

# International Trade and Domestic Regulation

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## Abstract

Existing formal models of the relationship between trade policy and regulatory policy suggest the potential for a regulatory race to the bottom as nations lower their regulatory standards to advantage their firms against foreign competitors. WTO rules and disputes, however, center on complaints about excessively stringent regulations. This paper bridges the gap between the existing formal literature and the actual pattern of rules and disputes. Employing the now standard terms of trade framework for the modeling of trade agreements, we show how “large” nations may have an incentive to discriminate against imported goods in regulatory policy once border instruments are constrained, and how inefficiently stringent regulation may emerge under certain circumstances even if regulatory discrimination is prohibited. We then assess the WTO legal framework in light of our results, arguing that it does a reasonably thorough job of policing regulatory discrimination, but that it does relatively little to address excessive nondiscriminatory regulations.

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# 1. Introduction

Existing formal models of the relationship between trade policy and domestic regulatory policy suggest the potential for a regulatory race to the bottom (e.g., Markusen, 1975, Copeland, 1990, Ederington, 2001 and Bagwell and Staiger 2002, chapter 9). When nations constrain their tariffs through trade agreements, they in effect promise a certain degree of market access to trading partners. A subsequent relaxation of regulatory standards (labor and environmental standards, for example) that apply predominantly to import-competing sectors can undermine these market access commitments. In particular, if “large” nations relax such regulations, foreign suppliers who export to these markets will lower their prices to remain competitive with domestic producers, and some of the costs of the weakening of domestic regulations are thereby shifted abroad through the implied foreign-exporter price (“terms of trade”) movements. Consequently, these models provide a formal basis for concern that large nations may relax their regulatory standards to inefficiently low levels as a way to engage in terms-of-trade manipulation when they have constrained their trade policies as a result of tariff negotiations. Ederington (2009) surveys the recent body of empirical research that lends some support to the concerns emphasized by these models.

The existing models highlight an important potential concern for the world trading system, but they have limited purchase when it comes to explaining the specific obligations that have been negotiated in the WTO system with respect to national regulatory policies, and the actual disputes that have arisen over such policies. In particular, the legal obligations that explicitly address national regulatory policies – embodied in the GATT Article III “national treatment” (nondiscrimination) principle,<sup>1</sup> the WTO Agreement on Technical Barriers to Trade (TBT), and the WTO Agreement on Sanitary and Phytosanitary Measures (SPS) – do not place legal constraints on nations that wish to lower domestic regulatory standards or otherwise under-regulate their domestic industries relative to some efficient regulatory ideal. Rather,

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<sup>1</sup>The national treatment principle has been the subject of recent formal analysis in Horn (2006) and Horn, Maggi and Staiger (forthcoming), but the focus in these papers is on domestic taxes rather than regulatory standards. Costinot (2008) provides a formal analysis of the national treatment clause as applied to regulatory standards, but the focus of his paper (comparing the national treatment clause of the GATT/WTO to the mutual recognition rules of the EU) is very different from our paper. Finally, Gulati and Roy (2008) also consider the role of national treatment in the presence of regulatory standard setting, and some of our results parallel their findings; but they focus on the small-open economy case, and as a result the emphasis of the two papers is very different. In some ways, our focus is closest to Battigalli and Maggi (2003). We discuss the differences between their paper and ours at a later point in the Introduction.

they restrict the ability of member governments to impose regulations on foreign suppliers.<sup>2</sup> Likewise, all of the pertinent disputes in the WTO system regarding national regulations, such as the beef hormones dispute (EC prohibition on domestic production and importation of hormone-raised beef), the asbestos dispute (French prohibition on domestic production and importation of asbestos-containing products), the sardines dispute (EC prohibition on labeling of certain species of fish as “sardines”), and the recent Canadian challenge to Korean beef import restrictions (prohibition of Canadian beef imports ostensibly to prevent mad cow disease), involve complaints about excessive regulation by importing nations.<sup>3</sup>

This paper seeks to bridge the gap between the existing economics literature on trade and domestic regulatory policy, and the explicit WTO obligations and pattern of actual WTO disputes. To this end, we first develop a formal economic analysis that is capable of accounting for the basic features of the actual WTO disputes highlighted above. We then apply the results from this analysis to interpret and evaluate the relevant WTO obligations, and we interpret as well the WTO disputes that have arisen around these obligations in the context of domestic regulatory policies.

To undertake the economic analysis, we adapt and extend the general insights of Bagwell and Staiger (2001) to a setting that can more readily be applied to the kinds of regulatory standards – namely *product standards* – that are typically the subject of WTO disputes. The model is tailored to represent the problem faced by a government who must choose trade policy as well as domestic tax and regulatory policy for a product that is both domestically produced

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<sup>2</sup>Of course, the trade implications of under-regulating domestic firms can be quite similar to the trade implications of over-regulating foreign suppliers, and in this sense a degree of symmetry exists between the two phenomena. The key point for our purposes is that the specific obligations in WTO law to which we refer in the text do not prevent nations from relaxing their domestic regulations as they wish as long as they do not concurrently attempt to impose more stringent obligations on foreign suppliers. Likewise, the body of WTO disputes is limited to cases in which foreign suppliers complain about new regulations that disadvantage them, rather than about a relaxation of the regulations applicable to import-competing firms (the one exception is the *Japan – Film* case, in which it was alleged that lax antitrust enforcement facilitated exclusive dealing arrangements that disadvantaged imports. We discuss the case a bit further in 3.2 below).

<sup>3</sup>The existing models do point out the possibility that governments who constrain their tariffs in trade agreements may have an incentive to raise some standards above efficient levels, but this incentive would typically arise in export sectors. What is not well-represented in the existing formal literature is the incentive to raise standards to inefficiently high levels in import-competing sectors, which as we have noted seems to be the case which is most prevalent in actual WTO disputes. It should also be emphasized, of course, that observed/actual disputes may represent only the tip of the iceberg when it comes to understanding the scope of government incentives that are kept in check by existing WTO obligations, since much of the enforcement of WTO commitments may be accomplished through “off equilibrium” threats and therefore not manifested in observed disputes (see, for example, Bagwell and Staiger, 2002, Ch. 6).

and imported, and whose domestic consumption generates a negative externality (“pollution”) that is costly in terms of domestic utility (but is not internalized by individual consumers and does not cross international borders).<sup>4</sup> A higher standard will reduce the pollution generated when the product to which the standard applies is consumed, but the cost of compliance with a higher standard is also higher. And unless it is constrained otherwise, the government is free to choose domestic tax and regulatory policies which discriminate against foreign imports.

In this setting, where a government chooses product standards that must be met for consumption of the product within its borders, goods produced to different standards are effectively different products (i.e., products of different “quality”). This raises the question of how the foreign supply price to the domestic market – and hence the terms of trade between the domestic and foreign country – should be measured when gauging the manner in which the terms of trade is impacted by changes in domestic regulatory standards. By focusing on the impact of changes in policies on the foreign supply price of the *un*regulated good – and by defining the terms of trade controlling for quality in this way – we are able to isolate the pure international cost-shifting incentive that drives the race-to-the-bottom results of the existing literature, and to establish that this same incentive delivers a tendency in our model for governments to *excessively* regulate the products that they import from abroad when their tariffs are constrained by a trade agreement.

More specifically, with the terms of trade defined in this way, we first extend a key finding of Bagwell and Staiger (2001) to the current setting, by demonstrating that the inefficiency of the non-cooperative (Nash) equilibrium can be traced to a single source: Nash tariffs are higher than is efficient, and Nash trade volumes are correspondingly too low, because each country manipulates its terms of trade with its tariff. From this vantage point, an important insight emerges: despite the complex domestic policy environment, domestic tax and regulatory policies are set efficiently in the Nash equilibrium, and only the tariff is distorted from its efficient

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<sup>4</sup>Battigalli and Maggi (2003) also focus on the treatment of product standards in trade agreements, and like us develop a possible role for a national treatment rule. But the formal analysis in the two papers is very different and they emphasize different things. Battigalli and Maggi abstract from tariffs and consumption taxes to focus on standards, and they adopt an incomplete contracts perspective in which standards for existing products can be and are contracted over, but where standards for future potential products cannot be contracted over ex ante and where there is hence missing “issue linkage” that gives rise to ex-ante inefficiency; and they show how a national treatment rule in combination with a dispute settlement body can then help to remedy the incompleteness of the agreement in this setting. By contrast, our approach follows that of Bagwell and Staiger (2001) in focusing on the substitutability between tariffs and domestic policy instruments and developing a terms-of-trade interpretation of the problem for a trade agreement to solve, and we then explore the role of a national treatment clause from this perspective.

level; hence, the fundamental problem for a trade agreement to address is to prevent terms-of-trade manipulation and to thereby reduce tariffs and raise trade volumes, without introducing distortions into the choice of domestic regulatory and tax policies.

Having identified the problem for a trade agreement to address in this setting, we next derive a number of results that help to illuminate the possible logic behind features of trade agreements that are designed to correct this problem. To facilitate our discussion, we suppose that the technology for compliance with any given standard level, and the pollution generated per unit of product consumed under any given standard level, are the same across domestically-produced and foreign-produced products. In this case, the internationally efficient policies take a simple and intuitive form: free trade, a nondiscriminatory regulatory standard that equates the marginal benefit of pollution abatement to the marginal compliance cost, and a Pigouvian consumption tax set at the level of the consumption externality.<sup>5</sup>

From this starting point, we begin with a simple thought experiment: What would be the shortcoming of an international agreement that simply constrained tariffs to their efficient levels? After all, as indicated above, of all the policies chosen by governments, it is only the tariffs that are set inefficiently absent an agreement (i.e., in the Nash equilibrium). We show that, absent a nondiscrimination rule applied to domestic taxation, tariff commitments would be completely undone by the introduction of consumption taxes which discriminate against foreign products. Hence, tariff commitments alone that are not protected by a national treatment clause applied to domestic taxation will be meaningless in this setting.

We next show that a commitment to free trade that is accompanied by a national treatment clause applied narrowly to domestic taxation will still fail to achieve internationally efficient policies, because (i) discriminatory standards will be introduced against foreign imports and (ii) the standards on domestically produced units will be made inefficiently lax. In addition, the standard on foreign imports will in general be set at an inefficient level, as will the level of the consumption tax, although these policies may be set either too high or too low relative to their efficient levels. Intuitively, with its tariff constrained, the domestic government will

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<sup>5</sup>As we demonstrate below, when the cost of compliance and/or the consumption-generated emission level for a given standard differs across domestically-produced and foreign-produced products, efficiency generally requires that domestically-produced goods face a different standard from foreign-produced goods, and requires as well a (positive or negative) tariff so that the domestic and foreign goods can face distinct (Pigouvian) implied consumption taxes (see also Gulati and Roy, 2008, on this point). As there is little basis for a presumption regarding the direction that domestic and foreign products might differ along these lines, we adopt the neutral case of symmetric technologies as our benchmark from which to assess the features of efficient trade agreements. See also note 13 for further discussion on this point.

look for alternative methods for manipulating the terms of trade: the consumption tax can be raised to partially accomplish this, but it is an imperfect substitute for the tariff; and by raising the standard applied to foreign imports while reducing the standard applied to domestically-produced goods, the same overall level of pollution can be attained at a lower domestic cost, because this maneuver forces foreign producers to absorb some of the cost of pollution abatement in order to remain competitive in the domestic market. When the tariff itself is unavailable to manipulate the terms of trade, the regulatory “cost-shifting” that can be accomplished with standards that discriminate against foreign imports in this fashion becomes attractive.

We then suppose that governments agree to a national treatment clause that applies to both domestic taxation and regulatory standards, and we ask: Will a tariff agreement that is protected by this broader rule allow governments to reach internationally efficient policies? Again we show that the answer is “no,” because governments will have then incentive to distort their consumption taxes to inefficiently high levels even if these taxes cannot be set in a discriminatory fashion, and they may (and will, if product-level consumption taxes are unavailable) have incentive to distort upward their nondiscriminatory product standards as well.

Our economic analysis thus leads to the following broad conclusion. To achieve internationally efficient policy levels in this environment, tariff agreements must include rules that prevent the use of discriminatory domestic tax and regulatory policies, while at the same time preventing governments from setting excessively high nondiscriminatory taxes and product standards in response to the ability to shift some of the costs of these policies onto foreign exporters.

With our formal analysis developed, we then turn to consider its implications for understanding the structure of WTO obligations and disputes. The analysis suggests an obvious role for legal disciplines that constrain regulations that are discriminatory against foreign suppliers, whether *de jure* or *de facto*, and we relate this role to the national treatment provisions contained in GATT Article III and the further strengthening of these provisions embodied in the WTO SPS and TBT Agreements. The analysis suggests as well a possible need for additional legal disciplines on nondiscriminatory regulatory and tax policies to prevent international cost-shifting and over-regulation in appropriate cases. In this regard, we note that the explicit obligations contained in GATT Article III and the SPS and TBT Agreements would do little to address this second issue; and we evaluate the possible role for “nonviolation” claims in cases involving nondiscriminatory regulations, which would allow exporting nations to seek compensation for reduced market access, but conclude that as currently interpreted such claims are

probably ineffective in providing the needed disciplines as well. In each case, we discuss and interpret the relevant WTO disputes.

Overall, our conclusion is that GATT/WTO disciplines can be viewed as being fairly well-designed to address the incentives to engage in international cost-shifting with discriminatory domestic tax and regulatory policies that our model has identified, but that these disciplines may ultimately have little to say about inefficiently high but nondiscriminatory domestic taxes and product standards. Regarding this second conclusion, it is interesting to note that Broda, Limao and Weinstein (2008) find that the United States sets significantly higher non-tariff barriers in import-competing sectors where it has greater ability to affect foreign exporter prices. Measures of non-tariff barriers reflect a broader set of policies than simply the domestic regulatory policies that we have in mind here (for example, they include antidumping actions), but these measures do include domestic product standards and other regulatory policies; and so the evidence reported by Broda, Limao and Weinstein is suggestive of the kind of pattern one would expect based on our model if (i) the United States constrained its ability to engage in terms-of-trade manipulation with its tariffs through GATT/WTO tariff commitments and (ii) GATT/WTO rules are ineffective at preventing governments from setting (nondiscriminatory) product standards with terms-of-trade manipulation in mind. Broda, Limao and Weinstein offer additional specific empirical evidence consistent with (i), while we maintain based on our legal analysis that (ii) is also likely to be true. Accordingly, our analysis may be viewed as confirming essential features of the GATT/WTO approach while at the same time pointing to potential weaknesses in that approach, albeit weaknesses that may be difficult to eliminate.

The next section presents our economic analysis. Section 3 then provides the legal discussion. A brief conclusion is contained in Section 4.

## **2. Economic Analysis**

We begin with an economic analysis of the main features of the problem. The purpose of the analysis is to illuminate some basic insights that will guide the subsequent legal discussion.

### **2.1. The Basic Model**

We consider a simple partial equilibrium model of trade between a domestic and a foreign country, with ‘\*’s denoting foreign variables. The product under consideration is produced in

both countries but only demanded in the domestic country, where its demand can be represented by the linear demand curve

$$D = \alpha - P,$$

with  $P$  the consumer price of this good in the domestic market. Consumption of the good generates a negative externality (an “eye sore” pollutant) that is not internalized by individual consumers (and hence does not impact demand for the product) and which does not effect production, but which detracts from aggregate national welfare in the domestic country (the externality does not cross borders).

The domestic government can impose a regulatory standard which specifies a (maximum) level of pollution generated per unit of the good consumed, and the standard may differ across domestically produced and imported units. We denote by  $r$  the standard imposed on domestically produced units, and by  $\rho$  the standard imposed on imported units, with  $\theta(r)$  and  $\theta^*(\rho)$  the associated per-unit pollution levels generated by consumption of domestically produced and imported units under the respective standards  $r$  and  $\rho$ . We assume that  $\theta$  and  $\theta^*$  are decreasing and convex in their respective arguments.

To meet the standard  $r$ , domestic producers must incur the per-unit compliance cost  $\phi(r)$ ; and similarly, to meet the standard  $\rho$ , foreign producers must incur the per-unit compliance cost  $\phi^*(\rho)$ . We assume that  $\phi$  and  $\phi^*$  are increasing and convex in their respective arguments. For any regulatory standards  $r$  and  $\rho$ , domestic and foreign supply are then given by

$$S = q - \phi(r) \text{ and } S^* = q^* - \phi^*(\rho),$$

where  $q$  and  $q^*$  are the domestic and foreign producer prices respectively.

In addition to the regulatory standards, the domestic government has at its disposal an import tariff  $\tau$  and a consumption tax  $t$  (both expressed in specific terms).<sup>6</sup> The foreign government has an export tax  $\tau^*$  (also expressed in specific terms). Assuming that all taxes are set at non-prohibitive levels, it then follows that the domestic consumer and producer price are related according to

$$P = q + t, \tag{2.1}$$

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<sup>6</sup>A tariff and a consumption tax represent a complete set of tax instruments for the home government in this industry (i.e., they in effect amount to an independent consumption tax and production subsidy), because the tariff itself is equivalent to a combination consumption tax and production subsidy. Also, for now we assume without loss of generality that the consumption tax is applied in a nondiscriminatory manner across domestically-produced and foreign-produced goods, and postpone consideration of discriminatory consumption taxes until our discussion of trade agreements in section 2.3, when a strict incentive to apply discriminatory consumption taxes first arises in our model.

while the domestic and foreign producer prices are related according to

$$q = q^* + \tau + \tau^*. \quad (2.2)$$

Notice that all units of the product sell in the domestic country at the same price  $P$  regardless of the standard to which they are produced, owing to the fact that the pollution generated by consumption is modeled as an “eye sore” externality that has no demand implications: that is, individual consumers do not differentiate across units of the good on the basis of how much pollution it generates when they consume it, and so their willingness to pay for the good is independent of its pollution-generating characteristics. We may also define the “world” producer price (i.e., the price at which the good is available for sale in international markets once it clears customs in the exporting country):

$$q^w \equiv q^* + \tau^* = q - \tau. \quad (2.3)$$

Equilibrium in this market is determined by the market-clearing condition that the volume of domestic imports must equal the volume of foreign exports

$$D - S = S^*,$$

which, using the explicit expressions for demands and supplies and the pricing relationships in (2.1)-(2.3), determines the market-clearing world price as a function of the tax and regulatory policies:

$$\tilde{q}^w = \frac{1}{3}[\alpha - 2\tau + \tau^* - t + \phi(r) + \phi^*(\rho)]. \quad (2.4)$$

Moreover, using (2.1)-(2.3) we may derive expressions for the market-clearing levels of each of the other prices as functions of the tax and regulatory policies:

$$\begin{aligned} \tilde{P} &= \frac{1}{3}[\alpha + \tau + \tau^* + 2t + \phi(r) + \phi^*(\rho)], \\ \tilde{q} &= \frac{1}{3}[\alpha + \tau + \tau^* - t + \phi(r) + \phi^*(\rho)], \text{ and} \\ \tilde{q}^* &= \frac{1}{3}[\alpha - 2(\tau + \tau^*) - t + \phi(r) + \phi^*(\rho)]. \end{aligned} \quad (2.5)$$

It will be helpful in what follows to define as well the market-clearing foreign producer price of the “raw” *unregulated* good – prior to bringing it into compliance with the prevailing regulatory standard – as a function of the tax and regulatory policies, and the associated world

price of the foreign-produced unregulated good, by

$$\begin{aligned}\tilde{q}_0^* &\equiv \tilde{q}^* - \phi^*(\rho) = \frac{1}{3}[\alpha - 2(\tau + \tau^*) - t + \phi(r) - 2\phi^*(\rho)], \text{ and} \\ \tilde{q}_0^w &\equiv \tilde{q}^w - \phi^*(\rho) = \frac{1}{3}[\alpha - 2\tau + \tau^* - t + \phi(r) - 2\phi^*(\rho)].\end{aligned}\tag{2.6}$$

We will refer to  $\tilde{q}_0^w$  rather than  $\tilde{q}^w$  as the terms of trade, although for any  $\rho$  there is a one-to-one mapping between the two notions of world price as the bottom line of (2.6) indicates.<sup>7</sup> Notice as well from the definition of  $S^*$  that  $\tilde{q}_0^*$  is also the market-clearing volume of foreign exports (production).

We next introduce expressions for domestic and foreign welfare. Welfare in the domestic country is given by calculating the usual partial equilibrium measure of consumer surplus plus producer surplus plus tax revenue, and then subtracting off the disutility of the consumption-generated pollution.

More specifically, domestic consumer surplus ( $CS$ ) and domestic producer surplus ( $PS$ ) are defined respectively by

$$\begin{aligned}CS &= \int_{\tilde{P}}^{\alpha} [\alpha - P]dP \equiv CS(\tilde{P}), \text{ and} \\ PS &= \int_{\phi(r)}^{\tilde{q}} [q - \phi(r)]dq \equiv PS(r, \tilde{q}).\end{aligned}$$

Using the pricing relationships above and the definition of  $\tilde{q}_0^w$ , the tax revenue collected by the domestic government ( $TR$ ) is given by

$$\begin{aligned}TR &= [\tilde{P} - \tilde{q}] \cdot [\alpha - \tilde{P}] + [\tilde{q} - \tilde{q}_0^w - \phi^*(\rho)] \cdot [(\alpha - \tilde{P}) - (\tilde{q} - \phi(r))] \\ &\equiv TR(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w).\end{aligned}$$

Finally, the utility cost of domestic pollution ( $Z$ ) is given by

$$\begin{aligned}Z &= \theta(r) \cdot [\tilde{q} - \phi(r)] + \theta^*(\rho) \cdot [(\alpha - \tilde{P}) - (\tilde{q} - \phi(r))] \\ &\equiv Z(r, \rho, \tilde{P}, \tilde{q}).\end{aligned}$$

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<sup>7</sup>Our focus on  $\tilde{q}_0^w$  rather than  $\tilde{q}^w$  as the terms of trade is the key step by which we keep the dimensionality of our analysis at a manageable level, despite the fact that in the presence of the (continuous) consumption standard we consider there are an infinite number of possible products that could be imported and consumed by the domestic country, corresponding to each possible setting of the standard (see Bagwell and Staiger, 2001, note 8, for a discussion of this problem).

With these definitions, domestic welfare may now be expressed as

$$\begin{aligned} W &= CS(\tilde{P}) + PS(r, \tilde{q}) + TR(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w) - Z(r, \rho, \tilde{P}, \tilde{q}) \\ &\equiv W(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w). \end{aligned} \quad (2.7)$$

Domestic welfare is ultimately a function of the domestic regulatory policies and the domestic and foreign tax policies, but as  $W(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w)$  indicates the tax policies all impact domestic welfare indirectly through their impacts on domestic and world prices, while the regulatory policies impact domestic welfare both directly and also indirectly through the price channels. Finally, using (2.7) and the definition of  $TR(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w)$ , observe that  $W_{\tilde{q}_0^w} = -[(\alpha - \tilde{P}) - (\tilde{q} - \phi(r))] < 0$  (where here and throughout a subscripted variable denotes a partial derivative with respect to the variable). This simply reflects the domestic welfare loss that comes when the terms of trade move against the domestic country (i.e., when  $\tilde{q}_0^w$  rises) holding all regulatory standards and domestic local prices fixed: this loss is nothing other than the income effect of the terms-of-trade deterioration for the domestic country, which amounts to the domestic import volume.

Turning now to foreign welfare, the absence of foreign demand for the product under consideration and of foreign pollution makes the foreign welfare measure very simple: foreign welfare is given by the sum of producer surplus and trade tax revenue. More specifically, using the pricing relationships above and the definitions of  $\tilde{q}_0^*$  and  $\tilde{q}_0^w$ , foreign producer surplus ( $PS^*$ ) and trade tax revenue ( $TR^*$ ) can be defined as

$$\begin{aligned} PS^* &= \int_{\phi^*(\rho)}^{\tilde{q}_0^* + \phi^*(\rho)} [q^* - \phi^*(\rho)] dq^* = \int_0^{\tilde{q}_0^*} q^* dq^* \equiv PS^*(\tilde{q}_0^*), \text{ and} \\ TR^* &= [\tilde{q}_0^w - \tilde{q}_0^*] \cdot \tilde{q}_0^* \equiv TR^*(\tilde{q}_0^*, \tilde{q}_0^w). \end{aligned}$$

With these definitions, foreign welfare may now be expressed as

$$\begin{aligned} W^* &= PS^*(\tilde{q}_0^*) + TR^*(\tilde{q}_0^*, \tilde{q}_0^w) \\ &\equiv W^*(\tilde{q}_0^*, \tilde{q}_0^w). \end{aligned} \quad (2.8)$$

Notice that, as expressed by  $W^*(\tilde{q}_0^*, \tilde{q}_0^w)$ , foreign welfare does *not* depend directly on the standard  $\rho$  to which foreign producers must comply, but only indirectly through the impact of  $\rho$  on  $\tilde{q}_0^*$  and  $\tilde{q}_0^w$ , the market-clearing producer price and world price of the foreign-produced unregulated good. Intuitively, we have modeled production of the unregulated good as an

increasing cost (upward-sloping supply) industry, while for a given standard level  $\rho$  the per-unit cost of coming into compliance with the standard is then constant (and equal to  $\phi^*(\rho)$ ) regardless of how many units of the unregulated good must be altered to meet the standard. As a consequence, foreign producer surplus is impacted by the standard level  $\rho$  only to the extent that  $\rho$  impacts the market-clearing foreign supply decisions for the unregulated good (through  $\tilde{q}_0^*$ ).<sup>8</sup> Finally, using (2.8) and the definition of  $TR^*(\tilde{q}_0^*, \tilde{q}_0^w)$ , observe that  $W_{\tilde{q}_0^w}^* = \tilde{q}_0^* > 0$ . This reflects the foreign welfare gain that comes when the terms of trade move in favor of the foreign country (i.e., when  $\tilde{q}_0^w$  rises) holding the foreign local price fixed: this gain is nothing other than the income effect of the terms-of-trade improvement for the foreign country, which amounts to the foreign export volume.

We close this section by developing an expression for the joint (sum of) domestic and foreign welfare. When we characterize efficient policies in the next section, we will look for the policy choices that maximize the sum of the welfare across the two countries (and thereby assume that lump sum transfers are available to distribute surplus across the two countries as desired). Using the equilibrium condition that the volume of domestic imports  $[(\alpha - \tilde{P}) - (\tilde{q} - \phi(r))]$  must equal the volume of foreign exports  $\tilde{q}_0^*$ , observe first that the world price  $\tilde{q}_0^w$  cancels from the sum of domestic and foreign tax revenue:

$$\begin{aligned} TR(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w) + TR^*(\tilde{q}_0^*, \tilde{q}_0^w) &= [\tilde{P} - \tilde{q}] \cdot [\alpha - \tilde{P}] + [\tilde{q} - \tilde{q}_0^* - \phi^*(\rho)] \cdot [(\alpha - \tilde{P}) - (\tilde{q} - \phi(r))] \\ &\equiv g(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^*). \end{aligned}$$

With this and the above expressions for  $W$  and  $W^*$ , we may write

$$\begin{aligned} W + W^* &= W(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w) + W^*(\tilde{q}_0^*, \tilde{q}_0^w) \\ &= CS(\tilde{P}) + PS(r, \tilde{q}) + PS^*(\tilde{q}_0^*) + g(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^*) - Z(r, \rho, \tilde{P}, \tilde{q}) \\ &\equiv G(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^*). \end{aligned} \tag{2.9}$$

Note that the world price  $\tilde{q}_0^w$  enters into each country's welfare function, but it does not enter into joint welfare, because movements in the world price represent pure (lump-sum) international transfers between countries: that is,  $W_{\tilde{q}_0^w}^* + W_{\tilde{q}_0^w} = \tilde{q}_0^* - [(\alpha - \tilde{P}) - (\tilde{q} - \phi(r))] = 0$ .

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<sup>8</sup>If there were a separate increasing-cost industry in the foreign country that took unregulated goods as inputs and provided a service which transformed these goods to achieve compliance for a given regulatory standard, then there would be an additional foreign producer surplus consequence of the domestic regulatory choice  $\rho$ , but again the impact would travel through market-clearing prices, in this case the price of the service performed. As long as this new price is introduced into our measure of welfare in the appropriate way, the added complication would not alter our basic findings.

## 2.2. Efficient and Nash Policies

With the basic model described, we now turn to characterizing the jointly efficient policy choices, and we characterize as well the non-cooperative (Nash) policy choices that each government would make in this environment absent any international agreement. By exploring the difference between the efficient and the Nash policies, we may then identify and understand the problem that a trade agreement must solve in this setting if it is to move governments from inefficient Nash choices to the efficiency frontier.

To characterize efficient policy choices, observe first from (2.4), (2.5) and (2.6) that world prices depend on both  $\tau$  and  $\tau^*$  independently, but that  $\tau$  and  $\tau^*$  affect all local prices only through their sum. However, as we have observed and as (2.9) indicates, the only prices that are relevant for joint welfare are the local prices. Therefore, in addition to the choices of  $t$ ,  $r$ , and  $\rho$ , efficiency ties down only the sum of  $\tau$  and  $\tau^*$ , not their individual levels. Using the expression for joint welfare given in (2.9), the efficient policy choices must satisfy the following four first-order conditions:<sup>9</sup>

$$\begin{aligned}
 W_{\tilde{P}} \frac{d\tilde{P}}{d\tau} + W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau} &= 0, \\
 W_{\tilde{P}} \frac{d\tilde{P}}{dt} + W_{\tilde{q}} \frac{d\tilde{q}}{dt} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{dt} &= 0, \\
 W_r + W_{\tilde{P}} \frac{d\tilde{P}}{dr} + W_{\tilde{q}} \frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{dr} &= 0, \text{ and} \\
 W_\rho + W_{\tilde{P}} \frac{d\tilde{P}}{d\rho} + W_{\tilde{q}} \frac{d\tilde{q}}{d\rho} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\rho} &= 0.
 \end{aligned} \tag{2.10}$$

Employing the expressions in (2.4)-(2.8) to evaluate the first-order conditions for efficiency contained in (2.10), and denoting the efficient policy choices by  $\tau^E + \tau^{*E}$ ,  $t^E$ ,  $r^E$  and  $\rho^E$ , the following expressions for the efficient policy levels may be derived:

$$\begin{aligned}
 \tau^E + \tau^{*E} &= [\theta^*(\rho^E) - \theta(r^E)], \\
 t^E &= \theta(r^E), \\
 -\theta'(r^E) &= \phi'(r^E), \text{ and} \\
 -\theta^{*'}(\rho^E) &= \phi^{*'}(\rho^E),
 \end{aligned} \tag{2.11}$$

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<sup>9</sup>We assume throughout that policy choices correspond to interior solutions of the relevant maximization problems. It is easily confirmed that the second-order conditions associated with the maximization problems considered here and throughout the paper are satisfied under our convexity assumptions for  $\theta$ ,  $\theta^*$ ,  $\phi$  and  $\phi^*$ .

where here we have used primes to denote derivatives. A number of features of the efficient policies are worth emphasizing.

First, notice that  $t^E = \theta$ , and so the efficient domestic consumption tax is set at a Pigouvian level that reflects the externality associated with consumption of a unit of the *domestically produced* good, even if this externality differs from the externality associated with consumption of a unit of the imported good. The efficient way to respond to any difference in the externality generated by consumption of the domestically produced and imported goods is via *tariffs*: as the top expression of (2.11) indicates,  $\tau^E + \tau^{*E}$  is positive (a net tax on imports) if consumption of a unit of the imported good generates more pollution than a unit of the domestically produced good; and  $\tau^E + \tau^{*E}$  is negative (a net subsidy to imports) if consumption of a unit of the imported good generates less pollution than a unit of the domestically produced good. This feature may at first seem puzzling, but it can be given a natural interpretation once it is observed that a tariff can be equivalently thought of as a (discriminatory) domestic tax on the consumption of the imported good: evidently, then, these two policies together represent the usual Pigouvian intervention to address the (possibly distinct levels of) consumption externality associated with consumption of the domestically produced and imported good.

Second, notice that the efficient standard on domestically produced goods  $r^E$  equates  $-\theta'(\cdot)$ , the marginal per unit benefit of reduced pollution that comes with a slightly tighter standard  $r$ , with  $\phi'(\cdot)$ , the marginal per unit cost of domestic compliance with the tighter standard. Similarly, the efficient standard on imported goods  $\rho^E$  equates the marginal per unit benefit of reduced pollution that comes with a slightly tighter standard  $\rho$  with the marginal per unit cost of foreign compliance with the tighter standard. In general, neither the efficient regulatory standards for domestic and imported goods, nor the efficient level of the externality produced by each type of good, will be the same.<sup>10</sup>

Third, and related to this last point, it is interesting to consider the efficient policies for the case in which domestically produced and imported goods share an identical technology, in the particular sense that both domestic and foreign producers face the same compliance cost for any (common) standard level (i.e., the functions  $\phi$  and  $\phi^*$  are identical), and consumption of both the domestically produced and imported good generate the same per unit level of pollution for any (common) standard level (i.e., the functions  $\theta$  and  $\theta^*$  are identical). In this case, due to symmetry in the compliance cost functions  $\phi$  and  $\phi^*$ , the level of  $r$  that satisfies the third

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<sup>10</sup>See also Gulati and Roy (2008).

condition in (2.11) is the same as the level of  $\rho$  that satisfies the fourth condition in (2.11): hence,  $\rho^E = r^E$ . And given that  $\rho^E = r^E$ , symmetry in the pollution functions  $\theta$  and  $\theta^*$  then implies by the first condition in (2.11) that  $\tau^E + \tau^{*E} = 0$ . Therefore, in the identical-technology case the efficient policies are given by

$$\begin{aligned}\tau^E + \tau^{*E} &= 0, \\ t^E &= \theta(r^E), \\ -\theta'(r^E) &= \phi'(r^E), \text{ and} \\ \rho^E &= r^E.\end{aligned}\tag{2.12}$$

As (2.12) indicates, efficient policy intervention in the case of identical technologies across countries takes the intuitive form of free trade, a nondiscriminatory regulatory standard that equates the marginal benefit of pollution reduction to the marginal compliance cost, and a Pigouvian consumption tax set at the level of the consumption externality.

Next we turn to characterize the Nash policy choices. Using the domestic welfare expression given in (2.7), and facing any foreign export tax  $\tau^*$ , the best-response domestic policy choices are the choices of  $\tau$ ,  $t$ ,  $r$  and  $\rho$  that satisfy the following four first-order conditions:

$$\begin{aligned}W_{\tilde{P}} \frac{d\tilde{P}}{d\tau} + W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{d\tau} &= 0, \\ W_{\tilde{P}} \frac{d\tilde{P}}{dt} + W_{\tilde{q}} \frac{d\tilde{q}}{dt} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{dt} &= 0, \\ W_r + W_{\tilde{P}} \frac{d\tilde{P}}{dr} + W_{\tilde{q}} \frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{dr} &= 0, \text{ and} \\ W_\rho + W_{\tilde{P}} \frac{d\tilde{P}}{d\rho} + W_{\tilde{q}} \frac{d\tilde{q}}{d\rho} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{d\rho} &= 0.\end{aligned}\tag{2.13}$$

Similarly, facing any domestic choices of  $\tau$ ,  $t$ ,  $r$  and  $\rho$ , the best-response foreign export tax must satisfy the following first-order condition:

$$W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau^*} + W_{\tilde{q}_0^w}^* \frac{d\tilde{q}_0^w}{d\tau^*} = 0.\tag{2.14}$$

The Nash equilibrium policy choices are the policies that simultaneously satisfy the conditions in (2.13) and (2.14), ensuring that each country is adopting its best-response policy to the other country's policy choices.

Using the expressions in (2.4)-(2.8) to evaluate the first-order conditions contained in (2.13) and (2.14) that define the Nash policies, and denoting the Nash volume of foreign export supply

by  $S^{*N}$  and the Nash policy choices by  $\tau^N$ ,  $t^N$ ,  $r^N$ ,  $\rho^N$  and  $\tau^{*N}$ , the following expressions for the Nash policy levels may be derived:

$$\begin{aligned}
\tau^N &= [\theta^*(\rho^N) - \theta(r^N)] + S^{*N}, \\
\tau^{*N} &= \frac{S^{*N}}{2}, \\
t^N &= \theta(r^N), \\
-\theta'(r^N) &= \phi'(r^N), \text{ and} \\
-\theta^{*'}(\rho^N) &= \phi^{*'}(\rho^N).
\end{aligned} \tag{2.15}$$

A number of features of the Nash policies are worth emphasizing.

First, as a comparison of the bottom two conditions in (2.11) and (2.15) reveals, the Nash standards choices satisfy the same conditions as the efficient standards choices, and indeed  $r^N = r^E$  and  $\rho^N = \rho^E$ : the Nash standards correspond to the efficient standards. Second, given that  $r^N = r^E$ , it also follows from a comparison of the middle conditions in (2.11) and (2.15) that  $t^N = t^E$ : the Nash consumption tax corresponds to the efficient consumption tax. Finally, given that  $r^N = r^E$  and  $\rho^N = \rho^E$ , it is apparent from a comparison of the first condition in (2.11) with the first two conditions in (2.15) that  $\tau^N + \tau^{*N} > \tau^E + \tau^{*E}$ .<sup>11</sup> And it is easily shown that the difference between Nash and efficient tariffs is driven by each country's incentive to manipulate the terms of trade ( $\tilde{q}_0^w$ ) with its unilateral tariff choice (i.e., to impose its Johnson (1953-54) "optimal tariff").<sup>12</sup> Finally, it can be seen that the same characterization applies in the case of identical technologies, by comparing the efficient policies for the identical-technology case in (2.12) to the Nash policies which in this case take the form

$$\begin{aligned}
\tau^N &= S^{*N}, \\
\tau^{*N} &= \frac{S^{*N}}{2}, \\
t^N &= \theta(r^N), \\
-\theta'(r^N) &= \phi'(r^N), \text{ and} \\
-\theta^{*'}(\rho^N) &= \phi^{*'}(\rho^N).
\end{aligned} \tag{2.16}$$

<sup>11</sup>This follows from our focus on non-prohibitive intervention, which ensures that the Nash export volume  $S^{*N}$  is strictly positive.

<sup>12</sup>To confirm this, note that the elasticity of foreign export supply in this model can be written as  $\frac{\partial S^*}{\partial \tilde{q}^w} \frac{\tilde{q}^w}{S^*} = \frac{\tilde{q}^w}{S^*}$ . But then, dividing  $\tau^N$  by  $\tilde{q}^w$  to convert the specific import tariff of the domestic country into an ad-valorem equivalent yields  $\frac{\tau^N}{\tilde{q}^w} = \frac{[\theta^*(\rho^N) - \theta(r^N)]}{\tilde{q}^w} + \frac{S^*}{\tilde{q}^w}$ , and hence the second term in this expression is simply the inverse of the foreign export supply elasticity (which is the Johnson (1953-54) optimal ad-valorem tariff term). A similar calculation can be performed for the foreign export tax, leading to an analogous interpretation.

Evidently, then, the inefficiency of the Nash equilibrium can be traced to a single source: Nash tariffs are higher than is efficient, and Nash trade volumes are correspondingly too low, because each country seeks to manipulate its terms of trade with its tariff (see Bagwell and Staiger, 2001, on this point more generally). And from this vantage point, a key insight emerges: despite the complex domestic policy environment, the fundamental problem for a trade agreement to address is to prevent terms-of-trade manipulation and to thereby reduce tariffs and raise trade volumes, without introducing distortions into the choice of domestic regulatory and tax policies.

This insight can be confirmed at a more general level by following Bagwell and Staiger (1999, 2001) and defining *politically optimal* policies as those policies that would hypothetically be chosen by governments unilaterally if they did not value the terms-of-trade implications of their policy choices. In particular, we suppose that the domestic government acts as if  $W_{\tilde{q}_0^w} \equiv 0$  when choosing its politically optimal policies, while the foreign government acts as if  $W_{\tilde{q}_0^*} \equiv 0$  when choosing its politically optimal policy. Politically optimal policies are therefore defined as those policies that satisfy the following five first-order conditions:

$$\begin{aligned}
W_{\tilde{P}} \frac{d\tilde{P}}{d\tau} + W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} &= 0, & (2.17) \\
W_{\tilde{P}} \frac{d\tilde{P}}{dt} + W_{\tilde{q}} \frac{d\tilde{q}}{dt} &= 0, \\
W_r + W_{\tilde{P}} \frac{d\tilde{P}}{dr} + W_{\tilde{q}} \frac{d\tilde{q}}{dr} &= 0, \\
W_\rho + W_{\tilde{P}} \frac{d\tilde{P}}{d\rho} + W_{\tilde{q}} \frac{d\tilde{q}}{d\rho} &= 0, \text{ and} \\
W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau^*} &= 0.
\end{aligned}$$

Defining politically optimal policies in this way then allows us to ask whether politically optimal policies are efficient when evaluated in light of the governments' actual objectives, and thereby to explore whether the Nash inefficiencies identified above can in fact be given the terms-of-trade interpretation we have just outlined.

But with the bottom condition in (2.17) implying that  $W_{\tilde{q}_0^*}^* = 0$ , it is immediate that the first four conditions in (2.17) then satisfy the respective four conditions for efficiency given in (2.10), and it may thus be concluded that politically optimal policies are indeed efficient. Hence, if governments could be induced to make policy choices free from motives reflecting terms-of-trade manipulation, there would be nothing left for a trade agreement to do. And as a consequence,

the fundamental inefficiency for a trade agreement to correct in this setting – and therefore the problem that gives rise to the need for a trade agreement to exist – is the unilateral incentive for governments to manipulate the terms of trade  $\tilde{q}_0^w$  with their tariff choices.

### 2.3. Trade Agreements

With the problem for a trade agreement to address now identified, we next illustrate a number of points that can help illuminate the possible logic behind features of trade agreements that are designed to correct this problem. To highlight the main themes, we now adopt the assumption – considered in the previous section – of identical technologies, and henceforth denote the (common) per-unit pollution function by  $\theta(\cdot)$  and the (common) cost of compliance function by  $\phi(\cdot)$ . We do this for two reasons. First, the assumption itself may often be plausibly met in reality, and indeed the burden of proof may be rather to explain why technology is *not* equally available across countries. And second, even if technologies are in fact distinct across countries, and are distinct in particular with regard to pollution and the compliance cost associated with a given regulation, it is not at all obvious which way the distinction would go between imports and domestically produced goods, and so abstracting from such differences seems a reasonable simplification for the purpose of illuminating the possible design features of trade agreements.<sup>13</sup>

We begin with a simple thought experiment: What would be the shortcoming of an international agreement that simply constrained tariffs to their efficient levels? After all, as the discussion in the previous section indicates, of all the policies chosen by governments, it is only the tariffs that are set inefficiently absent an agreement (i.e., in the Nash equilibrium).

An immediate answer to this question is that, without any other limitations on policies, the domestic government could simply undo its tariff commitments by imposing discriminatory consumption taxes on imported goods, which as we have already observed above are identical to tariffs except by name. Hence, tariff commitments alone that are not protected by a nondiscrimination (“national treatment”) clause applied to domestic taxation will be meaningless in this setting. Suppose, then, that countries agree to bind their tariffs below their Nash levels and also agree (in the domestic government’s case) not to impose discriminatory consumption

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<sup>13</sup>A more sophisticated analysis might allow for the possibility that each country is privately informed about the pollution and regulatory compliance-cost details of its own industry, and the analysis might then seek to characterize the design features of trade agreements that could best handle this complication. This suggests an interesting direction for research (see Ludema and Wooton, 1994, 1997, Ludema and Takeno, 2007, Bagwell and Staiger, 2005, and Bagwell, 2009, for some related analyses), but it is beyond the scope of the present paper.

taxes on imported goods.

To fix ideas, let us consider an agreement to eliminate tariffs completely, as free trade is the efficient trade policy in this identical-technology environment according to (2.12) above. If in response to the elimination of the domestic and foreign tariff, the domestic government would not alter its domestic tax and regulatory policies from their Nash levels, then efficiency would be achieved, owing to the fact that the domestic tax and regulatory Nash policies are already efficient as we have shown. The question, then, is whether the domestic government's choices of  $t$ ,  $r$  and  $\rho$  will be altered by the move from Nash tariffs to free trade and, if so, how.

To answer this question, we evaluate the bottom three first-order conditions in (2.13) under the assumption that  $\tau \equiv 0 \equiv \tau^*$  (and hence the top first-order condition in (2.13) does not hold). This characterizes the domestic government's best-response choices of  $t$ ,  $r$  and  $\rho$  given the hypothetical tariff commitments  $\tau \equiv 0 \equiv \tau^*$ .

Consider first the domestic government's best-response choice of consumption tax in this setting, taken as given the levels of  $r$  and  $\rho$ . Denoting this choice by  $t^{BR}(\tau \equiv 0 \equiv \tau^*, r, \rho)$ , the following characterization may be derived:

$$t^{BR}(\tau \equiv 0 \equiv \tau^*, r, \rho) = \theta(r) + \frac{\alpha - \theta(r) - \phi(r)}{7} + \frac{4[\theta(\rho) - \theta(r)] + 2[\phi(r) - \phi(\rho)]}{7}. \quad (2.18)$$

It can be shown that the second term on the right-hand side of (2.18) is strictly positive for non-prohibitive policies. The third term on the right-hand side is zero if  $\rho = r$ , and is negative (positive) if  $\rho > r$  ( $\rho < r$ ). Hence, if  $r$  and  $\rho$  remain at their Nash and efficient levels  $\rho^E = r^E$ , (2.18) implies that the domestic government will raise its consumption tax above the efficient level (i.e.,  $t^{BR}(\tau \equiv 0 \equiv \tau^*, r^E, \rho^E) > \theta(r^E)$ ) in response to the tariff binding. Intuitively, as we have already observed, the Nash import tariff is higher than the efficient level of free trade owing to the domestic government's incentive to utilize the tariff as an instrument for reducing  $\tilde{q}_0^w$  and hence manipulating the terms of trade to its advantage; and as the bottom expression in (2.6) indicates, if the domestic government is prevented by a trade agreement from setting its tariff with an eye toward reducing  $\tilde{q}_0^w$ , it can (imperfectly) substitute a rise in the consumption tax  $t$  to accomplish this goal.

Consider next the domestic government's choice of regulatory standards. With  $\tau \equiv 0 \equiv \tau^*$  and with  $t = t^{BR}(\tau \equiv 0 \equiv \tau^*, r, \rho)$  as defined in (2.18), the first-order conditions that define

the domestic government's best-response levels of  $r$  and  $\rho$  can be written, respectively, as

$$\begin{aligned} -\theta'(r)[2\alpha - \theta(r) - \theta(\rho) - 5\phi(r) + 3\phi(\rho)] &= \phi'(r)[3\alpha - 4\theta(r) + 2\theta(\rho) - \phi(r) + \phi(\rho)], \\ -\theta'(\rho)[2\alpha - \theta(\rho) - \theta(r) + 2\phi(r) - 4\phi(\rho)] &= \phi'(\rho)[\alpha - 4\theta(\rho) + 3\theta(r) - 2\phi(\rho) + \phi(r)]. \end{aligned} \quad (2.19)$$

Solving the two expressions in (2.19) for  $r$  and  $\rho$  yields the domestic best-response levels of  $r$  and  $\rho$  given  $\tau \equiv 0 \equiv \tau^*$  (and with  $t$  set to  $t^{BR}(\tau \equiv 0 \equiv \tau^*, r, \rho)$ ), which we denote respectively by  $r^{BR}(\tau \equiv 0 \equiv \tau^*)$  and  $\rho^{BR}(\tau \equiv 0 \equiv \tau^*)$ . Plugging these into the expression in (2.18) then yields  $t^{BR}(\tau \equiv 0 \equiv \tau^*)$  as well. Several conclusions may be drawn from the expressions in (2.19).

First, it can be shown that  $\rho^{BR}(\tau \equiv 0 \equiv \tau^*) > r^{BR}(\tau \equiv 0 \equiv \tau^*)$ : binding tariffs at free trade (or more generally below the Nash level) introduces an incentive for the domestic country to implement discriminatory regulation against foreign imports.<sup>14</sup> Intuitively, as indicated above, with its tariff constrained, the domestic government will look for alternative methods for manipulating the terms of trade  $\tilde{q}_0^w$ : the consumption tax can be raised to partially accomplish this, but as we have observed it is an imperfect substitute for the tariff; and by raising  $\rho$  and reducing  $r$ , the same overall level of pollution can be attained at a lower domestic cost, because as the bottom expression in (2.6) indicates this maneuver depresses  $\tilde{q}_0^w$  and hence forces some of the cost of pollution abatement on to foreign producers. When the tariff itself is unavailable to depress  $\tilde{q}_0^w$ , the regulatory “cost-shifting” accomplished with standards that discriminate against foreign imports becomes attractive.

Note also that, in light of our finding that regulatory standards must discriminate against imports, it need not be the case that the best-response consumption tax  $t^{BR}(\tau \equiv 0 \equiv \tau^*)$  is necessarily higher than  $\theta$ . In particular, if the incentive to discriminate is high enough, then  $t^{BR}(\tau \equiv 0 \equiv \tau^*) < \theta$ , as can be confirmed with (2.18). Evidently, the ability to set discriminatory regulation provides a very attractive means of manipulating the terms of trade when the first-best means – the tariff – is unavailable; and indeed, this attraction may be so powerful as to wipe out the use of the domestic consumption tax for this purpose.

Second, the two expressions in (2.19) can be used to confirm the following feature: we must have  $-\theta'(r^{BR}(\tau \equiv 0 \equiv \tau^*)) > \phi'(r^{BR}(\tau \equiv 0 \equiv \tau^*))$ , while we may have  $-\theta'(\rho^{BR}(\tau \equiv 0 \equiv \tau^*)) > \phi'(\rho^{BR}(\tau \equiv 0 \equiv \tau^*))$ .

<sup>14</sup>This can be shown by supposing that  $\rho = r$  and then confirming that: (i) if the top condition in (2.19) is satisfied, so that  $r$  is indeed the best-response, then the left-hand side of the bottom condition is strictly greater than the right-hand side, indicating that the best-response  $\rho$  must be higher; and similarly (ii) if the bottom condition in (2.19) is satisfied, so that  $\rho$  is indeed the best-response, then the left-hand side of the top condition is strictly less than the right-hand side, indicating that the best-response  $r$  must be lower.

$\tau^*) \geq \phi'(\rho^{BR}(\tau \equiv 0 \equiv \tau^*))$ .<sup>15</sup> In words, binding tariffs at free trade (or more generally below the Nash level) introduces an incentive for the domestic country to lower the standard that it applies to domestic production below the efficient level, while the standard that it applies to imported products is always more stringent than the domestic standard but may be lower or higher than the efficient level.

Summarizing thus far, we have established that an agreement to eliminate tariffs that is accompanied by a nondiscrimination rule applied to domestic consumption taxes will fail to achieve internationally efficient policies, because discriminatory standards will be implemented against foreign imports and the standards on domestically produced units will be inefficiently lax. In addition, the standard on foreign imports will in general be set at an inefficient level, as will the level of the consumption tax, although these policies may be set either too high or too low relative to their efficient levels.

Let us next suppose, then, that in addition to a nondiscrimination rule applied to domestic consumption taxes, governments also agree to a nondiscrimination rule applied to domestic regulation. Will a commitment to free trade that is protected by these two rules allow governments to reach the internationally efficient policies described by (2.12)?

The regulatory nondiscrimination rule amounts to a restriction that  $\rho \equiv r$ . A first immediate implication is that international efficiency still cannot be achieved, even with the addition of this rule. The reason is that the domestic consumption tax will now surely be set higher than its efficient level as an imperfect way for the domestic government to manipulate the terms of trade when its tariff – and discriminatory standards – are unavailable. This can be seen with reference to (2.18) and by noting that the restriction  $\rho \equiv r$  implies

$$t^{BR}(\tau \equiv 0 \equiv \tau^*, \rho \equiv r) = \theta(r) + \frac{\alpha - \theta(r) - \phi(r)}{7}. \quad (2.20)$$

As indicated previously, the second term on the right-hand side of (2.20) is strictly positive for non-prohibitive policies, and so (2.20) implies  $t^{BR}(\tau \equiv 0 \equiv \tau^*, \rho \equiv r) > \theta(r)$ : when tariffs are eliminated and countries commit not to use discriminatory domestic taxes or regulations, the domestic consumption tax will be raised above its Pigouvian level as a means of manipulating the terms of trade.

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<sup>15</sup>This can be established by showing that the condition that  $-\theta'(r) < \phi'(r)$  and  $-\theta'(\rho) < \phi'(\rho)$  is inconsistent with the two expressions in (2.19). This finding, together with the already-established fact that  $\rho^{BR}(\tau \equiv 0 \equiv \tau^*) > r^{BR}(\tau \equiv 0 \equiv \tau^*)$ , then yields the result.

What about the regulatory standard level chosen by the domestic government? Interestingly, once the ability to set a discriminatory product standard is taken away from the domestic country, when tariffs are eliminated *all* of the government’s incentive to manipulate the terms of trade is shifted to the consumption tax, and the (nondiscriminatory) product standard chosen by the domestic government is efficient. That is, imposing the restriction that  $\rho \equiv r$ , it can be shown with analogous steps to those described above that  $r^{BR}(\tau \equiv 0 \equiv \tau^*)$  satisfies  $-\theta'(r) = \phi'(r)$ . Evidently, as long as the domestic government remains free to set its (nondiscriminatory) consumption tax when its tariff options are restricted through an international trade agreement, the appeal to use product standards as a means to manipulate the terms of trade is completely eliminated if the standards must be set in a nondiscriminatory fashion.<sup>16</sup>

Our analysis thus far has adopted the view that good-specific consumption taxes are available to the domestic government. As the discussion just above suggests, the ability of governments to tailor specific consumption taxes at the same level of product detail as tariffs and product standards plays a crucial role in our results. In practice, consumption taxes are sometimes tailored to specific products (e.g., gasoline), but more generally the collection costs of such fine-level consumption taxes make them broadly unattractive to governments. Therefore, in the next section we briefly consider how our results must be modified when the consumption tax instrument is unavailable to the domestic government in the industry under consideration.

Before turning to this additional consideration, however, we make one final observation in the present setting. To do so, let us now return to the situation considered earlier in which countries agree to eliminate tariffs and also agree (in the domestic government’s case) not to impose discriminatory consumption taxes on imported goods but do not agree to rule out the use of discriminatory regulations. But now suppose that in addition the domestic government submits to the following rule: if, subsequent to the agreement, it alters its non-tariff policies, then it will simultaneously adjust its tariff so that its combined tariff and non-tariff policy adjustments do not alter the volume of imports it demands at the existing terms of trade. If we use the phrase “market access” to denote the volume of imports demanded at a given terms of trade, then we can think of this as a *market-access preservation* rule. The question we wish

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<sup>16</sup>This is a strong result, and the question naturally arises how general it is. We can show that it does not depend on symmetry: the introduction of asymmetric supply curves between domestic and foreign producers leaves the result unchanged. Whether other special features of our model are required for the result remains an open question. However, the result does depend on the assumption that the domestic government can set domestic consumption taxes at the same level of product detail as its tariffs are set. This is a strong assumption, and in the following section, we consider how the result is modified when this assumption is relaxed.

to ask is whether countries could achieve efficient policies under the described agreement in the presence of such a rule. The answer turns out to be “yes,” and the logic is simple to describe (see Bagwell and Staiger, 2001, for a related discussion).

Specifically, with the agreed elimination of tariffs ensuring that tariffs are set at their efficient (and politically optimal) free-trade level, we need only check that the domestic government would have no incentive to alter its tax and regulatory policies from their Nash and efficient (and politically optimal) levels under the terms of the market-access preservation rule. Under this rule, however, the allowable adjustments in the domestic country’s policies cannot alter the volume of imports it demands at the existing terms of trade  $\tilde{q}_0^w$ ; and as the volume of exports offered by foreign producers is also unchanged at existing terms of trade, it follows that the market clearing terms of trade itself  $\tilde{q}_0^w$  cannot be affected by the policy adjustments available to the domestic government under this rule. But then, in selecting its preferred levels of  $t$ ,  $r$  and  $\rho$ , the domestic government is induced to satisfy the middle three conditions for political optimality contained in (2.17), with the first and last condition in (2.17) then being satisfied by the negotiated commitment to free trade. Hence, the described tariff agreement, in combination with the market-access preservation rule, implements the politically optimal policies and therefore achieves the efficiency frontier.<sup>17</sup>

A notable feature of the market-access preservation rule in this environment is that, to deliver its desirable impact, it must be defined with respect to the world price of the unregulated good  $\tilde{q}_0^w$  rather than with respect to  $\tilde{q}^w$ , the world price of the version of the good actually being imported by the domestic country under its chosen standard. The reason is simple to understand in light of the above analysis: a rule that prevents the domestic country from altering the foreign exporter price of the unregulated good as it considers various levels of domestic taxes and regulatory standards ensures that the domestic country pays the full price of higher standards and taxes and – as it also enjoys the full benefits – therefore makes internationally efficient policy choices.

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<sup>17</sup>A simple way to see that this must be true is to note that efficiency will be achieved under the free-trade agreement if only the domestic government does not alter its domestic tax and regulatory policies from their Nash levels; and note as well that the market-access preservation rule, by preserving  $\tilde{q}_0^w$ , must also preserve the level of foreign welfare  $W^*(\tilde{q}_0^*, \tilde{q}_0^w)$ , because  $\tau^*$  and hence  $\tilde{q}_0^*$  must also be unchanged; but then, with the elimination of tariffs and beginning from the Nash domestic tax and regulatory policies, the efficiency of this starting point ensures that it is impossible for the domestic government to find alternative domestic tax and regulatory policies to the Nash policies which would satisfy the market-access preservation rule (and thereby preserve the level of foreign welfare) and yet make itself better off.

## 2.4. Limitations on Domestic Tax Instruments

In this section we briefly consider how our results must be modified when the consumption tax instrument is unavailable to the domestic government in the industry under consideration, i.e., we set  $t \equiv 0$ .<sup>18</sup> According to (2.1), this implies  $P \equiv q$  so that there is a single local (producer and consumer) price in the domestic industry which we denote by  $q$ , with the pricing relationships in (2.2) and (2.3) then still applying. To highlight the main point, we focus on the identical technologies case in which there is a common per-unit pollution function  $\theta(\cdot)$  and a common cost of compliance function  $\phi(\cdot)$ , and we consider only nondiscriminatory standards, i.e., we impose  $\rho \equiv r$ . Our purpose is to consider whether the nondiscriminatory standard  $r$  remains undistorted when tariffs are eliminated by a trade agreement, as we established above, if the consumption tax  $t$  is not an instrument that is available to the domestic government in the industry under consideration.

Proceeding as before, we may derive the market-clearing world price as a function of the tax and regulatory policies:

$$\tilde{q}^w = \frac{1}{3}[\alpha - 2\tau + \tau^* + 2\phi(r)], \quad (2.21)$$

and also the market-clearing levels of the local domestic and foreign prices as functions of the tax and regulatory policies:

$$\begin{aligned} \tilde{q} &= \frac{1}{3}[\alpha + \tau + \tau^* + 2\phi(r)], \text{ and} \\ \tilde{q}^* &= \frac{1}{3}[\alpha - 2(\tau + \tau^*) + 2\phi(r)]. \end{aligned} \quad (2.22)$$

In addition, the market-clearing foreign producer price of the unregulated good, and the world price of the unregulated good – which we continue to call the terms of trade – are given by

$$\begin{aligned} \tilde{q}_0^* &\equiv \tilde{q}^* - \phi(r) = \frac{1}{3}[\alpha - 2(\tau + \tau^*) - \phi(r)], \text{ and} \\ \tilde{q}_0^w &\equiv \tilde{q}^w - \phi(r) = \frac{1}{3}[\alpha - 2\tau + \tau^* - \phi(r)]. \end{aligned} \quad (2.23)$$

Consider next the expressions for domestic and foreign welfare. Foreign welfare continues to be represented by

$$\begin{aligned} W^* &= PS^*(\tilde{q}_0^*) + TR^*(\tilde{q}_0^*, \tilde{q}_0^w) \\ &\equiv W^*(\tilde{q}_0^*, \tilde{q}_0^w). \end{aligned} \quad (2.24)$$

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<sup>18</sup>As mentioned in the previous subsection, such a restriction on instruments can be motivated by the high level of collection costs that would likely accompany a system of consumption taxes that varied by product.

where

$$\begin{aligned} PS^* &= \int_{\phi(r)}^{\tilde{q}_0^* + \phi(r)} [q^* - \phi(r)] dq^* = \int_0^{\tilde{q}_0^*} q^* dq^* \equiv PS^*(\tilde{q}_0^*), \text{ and} \\ TR^* &= [\tilde{q}_0^w - \tilde{q}_0^*] \cdot \tilde{q}_0^* \equiv TR^*(\tilde{q}_0^*, \tilde{q}_0^w). \end{aligned}$$

Domestic welfare is now given by

$$\begin{aligned} W &= CS(\tilde{q}) + PS(r, \tilde{q}) + TR(r, \tilde{q}, \tilde{q}_0^w) - Z(r, \tilde{q}) \\ &\equiv W(r, \tilde{q}, \tilde{q}_0^w), \end{aligned} \tag{2.25}$$

where

$$\begin{aligned} CS &= \int_{\tilde{q}}^{\alpha} [\alpha - q] dq \equiv CS(\tilde{q}), \quad PS = \int_{\phi(r)}^{\tilde{q}} [q - \phi(r)] dq \equiv PS(r, \tilde{q}), \\ TR &= [\tilde{q} - \tilde{q}_0^w - \phi(r)] \cdot [(\alpha - \tilde{q}) - (\tilde{q} - \phi(r))] \equiv TR(r, \tilde{q}, \tilde{q}_0^w), \text{ and} \\ Z &= \theta(r) \cdot [\alpha - \tilde{q}] \equiv Z(r, \tilde{q}). \end{aligned}$$

Finally, we develop an expression for the joint (sum of) domestic and foreign welfare. As before, using the equilibrium condition that the volume of domestic imports  $[(\alpha - \tilde{q}) - (\tilde{q} - \phi(r))]$  must equal the volume of foreign exports  $\tilde{q}_0^*$ , the world price  $\tilde{q}_0^w$  again cancels from the sum of domestic and foreign tax revenue:

$$\begin{aligned} TR(r, \tilde{q}, \tilde{q}_0^w) + TR^*(\tilde{q}_0^*, \tilde{q}_0^w) &= [\tilde{q} - \tilde{q}_0^* - \phi(r)] \cdot [(\alpha - \tilde{q}) - (\tilde{q} - \phi(r))] \\ &\equiv g(r, \tilde{q}, \tilde{q}_0^*). \end{aligned}$$

With this and the above expressions for  $W$  and  $W^*$ , we may write

$$\begin{aligned} W + W^* &= W(r, \tilde{q}, \tilde{q}_0^w) + W^*(\tilde{q}_0^*, \tilde{q}_0^w) \\ &= CS(\tilde{q}) + PS(r, \tilde{q}) + PS^*(\tilde{q}_0^*) + g(r, \tilde{q}, \tilde{q}_0^*) - Z(r, \tilde{q}) \\ &\equiv G(r, \tilde{q}, \tilde{q}_0^*). \end{aligned} \tag{2.26}$$

Consider now the efficient policy choices in this environment. As before, in addition to the regulatory standard  $r$ , efficiency ties down only the sum of  $\tau$  and  $\tau^*$ , not their individual levels. Using the expression for joint welfare given in (2.26), the efficient policy choices must satisfy the following two first-order conditions:

$$\begin{aligned} W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau} &= 0, \text{ and} \\ W_r + W_{\tilde{q}} \frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{dr} &= 0. \end{aligned} \tag{2.27}$$

To facilitate comparison with the Nash conditions, it is helpful to rewrite the conditions for efficiency contained in (2.27) in a slightly different form. To this end, consider the changes in  $\tau$  and  $r$  that would hold fixed  $\tilde{q}_0^*$  – and with  $\tau^*$  unchanged, also hold fixed  $\tilde{q}_0^w$  according to (2.3). Using (2.23), we have

$$\left. \frac{d\tau}{dr} \right|_{d\tilde{q}_0^*=0} = \frac{-d\tilde{q}_0^*/dr}{d\tilde{q}_0^*/d\tau} = \frac{\phi'(r)}{2} = \frac{-d\tilde{q}_0^w/dr}{d\tilde{q}_0^w/d\tau} = \left. \frac{d\tau}{dr} \right|_{d\tilde{q}_0^w=0}. \quad (2.28)$$

Solving the top expression in (2.27) for  $W_{\tilde{q}_0^*}^*$ , substituting this into the bottom expression in (2.27) and using (2.28) allows the conditions for efficiency to be re-expressed as

$$\begin{aligned} W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau} &= 0, \quad \text{and} \\ W_r + W_{\tilde{q}} \left[ \frac{d\tilde{q}}{dr} + \frac{d\tilde{q}}{d\tau} \frac{d\tau}{dr} \right]_{d\tilde{q}_0^w=0} &= 0. \end{aligned} \quad (2.29)$$

The bottom condition in (2.29) can be interpreted as the (domestic) “national” condition for efficiency (see Bagwell and Staiger, 2001): it describes the choices of  $\tau$  and  $r$  that maximize domestic welfare holding fixed  $\tilde{q}_0^w$  – and with  $\tau^*$  unchanged, holding fixed as well  $\tilde{q}_0^*$  and hence  $W^*(\tilde{q}_0^*, \tilde{q}_0^w)$ . The top condition in (2.29) then ties down the trade volume, and can be interpreted as the “international” condition for efficiency.

We now turn to the Nash policy choices. The Nash policy choices satisfy the first-order conditions that define the domestic and foreign best-response policies:

$$\begin{aligned} W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{d\tau} &= 0, \\ W_r + W_{\tilde{q}} \frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{dr} &= 0, \quad \text{and} \\ W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau^*} + W_{\tilde{q}_0^w}^* \frac{d\tilde{q}_0^w}{d\tau^*} &= 0. \end{aligned} \quad (2.30)$$

With analogous steps to those described just above, we may rewrite the conditions for the domestic best-response policies contained in (2.30) in a slightly different form:

$$\begin{aligned} W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^w}^* \frac{d\tilde{q}_0^w}{d\tau} &= 0, \quad \text{and} \\ W_r + W_{\tilde{q}} \left[ \frac{d\tilde{q}}{dr} + \frac{d\tilde{q}}{d\tau} \frac{d\tau}{dr} \right]_{d\tilde{q}_0^w=0} &= 0. \end{aligned} \quad (2.31)$$

Nash policies satisfy (2.31) and (2.32).

Notice that the top condition in (2.32), when added to (2.31), implies after some simplification,

$$W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^*}^* \frac{d\tilde{q}_0^*}{d\tau} + S^{*N} = 0,$$

which is different than the top condition in (2.29) for efficient policies; but the bottom conditions in (2.29) and (2.32) are the same. This confirms the feature noted above in our earlier analysis, that the inefficiency of the Nash equilibrium can be traced to a single source: Nash tariffs are higher than is efficient, and Nash trade volumes are correspondingly too low. Conditional on Nash trade volumes, however, the domestic standards are set efficiently in the Nash equilibrium (i.e., they satisfy the national condition for efficiency expressed in the bottom condition of (2.29)).

We may now answer the central question of this subsection: Will nondiscriminatory standards remain undistorted when countries agree to eliminate tariffs, as we established in the previous subsection, if the consumption tax  $t$  is not an instrument that is available to the domestic government in the industry under consideration? To answer this question, notice that binding the domestic tariff at free trade (or any level below the best-response level) but permitting the domestic government to choose its best-response regulatory standard implies the two conditions

$$\begin{aligned} W_{\tilde{q}} \frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{d\tau} &> 0, \\ W_r + W_{\tilde{q}} \frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^w} \frac{d\tilde{q}_0^w}{dr} &= 0, \text{ and} \end{aligned} \tag{2.33}$$

The top condition of (2.33) says simply that, as it is bound below its best-response tariff level, the domestic country would (by definition) benefit from a unilateral increase in its tariff. But then, with similar steps to those described above we may derive that

$$W_r + W_{\tilde{q}} \left[ \frac{d\tilde{q}}{dr} + \frac{d\tilde{q}}{d\tau} \frac{d\tau}{dr} \Big|_{d\tilde{q}_0^w=0} \right] < 0. \tag{2.34}$$

Evidently, as a comparison of (2.34) and the bottom condition for efficiency in (2.29) confirms, eliminating tariffs induces the domestic country to distort upward its nondiscriminatory standard  $r$  relative to the efficient level.

Intuitively, when the domestic government loses the ability to use its tariff as a means of depressing  $\tilde{q}_0^w$  and thereby manipulating the terms of trade to its advantage, it will search for other means of doing so. Raising its nondiscriminatory regulatory standard  $r$  is one such means, as the bottom expression of (2.23) confirms; and when adjustments in a product-level consumption tax are not possible, as in the present subsection, upward distortions in regulatory standards become attractive for the domestic government in this setting once it commits to a policy of free trade, because a portion of the cost of compliance with these higher standards is shifted onto foreign producers in the form of a lower  $\tilde{q}_0^w$ .

## 2.5. Summary

We now offer a brief summary of the results to aid in the discussion below. In the symmetric case where the consumption-externality-generating function and the compliance-cost function are identical for the foreign and domestic industry, and given the assumption that both governments maximize the traditional measure of national welfare (the sum of domestic consumer surplus, producer surplus and government revenue) net of the disutility of consumption-generated pollution, the efficient trade policy is free trade. The efficient regulatory standard for imported and domestic goods equates the marginal benefit of an increase in the standard (which reduces the externality) with the marginal increase in compliance cost. The optimal standard will be the same for both imported and domestic goods (given the symmetry assumption). The efficient consumption tax is equal to the marginal social cost of the externality produced per unit of the good consumed (in our model the marginal cost is constant conditional on the regulatory standard).

In the Nash equilibrium, however, an international externality arises because governments fail to take account of the impact of their decisions on foreign surplus.<sup>19</sup> With unconstrained trade policy instruments, the result is inefficiently high tariffs and export taxes much as in the classic model of Johnson (1953-54). Absent constraints on border instruments, however, there is no reason to distort domestic taxation or regulation – the externality flows entirely through trade policy. This result follows from the fact that the most direct way to exploit national market power, while raising revenue at the same time, is the tariff or export tax.

If the importing and exporting nations enter a trade agreement to eliminate the distortion of trade policies in Nash equilibrium, however, the potential for other distortions arises. Most obviously, a constraint on tariffs is meaningless if the importing nation can substitute a discriminatory consumption tax. Thus, one would expect a trade agreement constraining tariffs also to prohibit discriminatory consumption taxes. If such discrimination is barred but regulatory policies remain unconstrained, a discriminatory regulatory standard will emerge that disfavors imported goods. Like the tariff or discriminatory consumption tax, the discrimina-

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<sup>19</sup>This statement corresponds to a slightly different but equivalent way of stating the point made formally in the previous section. More specifically, in the Nash equilibrium the domestic government fails to take account of  $W_{\tilde{q}_0^w}^*$ , the impact of a change in domestic-country policies on foreign welfare that travels through the terms of trade  $\tilde{q}_0^w$ , and similarly for the foreign government. If each government *did* take account of this impact, then since  $W_{\tilde{q}_0^w}^* + W_{\tilde{q}_0^w} = 0$  as we have noted, each country would be led not to value the terms-of-trade implications of its policy choices, and so its policies would correspond to the efficient politically optimal policies derived in the previous section.

tory regulatory standard exploits the fact that foreign suppliers will reduce their prices (for the unregulated good) in response to it, thus externalizing costs of regulatory compliance.

If the trade agreement also prohibits discrimination through regulatory standards, the analysis changes but the possibility of inefficiency remains. In our model, if both consumption taxes and regulatory standards must obey a nondiscrimination rule, then consumption taxes will tend to exceed the efficient level because they can still extract surplus from foreign suppliers. Consumption taxes are an inferior instrument for this purpose compared to a tariff because they also tax domestic products, but they will still be used to some degree if tariffs are infeasible. Regulatory standards are not distorted in this scenario, however, a result that is best understood in light of the fact that an inefficiently high consumption tax raises revenue while an inefficiently high product standard does not. If the ability of the importing nation to use (nondiscriminatory) consumption taxes at the product level is for some reason constrained, however, an upward distortion of the (nondiscriminatory) regulatory standard will then arise because foreign suppliers absorb part of the regulatory compliance cost.

The potential distortions that arise despite the imposition of nondiscrimination requirements on both taxes and regulation can be addressed in principle through a legal rule that prohibits the importing nation from imposing any domestic tax or regulatory policy that lowers the price of the imported good (net of regulatory compliance costs) received by foreign exporters – what we term the market-access preservation rule. Under such a rule, domestic measures that affect the net prices received by exporters are permissible but their effects on those prices must be undone through offsetting changes in trade policy. This rule effectively ensures that the importing nation will internalize the externality on foreign suppliers from changes in tax and regulatory policies, and will induce efficient policy choices.

The analysis is more complicated when the foreign and domestic industries are not symmetrical. If their respective externality and compliance cost functions differ, the efficient policy will not in general involve the same regulatory standard for both industries, or even produce the same marginal externality for each unit of imported and domestic goods. Likewise, a role for border instruments (tariffs or subsidies) survives to the degree that imported goods cause greater or lesser external harm per unit than domestic goods. The asymmetrical case thus suggests some justification for deviation from nondiscrimination requirements under appropriate circumstances, depending on exactly what is meant by “nondiscrimination.” Whether useful deviations can be identified in practice, however, and can be insulated from protectionist capture,

is another matter.

As noted, our results are derived from a model in which governments maximize the traditional measure of economic welfare (net of the utility costs of pollution). Much of the modern trade policy literature, by contrast, including Grossman and Helpman (1994) and Bagwell and Staiger (2001), assumes instead that governments maximize a function that depends on distribution as well as efficiency. Grossman and Helpman provide micro-foundations for the introduction of “political economy weights” into the welfare function, reflecting the notion that some interest groups are better organized than others. Bagwell and Staiger allow the welfare function to depend in a highly general way on local prices, which also implies that certain interest groups may be favored. The introduction of such considerations into our framework would afford other incentives for policy intervention and, among other things, would potentially alter the result that free trade is (politically) efficient in the symmetrical case. But a more general political economy approach would not alter the basic insights from our model. As long as governments may be presumed to ignore the harm to foreign surplus associated with their policy decisions in Nash equilibrium, the same externalities that drive our results would remain and the same tendencies toward policy distortion would arise.<sup>20</sup>

### **3. Implications: The Structure of WTO Obligations and Disputes**

We now turn to the implications of the model for understanding the WTO legal system. We argue that the core obligations of the system, and at least the bulk of the disputes that have arisen, are a response to the incentives for regulatory discrimination that arise when tariffs are restricted and consumption taxes are made subject to a nondiscrimination obligation. The more subtle issue is whether some parts of the system can be interpreted as going beyond the imposition of a nondiscrimination norm to deal with the distortions that may arise even from nondiscriminatory regulation.

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<sup>20</sup>This can be confirmed by noting that the introduction of political economy/distributional concerns would change the way governments feel about movements in local prices, but would still allow us to express the government objectives as functions of prices and standards as we have done here, and would not change the properties of these functions with respect to the world price, which is the feature that underlies all of our results (see Bagwell and Staiger, 2001, for an analogous point).

### 3.1. The Original GATT

The fundamental objective of the GATT, which was concluded in 1947, was to reduce tariffs that had risen dramatically prior to World War II. The negotiated tariff ceilings were termed “bindings.”

The drafters of GATT anticipated two potential distortions of domestic policy might result from tariff bindings, both of which are highlighted in our formal analysis. First, they recognized that discriminatory consumption taxes are a ready substitute for tariffs. Accordingly, paragraph 2 of GATT Article III, the “national treatment” article, provides that imported goods “shall not be subject, directly or indirectly, to internal taxes or other internal charges of any kind in excess of those applied, directly or indirectly, to like domestic products.” In addition, internal taxes and other internal charges may not be applied across “directly competitive or substitutable products” in a manner “so as to afford protection to domestic production.” The obvious intention of these provisions is to disable the use of discriminatory internal taxation for protective purposes, while recognizing that tax differentials for other purposes – particularly when imposed on products that are not in a competitive relationship – may be justified.<sup>21</sup>

Second, the drafters anticipated that tariff bindings coupled with a nondiscrimination principle for internal product taxes might lead member states to use regulatory measures for protective purposes. Thus, Article III paragraph 4 provides that imported products “shall be accorded treatment no less favourable than that accorded to like products of national origin in respect of all laws, regulations and requirements affecting their internal sale.” The evident intention once again is to disable the use of regulatory and related legal measures for protection, while allowing regulators the flexibility to respond to differences across products that justify varying regulatory treatment. The rather crude mechanism devised for this purpose was a limitation of the nondiscrimination rule to imported and domestic “like products.” The treaty text also couched the nondiscrimination rule as an obligation to afford “treatment no less favourable,” impliedly recognizing that formally identical treatment is neither necessary nor sufficient.

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<sup>21</sup>We note in passing one potentially worrisome “loophole” in the structure of Article III. Although discriminatory taxation is prohibited, Article III(8)(B) provides that subsidies to domestic producers are not a violation of the national treatment obligation. Thus, in principle, a nation might mimic the effects of discriminatory taxes – and indeed, mimic an import tariff – by enacting a non-discriminatory tax, and then using the proceeds to fund domestic producer subsidies. If such a policy were transparent, we conjecture that it might be deemed to violate Article III as a disguised form of discriminatory taxation. Interestingly, precisely such an arrangement was deemed unconstitutional in the United States under the “dormant commerce clause” in *West Lynn Creamery v. Healy*, 512 U.S. 186 (1994). See generally Sykes (2009).

It is noteworthy that GATT did not go beyond the creation of nondiscrimination norms. Nothing in its text specifically addresses the potential distortions that may arise even with nondiscriminatory policies (we address the possibility of “nonviolation” claims in a moment).

One small puzzle in the original GATT is the fact that the national treatment obligations of Article III apply to all products, irrespective of whether they are the subject of a negotiated tariff binding. Absent a binding, why should domestic tax and regulatory policies be constrained? An answer to this puzzle is also suggested by our model – before tariff bindings are negotiated, an importing nation has no reason to adopt discriminatory domestic tax and regulatory policies. If measures that violate the national treatment obligation will only arise in response to the negotiation of tariff commitments, a general prohibition on discriminatory policy has no effect except on products covered by bindings.<sup>22</sup>

### 3.2. The Nonviolation Doctrine

Article XXIII of GATT contained the dispute resolution provisions. Interestingly, it did not simply focus on breach of obligations. Rather, it introduced the concept of a “nullification or impairment” of obligations as a basis for disputes, and provided that nullification or impairment could result, among other things, from “the application by another contracting party of any measure, whether or not it conflicts with the provisions of this Agreement.” This provision was understood to reflect the possibility that GATT commitments might be undermined by measures that did not violate the letter of GATT but that nevertheless impaired market access. Claims of nullification or impairment that rest on measures not inconsistent with GATT are known as “nonviolation” claims. They represent the closest analogue in the WTO system to the “market access preservation” rule that we consider in our formal analysis.

Even if GATT Article III is limited to situations involving some demonstrable discrimination (“less favourable treatment”), might a nonviolation claim be employed to challenge nondiscriminatory regulation that impairs market access? The matter is subject to some uncertainty, but we suspect that the answer is “no.”

Over the history of the WTO/GATT system, only three nonviolation claims have been

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<sup>22</sup>This position is strengthened if general equilibrium effects are taken into account, because a tariff binding in one sector will generally introduce incentives to distort domestic tax and regulatory policies in other sectors as well once the (general equilibrium) effects of the tariff binding spread to the rest of the economy. On the other hand, a caveat to this position arises in the case of asymmetric technologies, though as we discuss in the previous section the case for discriminatory tax and regulatory treatment of imports on the basis of such asymmetries seems weak.

successful (resulting in panel reports adopted by the membership). None of these cases involved domestic regulation, but instead involved unanticipated changes in subsidies programs or tariff reclassifications.<sup>23</sup> The touchstone of these cases has been a change in policy by the importing nation that could not have been anticipated by the complainant at the time of tariff negotiations, and that significantly impairs export opportunities.

Only one challenge to domestic regulation has been brought forth in a nonviolation claim. The French regulation at issue in *EC – Asbestos* prohibited Canadian exports of concrete forms reinforced with asbestos fibers. Canada claimed that such products were “like” concrete forms reinforced with other fibers, and hence that the regulation afforded “less favourable treatment” to imported (asbestos-containing) products relative to domestic like products, in violation of GATT Article III paragraph 4. The dispute panel agreed<sup>24</sup> (a finding later overturned by the Appellate Body<sup>25</sup>), but nevertheless held that the French regulation was permissible under the “exception” to GATT obligations contained in Article XX(b) regarding measures “necessary” to protect human health.

Canada then argued that even if the regulation did not violate GATT, it nevertheless upset Canada’s reasonable expectations of market access and should be deemed the basis for a nonviolation finding. The panel rejected that claim in a finding that was not overturned by

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<sup>23</sup>In the first, Chile brought a claim against Australia over a change in farm subsidy policy. Chile had negotiated a tariff concession on its exports to Australia of a type of fertilizer that competed with another type of fertilizer. At the time, Australia subsidized the purchase of both types by farmers. Subsequently, Australia discontinued the subsidy on the type exported by Chile while maintaining the subsidy on the competing product. The working party found that the change in policy by the Australian government would impair benefits owing to Chile if the change in policy “could not reasonably have been anticipated by the Chilean government... at the time it negotiated (the tariff commitment).” Australian Subsidy on Ammonium Sulphate, II BISD 188, 193 (1952) (Working Party report adopted on April 3, 1950). In the second case, Germany had negotiated a tariff concession on sardines imported from Norway. At the time of the negotiation, competing species of fish were classified under the same tariff heading and given the same tariff treatment. Germany subsequently changed the tariff classification system to distinguish among species, however, resulting in a higher tariff on the Norwegian product than on its competitors. Treatment by Germany of Imports of Sardines, 1st Supp. BISD 53 (1953) (Panel Report adopted October 31, 1952). In the third case, the United States secured duty free treatment for its exports of oilseeds to the European Union in 1962. Some years later, the EU introduced agricultural subsidy programs that encouraged the production of oilseeds within the EU. The panel ruled that GATT members must “be assumed to base their tariff negotiations on the expectation that the price effect of the tariff concessions will not be systematically offset.” The unanticipated subsidy program for domestic producers upset those expectations. EEC – Payments and Subsidies Paid to Processors and Producers of Oilseeds and Related Animal-Feed Proteins, ¶148, 37th Supp. BISD 86 (Panel Report adopted on January 25, 1990).

<sup>24</sup>See European Communities – Measures Affecting Asbestos and Asbestos-Containing Products, WT/DS135/R, panel report adopted (as modified) on April 5, 2001.

<sup>25</sup>See European Communities – Measures Affecting Asbestos and Asbestos-Containing Products, WT/DS135/AB/R, Appellate Body report adopted on April 5, 2001.

the Appellate Body. The reasoning of both the panel and the Appellate Body in the case casts serious doubt on the prospect of successful nonviolation claims relating to domestic regulation in the future.

Among other things, the Appellate Body emphasized (as had various panels) that the nonviolation claim “should be approached with caution and should remain an exceptional remedy.”<sup>26</sup> And in a part of its opinion not addressed by the Appellate Body, the panel remarked:

By creating the right to invoke exceptions in certain circumstances [through Article XX], Members have recognized a priori the possibility that the benefits they derive from certain concessions may eventually be nullified or impaired at some future time for reasons recognized as being of overriding importance. This situation is different from that in which a Member takes a measure of a commercial or economic nature such as, for example, a subsidy or a decision organizing a sector of its economy, from which it expects a purely economic benefit.

It further stated:

[W]e consider that in view of the time that elapsed between [the tariff] concessions and the adoption of the [French] Decree (between 50 and 35 years), Canada could not assume that, over such a long period, there would not be advances in medical knowledge with the risk that one day a product would be banned on health grounds.

Accordingly, the panel ruled that a complainant bears a greater burden of proof in a case involving a challenge to a regulation that is permitted by Article XX. Likewise, despite the tariff commitment covering the products at issue, Canada had no “legitimate expectation” that France would refrain from regulating asbestos-containing products for health reasons.

To be sure, the ruling in *Asbestos* does not foreclose the possibility of a nonviolation claim based on a change in regulatory policy. But the passages quoted above strongly suggest that changes in regulatory policy, particularly if they are motivated by genuine concerns for matters such as public health, will be deemed foreseeable, and thus do not frustrate the legitimate expectations associated with tariff concessions.

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<sup>26</sup> Appellate Body Report, para. 186.

There is yet another obstacle to a successful nonviolation claim based on changes in regulatory policy. *Japan – Film* involved a claim by the United States that certain governmental measures in Japan had contributed to the exclusion of U.S. film producers (Kodak) from the Japanese retail film market. In a decision that was not appealed, the panel ruled against the United States,<sup>27</sup> and along the way rejected the U.S. nonviolation claim. Relying on earlier nonviolation cases, the panel held that the complainant in a nonviolation case must “prove that the governmental measures that it cites have upset the competitive relationship between domestic and imported” products. It is not enough that the measure has affected “trade flows.”<sup>28</sup> Thus, in the view of the panel, a successful nonviolation claim in effect requires a showing that the regulatory measure produces some discrimination, *de jure* or *de facto*, between imported and domestic products. The *Asbestos* panel also accepted this proposition, but found discrimination on the premise that Canadian products which were “like” French products had been banned.

Thus, the pertinent nonviolation decisions to date all seem to suggest that the measure in question must somehow favor domestic over imported goods. A regulatory measure that disadvantages them equally (in nondiscriminatory fashion) seems to be outside the scope of the doctrine.

Should the nonviolation cases be limited in this fashion? Our formal analysis raises some question about the wisdom of this limitation given that compliance cost externalization by large countries may, in some circumstances, lead to economically excessive regulation that is nondiscriminatory. Yet, if nondiscriminatory changes in regulatory policy could be expected to trigger an entitlement to compensation or retaliation under WTO law, other problems would likely arise. Among other things, new information can develop over time that changes the apparent need for regulation. The degree of market access that is negotiated at one point in time may no longer be politically optimal. If nations were nevertheless required to preserve market access in the face of new information justifying stricter regulation or else face retaliation from their trading partners, a disincentive to economically desirable regulation might develop.<sup>29</sup> Further, any effort to devise a rule that distinguished between sound and unsound changes

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<sup>27</sup>Japan – Measures Affecting Consumer Photographic Film and Paper, WT/DS44/R, panel report adopted on April 22, 1998.

<sup>28</sup>Id. paras. 10.83-10.88.

<sup>29</sup>In principle, this disincentive could be reduced through calibration of allowable foreign retaliation to a level that cannot exceed a reciprocal withdrawal of concessions, and therefore to a level which might approximate a system of efficient breach (see Schwartz and Sykes, 2002). In practice, of course, such calibration would be hard to achieve in light of the difficulty of assessing the trade impacts of domestic regulatory reform.

in regulatory policy would likely be fraught with error and uncertainty. In the face of such challenges, perhaps it makes sense to embrace a presumption that nondiscriminatory changes in regulatory policy would normally fall outside the strictures of the nonviolation doctrine, while leaving open the possibility that a nonviolation claim could be brought in exceptional circumstances (to ward off cases of obvious abuse).

### **3.3. The Technical Barriers Agreements**

Over time, GATT members became dissatisfied with the national treatment obligation of GATT Article III as the sole textual basis for disciplining regulatory policies that adversely affect international trade. During the Tokyo Round of GATT negotiations in the 1970's, the first supplementary agreement on regulatory matters emerged, the Agreement on Technical Barriers to Trade, popularly known as the Standards Code. The Standards Code was a plurilateral agreement to which 46 GATT members ultimately acceded. During the Uruguay Round, further negotiations on technical barriers went forward in two different negotiating groups – the technical barriers group and the agriculture group. These negotiations resulted in two new agreements, the WTO Agreement on Technical Barriers to Trade (TBT) and the WTO Agreement on Sanitary and Phytosanitary Measures (SPS), both of which were accepted by all WTO members. Roughly speaking, the SPS Agreement applies to measures adopted to protect human, animal or plant health from the spread of pests and from dangerous additives, contaminants, toxins and disease-causing organisms contained in foodstuffs.<sup>30</sup> The TBT Agreement applies to all “technical regulations” and “standards” not covered by the SPS Agreement.<sup>31</sup>

Why was GATT Article III alone perceived to be inadequate? The main problem in our view was that regulatory discrimination can occur in a wide variety of subtle and non-transparent ways, and can arise even if regulations are nondiscriminatory on their face. For the most part, therefore, the two technical barriers agreements serve to elaborate and specify the concept of “less favourable treatment,” and thus to clarify and strengthen the nondiscrimination norm of the original GATT. It is possible to interpret aspects of the agreements as going beyond nondiscrimination principles, however, and we consider below whether that interpretation is convincing.

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<sup>30</sup>See SPS Agreement Annex A.

<sup>31</sup>See TBT Agreement Art. 1.

### 3.3.1. Elaborating Principles of Non-Discrimination

Many provisions of the TBT and SPS Agreements have straightforward interpretations as corollaries of the nondiscrimination norm in GATT.<sup>32</sup> For example, both agreements require that regulatory measures be published through “enquiry points” that are made known to the WTO membership.<sup>33</sup> These requirements ensure that foreign firms seeking to do business in the market of a WTO member can readily ascertain what regulations are applicable. Similarly, both Agreements provide that new regulations must be publicized in advance of their effective dates absent emergency.<sup>34</sup> Such advance notice requirements protect foreign firms, which are less likely to have participated in the regulatory process, against unexpected changes in regulation that may require a considerable lead time for compliance.

Both Agreements also embody an obligation to devise regulations that achieve their objectives with minimum disruption to trade – in legal parlance, an obligation to employ the “least restrictive means.”<sup>35</sup> The least restrictive means requirement recognizes that regulatory objectives can often be achieved in a variety of ways, and firms may well differ as to which method is the cheapest for them. Regulations that require their objectives to be achieved in particular ways that are cheaper for domestic firms than their foreign competitors are equiv-

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<sup>32</sup>See Sykes (1995 and 1999) for more extensive discussion of the legal provisions in both Agreements.

<sup>33</sup>TBT Agreement, Art. 10.1; SPS Agreement, Annex B, para. 3. Developed country members also have an obligation to make all pertinent information available in English, French and Spanish if requested to do so by another member. TBT Agreement, Art. 10.5; SPS Agreement, Annex B, para. 8. For good measure, a specific nondiscrimination rule prohibits charging more for such information when it is sold to foreign firms than when it is sold to domestic firms. TBT Agreement, Art. 10.4; SPS Agreement, Annex B, para. 4.

<sup>34</sup>Any time a new regulation would depart from an established international standard, or would address an issue on which no international standard exists, advance notice must be given in the form of “notice in a publication at an early appropriate stage, in such a manner as to enable interested parties in other Members to become acquainted with it.” TBT Agreement Art. 2.9.1. Substantially equivalent language in the SPS Agreement may be found in Annex B, Para. 5(a). Direct notice must also be provided to the WTO Secretariat, indicating what products would be covered by the proposed regulation and how it would depart from any relevant standards promulgated by international agencies. TBT Agreement, Art. 2.9.2-2.9.3; SPS Agreement, Annex B, paras. 5(b), (c). Exceptions exist, as one might expect, where urgent matters of health, safety or national security preclude this advance notice. All regulations must also be “published promptly” when they are adopted. TBT Agreement Art. 2.11; SPS Agreement Annex B, para. 1.

<sup>35</sup>The TBT Agreement provides that “technical regulations shall not be more trade-restrictive than necessary to fulfil a legitimate objective...Such legitimate objectives are, inter alia, national security requirements, the prevention of deceptive practices, protection of human health or safety, animal plant life or health, or the environment.” TBT Agreement, Art. 2.2. TBT Agreement, Art. 2.8 further requires that regulations be drafted in terms of performance requirements rather than design requirements. The SPS Agreement’s version of these principles requires members to “ensure that any sanitary or phytosanitary measure is applied only to the extent necessary to protect human, animal or plant life or health.” SPS Agreement, Art 2.2. On the operation of the least restrictive means principle in WTO law, see Sykes (2003).

alent to regulatory discrimination. The least restrictive means principle avoids this problem. Thus, for example, a regulation governing fire doors in commercial buildings may be drafted to require a certain “burn-through” time for every door, but should not be drafted to require the use of particular materials (which may be chosen to favor domestic firms) where satisfactory performance can be achieved without them. Similarly, a regulation concerning emissions from automobiles may be drafted to require that emissions of particular pollutants fall below certain levels, but should not be drafted to require the use of a particular emissions control technology.

A closely related set of obligations concern “mutual recognition.”<sup>36</sup> Often, nations share similar or even identical regulatory objectives but may have chosen different means to attain them. If other nations employ regulatory measures that satisfactorily achieve the objectives of an importing nation and the products manufactured in those nations comply with such regulations, the importing nation should be willing to allow those products to enter its stream of commerce. A refusal to do so imposes unnecessary costs on foreign suppliers and effectively discriminates against them.

As a final example (our list here is by no means exhaustive), subtle and not so subtle forms of discrimination can creep into the process by which regulators certify compliance with their regulations, generally known as “conformity assessment.” To illustrate, regulations that require goods to be tested at a particular laboratory or by a particular method when equally good alternatives are available for certifying foreign products can inflate the costs of conformity assessment unnecessarily. Accordingly, the technical barriers agreements embody a number of principles designed to prevent explicit or implicit discrimination in the conformity assessment process. A national treatment obligation applies, a general least restrictive means requirement is in place, nations are prohibited from requiring information reasonably necessary to conformity assessment, nations must process imported goods as expeditiously as they process domestic goods, the siting of testing facilities is not to be used to disadvantage foreign goods, and notice and publication requirements apply to the adoption of new conformity assessment procedures.<sup>37</sup>

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<sup>36</sup>The strongest mutual recognition requirement is contained in the SPS agreement: “Members shall accept the sanitary or phytosanitary measures of other members as equivalent...if the exporting Member objectively demonstrates to the importing Member that its measures achieve the importing Member’s appropriate level of sanitary or phytosanitary protection.” SPS Agreement, Art. 4.1. The TBT Agreement is softer, requiring that “Members shall give positive consideration to accepting as equivalent technical regulations of other Members...provided they are satisfied that these regulations adequately fulfil the objectives of their own regulations.” TBT Agreement, Art. 2.7. This weaker language amounts at least to an obligation to give reasons for refusing to accept foreign regulations as equivalent, which should raise the costs of disingenuous refusals to do so.

<sup>37</sup>See TBT Agreement, Art. 5.1.1; SPS Agreement, Annex C, para. 1(a); TBT Agreement, Art. 5.1.2; SPS

### 3.3.2. Beyond Non-Discrimination?

Our formal analysis indicates that nondiscrimination obligations alone may be inadequate to address all of the distortions that may arise in domestic tax and regulatory policies when tariffs are constrained. Can aspects of the technical barriers agreements be interpreted as addressing these additional externality problems? Our answer is “maybe.”

With particular reference to consumption tax policy, nothing in the technical barriers agreements or elsewhere in WTO treaty text prevents importing nations from employing domestic consumption taxes as they see fit, even if a significant portion of the resulting tax revenue reflects an extraction of producer surplus from foreign suppliers. This observation hints that the system may be inattentive to the potential for surplus extraction through nondiscriminatory measures. Indeed, as our formal analysis suggests, taxes are likely the preferred method of surplus extraction (relative to product standards) because they enhance revenue for the importing nation. As long as product-specific consumption taxes are feasible and unconstrained except for a nondiscrimination rule, any extraction of surplus from foreign suppliers will tend to occur through taxation rather than through product regulation. Hence, given the WTO rules for consumption taxes, it is unclear whether the phenomenon of excessive (nondiscriminatory) regulation is an important one. We would expect it to arise only when product-specific consumption taxation is for some reason administratively or politically infeasible.

Nevertheless, certain aspects of the technical barriers agreements might be interpreted to go beyond the elaboration of a nondiscrimination norm. We will focus on three of them here – obligations to employ international standards, scientific evidence requirements, and consistency requirements.

A number of international institutions develop and publish product standards of all varieties (including standards relating to quality, health and safety).<sup>38</sup> The technical barriers agreements impose an obligation to employ international standards as the basis for regulation in appropriate

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Agreement, Annex C, para. 1(e); TBT Agreement, Art. 5.2.3; SPS Agreement, Annex C, para. 1(c); TBT Agreement, Art. 5.2.1; SPS Agreement, Annex C, para. 1(a)-(b); TBT Agreement, Art. 5.2.6; SPS Agreement, Annex C, para. 1(g); TBT Agreement, Art. 5.6; SPS Agreement, Annex C, para. 1(b).

<sup>38</sup>The International Organization for Standardization (ISO) has jurisdiction to address design, safety and quality concerns in product markets across the board, and publishes thousands of standards as a result of its work. The Codex Alimentarius, affiliated with the United Nations, focuses mainly on food safety issues. A miscellany of other entities with standard setting functions includes the International Labor Organization, the International Telecommunications Union, the International Institute on Refrigeration, the International Commission on Illumination, and others. See Sykes (1995).

circumstances.<sup>39</sup> International standards, one might argue, represent a global “consensus view” on the appropriate extent of regulation. If a nation chooses to regulate more stringently even in a nondiscriminatory fashion, the argument might run, that fact is evidence that regulation is excessive and perhaps reflects the externalization of regulatory compliance costs. An obligation to employ international standards, therefore, might be seen as a mechanism for policing excessive regulation that might result from compliance cost externalization.

The SPS Agreement contains a further requirement that regulation be “based on scientific principles” and “not maintained without sufficient scientific evidence” except in cases of scientific uncertainty.<sup>40</sup> A departure from international standards under the SPS Agreement also requires a “scientific justification” or a “risk assessment.” These “scientific evidence requirements” might also be interpreted as limiting the ability of importing nations to regulate excessively, even if they do so in a nondiscriminatory fashion.

Finally, the SPS Agreement includes a “consistency requirement.” Each member is obligated to “avoid arbitrary or unjustifiable distinctions in the levels [of protection] it considers appropriate in different situations.”<sup>41</sup> Consistency requirements might also be used to police excessive regulation that results from the externalization of compliance costs – if the same type of hazard is regulated more stringently in settings where imports have a large share of the market than in other settings where most of the goods are produced domestically, one might infer that the stricter regulation results from cost externalization.

Such an interpretation of these provisions, however, is open to challenge. The obligation to use international standards is a limited one. Under the TBT Agreement, nations are free to adopt more stringent standards when international standards “would be an ineffective or inappropriate means for the fulfillment of the legitimate objectives pursued” by regulation.<sup>42</sup> The TBT Agreement further recites in its preamble that “no country should be prevented from taking measures necessary” to achieve its regulatory objectives “at the levels it considers appropriate” as long as it complies with the agreement. Under the SPS Agreement, as noted, members may depart from international standards “if there is a scientific justification” or if a member determines that a higher level of protection is “appropriate” after conducting a “risk

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<sup>39</sup>TBT Agreement Art. 2.4; SPS Agreement Art. 3.1.

<sup>40</sup>SPS Agreement Arts. 2.2, 5.7. The TBT Agreement merely provides that in assessing the risks that are the subject of regulation, the available scientific information is a “relevant consideration.” TBT Agreement Art. 2.2.

<sup>41</sup>SPS Agreement Art. 5.5.

<sup>42</sup>See TBT Agreement Art. 2.4.

assessment.”<sup>43</sup> Collectively, these provisions suggest that WTO members enjoy considerable freedom to select their own target level of risk without much regard to the costs of achieving the regulatory target or the incidence of those costs.

Similarly, the scientific evidence requirements of the SPS Agreement seem to require only that some scientific foundation exist for the regulation that is undertaken. They do not require a balancing of the scientifically identified risk with the costs of eliminating it. In the “beef hormones” dispute between the United States and Europe, for example, the European prohibition on the sale of hormone-raised beef was found to violate the SPS Agreement because Europe could not point to scientific studies establishing a risk to human health from the low residues found in imported beef, and could not point to studies establishing a risk due to the failure of exporters to follow sound veterinary practices in the administration of growth hormones.<sup>44</sup> Had such studies been in evidence, the scientific evidence requirements would have afforded no basis for rejecting Europe’s zero risk tolerance policy.

The consistency requirements of the SPS Agreement also have limited sweep. They apply only to “arbitrary and unjustifiable distinctions” that “result in discrimination or a disguised restriction on international trade.”<sup>45</sup> Again in the beef hormones dispute, for example, the Appellate Body held that the consistency requirements were not violated simply because Europe failed to regulate the consumption of products containing natural hormone residues (such as eggs) even though some such products had higher residues than those contained in the prohibited imported beef. The distinction between artificially added hormones and naturally occurring hormones was not “arbitrary and unjustifiable.”

Thus, it is at least questionable whether the obligations to use international standards, the scientific evidence requirements, and the consistency requirements will do much in practice to address instances of economically excessive nondiscriminatory regulation. Indeed, it is possible to interpret all of these provisions as falling within the nondiscrimination framework. If a nation declines to adopt international standards when they would achieve its objectives adequately, it might be presumed to be acting strategically to disadvantage foreign suppliers, whose goods will often meet the international standard but perhaps not the domestic alternative. The

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<sup>43</sup>SPS Agreement Art. 3.3.

<sup>44</sup>See WTO, EC Measures Concerning Meat and Meat Products (Hormones), WT/DS26&48/AB/R, report of the Appellate Body adopted February 13, 1998.

<sup>45</sup>SPS Agreement Art. 5.5.

obligation to use international standards is then perhaps little more than a corollary of the least restrictive means principle. Similarly, a regulation that has no scientific justification might be considered a sham, again designed to raise the costs of foreign suppliers relative to their domestic competitors. Perhaps a ban on hormone-raised beef, for example, imposes higher costs on foreign suppliers than on domestic suppliers because the foreign suppliers must thereafter segregate their herds and undertake expensive tests to prove their exports hormone free. The SPS consistency requirement is by its own terms limited to cases where inconsistency causes “discrimination” or is a “disguised restriction” on trade.

In sum, like the nonviolation doctrine, the technical barriers agreements may ultimately have little to say about inefficient but nondiscriminatory regulation. This situation is perhaps unsurprising because the task of identifying excessive regulation seems enormously difficult. How can the law sensibly distinguish situations in which a nation is “over-regulating” because it externalizes compliance costs, from situations in which the nation has a *bona fide* interest in stringent regulation because of, for example, a higher implicit value of life or health? An international system that second-guessed the cost-benefit determinations of national regulators would also likely intrude heavily on notions of national sovereignty and meet considerable political resistance. Although existing law leaves open the door to excessive product regulation in some scenarios, therefore, and even while as we noted in the Introduction there is some recent evidence suggesting that these scenarios could be empirically important, perhaps the cure would ultimately prove worse than the disease.

## 4. Conclusion

This paper employs a terms-of-trade framework to study the choice of regulatory policies in “large” open economies. We show how the standard terms of trade externality that affords a rationale for trade agreements to limit protection through border instruments can also lead to distortion of regulatory policies. In particular, and unlike the existing “race to the bottom” models, we show how terms of trade externalities may lead to discriminatory regulatory policies that inefficiently impose higher regulatory burdens on imports. A nondiscrimination rule applicable to domestic regulation is thus a useful legal principle for a trade agreement to incorporate. A nondiscrimination rule does not eliminate the danger of excessively stringent regulation, however, at least if product-specific consumption taxes are administratively or politically infeasible. The task of identifying and policing inefficient, nondiscriminatory regulation

is nevertheless surely a difficult one, which perhaps explains why the WTO legal system does not do much to address it.

Formally, our modeling approach posits that governments “take account” of the effects of their policy decisions on their terms of trade. As we have demonstrated, this phenomenon gives rise to a reason for governments to constrain their tariff levels through a trade agreement, and at the same time indicates that domestic regulatory policies – even nondiscriminatory ones – may be distorted away from efficient levels when tariffs are constrained. Commentators such as Regan (2006) object to the analysis generated by such models, arguing that government decision makers do not in fact “take account” of terms of trade effects (or even appreciate their existence) when formulating policy.

Regan (2006) then combines his objection to the modeling approach with an implication of the modeling approach – that governments would make internationally efficient (politically optimal) policy choices if they did not consider the terms-of-trade effects of their policy choices – to support the following proposition: because governments do not seek to manipulate the terms of trade, their (nondiscriminatory) regulatory choices will be internationally efficient, and so “dispute settlement tribunals should give substantial deference to” these choices (p. 955). We view this reasoning as seriously incomplete. It is true according to the terms-of-trade theory that regulatory choices would be internationally efficient if all governments made their policy choices without regard to the terms-of-trade consequences. But if all governments behaved in this way without the constraints imposed by a trade agreement, as Regan argues, there would be no reason for a trade agreement to exist at all according to the terms-of-trade theory, and hence no reason for dispute settlement tribunals. In the world that Regan posits, deference should be given to *all* national policy choices.<sup>46</sup>

For Regan, the goal of trade agreements is to eliminate protectionism. But why do governments care about protection imposed by other governments? The answer lies in the fact that their exporters are harmed, and earn less on their export sales than otherwise. This is precisely the injury that terms of trade theory captures. Thus, we view the “governments do not take account of the terms of trade” objection to the terms-of-trade theory as misguided. It is not necessary for governments to literally “take account” of terms of trade effects in their decision making processes for the issues that the model highlights to arise. It is enough that government

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<sup>46</sup>Of course, some other (non-terms-of-trade) explanation for trade agreements to exist might be introduced (though it is not in Regan’s analysis), but unless that alternative reason is articulated it is impossible to evaluate whether the alternative reason would provide an incentive for governments to distort their regulatory policies.

policy is the result of a political process in which domestic interest groups are represented and foreign interests are not. The resulting political equilibrium will then naturally select policies that ignore the harm done to foreign interest groups, and in particular the harm due to the fact that tariffs, consumption taxes, regulatory standards and the like may force foreign exporters to reduce their prices to remain competitive. As long as governments ignore such harm to foreign interests, they will tend to behave “as if” they were consciously manipulating their terms of trade.

Notwithstanding our disagreement with the method by which Regan arrives at his conclusion, however, we too are skeptical that the WTO legal system can constructively police the inefficiencies that may emerge in nondiscriminatory national regulation. The challenges of identifying those inefficiencies are great, and despite the fact that existing law does little to address them, the alternative options might well prove worse.

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