes, 2005, for a similar assessment). 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 the WTO Subsidy Game are as follows:  

### Stage 1:  
The home and foreign governments negotiate tariff levels \((\hat{\tau}, \hat{\tau}^*)\), and a stage-1 market-clearing world price \(p_{0}^w = \tilde{p}^w(s_0, t_0, \hat{\tau}, \hat{\tau}^*)\) is implied by \((\hat{\tau}, \hat{\tau}^*)\) and the existing domestic subsidy and tax policies \((s_0, t_0)\).

### Stage 2:  
The home government chooses domestic policies \((\hat{s}, \hat{t})\), and a stage-2 market-clearing world price \(p_{0}^w = \tilde{p}^w(s, \hat{t}, \hat{\tau}^*)\) is implied.

### Stage 3:  
If \(\hat{s} \neq 1\), then the foreign government chooses whether to challenge the subsidy under the SCM Agreement. If the subsidy is challenged, then \(s = 1\), and the home government may choose again its domestic tax \(\hat{\tau}\).

### Stage 4:  
If the conditions for an NV claim are met, the foreign government chooses whether to make an NV claim; if the conditions for a CVD response are met, the foreign government chooses whether 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 NV claim or a CVD. We now turn in the next subsection to consider the impact of the WTO Subsidy Rules on negotiating outcomes.

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

We continue to allow that an NV claim is costly, but we assume 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 home government, we say that a particular pair of payoffs for the home 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 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 policy combination \((s^E, t^E, \tau^E, \tau^*E)\) on the Contracting Frontier. Defining \(\tau^E\) implicitly by \(\tilde{p}^w(s_0, t_0, \tau^E, \tau^*E) = \tilde{p}^w\), recalling that \(\tilde{p}^w\) satisfies \(W^E(p^E(\tau^*E, \tilde{p}^w), \tilde{p}^w, NV) = W^E(p^E(\tau^*E, \tilde{p}^w), \tilde{p}^w, E)\), and letting \(\tilde{\alpha} = \tau^E/\tau^E\), we observed previously that the stage-1 negotiating outcome of \((\hat{\tau} = \tau^E, \hat{\tau}^* = \tau^*E)\) would implement the equivalent policy combination \((s^E/\tilde{\alpha}, t^E/\tilde{\alpha}, \tau^E, \tau^*E)\) under GATT tariff negotiations (leading to Proposition 2).

Now, suppose that stage-1 negotiations in the WTO Subsidy Game result in the tariff pair \((\hat{\tau} = \tau^E, \hat{\tau}^* = \tau^*E)\), so that the implied stage-1 market-clearing world price is \(p_{0}^w = \tilde{p}^w\). Consider the home government’s stage-2 problem. If it selects \((\hat{s} = s^E/\tilde{\alpha}, \hat{t} = t^E/\tilde{\alpha})\) 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 home government, by arguments exactly analogous to those made in the context of the GATT.
Subsidy Game. Finally, the home 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 a stage-1 negotiating outcome of \((\hat{\tau} = \hat{\tau}^E, \hat{\tau}^* = \tau^*E)\), followed by a stage-2 selection of \((\hat{s} = s^E/\hat{\alpha}, \hat{t} = t^E/\hat{\alpha})\), will elicit a stage-3 subsidy challenge under the SCM Agreement. If the foreign government chooses not to bring an SCM challenge in stage 3, then its payoff is \( W^0(\hat{p}^E(\hat{\tau}^*E, \hat{p}^*E), \hat{p}^*E) \). It can therefore gain from bringing an SCM challenge only if the resulting market-clearing world price is greater than \( \hat{p}^wE \). Fixing \((\hat{s}^E, \hat{t}^E, \hat{\tau}^E, \tau^*E)\) and noting that \( \hat{\alpha} \) varies with \((s_0, t_0)\), we observe that, for \( \hat{s} = s^E/\hat{\alpha} > 1 \) 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 \( \tau \) that preserves the implied world price at \( \hat{p}^wE \), at least not for \((\hat{s}^E, \hat{t}^E, \hat{\tau}^E, \tau^*E)\) where the home government is positioned near its best-response policies. For \( \hat{s} = s^E/\hat{\alpha} > 1 \) 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 home government near its best-response policies. Provided the increase in \( \hat{p}^w \) is not too large, which is guaranteed provided that \( \hat{s} = s^E/\hat{\alpha} \) is not too large, the foreign government must then gain from the SCM challenge (as implied by (C1)), and the efficient policies are not implemented with a stage-1 negotiating outcome of \((\hat{\tau} = \hat{\tau}^E, \hat{\tau}^* = \tau^*E)\).

Finally, we observe that, when the stage-1 negotiating outcome of \((\hat{\tau} = \hat{\tau}^E, \hat{\tau}^* = \tau^*E)\) 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 NV 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 NV 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 NV costs are costly, there exists a range of outcomes on the Contracting Frontier 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.

**IV. Limited Domestic Policy Instruments**

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 home government has a tariff and a domestic production subsidy at its disposal, but we now remove the domestic consumption tax (i.e., we set \( t = 0 \)). This restriction on policy instruments is ad hoc, but it may reflect more accurately the constraints that governments face when they attempt to offset—

with adjustments in their domestic policies—
the effects 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 or the noncooperative (Nash) equilibrium, though it does make the associated policy combinations unique. 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.

A. GATT Subsidy Rules in a Limited-Instrument Environment

We consider first the efficiency properties of the GATT Subsidy Game, concentrating on the case where NV is costly. When NV is costly, the efficiency frontier cannot be attained if an NV claim is filed, and so we need only ask whether a point on the Contracting Frontier can be implemented under GATT tariff negotiations when an NV claim is not triggered.

Suppose, then, that a policy combination on the Contracting Frontier 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 is triggered or not. If a CVD response is triggered, then by Lemma 4 we have that \( \tilde{p}_1 > \tilde{p}_1^{*} \), and by Lemma 6 it then follows that a small increase in \( s \) above \( s^E \) would not trigger an NV response from the foreign government, and would lead to a reduction of \( \tau^s \) below \( \tau^s \), under the permissible CVD response (i.e., letting \( \tau^s \) denote the CVD response, \( d\tau^s/CVD/ds < 0 \)). But then the home government gains from deviating to \( s > s^E \), since at a point on the Contracting Frontier we have \( [dW/d\tau^s][d\tau^s/CVD/ds] > 0 \) by the proof of Lemma 1 and \( dW/ds > 0 \) by the proof of Lemma 2 (see Appendix). The remaining possibility is that a CVD response is not triggered. In this case, the efficient tariffs \( \tau^E \) and \( \tau^s \) 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

PROPOSITION 4: In the presence of limited domestic policy instruments and costly NV claims, there does not exist (generically) a point on the Contracting Frontier that can be implemented under GATT tariff negotiations.

B. WTO Subsidy Rules in a Limited-Instrument Environment

In light of Proposition 4, it can now be seen that WTO subsidy rules must improve upon GATT subsidy rules in our limited-instrument environment when subsidies are of sufficiently minor importance on the efficiency frontier. To see this, consider the extreme case in which there is no role for a domestic production subsidy at any point on the international efficiency frontier. In this case, any point on the Contracting Frontier can be implemented under WTO tariff negotiations, by simply negotiating in stage 1 to the efficient tariffs \( \tau^E \) and \( \tau^s \) 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 home government cannot find an \( s \neq 1 \) that is preferred by it and the foreign government (and therefore not challenged under the SCM Agreement). Since (generically) no point on the Contracting Frontier can be implemented under GATT tariff negotiations in these circumstances according to Proposition 4, it follows that WTO subsidy rules must lead to more efficient outcomes than GATT subsidy rules. These circumstances, however, are at odds with the views expressed by GATT/WTO members concerning
the legitimate role of subsidies in the pursuit of public policy objectives (see footnote 1).

At the other extreme, as we show in an example below and more generally in our working paper (Bagwell and Staiger, 2004), if the role of production subsidies in an internationally efficient policy environment is sufficiently important, then the WTO subsidy rules can completely undermine the ability of tariff negotiations to provide governments with an avenue of escape from the noncooperative (Nash) equilibrium, and in these circumstances GATT subsidy rules must surely dominate WTO subsidy rules. In effect, if governments consider domestic subsidies to be a vital policy instrument, they may be leery of negotiating tariff commitments under the subsidy rules of the WTO, since such commitments may increase the likelihood that their subsidies will be the target of an SCM challenge. In this way, the SCM Agreement may have a “chilling” effect on the desire of governments to take on market access commitments through WTO negotiations.

To understand this effect, observe that an SCM challenge of the home subsidy is worth less to the foreign government if the home government has not bound its tariff, because the home government is then free to adjust its tariff in response to the loss of its subsidy. But this raises the possibility that the home government may be able to avoid an SCM challenge by refusing to bind its tariff in stage 1 negotiations. When this is the case, the home government then confronts a choice between securing its noncooperative (Nash) welfare—which it receives if it refuses to negotiate in stage 1 and thereby avoids an SCM challenge—and receiving the welfare it can secure from negotiated tariff levels but without the use of its subsidy. If the use of the subsidy is sufficiently valuable for the home government, then its elimination results in a “tariffs-only” international efficiency frontier that lies below the Nash point, and a tariff agreement is impossible.

An example can help illustrate this last point. We consider a 2-good endowment world economy similar to that of John Kennan and Raymond Riezman (1986), extended to allow for the use of production subsidies as well as tariffs. The foreign country is endowed with $\gamma$ units of good $x$ and $(1 - \gamma)$ units of good $y$. If the representative agent in the foreign country consumes $X^*$ units of $x$ and $Y^*$ units of $y$, its utility is $U^* = X^*Y^*$. It is direct to show that the foreign price in autarky is given by $p^\psi = (1 - \gamma)/\gamma$. The home region is composed of a continuum of small identical countries indexed by $h \in [0, 1]$. The endowment of $x$ in the interval of home countries $dh$ is $(1 - \gamma)dh$, and this endowment is owned by the type-1 agents of these countries, while the endowment of $y$ in the interval of home countries $dh$ is $\gamma dh$, and this endowment is owned by the type-2 agents of these countries. If a type-1 agent consumes $X_1$ units of $x$ and $Y_1$ units of $y$, its utility is $U_1 = X_1Y_1$. Type-2 agents, by contrast, consume only good $x$, and if a type-2 agent consumes $X_2$ units of $x$, its utility is $U_2 = X_2$. It is direct to show that the price in autarky in a representative home country is given by $p^\psi = 2\gamma(1 - \gamma)$. We impose the parameter restriction $\gamma \in (\sqrt{2} - 1, 1)$, which implies $p^\psi > p^{\psi\psi}$ and therefore ensures that, if trade is allowed and conforms with comparative advantage, the representative home country will be an importer of $x$ and the foreign country will be an importer of $y$. As can be confirmed from (7) below, $\gamma < 1$ ensures that the Nash foreign tariff is finite.

The foreign government selects $\tau^*$ to maximize $U^*$, which can be written as

$$U^* = \frac{1}{p^*} \left( \gamma + \left[ 1 - \gamma \right]/p^\psi \right)^2,$$

$$\equiv W^*(p^*, p^\psi).$$

The government of a representative home country has at its disposal both a tariff $\tau$ and a production subsidy $s$. We assume that revenue from intervention in a representative home country is redistributed across its type-1 and type-2 agents as in Wolfgang Mayer (1984), so that the $i$th agent’s share of revenue is its share of factor income. We assume further that the government of a representative home country operates under a rigid political constraint, according to which it cannot allow international trade to alter the relative incomes of its type-1 and type-2 agents from their relation in autarky. This constraint amounts to the requirement that $q = p^\omega$. Subject to this constraint, the representative home government is assumed to select its
instruments to maximize $U = U_1 U_2$, which after substituting the constraint can be expressed as

$$U = p \frac{(\gamma + [1 - \gamma] \bar{p}_w)^3}{(p + 2\bar{p}_w)^2} = W(q = p^*, p, \bar{p}_w).$$

Exploiting the fact that the representative home country is small and therefore takes $\bar{p}_w$ as fixed when selecting its tariff and production subsidy, it is direct to calculate that the unique interior Nash equilibrium between the home and foreign countries is characterized by

$$\tau^* = \frac{\gamma(4\gamma + 2)}{(3 - \gamma)(1 - \gamma)}; \quad \tau^N = 1;$$

$$s^N = \frac{2\gamma}{(1 - \gamma)\bar{p}_w};$$

$$\bar{p}_w^N = \frac{2\gamma + (3 - \gamma)\tau^*}{3\gamma + (1 - \gamma)(1 + \tau^* N)}.$$  

Consider next the Nash equilibrium in home and foreign tariffs that would arise if $s = 1$, so that no home country were permitted to utilize its production subsidy. In this case, we may observe that the representative home country must then have $p = q$, and so the constraint $q = p^*$ demands $p = p^*$ and hence autarky, which corresponds to a point on the tariffs-only efficiency frontier. Since the foreign government achieves greater welfare in the interior Nash equilibrium than under autarky, we may also observe that, if the representative home government refuses to bind its tariff, it avoids an SCM challenge and thereby secures its interior Nash payoff. Hence, the disagreement payoff for a representative home government in the WTO Subsidy Game is its interior Nash payoff, and it will not accept a stage-1 tariff agreement in which a stage-3 SCM challenge is not brought.\(^{15}\)

Hence, we may conclude that no stage-1 tariff agreement is possible in the WTO Subsidy Game in this example.

Figure 1 illustrates. With the utility of the foreign and representative home governments on the horizontal and vertical axes, respectively, the interior Nash utilities are depicted by the point $N$, while the (full-instrument) efficiency frontier is labeled $EF$. The autarky utility levels associated with the Nash tariff equilibrium when $s = 1$ are depicted by the point $N(s = 1)$, which is also a point on the tariffs-only efficiency frontier. As we have explained, $N$ is the disagreement point for stage-1 tariff negotiations in the WTO Subsidy Game; therefore, any stage-1 agreement under which an SCM challenge can be anticipated is infeasible, since such an agreement must rest on the tariffs-only efficiency frontier at point $N(s = 1)$, which lies below point $N$; but $\tau$ must be bound below 1 if

\(^{15}\) This can be shown in two steps. First, since the subsidy is used in a representative home country to redistribute income from type-2 agents (who consume only $x$) to type-1 agents (who consume both $x$ and $y$), the subsidy reduces aggregate demand for the imported good $x$ in the representative home country, and hence an SCM challenge that removes these subsidies raises $\bar{p}_w$. Second, (5) confirms that the foreign government gains from any such rise in $\bar{p}_w$. 

\[\]
the foreign government is to gain from a stage-1 agreement that does not trigger an SCM challenge; and under any stage-1 agreement that binds $\tau$ below 1, an SCM challenge may be anticipated. Hence, the Nash point $N$ depicts the unique equilibrium of the WTO Subsidy Game in this example.

V. Conclusion

This paper raises at least as many questions as it answers. Among the most important questions are: (a) A central efficiency-enhancing role is suggested for the right to bring NV claims, but we have modeled these claims stylistically. Does this central role survive when the nature of NV claims is modeled more precisely? (b) Our results suggest that the WTO Subsidy rules may mark a step backward. If one accepts this suggestion, then a natural question is, how could this (inferior) change have been agreed to by GATT/WTO members?

These are important questions for future work. Here we comment briefly on each of them. Regarding a more precise modeling of NV claims, we have modeled NV claims as preserving the level of market access commitments implied by tariff negotiations. More accurately, as Petersmann (1977, p. 172) explains, in combination with renegotiation rights, the NV claims operate to preserve the balance of market access commitments implied by tariff negotiations. This suggests that a more precise modeling of NV claims requires, as well, the introduction of renegotiation opportunities, along the lines pursued in Bagwell and Staiger (2001a) in the context of domestic standards. A similar analysis in the context of subsidies could be illuminating. Regarding the possibility that an inferior change in subsidy rules could have been agreed to by the GATT/WTO members, one explanation builds from the observation by Sykes (2005) that a major limitation of GATT subsidy disciplines as perceived by member governments was their inability to address third-country issues. These issues do not arise in our 2-country model, but in a 3-country environment it can be seen that GATT’s reliance on NV claims to discipline subsidies that upset market access expectations would be effective only if these claims extended to third parties.

Under GATT, NV claims were not interpreted to have third-party validity, and as Sykes explains, the WTO subsidy disciplines were introduced in part to achieve this third-party reach. Under this explanation, our results indicate that a better fix would be to extend the reach of NV claims to third parties.

APPENDIX

LEMMA 1: Let $(s^E, t^E, \tau^E, \tau^*E)$ denote a point on the Contracting Frontier, and let $\tilde{p}^wE = \tilde{p}^w(s^E, t^E, \tau^E, \tau^*E)$. Then for any $\tilde{p}^w < \tilde{p}^wE W(p^E(\tau^*E, \tilde{p}^w)), \tilde{p}^w) < W(p^E(\tau^*E, \tilde{p}^wE), \tilde{p}^wE)$.

PROOF:

We begin by observing that, at a point on the Contracting Frontier, we cannot have $dW/d\tau > 0$ or $dW/d\tau > 0$; otherwise, under (C1), governments would agree on the direction of movement in a tariff which each would strictly prefer, and the initial policies could not then be internationally efficient. Moreover, as international efficiency requires the tangency condition

\[
\frac{d\tau}{d\tau^*} \bigg|_{dW=0} = -\frac{dW/d\tau^*}{dW/d\tau} = \frac{d\tau}{dW/d\tau} \bigg|_{dW^*=0},
\]

it follows that at a point on the Contracting Frontier we cannot have $dW/d\tau^* = 0$ or $dW^*/d\tau = 0$. Therefore, any point on the Contracting Frontier must satisfy

\[(A1) \quad dW/d\tau^* < 0; \quad dW^*/d\tau < 0.\]

In addition, notice that $dW/d\tau = [(1/\tau^*)W^*_{p^*} + W^*_{p^*} - \partial \tilde{p}^w/\partial \tau]$, and so with $\partial \tilde{p}^w/\partial \tau < 0$ it follows that $dW^*/d\tau < 0$ implies $[(1/\tau^*)W^*_{p^*} + W^*_{p^*}] > 0$. As a consequence, beginning from a policy combination $(s^E, t^E, \tau^E, \tau^*E)$ on the Contracting Frontier, any set of small changes in the policies of the domestic government $(s, t, \tau)$ that reduce $\tilde{p}^w$ from its implied level $\tilde{p}^wE = \tilde{p}^w(s^E, t^E, \tau^E, \tau^*E)$ will reduce the welfare of the foreign govern-
ment. Under our global concavity assumption, the statement of Lemma 1 then follows.

**LEMMA 2:** Let \((s^E, t^E, \tau^E, \tau^*E)\) denote a point on the Contracting Frontier, and let \(\bar{\rho}^{wE} = \bar{\rho}^{w}(s^E, t^E, \tau^E, \tau^*E)\) and \(\bar{\rho}^{\nu} = \bar{\rho}^{\nu}(s^E, t^E, \tau^E, \tau^*E)\) for any \(s', t'\) and \(\tau^{*E}\). Then for any \(s', t'\) and \(\tau^{*E}\) implying \(\bar{\rho}^{wE} > \bar{\rho}^w\), \(W(q(s, \tau, \bar{\rho}^{\nu}(s, \tau)), p(t, \tau, \bar{\rho}^{wE}(s, \tau)) < W(q(s, \tau, \bar{\rho}^{wE}(s, \tau)), p(t, \tau, \bar{\rho}^{wE}(s, \tau)), \bar{\rho}^{wE}(s, \tau), \bar{\rho}^{wE}(s, \tau))\).

**PROOF:**

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

\[
\frac{\partial \bar{\rho}^{w}}{\partial \tau} = s \frac{\partial \bar{\rho}^{\nu}}{\partial s} + t \frac{\partial \bar{\rho}^{w}}{\partial t}.
\]

Moreover, it may also be confirmed that the first-order conditions that define the international efficiency frontier imply

\[
\frac{dW}{ds} + \frac{dW}{dt} \left[ - \frac{\partial \bar{\rho}^{\nu}/\partial s}{\partial \bar{\rho}^{w}/\partial t} \right] = 0,
\]

which says that the domestic government must be indifferent to small changes in \(s\) and \(t\) that preserve the market-clearing world price \(\bar{\rho}^w\). An implication of (A3) is that, with \(\bar{\rho}^{\nu}/\partial s < 0\) and \(\bar{\rho}^{\nu}/\partial t < 0\), starting from any point on the international efficiency frontier \(sign(dW/ds) = sign(dW/dt)\). But by (A2), we also have that

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

and thus at a point on the efficiency frontier satisfying (C1), we must also have \(dW/ds > 0\) and \(dW/dt > 0\). As a consequence, beginning from a point \((s^E, t^E, \tau^E, \tau^*E)\) that rests on the Contracting Frontier, it follows that

\[
\frac{dW}{ds} + \frac{dW}{dt} \frac{dt}{ds} \equiv 0 \quad as \quad \frac{dt}{ds} \equiv - \left[ \frac{\partial \bar{\rho}^{\nu}/\partial s}{\partial \bar{\rho}^{w}/\partial t} \right],
\]

and therefore that any set of small changes in the domestic policies of the home government \((s, t)\) that increase \(\bar{\rho}^w\) from its implied level \(\bar{\rho}^{wE} \equiv \bar{\rho}^{w}(s^E, t^E, \tau^E, \tau^*E)\) will reduce the welfare of the home government. Combined with our finding (A1) in the proof of Lemma 1 above that \(dW/d\tau^* < 0\) and our global concavity assumption, the statement of Lemma 2 then follows.

**REFERENCES**


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