Non-Tariff Measures and the WTO*

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Abstract

In this paper I sketch out the rough contours of the challenge faced by the WTO in dealing with non-tariff measures (NTMs) as seen from the economic theories of trade agreements. The key questions for the WTO – the answers to which largely dictate the choice between shallow and deep approaches to integration – appear to be two: (1) Is it the terms-of-trade problem or the commitment problem that WTO member governments seek to solve with their WTO membership?; and (2) Is it market clearing or offshoring/bilateral bargaining that is now the most prominent mechanism for the determination of international prices? I suggest that evidence on the first question points to the terms-of-trade theory and hence toward shallow integration, but that answering the second question may be the key to identifying the best way forward on NTMs for the WTO. Along the way I provide a terms-of-trade interpretation of the WTO's Trade Facilitation Agreement.

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1. Introduction

In this paper I consider how the World Trade Organization (WTO) might best approach the issue of non-tariff measures (NTMs). The General Agreement on Tariffs and Trade (GATT) adopted a particular minimalist approach to handling NTMs. That approach evolved over time, and with the creation of the WTO, GATT's successor organization, the handling of NTMs has evolved further still, with the latest example of this evolution provided by the recently concluded negotiations over the Trade Facilitation Agreement emerging from the Doha Round. Was there an economic logic to GATT's approach? Do the changes in the treatment of NTMs ushered in with the creation of the WTO mark an improvement from the perspective of the economic theory of trade agreements? Is the GATT/WTO approach to the treatment of NTMs adequate for the world economy of today? I survey and extend the economic theory of trade agreements to provide answers to these questions, and I use the theory to characterize the central issues with which the WTO must contend in regard to NTMs.

The issue of NTMs may have particular relevance for developing countries. As I describe further below, a central question faced by the WTO regarding NTMs is whether a continued evolution away from a primary focus on border measures ("shallow integration") to greater emphasis on behind-the-border measures ("deep integration") is warranted. While the use of policy measures that could be classified as NTMs is widespread across all countries (see, for example, UNCTAD, 2013), the NTMs typically employed in developing countries tend to take the form of border measures (e.g., quantitative restrictions), while in developed countries behind-the-border measures (e.g., technical regulations) receive greater emphasis. Hence, the NTMs that are most important for developing country exporters in their attempts to export into developed-country markets are those NTMs that are at the heart of the shallow/deep integration question.

Moreover, the issue of NTMs and the WTO's approach to this issue is at the center of rising concerns about the clash between international trade agreements and national sovereignty. While the WTO and deeper forms of integration are not mutually inconsistent, an important question is this: Can the WTO continue to emphasize a shallow-integration approach and deliver internationally efficient policy outcomes while avoiding unnecessary intrusions into national sovereignty?; or instead does achieving internationally efficient policies require that the WTO evolve further toward deep integration, with the increasing erosion of the national

sovereignty of WTO members that this implies?

The subsequent sections of the paper sketch out the rough contours of the challenge faced by the WTO in dealing with NTMs from the perspective of the economic theories of trade agreements. I conclude that, when it comes to handling NTMs, the key questions for the WTO appear to be two: (1) Is it the terms-of-trade problem or the commitment problem (or both, or neither) that WTO member governments seek to solve with their WTO membership?; and (2) Is it market clearing or offshoring/bilateral bargaining that is now the most prominent mechanism for the determination of international prices? As I describe below, answers to these questions help to indicate whether shallow or rather deep integration with regard to NTMs is warranted.

Regarding the first question, the empirical evidence as surveyed by Bagwell and Staiger (2010) and most recently by Bagwell, Bown and Staiger (2016) offers support for the terms-of-trade theory as identifying the main purpose of the GATT/WTO, though more evidence on this important question is needed. Regarding the second question, there is as yet no systematic body of evidence that would help provide an answer. But as I argue below, it seems likely that answering this second question will be a key input to identifying the best way forward on NTMs for the WTO.

The rest of the paper proceeds as follows. The next section considers the definition of non-tariff measures. Section 3 then describes the evolving approach to NTMs in existing trade agreements. In section 4 I describe what the various economic theories of trade agreements have to say about the treatment of NTMs, and along the way I provide a novel terms-of-trade interpretation of the WTO's Trade Facilitation Agreement. Finally, section 5 concludes with a summary of the challenge faced by the WTO regarding the treatment of NTMs as that challenge is suggested by the material in the preceding sections.

2. Non-Tariff Measures

In this section I consider the definition of non-tariff measures, and thereby frame the scope of my discussion for the remainder of the paper. After describing in broad terms the available evidence on the landscape of non-tariff measures in practice, I then turn briefly to discuss the quantification of trade effects associated with non-tariff measures.

2.1. Defining Non-Tariff Measures

What are "non-tariff measures" (NTMs)? As the term suggests, NTMs may include any policy measures other than tariffs that can impact trade flows. At a broad level NTMs can usefully be divided into three categories.

A first category of NTMs are those imposed on imports. This category includes import quotas, import prohibitions, import licensing, and customs procedures and administration fees, as well as the non-tariff features associated with various forms of administered protection (e.g., price undertakings resulting from antidumping actions). A second category of NTMs are those imposed on exports. These include export taxes, export subsidies, export quotas, export prohibitions, and voluntary export restraints. These first two categories encompass NTMs that are applied at the border, either to imports or to exports. A third and final category of NTMs are those imposed internally in the domestic economy. Such behind-the-border measures include domestic legislation covering health/technical/product/labor/environmental standards, internal taxes or charges, and domestic subsidies.

It is difficult to obtain a comprehensive picture of the catalog of possible NTMs, but an impressive collection of studies compiled by the OECD (OECD, 2005) provides a view of the range, complexity and diversity of NTMs in practice. One study contained in this collection sets out to assess the relative importance for the post-Uruguay Round landscape of the various kinds of behind-the-border measures and NTMs (or equivalently, NTBs – non-tariff barriers) imposed on imports as these measures are perceived by foreign exporters and recorded in various survey results. Summarizing the survey findings, the study reports:

> "The ten and seven surveys that report technical measures and customs rules and procedures, respectively, rank these barriers high. They are always among the five most reported categories of barriers...Where internal taxes or charges and competition-related restrictions on market access are reported, these are also often among the top five. Although less often mentioned, restrictions for services in general rank high in three out of the five surveys that report them. The relatively consistent high ranking observed for these items does not hold in the case of other NTB categories, such as government procurement practices or subsidies, although they are reported by a substantial number of the surveys. Finally, although respondents in almost half of the 12 surveys mention problems related to intellectual

property protection and finance measures and a smaller number report price control measures, import charges and other para-tariff measures, these categories of barriers are not among the most reported." (OECD 2005, p, 23)

Another study in the OECD collection focuses on NTMs that are of particular importance to developing countries, including technical barriers to trade (TBTs) and sanitary and phytosanitary (SPS) measures, and paints a more complicated, dynamic and somewhat mixed picture of the evidence in this regard:

"The existing literature describes a few key findings and trends pertaining to developing countries. Most analysts observe that the utilization of certain types of NTBs affecting developing countries, such as quantitative restrictions, has decreased markedly in the post-Uruguay Round (UR) setting...The remaining post-Uruguay NTBs, according to frequency ratio analyses...appear to be more prevalent in developing-country than in developed country markets, although they have decreased over time. Michalopoulos (1999) notes that frequency ratios of quantity and price control measures tend to be higher in countries with lower levels of per capita income and lower degrees of openness. A seemingly greater prevalence of these NTBs in trade among developing countries is however difficult to demonstrate given that the literature focuses predominantly on barriers to developing-country trade in their major export markets, which are generally OECD markets... .

"Although the literature takes a range of approaches to identifying measures of concern to developing countries, it frequently focuses on quantity control measures: nonautomatic import licensing, quotas and tariff rate quotas. These measures may also attract attention because their effects are by nature easier to quantify and analyze than most other types of NTBs. Researchers report that post-UR NTBs are far more frequent for processed goods than for primary commodities.

"Laird (1999) finds that the primary NTBs affecting developing-country access to both OECD and non-OECD markets are essentially the same, primarily import licensing systems (including allocation of tariff quotas); variable levies and production and export subsidies (in the agricultural sector); import/export quotas (in textiles and clothing sector) and local content and export balancing requirements (automotive industry); export subsidies to develop non-traditional manufacturers

(administered as tax breaks or subsidized finance, as direct subsidies have almost disappeared under fiscal pressures); and state trading operations.

"Another perspective comes from research that identifies the prevalence of various types of NTBs differently, according to whether developing countries trade with developed countries or among themselves...The literature suggests that technical regulations, price control measures and certain other measures are very often subject to concerns about access to developed-country markets.

"...A more systematic account of developing countries' perceptions of non-tariff barriers comes from the notification process established under the auspices of NAMA [non-agricultural market access negotiations]... TBTs represent the NTB category with the highest incidence of notifications with 530 entries, or almost half of the total, followed by Customs and Administrative Procedures (380 entries) and SPS measures (137 entries). Quantitative restrictions, trade remedies, government participation in trade, charges on imports, as well as other barriers amount to less than 5% of total NTB entries." (OECD 2005, pp. 230-234).

Finally, two of the OECD studies focus specifically on export NTMs, in the form of export duties and export restrictions. Regarding export duties, a natural question is why these duties should be defined as non-tariff measures rather than as tariffs. This and related questions are addressed in one of the OECD studies in this way:

"The question also arises whether export duties should be considered a tariff or a nontariff measure. In the Doha Declaration of 2001, paragraph 16 on market access for nonagricultural products states that negotiations aim to reduce, or as appropriate eliminate, tariffs as well as non-tariff barriers. In discussions on the organisation of these negotiations, the definition of the scope of non-tariff barriers to be included has been a primary concern, while for tariffs (particularly reduction of import tariffs), the coverage and issues for discussion have been well defined. Export duties are sometimes equated with tariffs (and even called export tariffs), perhaps reflecting the fact that they are normally levied by customs in a manner similar to import tariffs. For example, the EU-Mexico free trade agreement (FTA) includes 'customs duties on exports' in the chapter on customs duties, rather than in the chapter on 'non-tariff measures'. However, the GATT and a number of regional

trade agreements (RTAs) tend to consider export duties as non-tariff measures. The 'Indicative List of Notifiable Measures' annexed to the Decision on Notification Procedures adopted at the conclusion of the Uruguay Round puts 'export taxes' in the category of non-tariff measures. The NAFTA also puts 'export taxes' in the section 'Non-tariff Measures.' A well-known case book uses the term 'export taxes' in the chapter entitled 'Export Controls under the GATT and National Law' (Jackson et al., 1995).

"A further question is the relationship between export duties and fees and formalities. Export duties are explicitly excluded from the application of Article VIII(a) of the GATT 1994, which deals with fees and formalities and prohibits fees and other charges rendered in connection with exportation (or importation) that exceed the costs of the service rendered. The article stipulates that fees and other charges shall not represent an indirect protection to domestic products or a taxation of imports or exports for fiscal purposes. It applies to all fees and formalities of whatever character, but it explicitly states that 'export duty' is excluded from the scope of application. Therefore, a distinction should be drawn between export duties and fees or charges, even though in specific cases the substance of the measures may be similar." (OECD 2005, p 179).

In short, we may think of NTMs as all of the measures that governments might take other than import tariffs which can impact trade flows. And as the quoted passages above make clear, NTMs comprise an extremely diverse set of policy measures, which can be individually as different from each other as they are collectively different from import tariffs.

This raises an important question: Why should non-tariff trade impacting measures be separated conceptually from import tariffs and lumped together as NTMs? For example, for the purpose of discussing trade-impacting measures, why not adopt an alternative categorization strategy, in which all trade-impacting measures are divided into tax and non-tax measures, or in which they are categorized in terms of border and non-border measures? In some sense, these alternative ways of categorizing trade-impacting measures would reflect a more natural and obvious intellectual coherence.

But in the context of the institutional features of the GATT/WTO, NTMs *are* usefully separated from import tariffs, because while both tariff and non-tariff measures may impact trade, import tariffs stand out as the central policy measure with which negotiated market access

commitments are made– through negotiated tariff "bindings" – and in this way, tariffs have a special place relative to all non-tariff measures in the GATT/WTO. A fundamental question is whether the GATT/WTO's asymmetric treatment of tariff versus non-tariff measures is warranted on economic grounds. As we will see, the answer to this question is complex, offering strong support for the GATT/WTO treatment of some NTMs but less support for others. And importantly, as I will describe below, the answer itself depends in part on the nature of trade, and so it may evolve as the nature of trade evolves.

2.2. Quantifying the Impact of NTMs on Trade

In light of the diversity of NTMs as described above, it should come as no surprise that quantifying the impact of NTMs on trade is a challenging exercise. For example, as the Executive Summary of the OECD study described above observes:

> "...Not only do these measures take often non-transparent forms, analysis also has to take into account whether and how they are linked to non-trade policy objectives. Some NTBs serve important regulatory purposes and are legitimate under WTO rules under clearly defined conditions even though they restrict trade. For example, import licences may be used to control the importation of products carrying potential health risks. Countries may ban imports of farm products for food safety reasons or impose labelling requirements in response to consumer demands for information. The issue here is whether governments, in pursuing legitimate goals, are restricting imports more than is necessary to achieve those goals. Under multilateral rules, the objective is not to remove these measures but to ensure that they are set at an appropriate level to achieve legitimate objectives with minimum impact on trade. However, because legitimacy claims are typically associated with the introduction of these measures, they are hard to assess.
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> "All this makes the issues that arise in connection with determining the economic impact of NTBs very different from those surrounding the use of tariffs. As far as trade and the economic impact of NTBs are concerned, much depends on the specific circumstances of their application. To understand the effect of a specific measure requires a case-by-case examination." (OECD, 2005, p. 13).

The validity of these concerns notwithstanding, various attempts using different methodologies and data have been undertaken to estimate the impact of NTMs on imports, including frequency/coverage measures, price comparison measures and quantity impact measures, as well as residuals of gravity-type equations (see Deardorff and Stern, 1997, for a review). The most ambitious attempt to date, in terms of both theoretical grounding and country/tariff line coverage, is contained in Kee et al (2009), who seek a consistent measure of the trade-restrictiveness of NTMs that can be compared to tariffs.[1] Kee et al motivate their approach as follows:

> "...trade policy can take many different forms: tariffs, quotas, non-automatic licensing, antidumping duties, technical regulations, monopolistic measures, subsidies, etc. How can one summarize in a single measure the trade restrictiveness of a 10% tariff, a 1000-ton quota, a complex non-automatic licensing procedure and a $1 million subsidy? Often the literature relies on outcome measures, e.g., import shares. The rationale is that import shares summarise the impact of all these trade policy instruments. The problem is that they also measure differences in tastes, macroeconomic shocks and other factors which should not be attributed to trade policy. Another approach that is often followed is to simply rely on tariff data or collected customs duties and assume that all other instruments are positively (and perfectly) correlated with tariffs. These are obviously unsatisfactory solutions. A more adequate approach...is to bring all types of trade policy instruments into a common metric." (Kee et al, 2009, p. 173).

The approach taken by Kee et al is to estimate ad-valorem equivalents of NTMs for each country at the tariff line level that can then be compared directly to (ad valorem) tariffs.

Despite all of these difficulties in measurement, most estimates of the trade impacts of NTMs suggest that they can be substantial. For example, Kee et al (2009) find that for a majority of tariff lines the ad valorem equivalent of the NTMs in their sample of 78 countries is higher than the actual tariff. And the mechanism by which NTMs impact trade can be subtle: for instance, Staiger and Wolak (1994) find that the mere filing of US antidumping claims can significantly reduce trade flows during the period of investigation of these claims, even though

[1] Recent papers that focus more narrowly on the trade effects of specific non-tariff measures include Martincus, Carballo and Graziano (2015) who estimate the effects of custom-related delays on Uruguay's firm-level exports, and Fontagne, Orefice, Piermartini and Rocha (forthcoming) who estimate the effects of SPS measures on the exports of French firms.

no antidumping duties are in place over the period of investigation and even if the investigation ends in a finding of no dumping and no duties are ever imposed.

3. The Evolving Approach to NTMs in Trade Agreements

In this section I describe briefly the evolving approach to NTMs taken first by GATT and then by the WTO. I also describe briefly the approaches to NTMs taken increasingly by countries when they create preferential trade agreements. In each case I first consider border (import and export) NTMs, and then turn to behind-the-border NTMs.

3.1. The GATT Approach

The GATT took a minimalist approach to NTMs in general. I begin by briefly describing GATT's approach to NTMs applied at the border, and then turn to describe in broad terms the GATT approach to behind-the-border NTMs.

3.1.1. Border NTMs

The GATT approach to border NTMs differs on the import side and the export side. The approach can be loosely characterized as follows.

First, on the import side, GATT was designed to serve as a negotiating forum in which reciprocal, voluntary and nondiscriminatory (MFN) tariff bargaining among member governments would lead to tariff bindings that defined maximum allowable tariff levels. Of course, tariff bindings in themselves are not likely to be valued by governments. But it was anticipated that these bindings would imply meaningful increases in market access and trade volumes for foreign exporters, and for this reason would be valued by the participating governments.

However, as Hudec (1990) describes, the drafters of GATT were acutely aware that policies other than tariffs could easily substitute for tariffs and might become tempting in this role once a country bound its tariffs as a result of a negotiation. And the drafters understood that if left unchecked these NTMs could undermine the market-access value of a negotiated tariff binding and hence the foundation of the negotiating framework they sought to create. For this reason, while member governments did not negotiate directly over the level of NTMs in GATT as they did over tariffs, GATT contains numerous provisions – e.g., Articles V (freedom of transit), VIII (fees and formalities connected with importation and exportation), X (publication and

administration of trade regulations) and XI (general elimination of quantitative restrictions) that are designed to induce "tariffication" of import-protective border measures and prevent the substitution of alternative forms of import protection for tariffs. This is the essence of GATT's approach to border NTMs on the import side.

On the export side, GATT was far more permissive (although the GATT rules on fees and formalities and prohibition on quantitative restrictions apply to both imports and exports), in part because it was not anticipated that GATT member governments would actively engage in negotiations over export-sector liberalization commitments (say, on export taxes or export subsidies), so the issues regarding NTMs that arise on the import side as described above do not arise symmetrically on the export side. In addition, at least with regard to developed countries (who were the major actors in GATT-sponsored negotiated liberalization), export taxes were less often used than import tariffs, and so they may have been seen as a less-pressing issue for the world trading system at the time of GATT's creation.[2] With regard to the particular issue of export subsidies, early GATT disciplines were very permissive though they have tightened over time. For example, originally, GATT contained only a loose reporting requirement regarding export subsidies (and granted the authority for affected importing countries to impose countervailing duties).

3.1.2. Behind-the-Border NTMs

The GATT approach to dealing with behind-the-border NTMs can also be described as a minimalist or "shallow integration" approach. The essence of this approach follows the logic described above for GATT's approach to border NTMs on the import side, though the tactics differ. In particular, as observed above, the drafters of GATT were well-aware that policies other than tariffs could easily substitute for tariffs and might become attractive if a country bound its tariffs as a result of a negotiation. But in the case of behind-the-border NTMs, issues of national sovereignty precluded the kind of approach to this issue that was taken with regard to border NTMs (e.g., the prohibition on quantitative restrictions). Hudec (1990) describes this problem as it was perceived by the drafters of GATT:

> "...The standard trade policy rules could deal with the common types of trade

[2] That said, Irwin et al (2008, pp. 69-70, 136) observe that in the negotiations leading up to the creation of GATT, the United States pushed for a prohibition on export taxes. While no such prohibition was ultimately included in GATT, this observation does indicate that export taxes were an important trade policy concern in the pre-GATT era to at least some of the major trading countries.

policy measure governments usually employ to control trade. But trade can also be affected by other 'domestic' measures, such as product safety standards, having nothing to do with trade policy. It would have been next to impossible to catalogue all such possibilities in advance. Moreover, governments would never have agreed to circumscribe their freedom in all these other areas for the sake of a mere trade agreement." Hudec (1990, p. 24).

To address this problem, the GATT essentially took a two-pronged approach to behind-the-border NTMs. First, GATT requires that all domestic taxes, charges and regulations satisfy a basic nondiscrimination rule (national treatment). This rule in principle prevents the simplest and most direct method of substituting behind-the-border NTMs for tariffs, namely, discriminating in taxes and/or regulations against imported products.

But it was also recognized by the drafters of GATT that even nondiscriminatory domestic taxes and regulations could be a partial substitute for tariffs, and it was therefore thought that something more unusual might be needed to guard against the substitution of behind-the-border NTMs for import tariffs. Hudec (1990) continues in this regard:

"The shortcomings of the standard legal commitments were recognized in a report by a group of trade experts at the London Monetary and Economic Conference of 1933. The group concluded that trade agreements should have another more general provision which would address itself to any other government action that produced an adverse effect on the balance of commercial opportunity..." Hudec (1990, p. 24).

As Hudec explains, these additional concerns eventually led to the inclusion of a second line of defense against the substitution of behind-the-border NTMs for import tariffs, which is contained in the so-called "nonviolation" nullification-or-impairment provision of GATT. According to the nonviolation clause, a GATT member is entitled to compensation from another GATT member if the two countries had originally negotiated an exchange of tariff bindings, and if one of the countries subsequently introduces a new measure – any new measure, even one on which there exist no GATT commitments – that erodes the market access value of its original tariff binding and that the other country could not reasonably have anticipated at the time of their original market access negotiation.

Hence, as with border NTMs, member governments did not negotiate directly over behind-the-border NTMs in GATT. But there are several provisions that are meant to protect the value of negotiated market access agreements against erosion by behind-the-border NTMs. This is the essence of GATT's approach to behind-the-border NTMs.

3.2. The WTO Approach

The approach to NTMs has evolved from the GATT to the WTO. As described above, GATT's approach to NTMs was minimalist, although as mentioned in the later GATT years some of the obligations regarding NTMs (e.g., export subsidies) became more stringent. With the creation of the WTO this trend was continued and extended in a number of important ways.

3.2.1. Border NTMs

The WTO approach to border NTMs represents a significant tightening of obligations relative to GATT along a number of dimensions. For example, the WTO Safeguard Agreement prohibits the use of various forms of border NTMs administered on the export side (e.g., Orderly Marketing Arrangements (OMAs) and Voluntary Export Restraints (VERs)) that were considered "grey-area" measures under GATT and had become popular in the last decade of GATT before the creation of the WTO. The WTO Subsidies and Countervailing Measures (SCM) Agreement strengthens significantly the prohibition against export subsidies. And most recently in the context of the Doha Round, the conclusion of the negotiations of the Trade Facilitation Agreement (TFA) at the Bali Ministerial marks a similar tightening and clarification of the rules related to border NTMs contained in GATT Articles V, VIII and X.

3.2.2. Behind-the-Border NTMs

The WTO approach to behind-the-border NTMs also represents a significant tightening of obligations relative to GATT along a number of dimensions. For example, the WTO Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Measures (SPS) Agreements represent a significant strengthening of the nondiscrimination/national treatment obligations regarding certain kinds of domestic regulations.[3] In addition, the WTO SCM Agreement con-

[3]The WTO TBT Agreement can also be seen as complementing the ongoing international standardization process, as embodied for example in the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). I do not emphasize this standardization process in what follows, because my focus is on the international cooperation (e.g., prisoners' dilemma) problems that I will argue the

tains substantial commitments regarding domestic subsidies that were not included in GATT. In essence, while the overall approach of the WTO with respect to behind-the-border NTMs can still be characterized as one of shallow integration, there has been some evolution over the history of the GATT/WTO in the direction of "deep integration."

3.3. The PTA Approach

I close this section by simply noting that many recent preferential trade agreements (PTAs) include commitments on behind-the-border NTMs that are substantially more stringent than those contained in the GATT or the WTO. In particular, a growing number of PTAs go significantly beyond eliminating tariffs on a preferential basis, and focus instead on negotiating specific commitments on behind-the-border NTMs. A recent and comprehensive documentation of this development, including a discussion of the circumstances under which countries seem to prefer this kind of deep integration from their negotiated agreements rather than the shallow integration that characterizes traditional GATT market access agreements, is provided in WTO (2011), while Bagwell, Bown and Staiger (2016) survey the relevant economics literature. I will return to the issue of deep versus shallow integration in later sections.

4. The Economics of the Approach to NTMs in Trade Agreements

In this section I review the two major established economic theories of trade agreements, the terms-of-trade theory and the commitment theory, and consider what each theory has to say about the treatment of border NTMs and the treatment of behind-the-border NTMs in trade agreements. Motivated by the recent rise in "offshoring" of specialized inputs, I then consider a world in which international prices are determined by bilateral bargaining between buyers and sellers, and I show that a key result from the terms-of-trade theory with regard to the treatment of behind-the-border NTMs is reversed. I use these contrasting findings to interpret the implications of the rise in offshoring for the treatment of NTMs in trade agreements.

4.1. The Terms-of-Trade Theory

According to the terms-of-trade theory of trade agreements, governments are attracted to trade agreements as a means of escape from a terms-of-trade driven Prisoners' Dilemma (see Bagwell

WTO is designed to solve rather than on the international coordination problems that the standardization process seeks to address.

and Staiger, 1999, 2002). The "problem" that arises in the absence of an agreement, and that a trade agreement can then exist to "fix," can be easily understood in intuitive terms as follows.

Suppose a government is unconstrained by a trade agreement, and chooses unilaterally the level of a tariff it will impose. This government will naturally consider the various costs and benefits of a slightly higher or lower tariff when coming to its decision on the preferred level of import protection, but there is one cost that the government will inevitably leave out of its calculation: the cost of its import protection that is borne by foreign exporters. And in ignoring this cost the unilateral trade policy choices of the government will then be too protective relative to internationally efficient choices. According to the terms-of-trade theory of trade agreements, the purpose of a trade agreement is to give foreign exporters a "voice" in the tariff choices of their trading partners, so that through negotiations they can make their trading partners responsive to this cost. And in accomplishing this, a trade agreement then naturally leads to lower tariffs and an expansion of market access and trade volumes.

4.1.1. Border NTMs

The description of the basic prediction of the terms-of-trade theory that I have provided above is focused on tariffs as the instrument of protection. What does the terms-of-trade theory say about border NTMs? Regarding border NTMs on the export side, and in particular export subsidies, there is some tension between the terms-of-trade theory and the negotiated restrictions on export subsidies that are observed, especially as those commitments are structured in the WTO, in effect because negotiated restrictions on export subsidies would tend to reduce trade volumes and therefore work against the basic goal of trade agreements according to the terms-of-trade theory (see Bagwell and Staiger, 2001a, 2012a).[4] However, regarding border NTMs on the import side, the observed treatment in GATT and the WTO resonates strongly with the terms-of-trade theory. In particular, the logic of tariffication as emphasized by GATT and described above finds support in the terms-of-trade theory. For example, the prohibition of quantitative measures contained in GATT Article XI facilitates the implementation of nondiscriminatory (MFN) import protection, which the terms-of-trade theory supports (see Bagwell and Staiger, 1999). And the evolving GATT/WTO approach to issues of "trade facilitation" in relation to GATT Articles V, VIII and X can also be usefully interpreted from the perspective

[4] A comprehensive assessment of the treatment of export subsidies (and of border NTMs more generally) in the GATT and the WTO and an evaluation of this treatment from the perspective of the terms-of-trade theory is provided in Bagwell, Staiger and Sykes (2013).

of the terms-of-trade theory.

This last point is not well-appreciated in the literature. Therefore, below I sketch a simple model to illustrate the rationale for the TFA from the perspective of the terms-of-trade theory. I emphasize three related points. First, the terms-of-trade theory provides a simple framework for interpreting the purpose of an agreement on trade facilitation. Second, the terms-of-trade theory indicates that the inefficiencies associated with unilateral investments in trade facilitation arise only once tariffs are constrained through international agreement. And third, in principle these inefficiencies can be addressed by either shallow or deep integrations approaches.[5]

A Model of Trade Facilitation At the broadest level, the issue of trade facilitation encompasses any measure that impacts the cost of international trade, including both border measures and behind-the-border measures. In the context of the WTO TFA, however, the focus on trade facilitation is decidedly narrow, restricted to improving administrative procedures at the border. I capture this focus by considering a simple partial equilibrium setting, in which a home country imports a competitively produced good from the foreign country, and I let I and I^* denote respectively home and foreign investments in border management processes (e.g., IT) that determine the efficiency of import and export transactions. In particular, I assume that the per-unit (specific) trade cost for exports from foreign to home, t, can be represented by the function $t(I, I^*)$, where $t(0, 0)$ is non-prohibitive and with $t(I, I^*)$ decreasing and convex in both its arguments and non-negative for all I and I^*.

With the (specific) import tariff set by the home government denoted by τ, and the (specific) export tax set by the foreign government denoted by τ^*, the arbitrage relationship between the home-country price of this good (P) and the foreign-country price of the good (P^*) that must hold as long as strictly positive trade occurs is given by

$$P = P^* + t(I, I^*) + \tau + \tau^*. \tag{4.1}$$

I then define the *foreign world price* by

$$P^{w*} \equiv P^* + \tau^*,$$

[5] Bond (2006) also provides an analysis of agreements on trade facilitation from the perspective of a terms-of-trade model, thereby also demonstrating that the terms-of-trade theory can account for the purpose of a trade facilitation agreement. His focus is somewhat different than my focus here, however, and he does not consider the second and third points that I emphasize below.

and I define the *home world price* by

$$P^w \equiv P - \tau.$$

The foreign and home world prices P^{w*} and P^w are measures of the foreign- and home-country terms of trade – the foreign terms of trade improves when P^{w*} rises, and the home terms of trade improves when P^w falls – and through (4.1) they are related by

$$P^w - P^{w*} = t(I, I^*).$$

A drop in transport costs t brings P^w and P^{w*} closer together, and when $t = 0$ the home and foreign world prices are equated.

To complete the model, I denote by $D(P)$ and $D^*(P^*)$ the home and foreign demands for the product under consideration, and I assume that each demand function is a decreasing function; and for simplicity I assume that the product is supplied only by the foreign country, and denote the foreign supply function by $S^*(P^*)$ which I assume is an increasing function. Using the pricing relationship (4.1), and denoting foreign export supply by $E^*(P^*) \equiv S^*(P^*) - D^*(P^*)$ and home import demand by $M(P) \equiv D(P)$, the market clearing condition may be written as

$$M(P^* + t(I, I^*) + \tau + \tau^*) = E^*(P^*)$$

yielding the market clearing foreign price $\hat{P}^*(t(I, I^*) + \tau + \tau^*)$, from which the market clearing home price and foreign and home world prices also follow:

$$\begin{aligned}
\hat{P}(t(I, I^*) + \tau + \tau^*) &\equiv \hat{P}^*(t(I, I^*) + \tau + \tau^*) + t(I, I^*) + \tau + \tau^* \\
\hat{P}^{w*}(t(I, I^*) + \tau, \tau^*) &\equiv \hat{P}^*(t(I, I^*) + \tau + \tau^*) + \tau^* \\
\hat{P}^{w}(t(I, I^*) + \tau^*, \tau) &\equiv \hat{P}(t(I, I^*) + \tau + \tau^*) - \tau.
\end{aligned}$$

As is standard, the world prices depend on the levels of both τ and τ^*, but the home and foreign prices depend only on the sum $\tau + \tau^*$ (and on the trade facilitation investment levels I and I^*).

With the market clearing price expressions above, the terms-of-trade impacts of policy choices can now be assessed. Regarding the terms-of-trade impacts of trade taxes, direct calculations yield (with a prime denoting the derivative of the function with respect to its argument):

$$\begin{aligned}
\frac{\partial \hat{P}^w}{\partial \tau} &= \frac{\partial \hat{P}^{w*}}{\partial \tau} = \frac{M'}{E^{*\prime} - M'} < 0 \\
\frac{\partial \hat{P}^{w*}}{\partial \tau^*} &= \frac{\partial \hat{P}^{w}}{\partial \tau^*} = \frac{E^{*\prime}}{E^{*\prime} - M'} > 0.
\end{aligned}$$

As expected, an increase in the home-country tariff improves the home terms of trade and worsens the foreign terms of trade, while an increase in the foreign-country tariff has the opposite impact, improving the foreign terms of trade and worsening the home terms of trade. These familiar terms-of-trade effects of tariff intervention provide the basis for the inefficient Prisoners' Dilemma situation that according to the terms-of-trade theory arises in the absence of a trade agreement.

The terms-of-trade impacts of investments in trade facilitation are more novel. For home-country investments in trade facilitation, these impacts are given by

$$\begin{aligned} \frac{\partial \hat{P}^w}{\partial t}\frac{\partial t}{\partial I} &= \frac{E^{*\prime}}{E^{*\prime}-M^{\prime}}\cdot\frac{\partial t}{\partial I} < 0 \\ \frac{\partial \hat{P}^{w*}}{\partial t}\frac{\partial t}{\partial I} &= \frac{M^{\prime}}{E^{*\prime}-M^{\prime}}\cdot\frac{\partial t}{\partial I} > 0, \end{aligned} \tag{4.2}$$

while for foreign-country investments in trade facilitation, these impacts are given by

$$\begin{aligned} \frac{\partial \hat{P}^{w*}}{\partial t}\frac{\partial t}{\partial I^*} &= \frac{M^{\prime}}{E^{*\prime}-M^{\prime}}\cdot\frac{\partial t}{\partial I^*} > 0 \\ \frac{\partial \hat{P}^{w}}{\partial t}\frac{\partial t}{\partial I^*} &= \frac{E^{*\prime}}{E^{*\prime}-M^{\prime}}\cdot\frac{\partial t}{\partial I^*} < 0. \end{aligned} \tag{4.3}$$

Evidently, home-country investments in trade facilitation improve the home-country terms of trade *while at the same time improving the terms of trade of the foreign country*, and similarly for foreign-country investments in trade facilitation. Such a "win-win" prospect for investments in trade facilitation makes it tempting to conjecture that the terms-of-trade theory cannot explain why countries would need an international agreement to encourage such investments.[6] As I will demonstrate below, however, this conjecture turns out to be false. Intuitively, the key is to note from the derivative expressions in (4.2) and (4.3) above that each country's investment in

[6]Indeed, the view that the rationale for international agreements regarding trade facilitation (such as the TFA) falls outside the purview of the terms-of-trade theory of trade agreements seems to have gained traction recently in policy circles. Although it appears in various writings, the clearest expression of this view of which I am aware is in Hoekman (2014, p. 5), who also emphasizes that investments in trade facilitation improve the terms of trade of both importing and exporting countries, and concludes:

> "The puzzle therefore is that a government can unilaterally take actions that will improve its terms of trade without in the process creating an adverse impact on its trading partners. While the foreign country will benefit from a trading partner's trade facilitation, it does not do so at the expense of the country concerned. There is therefore no prisoner's dilemma situation of the type that often drives cooperation on trade policy. The TFA cannot be motivated by the terms-of-trade rationale that has become the staple of the formal economic literature on trade agreements..."

trade facilitation imparts a positive terms-of-trade externality on the other country, providing a possible reason for under-investment in trade facilitation when countries are guided only by their unilateral interests (i.e., in the absence of an international agreement that covers trade facilitation).

I now define the welfare functions for the home and foreign country policy makers. I abstract from political economy motives, though the results I report below are easily generalized to include such motives. With no home-country production, home welfare is then given by the sum of consumer surplus plus tariff revenue minus the cost of home investment in trade facilitation. Letting c denote the unit cost for the home country of investment in trade facilitation, with the total cost of home-country investment in trade facilitation then given by $c \cdot I$, and with CS denoting home-country consumer surplus and using $\tau = P - P^w$, home welfare is given by

$$\begin{aligned} W &= CS(\hat{P}(t(I, I^*) + \tau + \tau^*)) \\ &\quad + [\hat{P}(t(I, I^*) + \tau + \tau^*) - \hat{P}^w(t(I, I^*) + \tau^*, \tau)] \cdot M(\hat{P}(t(I, I^*) + \tau + \tau^*)) - c \cdot I \\ &\equiv W(I, \hat{P}(t(I, I^*) + \tau + \tau^*), \hat{P}^w(t(I, I^*) + \tau^*, \tau)). \end{aligned}$$

Taking account of production in the foreign country and with PS^* denoting foreign producer surplus and with c^* denoting the unit cost for the foreign country of investment in trade facilitation, foreign welfare is similarly defined as the sum of consumer and producer surplus plus export tax revenue minus the cost of foreign investment in trade facilitation, or

$$\begin{aligned} W^* &= CS^*(\hat{P}^*(t(I, I^*) + \tau + \tau^*)) + PS^*(\hat{P}^*(t(I, I^*) + \tau + \tau^*)) \\ &\quad + [\hat{P}^{w*}(t(I, I^*) + \tau, \tau^*) - \hat{P}^*(t(I, I^*) + \tau + \tau^*)] \cdot E^*(\hat{P}^*(t(I, I^*) + \tau + \tau^*)) - c^* \cdot I^* \\ &\equiv W^*(I^*, \hat{P}^*(t(I, I^*) + \tau + \tau^*), \hat{P}^{w*}(t(I, I^*) + \tau, \tau^*)). \end{aligned}$$

Finally, the sum of home and foreign welfare, which I refer to as "world welfare" and denote by W^w, is given by

$$\begin{aligned} W^w &= CS(\hat{P}(t(I, I^*) + \tau + \tau^*)) + CS^*(\hat{P}^*(t(I, I^*) + \tau + \tau^*)) + PS^*(\hat{P}^*(t(I, I^*) + \tau + \tau^*)) \\ &\quad + [\hat{P}(t(I, I^*) + \tau + \tau^*) - \hat{P}^*(t(I, I^*) + \tau + \tau^*) - t(I, I^*)] \cdot E^*(\hat{P}^*(t(I, I^*) + \tau + \tau^*)) \\ &\quad - c \cdot I - c^* \cdot I^* \\ &\equiv W^w(I, I^*, \hat{P}(t(I, I^*) + \tau + \tau^*), \hat{P}^*(t(I, I^*) + \tau + \tau^*)). \end{aligned}$$

Notice that while home and foreign welfare each depend on their respective world prices and hence on the levels of both τ and τ^*, world welfare is independent of world prices – because

movements in these prices only serve to redistribute surplus between the home and foreign country – and hence world welfare depends only on the sum of home and foreign tariffs $\tau + \tau^*$ (in addition to trade facilitation investment levels I and I^*).

Efficient Policies I define efficient policies as those that maximize world welfare (and thereby implicitly assume that lump sum transfers are available to distribute surplus across the two countries as desired). As noted just above, world welfare depends on the sum of the home and foreign tariffs, $\tau + \tau^*$, and on home and foreign investment levels in trade facilitation, I and I^*. The first-order conditions that define the sum of efficient tariffs, $\partial W^w/\partial[\tau + \tau^*] = 0$, can be simplified to yield[7]

$$[\tau + \tau^*] \cdot \frac{\partial E^*}{\partial P^*} \frac{\partial \hat{P}^*}{\partial[\tau + \tau^*]} = 0$$

which immediately implies

$$\tau^e + \tau^{*e} = 0 \tag{4.4}$$

where a superscript "e" denotes efficient policies. Hence, as should come as no surprise in this perfectly competitive setting, there is no efficiency role for tariff intervention, and this is true independent of the setting of investment levels for trade facilitation (and hence independent of trade costs t).

Consider next the efficient level of home and foreign investment in trade facilitation, denoted by I^e and I^{*e} respectively. The first-order condition that defines I^e can be manipulated to yield

$$\{[\tau + \tau^*] \cdot \frac{\partial E^*}{\partial P^*} \frac{\partial \hat{P}^*}{\partial[\tau + \tau^*]} - E^*\} \frac{\partial t}{\partial I} = c$$

which, evaluated at the efficient tariffs $\tau^e + \tau^{*e}$, simplifies to

$$M^e \cdot [-\frac{\partial t}{\partial I}] = c \tag{4.5}$$

where M^e denotes home import volume evaluated at efficient policies. In words, the efficient level of home investment in trade facilitation I^e equates the marginal benefit of the last unit of this investment undertaken by the home country (the marginal savings in total trade costs $M^e \cdot [-\frac{\partial t}{\partial I}]$) with the marginal cost to the home country of the last unit of this investment (c). The efficient level of foreign investment in trade facilitation, I^{*e}, is similarly characterized:

$$E^{*e} \cdot [-\frac{\partial t}{\partial I^*}] = c^* \tag{4.6}$$

with E^{*e} denoting foreign export volume evaluated at efficient policies.

[7] Here and throughout I assume that second order conditions for the relevant maximization problems hold.

Nash Policies Next consider the Nash policies adopted by the two countries in the absence of a trade agreement. The first-order conditions for the home country that define its best-response levels of τ and I are given by

$$\begin{aligned} \frac{\partial W}{\partial \tau} &= -M(\hat{P})\frac{\partial \hat{P}}{\partial \tau} + \tau \frac{\partial E^*}{\partial P^*}\frac{\partial \hat{P}^*}{\partial \tau} + M(\hat{P}) = 0 \\ \frac{\partial W}{\partial I} &= [-M(\hat{P})\frac{\partial \hat{P}}{\partial t} + \tau \frac{\partial E^*}{\partial P^*}\frac{\partial \hat{P}^*}{\partial t}]\frac{\partial t}{\partial I} - c = 0. \end{aligned} \tag{4.7}$$

Similarly, the first-order conditions for the foreign country that define its best-response levels of τ^* and I^* are given by

$$\begin{aligned} \frac{\partial W^*}{\partial \tau^*} &= -E^*(\hat{P}^*)\frac{\partial \hat{P}^*}{\partial \tau^*} + \tau^* \frac{\partial M}{\partial P}\frac{\partial \hat{P}}{\partial \tau^*} + E^*(\hat{P}^*) = 0 \\ \frac{\partial W^*}{\partial I^*} &= [-E^*(\hat{P}^*)\frac{\partial \hat{P}^*}{\partial t^*} + \tau^* \frac{\partial M}{\partial P}\frac{\partial \hat{P}}{\partial t^*}]\frac{\partial t^*}{\partial I^*} - c^* = 0. \end{aligned} \tag{4.8}$$

The Nash policies, which I denote by τ^N, I^N, τ^{*N} and I^{*N}, satisfy the four first-order conditions in (4.7) and (4.8) simultaneously.

Now notice from the pricing relationships above that $\frac{\partial \hat{P}}{\partial \tau} = \frac{\partial \hat{P}}{\partial t}$ and $\frac{\partial \hat{P}^*}{\partial \tau} = \frac{\partial \hat{P}^*}{\partial t}$ and that $\frac{\partial \hat{P}^*}{\partial \tau^*} = \frac{\partial \hat{P}^*}{\partial t^*}$ and $\frac{\partial \hat{P}}{\partial \tau^*} = \frac{\partial \hat{P}}{\partial t^*}$. Using this, substituting the top first-order condition in (4.7) into the bottom first-order condition in (4.7), and simplifying the top condition in (4.7) further, and performing the analogous steps for the first order conditions in (4.8), it follows that the Nash tariffs are characterized by

$$\tau^N = \frac{\hat{P}^{w*N}}{\eta^{E^{*N}}} \quad \text{and} \quad \tau^{*N} = \frac{\hat{P}^{wN}}{\eta^{M^N}}, \tag{4.9}$$

while the Nash investment levels satisfy

$$M^N \cdot [-\frac{\partial t}{\partial I}] = c \quad \text{and} \quad E^{*N} \cdot [-\frac{\partial t}{\partial I^*}] = c^*, \tag{4.10}$$

with $\eta^{E^{*N}}$ the elasticity of foreign export supply evaluated at Nash policies and η^{M^N} the elasticity of home import demand (defined positively) evaluated at Nash policies, and where $\hat{P}^{w*N}$, $\hat{P}^{wN}$, M^N and E^{*N} denote their respective previously-defined magnitudes evaluated at Nash policies. The Nash tariffs in (4.9) represent the usual inverse-trade-elasticity formulae for the Johnson (1953-54) optimal tariff; the Nash investments in trade facilitation described by (4.10) equate the marginal benefit of investment with its marginal cost, just as described previously in the context of efficient policy choices.

A Trade Facilitation Agreement With the Nash and efficient policies characterized, I now offer an interpretation of the evolving GATT/WTO approach to issues of trade facilitation from the perspective of the terms-of-trade theory. An initial pair of observations come directly from a comparison of the conditions for Nash and efficient policies. First, as (4.4) and (4.9) make clear, Nash tariffs are too high relative to efficient tariffs: $\tau^N+\tau^{*N} = \frac{\hat{P}^{w*N}}{\eta^{E*N}}+\frac{\hat{P}^{wN}}{\eta^{MN}} > 0 = \tau^e+\tau^{*e}$. And second, as (4.5), (4.6) and (4.10) make clear, conditional on the Nash trade volume, the Nash investments in trade facilitation are *efficient* (i.e., they equate the marginal savings in total trade costs with the marginal cost of investment).

These initial observations reflect a hallmark prediction of the terms-of-trade theory of trade agreements that I will emphasize again in later sections: as the import tariff or export tax is the first-best policy for manipulating the terms of trade, and as terms-of-trade manipulation is the only problem for a trade agreement to fix, import tariffs and export taxes will be the only policies that are distorted in the Nash equilibrium, with all other policies set at their efficient levels conditional on (inefficiently low) Nash trade volumes. Hence, the job of a trade agreement is to liberalize tariffs and thereby expand trade volumes to efficient levels, without introducing inefficiencies in the other policy choices – once tariffs are constrained by the agreement – as a second-best means of terms-of-trade manipulation.

To interpret an agreement on trade facilitation through the lens of the terms-of-trade theory, it is then necessary to consider the incentive each country would have to distort unilaterally its investment in trade facilitation as a second-best means of terms-of-trade manipulation once its tariffs are bound below their best-response levels in a trade agreement and are therefore no longer set to optimally manipulate the terms of trade from a unilateral perspective. To this end, suppose countries begin from an efficient set of policies ($\bar{\tau}$, $\bar{\tau}^*$, $\bar{I}$ and $\bar{I}^*$) such that $\bar{\tau}+\bar{\tau}^* = \tau^e+\tau^{*e}$, $\bar{I} = I^e$ and $\bar{I}^* = I^{*e}$ and both countries are positioned below their best-response tariffs.[8] From this starting point, if it can be shown that $\frac{\partial W}{\partial I} < 0$ and $\frac{\partial W^*}{\partial I^*} < 0$ so that the home and foreign countries would each have a unilateral incentive to back away from efficient levels of investment in trade facilitation, then it may be concluded that if left unconstrained on this dimension the home and foreign country would under-invest in trade facilitation relative to the efficient level, indicating that some form of international cooperation on trade facilitation

[8] It is possible to be on the efficiency frontier and yet have one country strictly above its tariff reaction curve (because as I have noted, only the sum of the tariffs matters for efficiency, not the individual tariff levels), but it is standard to restrict attention to points on the efficiency frontier where both countries are strictly below their tariff reaction curves (see the discussion, for example, in Bagwell and Staiger, 2005).

would be needed to bring investments in trade facilitation up to their efficient levels.

Beginning from the efficient policies outlined above, we have

$$\frac{\partial W}{\partial I} = [-M^e \frac{\partial \hat{P}}{\partial t} + \bar{\tau} \frac{\partial E^*}{\partial P^*} \frac{\partial \hat{P}^*}{\partial t}] \frac{\partial t}{\partial I} - c \tag{4.11}$$

where all magnitudes in (4.11) are evaluated at these efficient policies. But it follows from the top condition in (4.7) that

$$\frac{\partial W}{\partial \tau} = -M^e \frac{\partial \hat{P}}{\partial \tau} + \bar{\tau} \frac{\partial E^*}{\partial P^*} \frac{\partial \hat{P}^*}{\partial \tau} + M^e > 0 \tag{4.12}$$

when all magnitudes in (4.12) are evaluated at these efficient policies. Manipulating (4.12) and substituting into (4.11) then implies

$$\frac{\partial W}{\partial I} = [-M^e \frac{\partial \hat{P}}{\partial t} + \bar{\tau} \frac{\partial E^*}{\partial P^*} \frac{\partial \hat{P}^*}{\partial t}] \frac{\partial t}{\partial I} - c < M^e \cdot [-\frac{\partial t}{\partial I}] - c = 0, \tag{4.13}$$

where the last equality follows from (4.5) which implies that $[-\frac{\partial t}{\partial I}] = \frac{c}{M^e}$ when evaluated at efficient policies. Using the top condition in (4.8), analogous steps lead to

$$\frac{\partial W^*}{\partial I^*} = [-E^*(\hat{P}^*) \frac{\partial \hat{P}^*}{\partial t^*} + \tau^* \frac{\partial M}{\partial P} \frac{\partial \hat{P}}{\partial t^*}] \frac{\partial t^*}{\partial I^*} - c^* < E^{*e} \cdot [-\frac{\partial t}{\partial I^*}] - c^* = 0, \tag{4.14}$$

where the last equality follows from (4.6) which implies that $[-\frac{\partial t}{\partial I^*}] = \frac{c^*}{E^{*e}}$ when evaluated at efficient policies.

Hence, according to (4.13) and (4.14), beginning from a position on the efficiency frontier as described above and if left unconstrained in their investment decisions, the home and foreign country would choose to under-invest in trade facilitation relative to the efficient level. This implies that, according to the terms-of-trade theory of trade agreements, some form of international cooperation on trade facilitation would be needed to bring investments in trade facilitation up to their efficient levels.

Finally, while I will develop closely related points further in the context of later sections, it is worth observing here that the terms-of-trade theory points to two interesting and potentially viable forms of international cooperation on trade facilitation: a "shallow" form of cooperation in which integration is accomplished with negotiated tariff bindings combined with "tariffication" rules to prevent the erosion of implied market access commitments through the use of border NTMs, reminiscent of GATT's reliance on negotiated tariff bindings plus associated rules such as GATT Articles V, VIII, X and XI as described above; and a "deeper" form of cooperation

in which integration is accomplished with direct negotiations over tariff bindings *and* specific border NTMs. The first approach places minimal restrictions on border NTMs and hence raises fewer issues of national sovereignty than the second, but in placing constraints on specific border NTMs directly the second approach may be more straightforward to implement.[9] An interpretation of the WTO's TFA according to the terms-of-trade theory is that the TFA represents an evolution of approaches on border NTMs in the GATT/WTO from shallow to deeper forms of integration over border measures.[10] As with the terms-of-trade theory more generally, an interesting implication of this interpretation is that TFA commitments should reflect the presence of market power, with truly small countries essentially left unconstrained to make unilateral investment decisions in trade facilitation.[11]

4.1.2. Behind-the-Border NTMs

Some of the terms-of-trade theory's most interesting and provocative predictions regarding the treatment of NTMs are associated with behind-the-border NTMs. To illustrate the implications of the terms-of-trade theory for the treatment of behind-the-border NTMs in trade agreements, I now present a variant of the basic model of Staiger and Sykes (2011), and confirm the findings of that paper (which in turn confirms the original findings of Bagwell and Staiger, 2001b and extends those findings to a setting with product standards): in the noncooperative Nash equilibrium from which countries would begin in the absence of a trade agreement, tariffs are set inefficiently high but behind-the-border NTMs are set at efficient levels. After establishing these findings, I then offer an interpretation of their implications for the treatment of behind-the-border NTMs in trade agreements.

[9] For a formal analysis of the implications of international agreements for national sovereignty with a particular emphasis on trade agreements and the GATT/WTO, see Bagwell and Staiger (forthcoming).

[10] As I later discuss, the degree of the GATT/WTO's evolution toward deeper forms of integration on behind-the-border NTMs has been much less significant than it has been for border NTMs as embodied especially in the recently negotiated TFA. A possible reason is that the sovereignty issues that arise with the TFA are minor compared to those that would arise with deep integration over behind-the-border NTMs.

[11] In this regard, it is also interesting to note that the negotiations leading to the WTO's TFA seemed to feature a distinctly more multilateral structure than that typical of GATT/WTO bargains over tariffs; in the latter, a more decentralized approach is often emphasized featuring bilateral bargaining in the presence of norms such as reciprocity and the principal supplier rule. It is not clear from the terms-of-trade perspective I have described here why the TFA negotiations featured such a different approach, though one possibility might be that the extreme nature of the free-rider potential associated with investments in trade facilitation as compared to tariff cuts on particular goods (it would be difficult to design improvements in ports or customs procedures that would selectively benefit some foreign exporters but not others) made the more decentralized bargaining approach infeasible in the context of the TFA. In any case, I thank Chad Bown for bringing this issue to my attention, and I view it as an interesting open question for future research.

The Basic Model Following Staiger and Sykes (2011), I consider a simple partial equilibrium two-country model of trade between a domestic and a foreign country. Throughout I denote foreign-country variables with a '*'. For simplicity I assume that the good under consideration is produced in both countries but only demanded in the domestic country, where its demand can be represented by the demand curve $D(P)$, with P the consumer price of the good in the domestic market. I assume that D is decreasing in P, with "choke price" α (possibly infinite) such that $D(\alpha) = 0$.[12]

To provide a possible rationale for government intervention with domestic policies, I assume that consumption of the good under consideration generates a negative externality. This externality is not internalized by individual consumers, and therefore it does not impact demand for the product; and I assume as well that it does not effect production. Hence I am considering an "eye sore" pollutant whose impact is simply to detract from aggregate national welfare in the domestic country (and I assume the externality does not cross borders).

The domestic government has the capability to impose a regulatory standard which specifies a (maximum) level of pollution generated per unit of the good consumed, and in principle the standard may discriminate between domestically produced and imported units of the good. I denote by r the standard imposed on domestically produced units of the good, with $\theta(r)$ the associated per-unit pollution level generated by consumption of domestically produced units under the standard r. And analogously, I denote by ρ the standard imposed on imported units of the good, with $\theta^*(\rho)$ the associated per-unit pollution level generated by consumption of imported units under the standard ρ. I assume that θ and θ^* are decreasing and convex in their respective arguments.

Meeting a regulatory standard of course has a cost. I assume that to meet the standard r, domestic producers must incur the per-unit compliance cost $\phi(r)$; and similarly, I assume that to meet the standard ρ, foreign producers must incur the per-unit compliance cost $\phi^*(\rho)$. And I assume that ϕ and ϕ^* are increasing and convex in their respective arguments. For simplicity, I take domestic and foreign supply to be linear in the price faced by producers. In particular, for any regulatory standards r and ρ, I assume that domestic and foreign supply are given respectively by $S = q - \phi(r)$ for $q \geq \phi(r)$, and $S^* = q^* - \phi^*(\rho)$ for $q^* \geq \phi^*(\rho)$, where q and q^*

[12] Staiger and Sykes (2011) adopt a linear demand assumption, and the more general demand function that I work with here is the main difference between the model of Staiger and Sykes and the model I develop in this section. As I will establish later in the paper, allowing for generalized demands is important once I introduce offshoring.

are the respective domestic and foreign producer prices.

The domestic government also has at its disposal an import tariff τ and a consumption tax t (both expressed in specific terms), in addition to the regulatory standards that I have just described. For simplicity and to keep focused on the main points, I assume that the foreign government is passive in this industry.[13] Assuming that all taxes are set at non-prohibitive levels, the domestic consumer and producer price must satisfy

$$P = q + t, \tag{4.15}$$

while the domestic and foreign producer prices must satisfy

$$q = q^* + \tau. \tag{4.16}$$

Note 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. This feature derives from my assumption that 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 the good's pollution-generating characteristics.

I also define the price at which the good is available for sale in international markets once it clears customs in the exporting country – which hereafter I call the "world" price – as:

$$q^w \equiv q^* = q - \tau. \tag{4.17}$$

Given my assumption that the foreign government has no export policy, the world price is simply the foreign exporter price in this setting, as (4.17) reflects. However, more generally the world price will differ from the foreign exporter price as a result of foreign export tax policies (see, for example, the analysis in Staiger and Sykes, 2011). To reflect this distinction and avoid confusion, I will continue where appropriate to use the notation q^w for the world price and the notation q^* for the foreign price, even though in this setting they happen to be one and the same.

I am now ready to use the model to determine equilibrium prices. Equilibrium in this market is determined by the market-clearing condition that the volume of domestic imports must equal

[13] Staiger and Sykes (2011) allow the foreign government to choose an export tax for the industry. They show that all of the results that I emphasize in this section go through with a policy-active foreign government of this kind. As none of the results depend on whether or not the foreign government is policy active, I simplify here by abstracting from foreign government policies altogether.

the volume of foreign exports:

$$D - S = S^*. \tag{4.18}$$

Employing the expressions for demands and supplies as well as the pricing relationships in (4.15)-(4.17), the market clearing condition (4.18) implicitly determines the market-clearing world price – which I denote by $\tilde{q}^w(\tau, t, r, \rho)$ – as a function of the tax and regulatory policies:

$$D(\tilde{q}^w + \tau + t) = 2\tilde{q}^w + \tau - \phi(r) - \phi^*(\rho). \tag{4.19}$$

With (4.15)-(4.17) I may also derive expressions for the market-clearing levels of each of the other prices as functions of the tax and regulatory policies:

$$\begin{aligned} \tilde{P}(\tau, t, r, \rho) &= \tilde{q}^w(\tau, t, r, \rho) + \tau + t, \\ \tilde{q}(\tau, t, r, \rho) &= \tilde{q}^w(\tau, t, r, \rho) + \tau, \text{ and} \\ \tilde{q}^*(\tau, t, r, \rho) &= \tilde{q}^w(\tau, t, r, \rho). \end{aligned} \tag{4.20}$$

It will also be useful to record how the equilibrium world price is impacted by policies. Implicit differentiation of (4.19) yields

$$\begin{aligned} \frac{\partial \tilde{q}^w}{\partial \tau} &= \frac{-[D'(\tilde{P}) - 1]}{[D'(\tilde{P}) - 2]} < 0, \\ \frac{\partial \tilde{q}^w}{\partial t} &= \frac{-D'(\tilde{P})}{[D'(\tilde{P}) - 2]} < 0, \\ \frac{\partial \tilde{q}^w}{\partial r} &= \frac{-\phi'(r)}{[D'(\tilde{P}) - 2]} > 0, \\ \frac{\partial \tilde{q}^w}{\partial \rho} &= \frac{-\phi^{*\prime}(\rho)}{[D'(\tilde{P}) - 2]} > 0. \end{aligned} \tag{4.21}$$

And using (4.20), the following derivative properties are direct (and as is clear from (4.20), all other price derivatives are the same as those for $\tilde{q}^w$ as reported above):

$$\begin{aligned} \frac{\partial \tilde{P}}{\partial \tau} &= \frac{-1}{[D'(\tilde{P}) - 2]} > 0, \\ \frac{\partial \tilde{P}}{\partial t} &= \frac{-2}{[D'(\tilde{P}) - 2]} > 0, \\ \frac{\partial \tilde{q}}{\partial \tau} &= \frac{-1}{[D'(\tilde{P}) - 2]} > 0. \end{aligned} \tag{4.22}$$

I next define the market-clearing foreign producer price of the "raw" *un*regulated 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. These are given by

$$\begin{aligned} \tilde{q}_0^*(\tau,t,r,\rho) &\equiv \tilde{q}^*(\tau,t,r,\rho) - \phi^*(\rho), \text{ and} \\ \tilde{q}_0^w(\tau,t,r,\rho) &\equiv \tilde{q}^w(\tau,t,r,\rho) - \phi^*(\rho). \end{aligned} \tag{4.23}$$

Following Staiger and Sykes (2011), I will refer to $\tilde{q}_0^w$ rather than $\tilde{q}^w$ as the terms of trade, although for any ρ there is a one-to-one mapping between the two notions of world price as the bottom line of (4.23) indicates. Note that $\tilde{q}_0^*$ also happens to be the market-clearing volume of foreign exports (production, S^*): this will simplify some of the calculations below, but it does not drive any of the results. The following derivative properties are direct (and as (4.23) makes clear, all other price derivatives are the same as those for $\tilde{q}^*$ and $\tilde{q}^w$ respectively as reported above):

$$\begin{aligned} \frac{\partial \tilde{q}_0^*}{\partial \rho} &= \frac{\phi^{*\prime}(\rho)\cdot[1-D'(\tilde{P})]}{[D'(\tilde{P})-2]} < 0, \\ \frac{\partial \tilde{q}_0^w}{\partial \rho} &= \frac{\phi^{*\prime}(\rho)\cdot[1-D'(\tilde{P})]}{[D'(\tilde{P})-2]} < 0. \end{aligned}$$

I can now write down expressions for domestic and foreign welfare. Domestic country welfare is given by first calculating the usual partial equilibrium measure of consumer surplus plus producer surplus plus tax revenue, and then subtracting off from this measure the disutility of the consumption-generated pollution. Domestic consumer (CS) and producer (PS) surplus are defined as

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

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

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

And the utility cost of domestic pollution (Z) is given by

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

With these definitions, I may write domestic welfare as

$$W = CS(\tilde{P}) + PS(r,\tilde{q}) + TR(r,\rho,\tilde{P},\tilde{q},\tilde{q}_0^w) - Z(r,\rho,\tilde{P},\tilde{q}) \equiv W(r,\rho,\tilde{P},\tilde{q},\tilde{q}_0^w). \tag{4.24}$$

Note that (4.24) expresses domestic welfare as a function of prices (in addition to non-tax regulations). As Bagwell and Staiger (1999, 2001b) have emphasized and as I confirm below, writing government objectives as functions of prices rather than tax policies directly can help to illuminate the basic structure of the terms-of-trade theory of trade agreements.

Using the definition of $TR(r, \rho, \tilde{P}, \tilde{q}, \tilde{q}_0^w)$, notice that (4.24) implies $W_{\tilde{q}_0^w} = -[D(\tilde{P}) - (\tilde{q} - \phi(r))] < 0$ (where here and throughout I use a subscripted variable to denote a partial derivative with respect to the variable). This captures the welfare reduction suffered by the domestic country when its terms of trade deteriorate (i.e., when $\tilde{q}_0^w$ rises) holding all regulatory standards and domestic local prices fixed; and it is simply the income effect of a small terms-of-trade deterioration for the domestic country, which amounts to the domestic import volume.

I turn next to foreign welfare. The fact that the foreign government is passive in the industry under consideration, combined with the absence of foreign demand for the product in this industry and the absence of foreign pollution, makes the foreign welfare measure very simple. Specifically, foreign welfare is given by foreign producer surplus. Using the pricing relationships above and the definition of $\tilde{q}_0^*$, foreign producer surplus (PS^*) can be defined as

$$PS^* = \int_{\phi^*(\rho)}^{\tilde{q}_0^* + \phi^*(\rho)} [q^* - \phi^*(\rho)] dq^* = \int_0^{\tilde{q}_0^*} q^* dq^* \equiv PS^*(\tilde{q}_0^*).$$

Hence, foreign welfare may be expressed as

$$W^* = PS^*(\tilde{q}_0^*) \equiv W^*(\tilde{q}_0^*). \tag{4.25}$$

Notice from $W^*(\tilde{q}_0^*)$ that foreign welfare does not depend directly on the standard ρ to which foreign producers must comply (though it does depend on ρ indirectly through the impact of ρ on $\tilde{q}_0^*$). As Staiger and Sykes (2011) explain, this feature derives from the fact that the production of the unregulated good has been modeled as an increasing cost (upward-sloping supply) industry, while for a given standard level ρ the per-unit cost of coming into compliance with the standard is then assumed to be constant (and equal to $\phi^*(\rho)$) regardless of how many units of the unregulated good must be altered to meet the standard. For this reason, foreign producer surplus is impacted by the standard level ρ only to the extent that ρ impacts the market-clearing foreign supply decisions for the unregulated good (through $\tilde{q}_0^*$).[14]

[14] 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 ρ, but

Efficient Policies With my variant of the basic Staiger and Sykes (2011) model described, I first characterize the jointly efficient policy choices (i.e., the policies that maximize $W+W^*$).[15] I will subsequently compare these policies to the noncooperative policy choices that the domestic government would make absent any international agreement, and in this way will identify and characterize the problem that a trade agreement must solve if it is to move governments from inefficient non-cooperative ("Nash") choices to the efficiency frontier.[16]

Recalling that the domestic government has at its disposal four policy instruments (and the foreign government has none), the first-order conditions that must hold at the choices of these policies that maximize the sum of domestic and foreign welfare are given by[17]

$$\begin{aligned} W_{\tilde{P}}\frac{d\tilde{P}}{d\tau} + W_{\tilde{q}}\frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^w}\frac{d_{\tilde{q}_0^w}}{d\tau} + W^*_{\tilde{q}_0^*}\frac{d\tilde{q}_0^*}{d\tau} &= 0, \\ W_{\tilde{P}}\frac{d\tilde{P}}{dt} + W_{\tilde{q}}\frac{d\tilde{q}}{dt} + W_{\tilde{q}_0^w}\frac{d_{\tilde{q}_0^w}}{dt} + W^*_{\tilde{q}_0^*}\frac{d\tilde{q}_0^*}{dt} &= 0, \\ W_r + W_{\tilde{P}}\frac{d\tilde{P}}{dr} + W_{\tilde{q}}\frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^w}\frac{d_{\tilde{q}_0^w}}{dr} + W^*_{\tilde{q}_0^*}\frac{d\tilde{q}_0^*}{dr} &= 0, \text{ and} \\ W_\rho + W_{\tilde{P}}\frac{d\tilde{P}}{d\rho} + W_{\tilde{q}}\frac{d\tilde{q}}{d\rho} + W_{\tilde{q}_0^w}\frac{d_{\tilde{q}_0^w}}{d\rho} + W^*_{\tilde{q}_0^*}\frac{d\tilde{q}_0^*}{d\rho} &= 0. \end{aligned} \tag{4.26}$$

But as previously noted and as (4.20) and (4.23) confirm, the foreign country's lack of available policy instrument in this industry implies that $\tilde{q}_0^w = \tilde{q}_0^*$. Moreover, observe that

$$[W_{\tilde{q}_0^w} + W^*_{\tilde{q}_0^*}] = -[D(\tilde{P}) - (\tilde{q} - \phi(r))] + \tilde{q}_0^w = 0,$$

where the second equality follows from market clearing. Hence I may write the first-order

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 the measure of welfare in the appropriate way, the added complication would not alter the basic findings I present below.

[15] As before, by focusing on the policy choices that maximize this joint welfare measure, I am thereby assuming implicitly that lump sum transfers are available to distribute surplus across the two countries as desired.

[16] I will sometimes refer to the noncooperative policy choices of the domestic country as "Nash" policies even though the foreign country has no policies of its own and so there is no strategic interaction between the countries, because all of the findings that I emphasize here would go through also when the foreign country is allowed to have policies as well and such strategic interaction between countries is present (see note 13).

[17] I 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 this section are satisfied under the convexity assumptions for θ, θ^*, ϕ and ϕ^*.

conditions for efficiency in (4.26) as

$$\begin{aligned} W_{\tilde{P}}\frac{d\tilde{P}}{d\tau} + W_{\tilde{q}}\frac{d\tilde{q}}{d\tau} &= 0, \\ W_{\tilde{P}}\frac{d\tilde{P}}{dt} + W_{\tilde{q}}\frac{d\tilde{q}}{dt} &= 0, \\ W_r + W_{\tilde{P}}\frac{d\tilde{P}}{dr} + W_{\tilde{q}}\frac{d\tilde{q}}{dr} &= 0, \text{ and} \\ W_\rho + W_{\tilde{P}}\frac{d\tilde{P}}{d\rho} + W_{\tilde{q}}\frac{d\tilde{q}}{d\rho} &= 0. \end{aligned} \tag{4.27}$$

Using the expressions in (4.19)-(4.25) to evaluate the first-order conditions for efficiency contained in (4.27), and letting the efficient policy choices be denoted by τ^E, t^E, r^E and ρ^E, it follows that

$$\begin{aligned} \tau^E &= [\theta^*(\rho^E) - \theta(r^E)], \\ t^E &= \theta(r^E), \\ -\theta'(r^E) &= \phi'(r^E), \text{ and} \\ -\theta^{*\prime}(\rho^E) &= \phi^{*\prime}(\rho^E), \end{aligned} \tag{4.28}$$

where here I have used primes to denote derivatives.

There are a number of notable features of the efficient policies as described by (4.28). 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. As the top expression of (4.28) indicates, the efficient way to respond to any difference in the externality generated by consumption of the domestically produced and imported goods is via the *tariff*: τ^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 τ^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 admits 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: thus, 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 r^E, the efficient standard on domestically produced goods, equates the marginal per unit benefit of pollution reduction that is associated with a slightly tighter standard ($-\theta'(\cdot)$) with the marginal per unit cost of domestic compliance with the tighter standard ($\phi'(\cdot)$). A similar observation holds for ρ^E, the efficient standard on imported goods: this standard must equate the marginal per unit benefit of pollution reduction that comes with a slightly tighter standard ($-\theta^{*\prime}(\cdot)$) with the marginal per unit cost of foreign compliance with the tighter standard ($\phi^{*\prime}(\cdot)$). In general, the efficient regulatory standards for domestic and imported goods, and the efficient level of the externality produced by each type of good, will not be the same.[18]

This raises a third and related point: it is interesting to consider the efficient policies for a symmetric benchmark case in which both domestic and foreign producers face the same compliance cost for any (common) standard level (i.e., the functions ϕ and ϕ^* 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 θ and θ^* are identical). In this case, due to symmetry in the compliance cost functions ϕ and ϕ^*, (4.28) implies $\rho^E = r^E$. And given that $\rho^E = r^E$, symmetry in the pollution functions θ and θ^* then implies by the first condition in (4.28) that $\tau^E = 0$. Hence, in the symmetric benchmark case, the efficient policies are given by

$$\begin{aligned} \tau^E &= 0, \\ t^E &= \theta(r^E), \\ -\theta'(r^E) &= \phi'(r^E), \text{ and} \\ \rho^E &= r^E. \end{aligned} \tag{4.29}$$

As (4.29) 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.

Noncooperative Policies I next characterize the noncooperative (Nash) policy choices of the domestic country (recall that the foreign country is assumed passive in this industry).

[18] This observation is also made in Staiger and Sykes (2011), where a discussion of its implications for the desirability of the GATT "national treatment" clause is included as well. See also Gulati and Roy (2008).

Using the domestic welfare expression given in (4.24), the noncooperative policy choices are the choices of τ, t, r and ρ that satisfy the following four first-order conditions:

$$\begin{aligned} W_{\tilde{P}}\frac{d\tilde{P}}{d\tau} + W_{\tilde{q}}\frac{d\tilde{q}}{d\tau} + W_{\tilde{q}_0^w}\frac{d\tilde{q}_0^w}{d\tau} &= 0, \\ W_{\tilde{P}}\frac{d\tilde{P}}{dt} + W_{\tilde{q}}\frac{d\tilde{q}}{dt} + W_{\tilde{q}_0^w}\frac{d\tilde{q}_0^w}{dt} &= 0, \\ W_r + W_{\tilde{P}}\frac{d\tilde{P}}{dr} + W_{\tilde{q}}\frac{d\tilde{q}}{dr} + W_{\tilde{q}_0^w}\frac{d\tilde{q}_0^w}{dr} &= 0, \text{ and} \\ W_\rho + W_{\tilde{P}}\frac{d\tilde{P}}{d\rho} + W_{\tilde{q}}\frac{d\tilde{q}}{d\rho} + W_{\tilde{q}_0^w}\frac{d\tilde{q}_0^w}{d\rho} &= 0. \end{aligned} \tag{4.30}$$

Using the expressions in (4.19)-(4.25) to evaluate the first-order conditions contained in (4.30), and denoting the noncooperative volume of foreign export supply by S^{*N} and the noncooperative policy choices by τ^N, t^N, r^N, ρ^N and τ^{*N}, the following expressions for the Nash policy levels may be derived:

$$\begin{aligned} \tau^N &= [\theta^*(\rho^N) - \theta(r^N)] + S^{*N}, \\ t^N &= \theta(r^N), \\ -\theta'(r^N) &= \phi'(r^N), \text{ and} \\ -\theta^{*\prime}(\rho^N) &= \phi^{*\prime}(\rho^N). \end{aligned} \tag{4.31}$$

And finally, in the symmetric benchmark case of identical technologies, Nash policies reduce to

$$\begin{aligned} \tau^N &= S^{*N}, \\ t^N &= \theta(r^N), \\ -\theta'(r^N) &= \phi'(r^N), \text{ and} \\ -\theta^{*\prime}(\rho^N) &= \phi^{*\prime}(\rho^N). \end{aligned} \tag{4.32}$$

The Problem for a Trade Agreement to Solve I now turn to a comparison of the efficient policies and the noncooperative policies as characterized above, in order to identify and understand the problem that a trade agreement must solve if it is to move governments from inefficient Nash choices to the efficiency frontier. This comparison turns out to be illuminating, and in the context of the present model and the terms-of-trade theory more generally (see Bagwell and Staiger, 2001b), it leads to a striking result.

Specifically, a comparison of the bottom two conditions in (4.28) and (4.31) reveals that the Nash standards choices satisfy the same conditions as the efficient standards choices, and indeed the Nash standards correspond to the efficient standards: $r^N = r^E$ and $\rho^N = \rho^E$. And with $r^N = r^E$, it also follows from a comparison of the middle conditions in (4.28) and (4.31) that the Nash consumption tax corresponds to the efficient consumption tax: $t^N = t^E$. Hence, all behind-the-border NTMs are left undistorted from their internationally efficient levels in the noncooperative Nash equilibrium.

Given that $r^N = r^E$ and $\rho^N = \rho^E$, it is then also apparent from a comparison of the first condition in (4.28) with the first condition in (4.31) that $\tau^N > \tau^E$.[19] And it is easily shown that the difference between Nash and efficient tariffs is driven by the home country's incentive to manipulate the terms of trade ($\tilde{q}_0^w$) with its unilateral tariff choice.[20] Finally, the same statements apply in the case of identical technologies. This can be seen by comparing the efficient policies for the symmetric benchmark case in (4.29) to the Nash policies in the symmetric benchmark case given in (4.32).

The inefficiencies of noncooperative policies in this model can thus be traced to a single source: the Nash tariff is too high, and the Nash trade volume is correspondingly too low, because the domestic country seeks to manipulate its terms of trade with its tariff. In fact, this interpretation of the problem for a trade agreement to solve can be confirmed at a more general level by following Bagwell and Staiger (1999, 2001b) 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.[21]

In particular, with the foreign government passive by assumption in the model I have developed here, to define politically optimal tariffs in the present setting I need only suppose hypothetically that the domestic government acts as if $W_{\tilde{q}_0^w} \equiv 0$ when choosing its politically optimal policies. I can then ask whether politically optimal policies so-defined are efficient

[19] This follows from my focus on non-prohibitive intervention, which ensures that the Nash export volume S^{*N} is strictly positive.

[20] To see this, notice that the elasticity of foreign export supply in this model can be written as $\frac{\partial S^*}{\partial \tilde{q}^w}\frac{\tilde{q}^w}{S^*} = \frac{\tilde{q}^w}{S^*}$. Dividing τ^N by $\tilde{q}^w$ to convert the specific import tariff of the domestic country into its ad-valorem equivalent yields $\frac{\tau^N}{\tilde{q}^w} = \frac{[\theta^*(\rho^N) - \theta(r^N)]}{\tilde{q}^w} + \frac{S^*}{\tilde{q}^w}$. Evidently, the second term in this expression is the inverse of the foreign export supply elasticity, which is the Johnson (1953-54) "optimal" terms-of-trade-manipulating ad-valorem tariff.

[21] The terminology used by Bagwell and Staiger (1999, 2001b) reflects the fact that they work with government objective functions that allow for general political economy motives. I have abstracted from political economy motives here, but it is convenient nevertheless to adopt their terminology (and it can be shown that the results I emphasize here extend to a setting with political economy motives, as Staiger and Sykes, 2011 also observe).

when evaluated in light of the governments' actual objectives, and thereby explore whether the Nash inefficiencies identified above can in fact be given the terms-of-trade interpretation I have just outlined. But comparing (4.30) when $W_{\tilde{q}_0^w} \equiv 0$ – which yields the first-order conditions that define the politically optimal policies in this setting – with the conditions for efficiency in (4.27), it is immediate 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.

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 in this setting – is the unilateral incentive for the domestic government to manipulate the terms of trade $\tilde{q}_0^w$ with its tariff choice. But as (4.23) makes clear, the domestic country can alter $\tilde{q}_0^w$ with *any* of its policies, both tariffs and behind-the-border NTMs. Why, then, are all behind-the-border NTMs left undistorted from their internationally efficient levels in the noncooperative Nash equilibrium, with all of the distortions contained in the level of the tariff? The simple reason is that the tariff is the first-best instrument for manipulating the terms of trade in this setting, and hence with the domestic country's Nash tariff set to achieve this purpose, there is no need for it to distort any other policy choices to engage in terms-of-trade manipulation.[22]

This leads to an important point: according to the terms-of-trade theory, even in the context of a complex policy environment there is no need for member governments of a trade agreement to negotiate directly over the levels of their behind-the-border NTMs. Rather, according to the terms-of-trade theory, the central task of a trade agreement is simply to reduce tariffs and raise trade volumes without *introducing* distortions into the unilateral choices of domestic regulatory and tax policies as a result of the negotiated constraints on tariffs.

For my purposes here, the important implication of this point is what it means for the approach to negotiations in a world where governments have a myriad of policies at their disposal: in principle, negotiations over tariffs alone, in combination with an effective "market access preservation rule" that prevents governments from subsequently manipulating their domestic policy choices to undercut the market access implications of their tariff commitments, can bring governments to the efficiency frontier. The key feature of such a market access preservation rule, which in practice as discussed further in Bagwell and Staiger (2001b) and Staiger

[22] With this interpretation it can also be seen that the international efficiency of the behind-the-border NTMs in the noncooperative Nash equilibrium does not hinge on the nature (e.g., complete) of the set of behind-the-border instruments that are available to a government.

and Sykes (2011) has its closest conceptual analogue in GATT's non-violation clause, is that in principle by securing market access against erosion from future unilateral changes in domestic policies such a rule also secures the terms of trade $\tilde{q}_0^w$ against such changes.[23]

To illustrate this point, consider its application to the setting I have analyzed here, where there are no political economy considerations. Efficiency can in this case be achieved in the presence of a market access preservation rule by a simple commitment to free trade from the domestic country and no negotiated commitments on its behind-the-border NTMs.[24] To see that this must be true, 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 $\tilde{q}_0^*$ given that $\tilde{q}_0^w = \tilde{q}_0^*$ and hence must preserve the level of foreign welfare $W^*(\tilde{q}_0^*)$.[25] 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.

Evidently, the terms-of-trade theory of trade agreements provides strong support for shallow integration as the most direct means to solve the policy inefficiencies that would arise absent a trade agreement. At a conceptual level, this resonates with the GATT approach to behind-the-border NTMs described earlier, where negotiators emphasize tariff reductions as a means to expand market access, and where various GATT provisions serve to protect the value of negotiated market access agreements against erosion by behind-the-border NTMs.[26]

[23] The importance of the non-violation clause in practice is difficult to assess, because it can shape GATT/WTO policy outcomes through both on-equilibrium and off-equilibrium impacts. Staiger and Sykes (2017) consider the implications of the observed (on-equilibrium-path) performance of the non-violation clause in GATT/WTO disputes for the implied importance of the clause in shaping GATT/WTO policy outcomes.

[24] See Bagwell and Staiger (2001b) and Staiger and Sykes (2011) for a demonstration that the same desirable properties of a market access preservation rule of the kind described in the text extends to the case of governments with political economy motives. Bagwell and Staiger (2006) establish related themes in the context of domestic subsidies.

[25] In a more general setting where the foreign government also had a trade tax instrument at its disposal so that a distinction between $\tilde{q}_0^*$ and $\tilde{q}_0^w$ could arise as a result of this foreign trade tax, the same conclusion would hold, because changes in domestic-country policies which hold $\tilde{q}_0^w$ fixed would also hold $\tilde{q}_0^*$ fixed given the (unchanged) level of the foreign trade tax (see Staiger and Sykes, 2011).

[26] This is not to imply that this support is without caveats. For example, important qualifications to some of the results I emphasize here have been shown to arise in the presence of private information (see Bagwell, Bown and Staiger, 2016, for a recent review of the relevant literature).

4.2. The Commitment Theory

Thus far I have described an "international externality" theory of trade agreements that emphasizes the control of the beggar-my-neighbor motives associated with terms-of-trade manipulation. A distinct though possibly complementary theory of trade agreements turns the focus away from international policy externalities that one government imposes on another, and posits instead that the purpose of a trade agreement is to tie the hands of its member governments in their interactions with private agents in the economy, and thereby to offer an external commitment device.[27]

With a few exceptions, two of which I discuss briefly below, most research adopting the commitment approach to trade agreements has focused on tariffs, and specifically on the possibility that governments might benefit from a trade agreement that could help them commit to a policy of free trade. As a result, the implications of the commitment approach for the treatment of NTMs in trade agreements is less well understood than for the terms-of-trade theory. Nevertheless, a basic feature of the commitment approach to trade agreements is worth emphasizing here: unlike the terms-of-trade theory, which offers a robust reason to expect that trade agreements ought to be trade *liberalizing*, there is no presumption one way or the other under the commitment theory as to whether trade agreements should increase or reduce trade. Hence a basic anchor of the terms-of-trade theory that resonates broadly with observed trade agreements and provides structure for understanding the treatment of NTMs is absent from the commitment theory.

A simple way to see this is to note that government commitment problems typically arise when governments are forced to use policy instruments that are "second best" for the task to which they are put. A tariff, which as is well known is equivalent to a combination production subsidy and consumption tax, will almost always be a second-best instrument for any goal (aside from terms-of-trade manipulation), because it distorts two margins, a production margin and a consumption margin. Consider, then, a developing country government that would like to offer a production subsidy to firms that invest in a new import-competing industry (i.e., it would like to distort the production margin), but cannot feasibly raise the funds for the production subsidy by independent means and so employs an import tariff in the industry instead (which

[27] The commitment role for trade agreements has been formalized in a large number of papers. In addition to the papers I discuss below, see Carmichael (1987), Staiger and Tabellini (1987), Matsuyama (1990) and Maggi and Rodriguez-Clare (1998, 2007), to name a few.

distorts both the production margin and the consumption margin).

In this case, the commitment problem faced by the government could be described as follows: announcing the import tariff in order to stimulate firm entry and import-competing production will not be credible for the government, because if firm entry were to occur and investments in production processes made, it would be optimal for the government to then renege on the promise of a tariff in order to avoid the consumption distortion that would be associated with the tariff. But anticipating this, domestic firms will not enter the import-competing industry in the first place, and the government will therefore be unable to carry out its desired plan on account of a credibility ("time consistency") problem. In principle, a trade agreement could help supply the needed credibility for the government, by credibly threatening to punish the government if it reneges on its import-tariff plan. But notice that in this case the purpose of a trade agreement would be to enable higher tariffs, not lower. In general, as noted above, there is no presumption either way as to the trade effects of trade agreements in a world where governments use trade agreements as commitment devices.

Still, commitment theories may offer important insights into features of the treatment of NTMs in real-world trade agreements that the terms-of-trade theory fails to explain. I next briefly describe two papers that provide insights into the trade-agreement treatment of border and behind-the-border NTMs, respectively.

4.2.1. Border NTMs

I first discuss the implications of the commitment theory of trade agreements for the treatment of border NTMs in trade agreements, focusing specifically on export subsidies. A paper that uses the commitment theory to offer an explanation for features of the observed treatment of export subsidies in the GATT/WTO is Potipiti (2012).

In particular, Potipiti (2012) employs the commitment theory to offer an explanation of the asymmetric treatment of tariffs and export subsidies in the WTO where, as described previously, tariffs are the subject of negotiated limits while export subsidies are banned outright. To focus on the distinct non-terms-of-trade elements, commitment theories of trade agreements typically adopt a small-country assumption, a convention that Potipiti follows. In Potipiti's model, the anticipation of protection generates inefficient investment ex ante for which the government is not compensated in its (ex-post) political relationship with the industry, along the lines of Maggi and Rodriguez-Clare (1998). A government can join an agreement that bans tariffs

and/or an agreement that bans export subsidies, and doing so will eliminate this anticipation and generate a social welfare gain. On the down side, commitment to such an agreement means that the government must forfeit the political contributions it would otherwise collect for the protection it offers. In Potipiti's model, the government therefore commits to a trade agreement on a particular policy (import tariff and/or export subsidy) if the social welfare gain from liberalizing that policy is greater than the government's valuation of the associated loss in political contributions.

The asymmetry in treatment across import tariffs and export subsidies in Potipiti's (2012) model stems from an underlying asymmetry in growth prospects of the two sectors. As Potipiti demonstrates, in an environment where trade and transportation costs are decreasing over time, export sectors grow and import-competing sectors decline. Therefore, in export sectors, export subsidies attract new entrants and investment that erodes the protection rent associated with the export subsidies: the political contributions that the government receives from providing export subsidies is therefore small, and Potipiti establishes conditions under which the government would opt to ban export subsidies for the social welfare gain as a result. On the other hand, in declining import-competing sectors, the return on capital drops and capital is therefore sunk and cannot exit. As Potipiti argues, this sunk capital allows protection to raise the rate of return in these sectors at least somewhat without attracting entry: here the rent from protection is not eroded by new entrants and the government can extract large political contributions for offering protection. Potipiti shows that under the same conditions that lead the government to ban export subsidies, it will opt for the political rents and not ban import tariffs.

Hence, as Potipiti (2012) demonstrates, the asymmetric treatment of export subsidies and import tariffs in the WTO, which is difficult to explain from the perspective of the terms-of-trade theory, may be understood from the perspective of the commitment theory as reflecting underlying differences in the rent-generating capacity of protection in export and import-competing sectors.

4.2.2. Behind-the-Border NTMs

Turning to the treatment of behind-the-border NTMs in trade agreements, Brou and Ruta (2013) adopt a small-country political economy setting similar to Potipiti (2012) and more specifically Maggi and Rodriguez-Clare (1998), but they introduce domestic production sub-

sidies as well as import tariffs to study what they term the "policy substitution problem."[28] Taxation is assumed to be distortionary, so that a tariff is not dominated by a production subsidy for achieving production goals: rather, as Brou and Ruta show, in the setting that they study optimal intervention will typically include a mix of tariffs and production subsidies.

In the model of Brou and Ruta (2013), the fundamental reason for signing a trade agreement that commits a government to free trade is the same as that in Maggi and Rodriguez-Clare (1998) and in Potipiti (2012). But the novel twist in the model of Brou and Ruta is that a commitment to free trade by itself will induce the government to simply turn more intensively to production subsidies in its political relationship with the import-competing lobbies – the policy substitution problem – and the resulting distortions are welfare-reducing (and recall that the country is assumed to be small, so there is no terms-of-trade reason for the government to distort its domestic subsidy once its tariff is constrained and no sense in which a "market access preservation rule" could fix this problem). As Brou and Ruta show, relative to an agreement that simply commits the government to free trade, the government is better off under an agreement that also imposes explicit rules on the use of domestic subsidies, because only under such a more complete trade agreement can policy credibility with respect to special interests be achieved.

As Brou and Ruta (2013) demonstrate, their model is capable of providing a commitment-theory based explanation of some of the important features for handling domestic subsidies that are contained in the WTO SCM agreement and that the terms-of-trade theory has difficulty explaining. And in particular, the findings of Brou and Ruta can provide a rationale for the need to pursue deep integration with regard to behind-the-border NTMs.[29]

[28] Limao and Tovar (2011) also study the role of trade agreements as commitment devices when governments have both tariffs and behind-the-border NTMs at their disposal, but their focus is on the possibility that international commitments to lower tariffs will impact the use of behind-the-border NTMs, and on whether tariff agreements can still be attractive to governments when these impacts are present. Unlike Brou and Ruta (2013), Limao and Tovar do not consider the possibility that international commitments might be extended to cover behind-the-border NTMs, and the way in which this extension might best be designed.

[29] DeRemer (2011) provides an alternative "international externality" rationale for deep integration, and in particular for the evolution of GATT/WTO subsidy rules in this direction. Working in a setting characterized by monopolistic competition, trade taxes and trade costs where entry is fixed but for an entry subsidy from the government, DeRemer argues that the kinds of market-access assurance rules incorporated in GATT do not prevent international policy externalities from being transmitted in this setting and so cannot enable countries to achieve efficient policies with shallow integration.

4.3. The Offshoring Theory

It is well-documented that modern trade flows are dominated by trade in intermediate inputs, many of which appear to be highly specialized to their intended use, and that this has not always been so (see, for example, the discussion in Antras and Staiger, 2012a). This rise in the prominence of "offshoring" raises the question whether the traditional approach to trade liberalization as embodied in the rules and norms of the GATT/WTO, crafted at a time when the nature of trade was quite different than it is today, is still appropriate in the world of today.

Recently, Antras and Staiger (2012a, 2012b) ask this question and suggest a provocative answer: if offshoring can be seen as changing the nature of international price determination from one governed by a standard market-clearing mechanism to one that is described by a collection of bilateral bargains between foreign suppliers and domestic buyers, then the rise in offshoring will require fundamental changes in the WTO's approach to trade liberalization if that institution is to remain effective. In the next two sections I discuss the implications of offshoring for the treatment of border and behind-the-border NTMs in trade agreements.

4.3.1. Border NTMs

Whether offshoring has strong implications for the treatment of border NTMs (such as export subsidies) that would differ from those of the terms-of-trade theory is not known at this time. However, as I demonstrate in the next section, some striking implications of offshoring for the treatment of NTMs in trade agreements come in the context of behind-the-border measures. In light of these implications, exploring the treatment of border NTMs in the presence of offshoring seems like a promising area of further research.

4.3.2. Behind-the-Border NTMs

To illustrate the implications of offshoring for the treatment of behind-the-border NTMs in trade agreements, I now introduce further changes to the variant of the model of Staiger and Sykes (2011) developed in section 4.1.2 above. Specifically, I now assume that individual pairs of foreign exporters and domestic importers bargain over the international price at which the traded good is exchanged between them, along the lines of Antras and Staiger (2012a, 2012b). As in Antras and Staiger, the model I describe here is meant to highlight and capture in a simple way the growing importance of the relationship-specific nature of trade between importers and their specialized suppliers.

Antras and Staiger (2012a) work in a setting in which the supply of a specialized input is offshored, providing a natural environment for the study of relationship-specific trade. Here, in order to make minimal changes to the framework of Staiger and Sykes (2011) within which the findings presented in earlier sections were derived, I follow Antras and Staiger (2012b) and do not introduce trade in inputs but instead simply assume that a domestic importer imports a specialized good from abroad for sale on the domestic market, and that the international price at which this good is exchanged is determined through bilateral bargaining between the domestic importer and the foreign exporter/supplier. In this setting, I show that now both the tariff *and* behind-the-border NTMs are set inefficiently in the Nash equilibrium (confirming related findings by Antras and Staiger). I then offer an interpretation of the implications of these findings for the treatment of behind-the-border NTMs in trade agreements when offshoring is present.[30]

In particular, I continue to assume that domestic demand ($D(P)$) and domestic supply ($S = q - \phi(r)$) are exactly as in the model of section 4.1.2 above, and I continue to make the same assumptions about the available policies (i.e., the domestic country has τ, t, r and ρ at its disposal while the foreign country is passive in this industry). But now I assume that there is a single domestic importer who acts like a monopolist in the domestic market facing a "competitive fringe" of domestic suppliers. As for the foreign exporters faced by the monopoly importer, there are now two interesting possibilities that might be considered.

A first possibility is that the monopoly importer faces a competitive foreign export supply, given by $S^* = q^* - \phi^*(\rho)$ just as before in the model of section 4.1.2. In this case, there is domestic market power, but otherwise nothing has changed from the earlier setup. It can be confirmed (along the lines of Bagwell and Staiger, 2002, Ch. 9, Bagwell and Staiger, 2012b and Antras and Staiger, 2012b) that all of the results from section 4.1 continue to apply in this market-power-augmented setup.

A second possibility is that the monopoly importer faces a single foreign exporter. It is this possibility that I focus on here. Specifically, I adopt an incomplete contracts setting (along the lines of Antras and Staiger, 2012a), and I assume that to successfully make sales in the domestic market, the foreign exporter must first invest in production and then (Nash) bargain over the

[30] As Antras and Staiger (2012b) emphasize, the key feature of the economy needed for results of the kind I describe below is that international prices are determined by bilateral bargaining rather than by market clearing mechanisms, and the rise of offshoring is just one plausible way in which the former method of price determination may have become increasingly prominent in recent decades.

price – the *international* price – at which it sells its production to the domestic importer. I take the good under consideration to be specialized for the domestic market and worthless if not sold there, and I assume that the importer has no alternative source of supply: hence the outside option of both the importer and the exporter is zero. For simplicity, I also now assume that the unit cost of foreign production is $1 + \phi^*(\rho)$. The decisions of this importer-exporter pair imply an import quantity x^* that together with the domestic competitive-fringe supply response then determines total supply in the domestic market.

I now describe the structure of the bilateral importer-exporter relationship in detail. I assume that all government policies are fixed in advance of the start of the following sequence of events:

stage 1. The foreign exporter decides on the amount x^* to be produced (at marginal cost of $1 + \phi^*(\rho)$).

stage 2. The foreign exporter and the domestic importer (symmetric Nash) bargain over the price at which the good will change hands. Failure to reach agreement leaves both partners with their zero outside option.

stage 3. The domestic importer imports the quantity x^* from the foreign exporter, payments agreed in *stage* 2 are settled, and the domestic importer sells x^* on the domestic market at the domestic market clearing price (with taxes collected at the time of importation and sale on the domestic market).

To analyze the outcome of this 3-stage game, I consider first the determination of the domestic producer price q given a level of imports x^*. With the supply of the domestic competitive fringe given by $q - \phi(r)$, domestic demand given by $D(P)$, and the relationship between the domestic consumer price P and the domestic producer price q given by $P = q + t$, domestic market clearing determines the domestic producer price according to

$$x^* + q - \phi(r) = D(q + t), \tag{4.33}$$

which implicitly defines $\tilde{q}(x^*, r, t)$. The following derivative properties may be obtained from

total differentiation of (4.33):

$$\begin{aligned}
\frac{\partial \tilde{q}}{\partial x^*} &= \frac{1}{D'(\tilde{q}(x^*,r,t)+t)-1} < 0, \\
\frac{\partial \tilde{q}}{\partial t} &= \frac{-D'(\tilde{q}(x^*,r,t)+t)}{D'(\tilde{q}(x^*,r,t)+t)-1} < 0, \\
\frac{\partial \tilde{q}}{\partial r} &= \frac{-\phi'(r)}{D'(\tilde{q}(x^*,r,t)+t)-1} > 0.
\end{aligned} \tag{4.34}$$

Consider now the subgame perfect equilibrium of the 3-stage game outlined above. First, if the domestic importer and foreign exporter reach agreement in stage 2, the importer can offer the quantity x^* for sale on the domestic market and make revenues net of trade taxes equal to $[\tilde{q}(x^*,r,t)-\tau]\cdot x^*$, whereas disagreement in stage 2 results in both the importer and the exporter receiving their outside option of zero. Hence, given the quantity x^* it follows that in the symmetric Nash bargain of stage 2 the domestic importer and the foreign exporter split the bargaining surplus and each receives $\frac{1}{2}[\tilde{q}(x^*,r,t)-\tau]\cdot x^*$. For the domestic importer, its share of the bargaining surplus is also its profits, and I record these profits (conditional on x^*) for future use:

$$\pi = \frac{1}{2}[\tilde{q}(x^*,r,t)-\tau]\cdot x^*. \tag{4.35}$$

Now consider the foreign exporter's output choice in stage 1. Recalling that the unit cost of production for the foreign exporter is $1+\phi^*(\rho)$, the foreign exporter chooses x^* to maximize its profits, which are given by

$$\pi^* = \left(\frac{1}{2}[\tilde{q}(x^*,r,t)-\tau] - [1+\phi^*(\rho)]\right)\cdot x^*. \tag{4.36}$$

Using (4.36) and (4.34), the chosen $\hat{x}^*(r,\rho,t,\tau)$ is therefore implicitly defined by the first order condition

$$\frac{1}{2}[\tilde{q}(x^*,r,t)-\tau+\frac{x^*}{D'(\tilde{q}(x^*,r,t)+t)-1}] - [1+\phi^*(\rho)] = 0. \tag{4.37}$$

It is direct to confirm that the second-order condition implies $2(D'-1)^2 - \hat{x}^*\cdot D'' > 0$, which is satisfied provided that demand is not too convex (i.e., D'' not too large and positive). In fact, for simplicity I impose the stronger assumption that demand is neither too convex nor too concave (i.e., $|D''|$ not too large), thereby ensuring that the impact on $\hat{x}^*$ of each policy takes

the intuitive sign, as I now record:

$$\begin{aligned}
\frac{\partial \hat{x}^*}{\partial r} &= \phi'[\frac{(D'-1)^2 - \hat{x}^* \cdot D''}{2(D'-1)^2 - \hat{x}^* \cdot D''}] > 0, \\
\frac{\partial \hat{x}^*}{\partial \rho} &= \frac{2\phi^{*\prime} \cdot (D'-1)^3}{2(D'-1)^2 - \hat{x}^* \cdot D''} < 0, \\
\frac{\partial \hat{x}^*}{\partial t} &= \frac{D' \cdot (D'-1)^2 - \hat{x}^* \cdot D''}{2(D'-1)^2 - \hat{x}^* \cdot D''} < 0, \\
\frac{\partial \hat{x}^*}{\partial \tau} &= \frac{(D'-1)^3}{2(D'-1)^2 - \hat{x}^* \cdot D''} < 0.
\end{aligned} \tag{4.38}$$

Using $\hat{x}^*(r, \rho, t, \tau)$ as implicitly defined by (4.37), I can now express the equilibrium domestic producer price as a function of government policies:

$$\hat{q}(r, \rho, t, \tau) = \tilde{q}(\hat{x}^*(r, \rho, t, \tau), r, t).$$

For future use, I record the following derivatives whose signs are intuitive and again follow from my assumption that $|D''|$ is not too large:

$$\begin{aligned}
\frac{\partial \hat{q}}{\partial r} &= -\phi'[\frac{(D'-1)}{2(D'-1)^2 - \hat{x}^* \cdot D''}] > 0, \\
\frac{\partial \hat{q}}{\partial \rho} &= \frac{2\phi^{*\prime} \cdot (D'-1)^2}{2(D'-1)^2 - \hat{x}^* \cdot D''} > 0, \\
\frac{\partial \hat{q}}{\partial t} &= -[\frac{D' \cdot (D'-1) - \hat{x}^* \cdot D''}{2(D'-1)^2 - \hat{x}^* \cdot D''}] < 0, \\
\frac{\partial \hat{q}}{\partial \tau} &= \frac{(D'-1)^2}{2(D'-1)^2 - \hat{x}^* \cdot D''} > 0.
\end{aligned} \tag{4.39}$$

And finally, using (4.35) and (4.36), the home and foreign profits may be written as functions of government policies:

$$\pi(r, \rho, t, \tau) = \frac{1}{2}[\hat{q}(r, \rho, t, \tau) - \tau] \cdot \hat{x}^*(r, \rho, t, \tau),$$

$$\pi^*(r, \rho, t, \tau) = \left(\frac{1}{2}[\hat{q}(r, \rho, t, \tau) - \tau] - [1 + \phi^*(\rho)]\right) \cdot \hat{x}^*(r, \rho, t, \tau).$$

The *international ("world") price* of the product under consideration (i.e., the untaxed price negotiated in stage 2 for the exchange between the foreign exporter and the domestic importer), which I now denote by $\hat{q}^w$, is given by $\hat{q}^w = \pi^*/\hat{x}^* + (1 + \phi^*(\rho))$, which can in turn be written as

$$\hat{q}^w = \frac{1}{2}[\hat{q}(r, \rho, t, \tau) - \tau] \equiv \hat{q}^w(r, \rho, t, \tau). \tag{4.40}$$

The remaining equilibrium prices may then be defined as follows:

$$\begin{aligned}\hat{P}(r,\rho,t,\tau) &= \hat{q}(r,\rho,t,\tau)+t,\\ \hat{q}^*(r,\rho,t,\tau) &= \hat{q}^w(r,\rho,t,\tau)=\frac{1}{2}[\hat{q}(r,\rho,t,\tau)-\tau],\end{aligned}$$

where observe that the absence of a foreign trade tax instrument again ensures $\hat{q}^* = \hat{q}^w$ as in the model of section 4.1.2. And analogously to before, I now define the "raw" prices of the foreign export good by

$$\begin{aligned}\hat{q}_0^*(r,\rho,t,\tau) &\equiv \hat{q}^*(r,\rho,t,\tau)-\phi^*(\rho), \text{ and}\\ \hat{q}_0^w(r,\rho,t,\tau) &\equiv \hat{q}^w(r,\rho,t,\tau)-\phi^*(\rho).\end{aligned} \tag{4.41}$$

Welfare in the domestic country is again given by the usual partial equilibrium measure of consumer surplus plus producer surplus – and now also domestic profits – plus tax revenue, and then subtracting off the disutility of the consumption-generated pollution. Domestic consumer surplus (CS) and producer surplus (PS), are given by

$$CS=\int_{\hat{P}}^{\alpha} D(P)dP \equiv CS(\hat{P}(r,\rho,t,\tau)), \text{ and } PS=\int_{\phi(r)}^{\hat{q}}[q-\phi(r)]dq \equiv PS(r,\hat{q}(r,\rho,t,\tau)),$$

while tax revenue is given by

$$TR = t\cdot D(\hat{P}(r,\rho,t,\tau))+\tau\cdot\hat{x}^*(r,\rho,t,\tau)\equiv TR(r,\rho,t,\tau).$$

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

$$Z=\theta(r)\cdot[\hat{q}(r,\rho,t,\tau)-\phi(r)]+\theta^*(\rho)\cdot\hat{x}^*(r,\rho,t,\tau)\equiv Z(r,\rho,t,\tau).$$

With these definitions, domestic welfare W may now be expressed as[31]

$$\begin{aligned}&CS(\hat{P}(r,\rho,t,\tau))+PS(r,\hat{q}(r,\rho,t,\tau))+\pi(r,\rho,t,\tau)+TR(r,\rho,t,\tau)-Z(r,\rho,t,\tau)\\ \equiv\ & W(r,\rho,t,\tau).\end{aligned} \tag{4.42}$$

Turning now to foreign welfare, recall that the absence of foreign demand for the product under consideration and of foreign pollution, together with the assumed policy passivity of the foreign government, makes the foreign welfare measure very simple: foreign welfare is given by the profits of the foreign exporter. Hence

$$W^*=\pi^*(r,\rho,t,\tau)\equiv W^*(r,\rho,t,\tau). \tag{4.43}$$

[31] I do not express welfare in terms of non-tax policies and prices as I did in section 4.1.2, because as I will show below the terms-of-trade structure that such a representation of welfare was useful for illuminating does not apply in the offshoring environment that I consider here.

Efficient Policies With the "offshoring" variant of the model of section 4.1.2 described, I now turn to characterize the jointly efficient policy choices in this environment. As before, after characterizing and interpreting the efficient policy choices I will subsequently compare these policies to the noncooperative policy choices that the domestic government would make absent any international agreement, and thereby shed light on the problem that a trade agreement must solve in this environment if it is to move governments from inefficient Nash choices to the efficiency frontier.

Recalling once more that the domestic government has at its disposal four policy instruments (and the foreign government has none), there are four first-order conditions that must hold at the choices of these policies that maximize the sum of domestic and foreign welfare as given in (4.42) and (4.43) respectively. Using the derivatives in (4.38) and (4.39) and solving these four equations for the efficient levels of the four policies yields

$$\begin{aligned} \tau^E &= \frac{\hat{x}^{*E}}{D'(\hat{P}^E) - 1} - [1 + \phi^*(\rho^E)] + [\theta^*(\rho^E) - \theta(r^E)], \\ t^E &= \theta(r^E), \\ -\theta'(r^E) &= \phi'(r^E), \text{ and} \\ -\theta^{*\prime}(\rho^E) &= \phi^{*\prime}(\rho^E), \end{aligned} \tag{4.44}$$

where I use $\hat{x}^{*E}$ and $\hat{P}^E$ to denote the equilibrium magnitudes of these variables evaluated at efficient policies. And in the symmetric benchmark setting in which the functions ϕ and ϕ^* are identical and the functions θ and θ^* are identical, (4.44) reduces to

$$\begin{aligned} \tau^E &= \frac{\hat{x}^{*E}}{D'(\hat{P}^E) - 1} - [1 + \phi^*(\rho^E)], \\ t^E &= \theta(r^E), \\ -\theta'(r^E) &= \phi'(r^E), \text{ and} \\ \rho^E &= r^E. \end{aligned} \tag{4.45}$$

Comparing the efficient policies in (4.44) and (4.45) with those of section 4.1.2 as contained in (4.28) and (4.29) where the international price is determined by market clearing, it is apparent that the only difference in efficient policies when international prices are determined by bilateral bargaining is in the efficient setting of the tariff. In particular, as the first line of (4.44) indicates, in addition to serving a Pigouvian role ($[\theta^*(\rho^E) - \theta(r^E)]$) as in (4.28) before, the efficient tariff now also offsets the market power wielded by the foreign exporter when it chooses its export

volume (a subsidy to imports in the amount $\frac{\hat{x}^{*E}}{D'(\hat{P}^E)-1}$) and corrects the "holdup" problem associated with the foreign exporter's ex-ante investment decision (a subsidy to imports in the amount $-[1+\phi^{*}(\rho^E)]$). Facing the efficient tariff τ^E, the foreign export volume is then determined by (4.37) to satisfy $\hat{q}^E = [1+\phi^{*}(\rho^E)] + [\theta^*(\rho^E) - \theta(r^E)]$: in words, the efficient tariff level induces a level of foreign exports $\hat{x}^{*E}$ such that the marginal cost of the last unit produced by the competitive fringe of domestic suppliers ($\hat{q}^E$) is equal to the cost of foreign supply ($[1+\phi^{*}(\rho^E)]$) adjusted for any difference in per-unit pollution level generated by consumption of the foreign and domestically produced good $[\theta^*(\rho^E) - \theta(r^E)]$.

Aside from the differences in the levels of the efficient tariff, the efficient levels of intervention for the other instruments as depicted in (4.44) and (4.45) are all unchanged relative to (4.28) and (4.29) by the presence of bilateral bargaining between the domestic importer and the foreign exporter/supplier. In particular, as before, 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. And as before, the efficient standards applied to domestic and imported goods must equate the marginal per unit benefit of pollution reduction that comes with a slightly tighter standard with the marginal per unit cost of compliance with the tighter standard.

Noncooperative Policies Next I turn to characterize the noncooperative (Nash) policy choices of the domestic country (recall again that the foreign country is assumed passive in this industry). Using the domestic welfare expression given in (4.42) and the derivatives in (4.38) and (4.39), the noncooperative choices of τ, t, r and ρ must satisfy the four first-order conditions for maximization of W. Denoting by $\hat{x}^{*N}$ and $\hat{P}^N$ the equilibrium magnitudes of these variables evaluated at non-cooperative (Nash) policies, these first-order conditions can be manipulated to yield

$$\begin{aligned}
\tau^N &= -\frac{\pi^N}{\hat{x}^{*N}} - \frac{\hat{x}^{*N}}{D/(\hat{P}^N) - 1} + [\theta^*(\rho^N) - \theta(r^N)], \qquad (4.46)\\
t^N &= \theta(r^N) + \frac{\hat{x}^{*N} \cdot D''(\hat{P}^N)}{2D'(\hat{P}^N) \cdot (D'(\hat{P}^N) - 1)^2},\\
-\theta'(r^N) &= \phi'(r^N), \text{ and}\\
-\theta^{*\prime}(\rho^N) &= \phi^{*\prime}(\rho^N).
\end{aligned}$$

And in the symmetric benchmark setting (4.46) reduces to

$$\begin{aligned} \tau^N &= -\frac{\pi^N}{\hat{x}^{*N}} - \frac{\hat{x}^{*N}}{D'(\hat{P}^N) - 1}, \\ t^N &= \theta(r^N) + \frac{\hat{x}^{*N} \cdot D''(\hat{P}^N)}{2D'(\hat{P}^N) \cdot (D'(\hat{P}^N) - 1)^2}, \\ -\theta'(r^N) &= \phi'(r^N), \text{ and} \\ \rho^N &= r^N. \end{aligned} \tag{4.47}$$

Comparing (4.46) and (4.47) to their analogues (4.31) and (4.32) in section 4.1.2, it is apparent that the conditions determining the Nash regulatory policies are the same. But the conditions determining the Nash tariff and domestic consumption tax are now different.

Referring to the general case of (4.46), the level of the Nash tariff now reflects three forces. First, τ^N is lower when the importer's profit per unit imported ($\frac{\pi^N}{\hat{x}^{*N}}$) is higher, because with $\frac{\partial \hat{x}^*}{\partial \tau} < 0$ by (4.38) a marginally higher tariff is then more costly to the domestic country in terms of reduced domestic profits. Second, τ^N is higher when the market power wielded by the foreign exporter ($-\frac{\hat{x}^{*N}}{D'(\hat{P}^N)-1}$) is higher, because more of the incidence of the tariff can then be imposed on the foreign country and extracted as tariff revenue. And finally, τ^N serves the now-familiar Pigouvian role ($[\theta^*(\rho^N) - \theta(r^N)]$).

Turning to the Nash domestic consumption tax, its level is now determined by two forces: first, its Pigouvian role ($\theta(r^N)$); and second, an add-on term ($\frac{\hat{x}^{*N} \cdot D''(\hat{P}^N)}{2D'(\hat{P}^N) \cdot (D'(\hat{P}^N)-1)^2}$) whose sign is opposite the sign of D''. This second term can be understood intuitively as follows.

First, note from (4.37) that the domestic country can alter its tariff and domestic consumption tax in a manner that leaves the equilibrium trade volume $\hat{x}^*$ unaffected. Using (4.37), the precise adjustment in τ that must accompany a small increase in t to hold $\hat{x}^*$ fixed is given by

$$\frac{d\tau}{dt}|_{d\hat{x}^*=0} = -[\frac{D' \cdot (D'-1)^2 - \hat{x}^* \cdot D''}{(D'-1)^3}] < 0,$$

where the inequality follows under my maintained assumption that the magnitude of D'' is not too large. Next observe that these tax adjustments impact foreign profits according to

$$\frac{d\pi^*(r, \rho, t, \tau(t)|_{d\hat{x}^*=0})}{dt} = -\frac{(\hat{x}^*)^2 \cdot D''}{2(D'-1)^3},$$

whose sign is the same as the sign of D''. And finally, it is direct to confirm that, beginning from the efficient domestic consumption tax $t^E = \theta(r^E)$, the impact of these tax adjustments

on domestic welfare is given by

$$\frac{dW(r,\rho,t,\tau(t)|_{d\hat{x}^*=0})}{dt}|_{t^E=\theta(r^E)} = \frac{(\hat{x}^*)^2 \cdot D''}{2(D'-1)^3},$$

which takes a sign opposite to the sign of D''. Evidently, when D'' is positive (negative) and beginning from t^E, the domestic country can reduce foreign profits and convert this foreign loss into its own welfare gain by reducing (increasing) the domestic consumption tax from its efficient level and adjusting the tariff so as to preserve the equilibrium volume of foreign exports $\hat{x}^*$. And as (4.46) indicates, what eventually stops this adjustment in t away from its efficient level is the cost of the domestic demand distortion (as reflected in the magnitude of $D'(\hat{P})$) that is induced by the changes in t.

Finally, notice from (4.40) and (4.41) that foreign profits may be written as $\pi^* = [\hat{q}_0^w - 1] \cdot \hat{x}^*$, and so the maneuver I have described just above – wherein the domestic country uses adjustments in t and τ to hold $\hat{x}^*$ fixed while reducing π^* for domestic benefit – amounts to a maneuver to manipulate the terms of trade in its favor (i.e., to reduce $\hat{q}_0^w$). However, while this points to terms-of-trade manipulation as again the root of the problem that leads to inefficiencies in the noncooperative Nash equilibrium, it should nevertheless be clear that the policies used to manipulate the terms of trade in the presence of offshoring are more complex than would be expected according to the terms-of-trade theory.[32]

The Problem for a Trade Agreement to Solve I now turn to a comparison of the efficient policies characterized in section 4.3.2 with the noncooperative policies characterized in section 4.3.2, in order to identify and understand the problem that a trade agreement must solve in this "offshoring" environment if it is to move governments from inefficient Nash choices to the efficiency frontier. This comparison again turns out to be illuminating, and in the context of the present model (as in Antras and Staiger, 2012a, 2012b), it leads to a striking result.

Consider first the tariff. It can be shown that $\tau^N > \tau^E$: the Nash tariff is again inefficiently high. Simply put, it is not in the unilateral interests of the domestic country to offer import subsidies so as to counter the inefficiencies associated with foreign market power and the holdup problem, as international efficiency concerns would dictate. On the contrary, as (4.46) indicates,

[32] In fact, Antras and Staiger (2012a) establish formally that when political economy motivations are absent (as is the case here), the problem for a trade agreement to fix in the presence of offshoring can be given a terms-of-trade interpretation. However, they also show that this interpretation no longer applies once political economy motives are introduced.

the domestic country has a unilateral incentive to tax imports and shift some of the incidence of this tax on to the foreign exporter, an incentive that is kept in check only by the trade volume reductions that come with the higher tariff. This finding is analogous to that derived in the context of the terms-of-trade theory in section 4.1.2

Now consider the domestic consumption tax. Recalling that according to the terms-of-trade theory the domestic consumption tax is not distorted in the Nash equilibrium from its efficient level, we now have a striking finding: in the presence of offshoring, where international prices are determined by bilateral bargaining rather than market clearing conditions, the Nash level of the domestic consumption tax is distorted from its internationally efficient level. That is, as a comparison of (4.44) and (4.46) reveals, t^N is greater than or less than its efficient Pigouvian level as D'' is negative or positive.[33] Hence, behind-the-border NTMs can no longer be presumed to be set at efficient levels in the noncooperative Nash equilibrium in the presence of offshoring.

Recalling now that it was the terms-of-trade theory's prediction of efficient Nash choices for behind-the-border NTMs that I interpreted as lending support to the kind of shallow integration that characterizes the GATT approach, the result just above indicates that the rise of offshoring, by changing the nature of international price determination, undercuts this support, and it points instead to the possibility that deep integration must now be achieved for effective trade agreements. In this way, the rise in offshoring may necessitate fundamental changes in the WTO's approach to behind-the-border NTMs.[34]

Interestingly, at least in the model considered here, the inefficiency of noncooperative behind-the-border NTMs in the presence of offshoring is contained to domestic tax policies, and does not spread to domestic non-tax regulations. This can be seen by noting from the bottom two lines in (4.44) and (4.46) that the Nash standards choices continue to satisfy the same conditions as the efficient standards choices, and indeed the Nash standards correspond to the efficient standards: $r^N = r^E$ and $\rho^N = \rho^E$. Hence, at least in this model and where product level consumption taxes are available, the presence of offshoring and the implications for international price determination that offshoring implies lead to inefficient noncooperative

[33] The role of my generalization of the model of Staiger and Sykes (2011) to non-linear demands can now be appreciated, since with linear demands $D'' = 0$ and the inefficiency identified here would not arise. The role of the curvature of demand plays an analogous role in the model of offshoring I develop here to the role of the curvature of the final-good production function in Antras and Staiger (2012a).

[34] See Antras and Staiger (2012a) for a discussion of this point as well as additional ways in which offshoring may change the role for trade agreements, and of the possibility that the recent proliferation of PTAs may in part be an institutional response to offshoring triggered by the WTO's inability to facilitate deep integration for its member governments.

choices for domestic tax instruments, but not for domestic non-tax policies.

A finding that is somewhat related to this last point is reported by Staiger and Sykes (2011) in the context of the terms-of-trade theory. They show that when the tariff is constrained in a trade agreement and when domestic taxes and non-tax regulations are constrained to satisfy a "national treatment" restriction, the domestic consumption tax will be distorted but the non-tax regulations will not.[35] However, as Staiger and Sykes observe, for a variety of reasons the ability of governments to impose product-specific consumption taxes appears to be quite limited in practice. Hence, it is important to note that this last point depends on the availability of such taxes. In the next section, I show that when a (product-specific) consumption tax is unavailable to the domestic government, the inefficiency of noncooperative Nash behind-the-border NTMs spreads to non-tax regulatory policies.

Consumption Tax Unavailable Thus far I have adopted the view that product-specific consumption taxes are available to the domestic government. As might be expected, the ability to impose product-specific consumption taxes at the same level of detail as the tariff and product standards is important for the formal results above, and in particular for the result that in the presence of offshoring, among all of the possible behind-the-border NTMs, only domestic tax instruments are distorted in the noncooperative Nash equilibrium.

In practice, however, governments are not typically observed to impose detailed and distinct product-specific consumption taxes across a wide swath of products (gasoline is an obvious exception). Rather, the norm in practice tends to be uniform sales (or value-added) taxes at various levels of government. Motivated by this observation, I now illustrate briefly how the "offshoring" results reported above must be altered if the domestic government does not have a (product-specific) consumption tax at its disposal.[36] For simplicity, and because it will not impact the point that I emphasize here, I also assume that consumption of the domestically produced good no longer has an externality associated with it, and that there is no regulatory policy imposed on the (clean) domestic production. That is, I now assume $t \equiv 0$, $r \equiv 0$ and $\theta \equiv 0$, so that I may concentrate on the domestic-country policies τ and ρ. In this context, I repeat my comparison of efficient and noncooperative policies to assess the efficiency properties

[35] Non-tax regulatory policies are not considered in Antras and Staiger (2012a, 2012b), so there is no analogous result reported in those papers.

[36] No changes would result in the (non-consumption-tax) findings I report from the terms-of-trade theory if the consumption tax is assumed unavailable to the domestic government (see note 22).

of the non-tax behind-the-border regulatory policy ρ in the noncooperative Nash equilibrium.

Proceeding as above, it is direct to demonstrate that when $t \equiv 0$, $r \equiv 0$ and $\theta \equiv 0$, the efficient domestic tariff and regulatory policies (recall once more that the foreign government is passive) satisfy

$$\begin{aligned} \tau^E &= \frac{\hat{x}^{*E}}{D'(\hat{P}^E) - 1} - [1 + \phi^*(\rho^E)] + \theta^*(\rho^E), \quad \text{and} \\ -\theta^{*\prime}(\rho^E) &= \phi^{*\prime}(\rho^E). \end{aligned} \tag{4.48}$$

The interpretation of (4.48) is analogous to that of (4.44) as described in section 4.3.2. And proceeding as before, it can be shown that the noncooperative Nash policies are now described by

$$\begin{aligned} \tau^N &= -\frac{\pi^N}{\hat{x}^{*N}} - \frac{\hat{x}^{*N}}{D'(\hat{P}^N) - 1} + \theta^*(\rho^N) + \frac{(\hat{x}^{*N})^2 \cdot D''}{(D'-1)^3}, \quad \text{and} \\ -\theta^{*\prime}(\rho^N) &= \phi^{*\prime}(\rho^N)[1 - \frac{(D'-1)^2}{2(D'-1)^2 - \hat{x}^{*N} \cdot D''}]. \end{aligned} \tag{4.49}$$

Notice that relative to (4.46), (4.49) implies that the Nash tariff is adjusted by an add-on term $(\frac{(\hat{x}^{*N})^2 \cdot D''}{(D'-1)^3})$ whose sign is opposite the sign of D'': this compensates for the lack of an available domestic consumption tax t. But the important difference to note is revealed by comparing the second lines of (4.48) and (4.49): it is direct to confirm that this comparison implies $-\theta^{*\prime}(\rho^N) < -\theta^{*\prime}(\rho^E)$, which in turn indicates that $\rho^N > \rho^E$. In words, in the presence of offshoring and when product-level domestic consumption taxes are unavailable to the domestic government, the noncooperative level of the domestic regulation applied to foreign exports is set higher than would be efficient. Hence, in this limited-domestic-tax-instrument setting, offshoring and the bilateral bargaining over international prices that is associated with it results in inefficiencies in the noncooperative Nash equilibrium that extend beyond border measures (tariffs) to apply as well to behind-the-border non-tax regulatory policies.

5. Conclusion

In this paper I have attempted to sketch out the rough contours of the challenge faced by the WTO in dealing the NTMs. As I have described, the GATT adopted a particular and minimalist "shallow-integration" approach to handling NTMs. That approach evolved over time, and with the creation of the WTO, the handling of NTMs evolved further still. I have

considered the economic logic to GATT's shallow-integration approach from the perspective of three theories of trade agreements: the terms-of-trade theory, the commitment theory, and the offshoring theory. I have shown that subject to certain caveats GATT's approach resonates well with the terms-of-trade theory of trade agreements. Along the way I have provided a terms-of-trade interpretation of the WTO's Trade Facilitation Agreement. Some of the changes in the treatment of NTMs toward a deeper form of integration that were ushered in with the creation of the WTO are less supported by the terms-of-trade theory, but may find some support in the commitment theory of trade agreements. Finally, I have asked: Is the GATT/WTO approach to the treatment of NTMs adequate for the world economy of today? Viewed through the lens of the offshoring theory of trade agreements, I have suggested that the answer to this question may be "No" if the rise in offshoring can be taken to imply that the predominate mechanism for international price determination has changed.

From this perspective I have suggested that when it comes to handling NTMs, and specifically the choice between shallow and deep approaches to integration, the key questions for the WTO appear to be two: (1) Is it the terms-of-trade problem or the commitment problem (or both, or neither) that WTO member governments seek to solve with their WTO membership?; and (2) Is it market clearing or offshoring/bilateral bargaining that is now the most prominent mechanism for the determination of international prices?

Regarding the first question, empirical evidence seems to support the terms-of-trade theory as identifying the main purpose of the GATT/WTO (see Bagwell, Bown and Staiger, 2016, for a recent review of this evidence), but more evidence on this important question is needed. Regarding the second question, I am not aware of any systematic evidence that would help provide an answer.[37] But it seems likely that answering this second question will be a key step in identifying the best way forward on NTMs for the WTO.

Finally, as I noted in the Introduction, the appropriate handling of NTMs in trade agreements may have particular importance for developing countries in light of evidence that the most prevalent form of NTMs faced by developing country exporters in their attempts to export into developed-country markets are behind-the-border measures. These are the NTMs that are at the heart of the shallow/deep integration question, and in this sense developing countries may have the biggest stake in getting the answer to this question right. In this light, extend-

[37] That said, some indirect evidence that hints at the growing relevance of the offshoring/bilateral bargaining perspective is provided in Antras and Staiger (2012a).

ing the simple frameworks I have outlined above to better reflect the particular experience of developing countries seems an especially important goal of future research.

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