Domestic Policy Coordination in Imperfectly Competitive Markets

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Abstract

Many international trade agreements regulate the use of domestic policies. One approach is "deep" integration, in which governments contract directly over domestic policies. An appealing alternative is "shallow" integration, in which nations contract over market access and avoid negotiations over specific policies. I generalize the shallow integration approach to a two-country differentiated-product setting. Governments choose trade policies and two domestic policies: a wage subsidy and a policy reducing the capital requirement for firm entry. I show that the sole source of international inefficiency is terms-of-trade manipulation and that the appropriate terms-of-trade definition here is a world price index. Shallow integration works because changes in domestic policies and trade policies that preserve market access also preserve the terms of trade. I discuss potential obstacles for shallow integration. Absent trade policy cooperation, direct negotiations over the wage subsidy cannot benefit governments, but direct negotiations over the entry policy provide a second-best benefit. The efficient agreement in theory differs significantly from the shallow integration approach of the General Agreement on Tariffs and Trade (GATT).

1   Introduction

An important question in global trade cooperation is to what extent governments should negotiate directly over each other's domestic policy choices. While negotiations over discriminatory border measures like import tariffs have always been central to international agreements, the scope for domestic policy coordination is less clear. The potential cross-border effects of domestic policy choices motivate some form of coordination. The General Agreement on Tariffs and Trade (GATT), which launched the modern multilateral trading system in 1947, contains an appealing "shallow" integration solution. The GATT constrains nondiscriminatory domestic policies only to the extent that they undermine the benefit of other GATT commitments. In practice, the GATT prevents non-tariff barriers from undermining the market access benefit of import tariff bounds. The agreement prevents a wide range of possible international distortions while avoiding the complexity of "deep" integration, which would involve costly negotiations over individual domestic policies. Trade theory suggests the shallow integration approach can work well in standard market-clearing settings (Bagwell and Staiger 2001, Staiger 2011, Antras and Staiger 2012a).[1] Nonetheless, trade agreements since the GATT typically have not relied solely on shallow integration for domestic policy coordination.

Deep integration has been characteristic of trade agreements past and present. Even the GATT arose from a broader negotiation that would have led to deep integration if the resulting charter had passed the United States Congress.[2] The European Union's origins date back to the 1951 Treaty of Paris that coordinated on many domestic policies involving coal and steel to create a "truly supranational institution" (EC 2010). Defining features of the 1995 World Trade Organization (WTO) were agreements on product standards and subsidies. More recently, nations have turned to preferential trade agreements to negotiate non-tariff issues (WTO 2012). In ongoing negotiations between the United States and Europe, the European Commission's stated view is that non-tariff issues are "key to unlocking" the potential of an agreement (EC 2013).[3] The potential costs of negotiating and enforcing such

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[1] This literature and the current paper abstract from cross-border nonpecuniary externalities, such as carbon emissions or direct concern for foreign labor standards, which would matter with or without international trade. As Bagwell and Staiger (2001) argue, other institutions can manage such externalities better than trade institutions.

[2] Irwin, Mavroidis, and Sykes (2008) detail the history of the GATT. In 1948, 53 states signed the Havana Charter to coordinate domestic policies such as antitrust. The Havana Charter was "based on the conviction you could not maximize trade liberalization—or probably not achieve the objectives of the GATT—by means of traditional trade negotiations alone... [One] was to find some way of relating the rules of international trade to the domestic policies of a group of diverse countries" (Diebold 1993-94).

[3] The non-tariff measures in question specifically include "behind the border regulatory restrictions," "standards definitions," and "certain aspects of security or consumer protection" (EC 2013).

deep agreements motivate a better understanding of how shallow integration works in theory and in practice.[4]

This paper is the first to generalize the shallow integration approach to a differentiated product setting with intra-industry trade.[5] Despite the importance of trade gains from product variety both theoretically (Krugman 1980, Romer 1994) and empirically (Broda and Weinstein 2006), few papers have focused on domestic policies that directly impact fixed costs in scale economies.[6] In this setting, we show that the only source of international inefficiency is terms-of-trade manipulation and that the appropriate terms-of-trade definition is a world price index. New traded products must reflect a terms-of-trade loss even if they have no impact on the international prices of incumbent products.[7] The appropriate terms-of-trade definition allows us to prove that shallow integration works in the theory. Absent a trade agreement, governments set domestic policies as if they had no influence on trade, because they use only trade policies to manipulate the terms of trade. Once governments bind trade policies, they continue to set domestic policies as if they had no influence on trade, provided that they also contract over market access. The appropriate measure for the market access benefit involves demand for the composite traded goods that correspond to the world price index.[8] Shallow integration works because changes in domestic policies and

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[4]Prior literature has found motives for deeper agreements in particular settings. Antras and Staiger (2012a, 2012b) find a motive for deep integration when bilateral bargaining determines prices. Such bargaining relates primarily to the recent rise of offshoring. Sauré (2012) shows that when nations contract over the terms of trade and the self-enforcement constraint between the two parties binds, efficient coordination requires domestic policy constraints. Brou and Ruta (2013) argue that WTO subsidy rules go beyond the GATT so nations can commit to avoid the political temptation to subsidize import-competing industries.

[5]The paper extends results from Bagwell and Staiger (2001) and Antras and Staiger (2012a). Bagwell and Staiger obtain similar results in a setting with perfect competition and quite general government preferences that could involve political motives. Antras and Staiger (2012a) provide similar results for an exporting monopolist with national income-maximizing governments.

[6]DeRemer (2013) considers similar domestic policies when arguing that nations would not pursue subsidy restrictions in the absence of trade policy cooperation, but that paper does not consider the need for policy coordination more generally. Campolmi, Fadinger, and Forlati (2013) also consider a domestic policy that influences fixed costs of production, but their policy is a wage subsidy in a single factor model that must proportionally affect the marginal cost and the fixed cost of production. They find that the domestic policy is set efficiently in the absence of a trade agreement. Rebeyrol and Vauday (2013) and Abel-Koch (2013) both model domestic product standards as costs for market access but have a focus distinct from the current paper. Abel-Koch finds that the domestic policy is set efficiently in the absence of an agreement.

[7]Bagwell and Staiger (2009), Ossa (2011), and Campolmi, Fadinger, and Forlati (2013) all use the world price of an individual good as the terms-of-trade measure in a monopolistically competitive environment. Ossa (2011) also observes that an import tariff causing domestic entry and foreign exit could be interpreted as causing a terms-of-trade loss when terms of trade is measured by a ratio of relative price indices. Campolmi, Fadinger, and Forlati (2010) and Bergin and Corsetti (2013) also use world price indices to describe international externalities. Epifani and Gancia (2011) uses similar price indices in a trade context.

[8]Bagwell and Staiger (2001) and Antras and Staiger (2012a, 2012b) have used the standard export volume or demand curve in homogeneous good environments to define market access rules. Bagwell and Staiger (2009) consider the standard export volume in a differentiated good environment but do not model domestic policy choices.

trade policies that preserve market access also preserve the terms of trade.

The theory also suggests potential obstacles for shallow integration. One new result is that absent trade policy cooperation, direct negotiations over individual domestic policies may differ in whether they provide any second-best benefit for governments, whereas under perfect competition such negotiations do not provide a benefit.[9] Moreover, the effective shallow agreement in theory differs significantly from the shallow integration approach of the General Agreement on Tariffs and Trade (GATT).[10] The commitment that constrains domestic policies in theory depends on a commitment to export volume implied by an export tax negotiation, but few export tax negotiations have existed under the GATT.[11] The immediate incentives for deeper integration and the challenges of the GATT approach suggest why nations may have turned to deep integration.

The following section proposes a highly tractable model to illustrate how scale economies affect domestic policy coordination.[12] We consider two symmetric countries, each with a monopolistically competitive differentiated sector and a freely traded outside sector. There is a capital factor required for entry in the differentiated sector and a labor factor required for marginal production in both sectors. Governments each choose two border measures (an import policy and an export policy)[13] and two domestic policies. One domestic policy is a standard wage subsidy that reduces the marginal cost of production, and the other is the domestic policy that influences the fixed costs of entry and the number of available varieties.

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[9]Horn, Maggi, and Staiger (2010) show in a perfectly competitive setting that if governments attempt to contract over a domestic subsidy without cooperating over trade policy, the strategic response of the trade policy will undo any benefits of the domestic policy contract. We find a similar result for a wage subsidy in the current paper.

[10]Bagwell and Staiger (2001) also observe one problem with the GATT not discussed further here. A tariff bound may prevent nations from adjusting domestic policies to globally efficient levels, if the efficient mix of trade policies and domestic policies requires a government to raise a trade tax above the bound. Efficient trade taxes can be positive because global efficiency is defined with respect to government preferences that could reflect political motivations.

[11]Antras and Staiger (2012a) show that shallow integration works efficiently in an exporting-monopolist model, in which export tax negotiations imply a commitment for export volume. Their model exhibits the same contrast with practice under the GATT, though they do not make the comparison. There is at least one example of an international bound on export taxes: China's WTO accession protocol (Espa 2012). The WTO has recently found such export taxes to be in violation of its rules. The U.S. Constitution prohibits export taxes, but this is a self-imposed bound, not an international bound.

[12]Others have used similar models to study trade policy under imperfect competition. A government can use trade policy to shift profits or production locations from outside its border to inside its border (Venables 1985, 1987). The profit-shifting and firm delocation motives imply governments care about local prices in foreign markets, but when governments negotiate over both import and export policies, countries' noncooperative and cooperative trade policy choices can eliminate such local price externalities (Bagwell and Staiger 2009, 2012). Governments can also eliminate the delocation externality if they use a first-best wage subsidy to eliminate the monopoly distortion (Campolmi, Fadinger, and Forlati 2013). If governments have only import tariffs at their disposal, then the firm delocation motive can rationalize the GATT principles or reciprocity and nondiscrimination (Ossa 2011).

[13]Each trade policy could be either a tax or a subsidy.

Modelling joint choices over all policies is essential, because other policies can influence the coordination problem in domestic policies. The number of firms depends only on the fixed costs of entry, while marginal production depends on the other three policies.

Next we evaluate what motivates a trade agreement in the differentiated-product setting. First we determine the first-best policies. Governments achieve joint efficiency with trade taxes yielding zero net revenue, a wage subsidy that sets prices equal to marginal cost, and an entry policy that weighs benefits of entry for both domestic and foreign consumers.

To help interpret trade agreement problems that arise at the Nash equilibrium, we next consider what policies governments would choose if they do not value their ability to manipulate their terms of trade. Bagwell and Staiger (1999) define the resulting policies to be *politically optimal* because they can yield Pareto efficient policies for governments with political motives, though governments need not be politically motivated for the concept to apply.[14] Practically, nations progress toward the politically optimal policies through reciprocal reductions in trade barriers. This paper evaluates politically optimal policies using two different definitions of terms of trade. One definition is the world price of an individual variety. A problem with this definition here is that new products have no terms-of-trade effects, so we also consider a world price index of exports for each country. We construct the politically optimal conditions for each terms-of-trade definition, by dropping the first-order effect of world prices on government welfare from the noncooperative policy-setting conditions. For the trade taxes and the wage subsidies, either set of politically optimal conditions imply the global efficiency conditions. So like usual, terms-of-trade manipulation is the only source of inefficiency for these policies. But for the entry policy, the efficiency condition fails when we define terms of trade as the world price of an individual variety. When we instead define terms of trade using world price indices, the political optimum is efficient. Governments achieve global efficiency if they do not consider the impact of entry in lowering the price index of traded goods. We also show the politically optimal choices of the entry subsidy are efficient even if the domestic subsidy does not eliminate the monopoly distortion. The paper then succeeds in clarifying the relevant terms-of-trade definition in the differentiated product setting.

Having determined that terms-of-trade manipulation is the source of inefficiency, we next find the Nash equilibrium policies and interpret them. We start with the trade policies. In the current stylized setting with CES demand, the import policy has no terms-of-trade effects by any definition, so governments set zero import tariffs and there is no coordination problem.

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[14]Bagwell and Staiger find politically optimal policies to be globally efficient under perfect competition with political preferences (1999), perfect competition with a domestic policy choice (2001), and various forms of imperfect competition when countries negotiate over only trade policies (2009, 2012).

Governments do, however, set optimal export tariffs to manipulate the terms of trade for their exports. The wage subsidy is set at the first-best level, though the global efficiency condition in wage subsidy choices is not satisfied due to the trade policy distortions. When governments set the domestic entry policy, the expression follows the same form as the first-best entry policy.[15] The policy does lead to firm entry below the first-best level, because the Nash trade volume is lower than the efficient trade volume. For both domestic policies, we show that the policy choice results from governments acting as if they do not value their ability to affect trade. The key model feature that leads to the result is that trade policies and domestic policies that preserve composite quantities of tradables also preserve the terms of trade.[16]

The Nash equilibrium results offer new insight into attempts to form second-best contracts over domestic policies, absent cooperation over trade policies. At the Nash equilibrium, holding other policies fixed, governments benefit from increases in wage subsidies or the entry policies, either of which increase trade. If governments can strategically respond with their export policy, then the contracts over each of the two policies have starkly different implications. A contract that constrains wage subsidies just above the Nash level in an attempt to increase trade volume would be completely undermined by a strategic response in export taxes, leaving both nations worse off with distortions in their export sales.[17] A contract that constrains the entry policy to induce symmetric firm entry in both nations would achieve a second-best benefit even if governments could strategically change their other policies.

We evaluate whether a shallow integration approach can lead to efficient policies. First, governments negotiate over both import and export taxes. The negotiated level of taxes and the prevailing domestic policies imply a commitment to market access. In this setting, the appropriate market access measure must be either the composite differentiated good or the composite world price index, rather than simply the trade volume or the world price. The market access constraints lead governments to continue to internalize the terms-of-trade externality, even after they achieve trade policy cooperation. The paper concludes by discussing challenges for the GATT shallow integration approach and further research directions.

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[15]Similar to what Horn, Maggi, and Staiger (2010) observe, the absence of international distortion in the domestic policy is a kind of "targeting" result (Bhagwati and Ramaswami 1963, Dixit 1985) since the export tariff is the first-best instrument for a nation to manipulate the terms of trade for its exporters.

[16]This key feature does not hold in the bilateral bargaining environment of Antras and Staiger (2012a), in which case shallow integration does not achieve the first-best.

[17]The finding for the wage subsidy here is similar to what Horn, Maggi, and Staiger (2010) find for a domestic subsidy in the perfectly competitive setting, except their governments respond with import taxes.

2 An Intra-industry Trade Model with Two Domestic Policies and Trade Policies

The baseline setting is a tractable two-country, two-factor model that builds on section 7.3 of Helpman and Krugman (1989) and DeRemer (2013).[18] The framework is convenient for the joint analysis of several domestic policies and trade policies. Jointly analyzing several policies is essential because the need for domestic policy coordination depends on the interaction between trade policies and domestic policies.

There are two large symmetric countries, Home and Foreign. The paper does not consider any issues specific to interaction among more than two countries. Symmetry is plausible here because the model is about problems arising in trade between similar developed countries. The United States and United Kingdom dominated the negotiations following World War II, and the United States and Europe dominated the negotiations leading to the WTO. There may be important motives for integration between dissimilar countries or three countries but they are beyond the scope of the current paper.

The economy has two sectors: one sector contains symmetric firms who produce differentiated products and engage in monopolistic competition, and the other sector produces a freely traded numeraire good that enters quasilinearly into consumer utility. The product differentiation is a crucial feature so we can contrast results for domestic policies that disproportionately affect either the intensive (volume of individual products) and extensive (number of products) margins of production. The paper follows much of the literature in using a quasilinear outside good (e.g. Bagwell and Staiger 2009, Antras and Staiger 2012a, 2012b). This framework allows the expenditure on the differentiated sector to vary as a share of income, but it abstracts from income effects. Another common structure is Cobb-Douglas preferences between sectors, such that expenditure as a share of income is constant (e.g. Ossa 2011, Campolmi, Fadinger, and Forlati 2013). Each type of preferences offers different kinds of analytic simplicity, and the quasilinear setting is better suited for the current paper given the complexity of eight policy choices between the two nations. The paper abstracts from firm heterogeneity because the focus is on aggregate government objectives.[19]

There are two factors of production: a capital endowment K for firm entry in the differentiated sector and a labor endowment L for marginal production in either sector. The capital factor is specific to the differentiated sector. The labor factor is freely mobile between the two sectors. The two-factor model permits several conveniences. The number of firms

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[18]DeRemer (2013) uses a similar framework, but considers distinct questions and does not include a wage subsidy that reduces the marginal cost of differentiated goods.

[19]See Abel-Koch (2013) and Rebeyrol and Vauday (2013) for results on non-tariff measures in settings with firm heterogeneity.

depends only on the capital endowment and capital requirement. We can solve for optimal policy for the three policies affecting marginal production without solving for optimal firm entry.

After detailing the model here, we derive two different functional representations of government objectives. In each representation, government objectives depend on different terms-of-trade definitions. One definition uses the price of an individual variety. The other uses a price index. Both representations will be helpful in interpreting trade agreement problems.

2.1 Setup

Government: The Home government chooses an ad valorem import tariff τ_I, an export tax τ_E, a wage subsidy reducing the marginal cost of differentiated products s_M, and a domestic policy affecting the capital entry requirement in the differentiated sector e. The Foreign government chooses corresponding policies τ_I^*, τ_E^*, s_M^*, and e^*. A negative import tariff indicates an import subsidy, and a negative export tax indicates an export subsidy. Governments transfer any budget deficit or surplus to consumers. Governments care directly about the level of their own entry policy but not the policy of the other government.

Consumption: Consumers in each country own the factors K and L. All have income large enough to ensure consumption Y of the numeraire good. The utility functions are

$$U = \frac{1}{\theta}(D)^\theta + Y, \text{ and } U^* = \frac{1}{\theta}(D^*)^\theta + Y^*.$$

The elasticity of substitution is $\frac{1}{1-\theta} \equiv \varepsilon$ between sectors. D is a composite good over n_h symmetric Home products and n_f symmetric Foreign products. The composite goods have corresponding price indices P and P^* such that PD and P^*D^* are the total expenditures on differentiated goods. After imposing symmetry on consumption for each product, we have

$$D = \left(n_h c_h^{\frac{\sigma-1}{\sigma}} + n_f c_f^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}, \text{ and}$$

$$D^* = \left(n_h c_h^{*\frac{\sigma-1}{\sigma}} + n_f c_f^{*\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}.$$

The elasticities of substitution satisfy $\sigma > \varepsilon > 1$. For per-good consumption variables c, subscripts h and f denote location of origin. The superscript "*" indicates location of consumption. Define the total production of each good to be x_h for Home firms and x_f for Foreign firms. The prices p have matching subscripts and superscripts.

Marginal Production: Good Y has a unit labor requirement, and differentiated products have marginal labor requirement m. To ship one unit of differentiated product abroad

requires an iceberg trade cost $\phi \geq 0$.

Firm Entry: Nations each have a capital endowment K specific for entry into the differentiated sector. Governments have a policy that affects the entry decision. The policy could be a subsidy, as in DeRemer (2013), or a labor or environmental standard that affects the entry requirement.[20]

The entry policy reduces the capital requirement at a cost e that enters into government utility. The function $k(e)$ gives the capital requirement, which is strictly decreasing in e.[21] As in Helpman and Krugman (1989), free entry ensures that all capital produces firms. The rental rate of capital adjusts so that capital collects all the profits—the revenues less taxes, labor costs, and trade costs. The domestic entry policies e and e^* determine the number of firms n_h and n_f in each country:

$$n_h = \frac{K}{k(e)}, \text{ and } n_f = \frac{K}{k(e^*)}. \tag{1}$$

The function k can be inverted to express the cost to the government of providing a given number of firms, as if governments were directly choosing the number of firms:

$$e = k^{-1}(\frac{K}{n_h}) \equiv f(n_h), \text{ and } e^* = k^{-1}(\frac{K}{n_f}) \equiv f(n_f).$$

As is standard, firms take government policy and the consumer price index as given and maximize profits. Individual firms are too small to behave strategically.

Additional Terms: The terms of trade for the individual products p_h^w and p_f^w are by definition the prices in between borders.[22] These prices are

$$p_h^w = (1 + \tau_E + \phi)p_h, \text{ and } p_f^w = (1 + \tau_E^* + \phi)p_f^*.$$

We also define the expenditure shares of domestic goods in the differentiated sector:

$$S = \frac{p_h n_h c_h}{PD}, \text{ and } S^* = \frac{p_f^* n_f c_f^*}{P^* D^*}. \tag{2}$$

Note also that $PD = p_h n_h c_h + p_f n_f c_f$ and $P^* D^* = p_f^* n_f c_f^* + p_h^* n_h c_h^*$.

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[20]If the policy were a labor or environmental standard, we rule out the possibility that the choice has any direct cross-border spillovers. Any externalities from the policy choice that do not affect production would have to be confined to within the border.

[21]See DeRemer (2013) for additional restrictions on $k(e)$ necessary to ensure that an equilbirium number of firms exists. Ultimately we require that the resulting cost function ($f(n)$ defined below) is sufficiently convex relative to consumer welfare.

[22]The world prices here are different from Bagwell and Staiger (2009), who do not include the iceberg trade cost in the world price. The distinction matters when we later evaluate the efficiency conditions for the wage subsidy.

2.2 Government Objectives

In this section, we first derive government objectives and the global objective as a function of product prices and firm counts. We then expresses the product prices and firm counts as a function of government policy choices. As in Bagwell and Staiger (1999, 2001, 2009), expressing government objectives as such is essential for interpreting trade agreement problems. We do not immediately replace the firm counts in the government objectives with prices, because the entry policies have a direct influence on firm entry, though we do this to some extent in the next subsection when we describe world price indices. The dependence of government objectives on one's own number of firms is not a significant departure, because in Bagwell and Staiger (2001) the objectives depend on a domestic policy. But the dependence of government objectives on the number of firms abroad is an important departure from prior work. Foreign firms enter into the Home government objectives in both import tariff revenue and the export volume.

First we present Home government objectives as a total of firm profits sans wage subsidy $((p_h - m)n_h x_h)$,[23] consumer utility from differentiated product consumption $(\frac{1}{\varepsilon-1}P^{1-\varepsilon})$,[24] import trade tax revenue $(\tau_I p_f^w n_f c_f)$,[25] export trade tax revenue $(\tau_E p_h n_h c_h^*)$, wage income (L), less entry policy costs $(-f(n_h))$:

$$G = (p_h - m)n_h x_h + \frac{1}{\varepsilon - 1}P^{1-\varepsilon} + \tau_I p_f^w n_f c_f + \tau_E p_h n_h c_h^* + L - f(n_h). \qquad (3)$$

Foreign objectives are similar:

$$G^* = (p_f^* - m)n_f x_f + \frac{1}{\varepsilon - 1}P^{*1-\varepsilon} + \tau_I^* p_h^w n_h c_h^* + \tau_E^* p_f^* n_f c_f + L - f(n_f).$$

Next we define all the variables as functions of firms and prices. The price indices take the standard form from Dixit and Stiglitz (1977):

$$
\begin{aligned}
P &= \left(n_h p_h^{1-\sigma} + n_f p_f^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \equiv P(n_h, n_f, p_f, p_h), \text{ and} \\
P^* &= \left(n_f p_f^{*1-\sigma} + n_h p_h^{*1-\sigma}\right)^{\frac{1}{1-\sigma}} \equiv P^*(n_h, n_f, p_h^*, p_f^*).
\end{aligned}
\qquad (4)
$$

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[23] The wage subsidy does not enter directly into the expression since it is a transfer between firms and the government, though it does affect the local domestic price.

[24] Utility maximization implies that $D = P^{-\varepsilon}$. For total income I, indirect utility is $\frac{1}{\varepsilon-1}PD + I = \frac{1}{\varepsilon}P^{1-\varepsilon} + I$.

[25] DeRemer (2013) and Bagwell and Staiger (2009) define the import trade tax to multiply the local price rather than the world price. The first-order conditions involving the wage subsidy are more elegant using the definition here, and the definition otherwise does not impact results.

Product consumption terms are a function of firm counts and local prices:

$$
\begin{aligned}
c_h &= p_h^{-\sigma} P^{\sigma-\varepsilon} \equiv c_h(n_h, n_f, p_f, p_h), \; c_f = p_f^{-\sigma} P^{\sigma-\varepsilon} \equiv c_f(n_h, n_f, p_f, p_h), \\
c_f^* &= p_f^{*-\sigma} P^{*\sigma-\varepsilon} \equiv c_f^*(n_h, n_f, p_h^*, p_f^*), \text{ and } c_h^* = p_h^{*-\sigma} P^{\sigma-\varepsilon}. \equiv c_h^*(n_h, n_f, p_h^*, p_f^*).
\end{aligned} \tag{5}
$$

Firm production depends on firm counts and both domestic and Foreign prices:

$$
\begin{aligned}
x_h &= c_h + (1+\phi)c_h^* \equiv x_h(n_h, n_f, p_h, p_f, p_h^*, p_f^*). \\
x_f &= c_f^* + (1+\phi)c_f \equiv x_f(n_h, n_f, p_h, p_f, p_h^*, p_f^*).
\end{aligned} \tag{6}
$$

The trade taxes relate to prices as follows:

$$
\begin{aligned}
\tau_I &= \frac{p_f - p_f^w}{p_f^w}, \qquad \tau_E = \frac{p_h^w - (1+\phi)p_h}{p_h}, \\
\tau_I^* &= \frac{p_h^* - p_h^w}{p_h^w}, \qquad \text{and } \tau_E^* = \frac{p_f^w - (1+\phi)p_f^*}{p_f^*}.
\end{aligned} \tag{7}
$$

All the preceding function definitions imply the Home government objective depends on prices and firms as follows:

$$
\begin{aligned}
G &= (p_h - m)n_h x_h(\cdot) + \frac{1}{\varepsilon - 1} P(\cdot)^{1-\varepsilon} \\
&\quad + (p_f - p_f^w)n_f c_f(\cdot) + (p_h^w - (1+\phi)p_h)n_h c_h^*(\cdot) - f(n_h) + L \\
&\equiv G(n_h, n_f, p_h, p_f, p_h^*, p_f^*, p_h^w, p_f^w).
\end{aligned}
$$

Similarly the Foreign government objective is

$$
\begin{aligned}
G^* &= (p_f^* - m)n_f x_f(\cdot) + \frac{1}{\varepsilon - 1} P^*(\cdot)^{1-\varepsilon} \\
&\quad + (p_h^* - p_h^w)n_h c_h^*(\cdot) + (p_f^w - (1+\phi)p_f^*)n_f c_f(\cdot) - f(n_f) + L \\
&\equiv G^*(n_h, n_f, p_h, p_f, p_h^*, p_f^*, p_h^w, p_f^w).
\end{aligned}
$$

Because of either symmetry or the quasilinearity of preferences, the global objective W is the sum of the two government objectives. W does depend on the firm counts but does not

depend on offshore prices:

$$
\begin{aligned}
W &= (p_h - m)n_h x_h(\cdot) + (p_f^* - m)n_f x_f(\cdot)) + \frac{1}{\varepsilon - 1}(P(\cdot)^{1-\varepsilon} + P^*(\cdot)^{1-\varepsilon}) + \qquad (8) \\
&\quad (p_f - (1 + \phi)p_f^*)n_f c_f(\cdot) + (p_h^* - (1 + \phi)p_h)n_h c_h^*(\cdot) - f(n_h) - f(n_f) + 2L \\
&\equiv W(n_h, n_f, p_h, p_f, p_h^*, p_f^*).
\end{aligned}
$$

To complete the derivation, we define all the prices as a function of the policy choices. We already have that $n_h \equiv n_h(e)$ and $n_f \equiv n_f(e^*)$. The local prices are a function of the wage subsidies:

$$
\begin{aligned}
p_h &= \frac{\sigma}{\sigma - 1}(m - s_M) \equiv p_h(s_M), \text{ and} \\
p_f^* &= \frac{\sigma}{\sigma - 1}(m - s_M^*) \equiv p_f^*(s_M^*).
\end{aligned}
$$

The world prices are

$$
\begin{aligned}
p_h^w &= (1 + \tau_E + \phi)p_h(s_M) \equiv p_h^w(\tau_E, s_M), \text{ and} \\
p_f^w &= (1 + \tau_E^* + \phi)p_f^*(s_M^*) \equiv p_f^w(\tau_E^*, s_M^*).
\end{aligned}
$$

The local prices of traded goods depend on the net trade taxes and the local prices:

$$
\begin{aligned}
p_h^* &= (1 + \tau_I^*)p_h^w(\tau_E, s_M) \equiv p_h^*(\tau_I^*, \tau_E, s_M), \text{ and} \qquad (9) \\
p_f &= (1 + \tau_I)p_f^w(\tau_E^*, s_M^*) \equiv p_f(\tau_I, \tau_E^*, s_M^*).
\end{aligned}
$$

With few policies affecting pricing and entry decisions, the analysis is much simpler.

2.3 Government Objectives with World Price Indices

An issue with the previous expression for government objectives is that it leaves no room for new product varieties to affect the terms of trade. Yet nations sinking costs to create new varieties clearly has terms-of-trade impacts, as certain varieties are now available at a finite price. To address this issue, we define the world price indices[26]

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[26]Note the relevant terms-of-trade measure here is not the ratio of price indices, because we are in an environment with a freely traded numeraire good.

$$P_h^w = p_h^w(\cdot)n_h^{\frac{1}{1-\sigma}} \equiv P_h^w(n_h, \tau_E, s_M), \text{ and} \qquad (10)$$

$$P_f^w = p_f^w(\cdot)n_f^{\frac{1}{1-\sigma}} \equiv P_f^w(n_f, \tau_E^*, s_M^*).$$

We also define the following composite trade bundles of differentiated products:

$$D_h^* = n_h^{\frac{\sigma}{\sigma-1}}c_h^*(\cdot) \equiv D_h^*(n_h, n_f, p_h^*, p_f^*), \text{ and} \qquad (11)$$

$$D_f = n_f^{\frac{\sigma}{\sigma-1}}c_f(\cdot) \equiv D_f(n_h, n_f, p_f, p_h),$$

We express government objectives as functions of the world price indices:

$$G = (p_h - m)n_h c_h(\cdot) + (1+\phi)(p_h - m)n_h^{\frac{1}{1-\sigma}}D_h^*(\cdot) + \frac{1}{\varepsilon - 1}P(\cdot)^{1-\varepsilon} \qquad (12)$$

$$+ \left(p_f n_f^{\frac{1}{1-\sigma}} - P_f^w\right)D_f(\cdot) + \left(P_h^w - (1+\phi)p_h n_h^{\frac{1}{1-\sigma}}\right)D_h^*(\cdot) - f(n_h) + L$$

$$\equiv \bar{G}(n_h, n_f, p_h, p_f, p_f^*, P_h^w, P_f^w, D_h^*, D_f).$$

Similarly the Foreign government objective is

$$G^* = (p_f^* - m)n_f c_f^*(\cdot) + (1+\phi)(p_f^* - m)n_f^{\frac{1}{1-\sigma}}D_f(\cdot) + \frac{1}{\varepsilon - 1}P^*(\cdot)^{1-\varepsilon}$$

$$\left(p_h^* n_h^{\frac{1}{1-\sigma}} - P_h^w\right)D_h^*(\cdot) + \left(P_f^w - (1+\phi)p_f^* n_f^{\frac{1}{1-\sigma}}\right)D_f(\cdot) - f(n_f) + L$$

$$\equiv \bar{G}^*(n_h, n_f, p_h, p_h^*, p_f^*, P_h^w, P_f^w, D_h^*, D_f).$$

We could go further in defining more price indices for composite products within borders, but the current definition will be sufficient for our purposes.

3 Trade Agreement Problems

Having derived government objectives, this section now turns to interpreting the problems for international agreements. This interpretation will be essential in deriving the appropriate approach for correcting the problems that arise. We start by deriving the first-best policies. While often the next step would be to derive the Nash equilibrium policies, we instead first look at what policies governments would choose if they did not value their ability to

manipulate their terms of trade. We use two definitions of terms of trade, and find that only one correctly interprets the trade agreement problem. We then proceed to derive and to interpret the Nash equilibrium policies.

3.1   First-Best Policies

To solve for the first-best policies, we can first find the optimal trade taxes and wage subsidy, and then find optimal entry. We show that the first-best policies set all local prices equal to marginal costs, so that $p_h = p_f^* = m$ and $p_f = p_h^* = (1 + \phi)m$. Governments can achieve these prices with trade taxes yielding zero net revenue and wage subsidies $s_M = s_M^* = \frac{m}{\sigma}$. The conditions for the global optimum, taking entry as given, are

$$W_{p_f} = 0, \; W_{p_h^*} = 0, \; W_{p_h} = 0, \text{ and } W_{p_f^*} = 0.$$

The four trade tax conditions simplify to two effects of local traded prices on welfare, because the effects of trade taxes on prices are nonzero (e.g. the condition $W_{p_f} \frac{dp_f}{d\tau_I} = 0$ simplifies to $W_{p_f} = 0$ because $\frac{dp_f}{d\tau_I} = p_f^w > 0$). We can then use the trade tax conditions to simplify the conditions for the wage subsidies (e.g. using $W_{p_h^*} = 0$ and $\frac{dp_h}{ds_M} \neq 0$, the condition $W_{p_h} \frac{dp_h}{ds_M} + W_{p_h^*} \frac{dp_h^*}{ds_M} = 0$ becomes $W_{p_h} = 0$).

We verify that the four conditions are satisfied at the candidate prices $p_h = p_f^* = m$ and $p_f = p_h^* = (1 + \phi)m$. First consider $W_{p_f} = 0$. The local Foreign price p_f has no effect on firm profits sans wage subsidy when $p_h = m$. The envelope theorem and consumer utility maximization imply the effect of p_f on the consumer utility of differentiated consumption $\left(\frac{d}{dp_f} \frac{1}{\varepsilon - 1} P(\cdot)^{1-\varepsilon} \right)$ is $-n_f c_f$. This effect is precisely offset by the effect on trade tax revenue, holding other prices fixed, and since $p_f - (1 + \phi)p_f^* = 0$ we can ignore $\frac{dc_f}{dp_f}$. So $W_{p_f} = 0$ holds, and $W_{p_h^*} = 0$ similarly holds. Next consider $W_{p_h} = 0$. The effect on firm profits sans wage subsidy is $n_h x_h$ and we can ignore $\frac{dx_h}{dp_h}$ when $p_h = m$. The effect on consumption of differentiated products is $-n_h c_h$ and the effect on trade tax revenue for Home goods, holding the price p_h^* fixed, is $-n_h c_h^* (1+\phi)$. Noting that $x_h = c_h + c_h^*(1+\phi)$, $W_{p_h} = 0$ holds. $W_{p_f^*} = 0$ similarly holds. So all four conditions hold. Governments achieve the optimal policies by setting $s_M = \frac{m}{\sigma}$ and zero trade taxes.[27]

Finally, we can implicitly solve for optimal entry. At the optimal prices, all terms drop out except for the indirect utility from differentiated-sector consumption and the entry costs. So we have

---

[27]Note that free trade is not the unique set of efficient trade policies. Symmetric Home and Foreign trade policy choices satisfying $(1 + \tau_I)(1 + \tau_E^* + \phi) = 1 + \phi$ and $(1 + \tau_I^*)(1 + \tau_E + \phi) = 1 + \phi$ will still lead to no distortions in export prices and zero net revenue.

$$D\frac{dP}{dn_f} + D^*\frac{dP^*}{dn_f} = f'(n_f), \text{ and } D\frac{dP}{dn_h} + D^*\frac{dP^*}{dn_h} = f'(n_h).$$

where we have made use of the results $P^{-\varepsilon} = D$ and $P^{*-\varepsilon} = D^*$. Further differentiating, the first best policies satisfy

$$\frac{1}{\sigma - 1}(p_f c_f + p_f^* c_f^*) = f'(n_f), \text{ and } \frac{1}{\sigma - 1}(p_h c_h + p_h^* c_h^*) = f'(n_h). \tag{13}$$

The optimal entry then balances the marginal cost of entry against the benefit of entry for Home and Foreign consumers. To preview the problem that will arise, notice a nation acting unilaterally would ignore the benefit to consumers abroad. We will later show that this benefit for Foreign consumers is actually a terms-of-trade gain.

Lemma 1 *The first-best outcome is implemented with zero trade taxes, wage subsidies $\frac{m}{\sigma}$ that bring all prices equal to marginal cost, and entry policies that balance the gains of variety to both Home and Foreign consumers against the marginal cost of entry.*

3.2   Politically Optimal Policies with Individual Product Prices

We turn from the first-best policies to the politically optimal policies, so we can determine whether there would be distortions if governments did not value their ability to manipulate their terms of trade. While a typical approach is to first consider the noncooperative policies and then the political optimum, there are reasons to begin with the political optimum: first, the politically optimal policies relate closely to the first-best policies just discussed; and second, we have two definitions of terms of trade to consider. Finding the correct definition will be helpful in interpreting the Nash equilibrium policies.

We first consider the political optimum such that the terms of trade is the world price of a single product—this has been the more common definition in the trade agreement literature to date. There are eight conditions for the political optimum, four for each government's policies.

First we establish that the politically optimal trade policy conditions satisfy two of the conditions for global efficiency. The four political optimum conditions for trade policies are

$$G_{p_f} = 0, \ G_{p_h^*} = 0, \ G_{p_h^*}^* = 0, \text{ and } G_{p_f}^* = 0.$$

The conditions result from totally differentiating the government objective with respect to each of the four trade policies, while disregarding the effect of the policies on welfare through changes in the terms of trade. Since the effects of the trade policies on prices are nonzero, the

conditions then reflect that the first-order effects of local traded-good prices on government objectives is zero. The same results hold in Bagwell and Staiger (1999, 2009). Similarly, the conditions for politically optimal trade policies imply two of the conditions for globally optimal trade policies, since $W_{p_f} = G_{p_f} + G^*_{p_f} = 0$ and $W_{p^*_h} = G_{p^*_h} + G^*_{p^*_h} = 0$. Terms-of-trade manipulation is then the only source of inefficiency in trade policy choices.

Next we show the politically optimal wage subsidies imply another two of the conditions for global efficiency. For the wage subsidy, the conditions for the political optimum are

$$G_{p_h} \frac{dp_h}{ds_M} + G_{p^*_h} \frac{dp^*_h}{ds_M} = 0, \text{ and } G^*_{p^*_f} \frac{dp^*_f}{ds^*_M} + G^*_{p_f} \frac{dp_f}{ds^*_M} = 0.$$

Applying the politically optimal conditions for export policies $G_{p^*_h} = G^*_{p_f} = 0$ and the nonzero effects of subsidies on prices, we have simply

$$G_{p_h} = 0, \text{ and } G^*_{p^*_f} = 0.$$

We show these conditions imply that $W_{p_h} = 0$. Given that $G_{p_h} = 0$ and $W_{p_h} = G_{p_h} + G^*_{p_h}$, we must show that $G^*_{p_h} = 0$. Consider that Foreign only depends on Home market prices via the export volume per product c_f, so there is a relationship between $G^*_{p_h}$ and $G^*_{p_f}$. In particular,

$$\frac{G^*_{p_h}}{\frac{dc_f}{dp_h}} = \frac{G^*_{p_f}}{\frac{dc_f}{dp_f}}, \tag{14}$$

where the expression on either side of the equality reflects a partial effect of c_f on G^*. The politically optimal setting of the export policy implies that $G^*_{p_f} = 0$, so this partial effect of export volume on the Foreign government objective must be zero. Knowing that $\frac{dc_f}{dp_h} \neq 0$, $G^*_{p_h} = 0$, so the price of Home goods has no effect on Foreign government welfare. $G^*_{p_h} = 0$ and $G_{p_h} = 0$ then imply that $W_{p_h} = 0$. A similar argument shows that $W_{p^*_f} = 0$.

Similar to the first-best case, we show that zero trade taxes and wage subsidies $s_M = s^*_M = \frac{m}{\sigma}$ satisfy six of the conditions for the political optimum. First consider $G_{p_f} = 0$. The local Foreign price p_f has no effect on firm profits sans wage subsidy when $p_h = m$. The envelope theorem and consumer utility maximization imply the effect of p_f on the consumer utility of differentiated consumption $\frac{d}{dp_f} \frac{1}{\varepsilon - 1} P(\cdot)^{1-\varepsilon}$ is $-n_f c_f$. This is offset by the effect on trade tax revenue, holding other prices fixed: $n_f c_f$ (since $p_f - (1 + \phi)p^*_f = 0$ we can ignore $\frac{dc_f}{dp_f}$). The effects cancel so $G_{p_f} = 0$ holds. Next consider $G_{p^*_h} = 0$ The local Foreign price affects Home only through export volume $n_f c_f$, but with $p_h = p^w_h = m$ Home is indifferent to any changes in export volume, so the condition holds. Last, consider $G_{p_h} = 0$. The effect on firm profits sans wage subsidy is $n_h x_h$ and we can ignore $\frac{dx_h}{dp_h}$ when $p_h = m$. The effect

on consumption of differentiated products is $-n_h c_h$ and the effect on export tax revenue, holding the Foreign price fixed is $-n_h c_h^*(1 + \phi)$. Noting that $x_h = c_h + c_h^*(1 + \phi)$, $G_{p_h} = 0$ holds. The corresponding conditions for Foreign hold, so all six conditions hold.

Now we turn to the politically optimal conditions for firm entry. Since firm entry has no influence on prices, the conditions for the political optimum are the same as the noncooperative conditions:

$$G_{n_h} = 0, \text{ and } G_{n_f}^* = 0.$$

At the politically optimal conditions with free trade and prices equal to marginal cost, the conditions reduce nicely to

$$\frac{p_h c_h}{\sigma - 1} = f'(n_h), \text{ and } \frac{p_f^* c_f^*}{\sigma - 1} = f'(n_f).$$

A comparison to the globally optimal conditions (13) reveals that governments do not internalize the benefit of entry abroad, so at the standard political optimum we have

$$
\begin{aligned}
W_{n_h} &= G_{n_h}^* = \frac{p_h^* c_h^*}{\sigma - 1} > 0, \text{ and} \\
W_{n_f} &= G_{n_f} = \frac{p_f c_f}{\sigma - 1} > 0,
\end{aligned}
$$

so the global efficiency conditions fail.

Lemma 2 *The political optimum with individual product prices is inefficient due solely to the inefficiency in entry policy choices. There is an international inefficiency that does not flow through the world price of individual products.*

3.3 Politically Optimal Policies with World Price Indices

We now determine if the politically optimal policies are efficient using an alternative definition of the terms of trade. We define each nation's terms of trade to be the world price index for its export goods. The new definition implies that firm entry has a negative impact on a nation's own terms of trade, whereas in the previous subsection firm entry had no impact on the terms of trade.

First, observe that since the wage subsidy and trade policies impact only the world price in the world price index expression (10), the policies satisfying the politically optimal conditions for these six policies are the same using both definitions.

Using the government objectives with world price indices from Section 2.3, the Nash equilibrium conditions for firm entry are

$$\bar{G}_{n_h} + \bar{G}_{P_h^w}\frac{dP_h^w}{dn_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} = 0, \text{ and}$$

$$\bar{G}_{n_f}^* + \bar{G}_{P_f^w}^*\frac{dP_f^w}{dn_f} + \bar{G}_{D_f}\frac{dD_f}{dn_h} = 0.$$

The conditions for the political optimum are then

$$\bar{G}_{n_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} = 0, \text{ and } \bar{G}_{n_f}^* + \bar{G}_{D_f}\frac{dD_f}{dn_h} = 0.$$

Distinct from the noncooperative policies, the governments are not influenced by the effects of entry policy on the world price indices, $\bar{G}_{P_h^w}\frac{dP_h^w}{dn_h}$ and $\bar{G}_{P_f^w}\frac{dP_f^w}{dn_f}$.

Evaluating $\bar{G}_{n_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h}$ at the political optimum we have

$$\bar{G}_{n_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} = \frac{p_h c_h}{\sigma - 1} - f'(n_h) + P_h^w\frac{dD_h^*}{dn_h} - (1+\phi)\frac{d}{dn_h}\left(p_h n_h^{\frac{1}{1-\sigma}} D_h^*\right).$$

We contrast this expression with the one obtained from evaluating $G_{n_h} = 0$, the condition for the political optimum from the previous subsection. The terms $\frac{p_h c_h}{\sigma - 1} - f'(n_h)$ appear in both expressions and reflect the benefits and costs of new varieties. The new terms are the ones involving P_h^w and D_h^*. The term that has been excluded from the politically optimal condition by definition is $D_h^*\frac{dP_h^w}{dn_h}$. Since $(1+\phi)p_h n_h^{\frac{1}{1-\sigma}} D_h^* = P_h^W D_h^*$ when there is no Home export policy, we can rewrite the new terms as the negation of the omitted term:

$$\bar{G}_{n_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} = \frac{p_h c_h}{\sigma - 1} - f'(n_h) - D_h^*\frac{d}{dn_h}P_h^w(\cdot).$$

Further evaluating the expression, we have that $D_h^w\frac{d}{dn_h}P_h^w(\cdot) = -\frac{p_h^w c_h^*}{\sigma - 1} = -\frac{p_h^* c_h^*}{\sigma - 1}$. The last equality follows because trade taxes are zero. So the condition for the politically optimal level of firms is then

$$\bar{G}_{n_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} = \frac{p_h c_h}{\sigma - 1} + \frac{p_h^* c_h^*}{\sigma - 1} - f'(n_h) = 0.$$

This equation implies (13), the global efficiency condition for firm entry. The symmetric Foreign condition holds, so we have shown the political optimum with world price indices is globally efficient. Efficiency results because we have forced the Home government not to internalize its terms-of-trade decline. Consequently, Home internalizes the Foreign terms-of-trade gain and exhibits globally efficient behavior.

Proposition 1 *The political optimum is efficient when the terms of trade are defined as a price index.*

In the Appendix, we also extend this result to the case where the wage subsidy is harmonized at a fixed level that does not fully eliminate the monopoly distortion.

3.4 Sources of Inefficiency at the Nash Equilibrium

We now interpret the fully noncooperative policy choices at the Nash equilibrium. Each government maximizes its objective under each policy choice taking others as given. The first-order conditions for the four trade policy choices are

$$
\begin{aligned}
G_{p_f} &= 0, & G^*_{p_f}(1 + \tau_I) &= -G^*_{p^w_f}, \\
G_{p^*_h}(1 + \tau^*_I) &= -G_{p^w_h}, & \text{and } G^*_{p^*_h} &= 0.
\end{aligned}
$$

Using the representation of government preferences incorporating the world price indices, the first-order conditions for the entry policies are (repeated)

$$
\begin{aligned}
\bar{G}_{n_h} + \bar{G}_{P^w_h}\frac{dP^w_h}{dn_h} + \bar{G}_{D^*_h}\frac{dD^*_h}{dn_h} &= 0, \text{ and} \\
\bar{G}^*_{n_f} + \bar{G}^*_{P^w_f}\frac{dP^w_f}{dn_f} + \bar{G}_{D_f}\frac{dD_f}{dn_h} &= 0.
\end{aligned}
$$

Lastly the first order conditions for the wage subsidy are

$$
\begin{aligned}
G_{p_h}\frac{dp_h}{ds_M} + G_{p^*_h}\frac{dp^*_h}{ds_M} + G_{p^w_h}\frac{dp^w_h}{ds_M} &= 0, \text{ and} \\
G^*_{p^*_f}\frac{dp^*_f}{ds^*_M} + G^*_{p_f}\frac{dp_f}{ds^*_M} + G^*_{p^w_f}\frac{dp^w_f}{ds^*_M} &= 0.
\end{aligned}
$$

We interpret each of the conditions in turn.

3.4.1 Trade Policies

The simplest policies to interpret are the trade policies. We evaluate the global efficiency conditions $W_{p^*_h} = 0$ and $W_{p_f} = 0$ at the Nash policies:

$$W_{p_h^*} = G_{p_h^*} + G_{p_h^*}^* = \frac{-G_{p_h^w}}{(1 + \tau_I^*)} = \frac{-n_h c_h^*}{(1 + \tau_I^*)} \neq 0, \text{ and}$$

$$W_{p_f} = G_{p_f} + G_{p_f}^* = \frac{-G_{p_f^w}^*}{(1 + \tau_I)} = \frac{-n_f c_f}{(1 + \tau_I)} \neq 0.$$

The Nash policies are inefficient. The failure of the first-order condition implies that export prices are too high for global efficiency. The expressions reveal prices are too high because governments value their ability to manipulate the terms of trade. The value of terms-of-trade manipulation comes from the terms $-G_{p_h^w}$ and $-G_{p_f^w}^*$. Instead of setting the export prices satisfying $G_{p_h^*} = 0$, the Home government considers the negative effect on its terms of trade when setting a lower export tax (or higher export subsidy). The source of inefficiency is precisely the same as in Bagwell and Staiger (2009).

Further evaluating Home's unilateral import policy condition, we have

$$G_{p_f} = 0 \Rightarrow \tau_I = -(\frac{p_h - m}{p_f^w})(\frac{n_h}{n_f})(\frac{dc_h}{dp_f} / \frac{dc_f}{dp_f}). \tag{15}$$

Notice that the import tariff has no terms-of-trade effects in this special environment with CES consumer utility. This holds regardless of whether we consider the terms of trade to be a world price or a world price index. As such, the only potential motive for an import trade policy here is profit-shifting. If there is rent available because prices exceed marginal costs, Home will turn to import tariff protection, trading off the gains in profits from domestic sales against the inframarginal fall in tariff revenue from lower imports. Notice that the higher tariff leads to a loss to consumers and a marginal gain in tariff revenue that precisely offset each other.

Next we consider Home's unilateral export policy condition:

$$G_{p_h^*}(1 + \tau_I^*) + G_{p_h^w} = 0 \Rightarrow \tau_E = -(1 + \phi)(\frac{p_h - m}{p_h}) - \frac{c_h^*}{(1 + \tau_I^*)p_h} / \frac{dc_h^*}{dp_h^*}. \tag{16}$$

The first term reflects a profit-shifting motive. If prices were above marginal costs, the Home government would subsidize the price toward the marginal cost. Home would not drive the markup down to zero, however, because the export policy has a terms-of-trade effect. The effect takes a standard inverse trade elasticity form typical of optimal tariff problems. When price equals marginal cost, an export tax is chosen.

20

3.4.2 Domestic Wage Subsidy

The wage subsidy conditions are more complex than the others since the policy affects several prices. Using the formulas for the local and world prices, we can divide through by the effect of each subsidy on the prices to get

$$
\begin{aligned}
G_{p_h} + G_{p_h^*}(1 + \tau_E + \phi)(1 + \tau_I^*) + G_{p_h^w}(1 + \tau_E + \phi) &= 0, \text{ and} \\
G_{p_f^*}^* + G_{p_f}^*(1 + \tau_E^* + \phi)(1 + \tau_I) + G_{p_f^w}^*(1 + \tau_E^* + \phi) &= 0.
\end{aligned}
$$

To further interpret the expression, use the Nash export policy conditions $G_{p_h^*}(1 + \tau_I^*) = -G_{p_h^w}$ and $G_{p_f}^*(1 + \tau_I) = -G_{p_f^w}^*$ to get

$$
\begin{aligned}
G_{p_h} &= 0, \text{ and} \\
G_{p_f^*}^* &= 0.
\end{aligned}
$$

Notice that the Home wage subsidy condition also reflects a terms-of-trade motive $G_{p_h^w}(1 + \tau_E + \phi)$, but the noncooperative setting of the export policy completely eliminates the motive. Governments at noncooperative policies now choose domestic policies as if they have no ability to affect the world price and the local price in the export market. An interpretation common to Bagwell and Staiger (2001) and Antras and Staiger (2012a) is that the governments choose (unilaterally) efficient policies conditional on the trade volume.[28]

Another reason why the Home Nash wage subsidy condition reduces to $G_{p_h} = 0$ is the following relationship between the price effects on the trade policies and domestic policies:

$$
\frac{\frac{dp_h^*}{d\tau_E}}{\frac{dp_h^*}{ds_M}} = \frac{\frac{dp_h^w}{d\tau_E}}{\frac{dp_h^w}{ds_M}}.
$$

These ratios also represent the differential changes in the export tax and wage subsidy that keep p_h^* and p_h^w fixed. Thus, a crucial feature for home choosing unilaterally efficient domestic policies conditional on trade volume is that the same changes in trade policy and wage subsidy that keep the world price fixed also keep the export price fixed. This holds, of course, because p_h^* is proportional to p_h^w when holding the Foreign import tariff fixed.

---

[28] In Bagwell and Staiger (2001), where Home governments have preferences $W(s, p, p^w)$ depending on a domestic policy s, local relative price p, and the world relative price p^w, the domestic policy choice satisfies $W_s = 0$ at both the Nash equilibrium and the politically optimal policies.

The Nash wage subsidy conditions also make the so-called "policy substitution problem" in trade agreements apparent (see WTO 2012). Suppose Home export policies were constrained to satisfy $G_{p_h^*} = 0$, yielding a level of export taxes that satisfies the global efficiency condition $W_{p_h^*} = 0$. In such a scenario, the Home government would set $G_{p_h} = -G_{p_h^w}(1 + \tau_E + \phi)$. The wage subsidy then becomes the instrument for terms-of-trade manipulation, instead of the export policy.

Further evaluating the Nash conditions, we have

$$
\begin{aligned}
G_{p_h} &= 0 \Rightarrow (p_h - m)\frac{dc_h}{dp_h} + \tau_I p_f^w \left(\frac{n_f}{n_h}\right)\frac{dc_f}{dp_h} = 0, \text{and} \quad (17)\\
G_{p_f^*}^* &= 0 \Rightarrow (p_f^* - m)\frac{dc_f^*}{dp_f^*} + \tau_I^* p_h^w \left(\frac{n_h}{n_f}\right)\frac{dc_h^*}{dp_f^*} = 0.
\end{aligned}
$$

With the two previous conditions plus (15) and (16), we can easily show that the Nash policies are $\tau_I = \tau_I^* = 0$, $\tau_E = -\frac{c_h^*}{p_h}/\frac{dc_h^*}{dp_h^*} > 0$, $\tau_E^* = -\frac{c_f}{p_f^*}/\frac{dc_f}{dp_f} > 0$ and $s_M = \frac{m}{\sigma}$. At the Nash equilibrium, the government uses a wage subsidy to eliminate the monopoly distortion, leaving no motive for an import tariff policy, since the import policy has neither terms of trade nor profit-shifting effects. The sole motive for trade policy is then terms-of-trade manipulation via the export tax.

Next, we determine whether the global efficiency condition $W_{p_h} = 0$ holds at the Nash policies. Since $G_{p_h} = 0$, $W_{p_h} = G_{p_h}^*$. Because the Home price influences Foreign only through the Home export volume, the equation (14) implies $G_{p_h}^* = G_{p_f}^* \frac{dc_f}{dp_h}/\frac{dc_f}{dp_f}$. The Nash export policy condition implies $G_{p_f}^* = -G_{p_f^w}^*$, so at last we find

$$
\begin{aligned}
W_{p_h} &= G_{p_h}^* = G_{p_f}^* \frac{dc_f}{dp_h}/\frac{dc_f}{dp_f} = -G_{p_f^w}^* \frac{dc_f}{dp_h}/\frac{dc_f}{dp_f} = -n_f c_f \frac{dc_f}{dp_h}/\frac{dc_f}{dp_f} > 0, \text{and}\\
W_{p_f^*} &= G_{p_f^*} = G_{p_h^*} \frac{dc_h^*}{dp_f^*}/\frac{dc_h^*}{dp_h^*} = -G_{p_h^w} \frac{dc_h^*}{dp_f^*}/\frac{dc_h^*}{dp_h^*} = -n_h c_h^* \frac{dc_h^*}{dp_f^*}/\frac{dc_h^*}{dp_h^*} > 0.
\end{aligned}
$$

The efficiency condition fails because governments are raising the terms of trade for their exports above marginal cost, whereas absent the terms-of-trade motive, policy would satisfy $G_{p_f}^* = G_{p_h}^* = 0$. The condition's failure reflects that when a nation collects excess tax on exports, it benefits when competitors' prices rise in the export market.

To determine how nations would cooperate on the wage subsidy, we need to consider the cross-border effects on all prices, not just the local domestic prices. For the Foreign

government,

$$\frac{dG^*}{ds_M} = G^*_{p_h}\frac{dp_h}{ds_M} + G^*_{p_h^*}\frac{dp_h^*}{ds_M} + G^*_{p_h^w}\frac{dp_h^w}{ds_M}.$$

We know the export price has no effect, because Foreign achieves $G^*_{p_h^*} = 0$ by setting the import tariff. The remaining terms balance the loss to Foreign in the export market against the terms-of-trade improvement when the Home wage subsidy rises. Under symmetry, we can conclude the terms-of-trade effect dominates:[29]

$$\frac{dG^*}{ds_M} = \left(-n_f c_f \frac{dc_f}{dp_h}\Big/\frac{dc_f}{dp_f} - n_h^* c_h^*(1 + \phi + \tau_E)\right)\frac{dp_h}{ds_M} > 0. \qquad (18)$$

Nations would then benefit by raising their wage subsidies, holding other policies fixed.[30]

We can further show, however, that any benefit of a constraint on the wage subsidy would be completely undone by strategic setting of the export tax. An alternative expression for the unilateral export policy condition (16) reveals that governments would set the export tariff so that world price equals the marginal cost plus an inverse elasticity term, regardless of the wage subsidy.

$$G_{p_h^*}(1 + \tau_I^*) + G_{p_h^w} = 0 \Rightarrow p_h^w = m(1 + \phi) - p_h^*\Big/\frac{\widehat{c_h^*}}{\widehat{p_h^*}}. \qquad (19)$$

(Here hat notation reflects log derivatives, so $\frac{\widehat{c_h^*}}{\widehat{p_h^*}}$ is a price elasticity of export demand.) Consider Home agreeing to increasing its subsidy by a small amount s_M that all else equal would provide a net benefit to Foreign. Assume Home then also undertakes a strategic response in the export tax along the reaction curve $\frac{d\tau^E}{ds_M}_{|dG=0}$. Since the export tax shuts down the channel by which Foreign benefits and has no other effects, the overall effect is

$$\frac{dG^*}{ds_M} + \frac{dG^*}{d\tau^E}\frac{d\tau^E}{ds_M}_{|dG=0} = \left(-n_f c_f \frac{dc_f}{dp_h}\Big/\frac{dc_f}{dp_f}\right)\frac{dp_h}{ds_M} < 0.$$

The net Foreign effect of the Home policy changes is that Foreign is worse off, due to the distortion that subsidized Home prices have on Foreign export sales. If both countries undergo a small increase in wage subsidy, then both countries are worse off due to the strategic response of the other, while there is no first-order effect on their own objectives

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[29]With the postitive export tax at the Nash equilibrium, $(1 + \phi + \tau_E) > 1$. Also, $1 > \left|\frac{dc_f}{dp_h}\Big/\frac{dc_f}{dp_f}\right|$ because the own-price effect is greater than the cross-price effect on demand. So $-(\frac{dc_f}{dp_h}\Big/\frac{dc_f}{dp_f} + 1 + \phi + \tau_E) < 0$, and the subsidy s_M decreases p_h, leading to a positive total effect of the subsidy on Foreign welfare.

[30]We can also show that governments would lose from wage subsidy coordination if they were allowed to strategically respond to the wage subsidy rise with export tax increases. Horn, Maggi, and Staiger (2010) find similar results in a perfectly-competitive setting with a domestic subsidy.

from the changes in their own policies at the Nash equilibrium.[31] The results suggest a pitfall of deep integration—a contract over domestic policies that seems beneficial is not, once strategic responses are considered.[32]

Proposition 2 *When governments set their wage subsidy, taking the Nash equilibrium levels of other policies as given, they act as if they do not value their ability to affect their terms of trade or their export price. The level of the wage subsidy matches the first-best level. The wage subsidy choices do not satisfy the conditions for global efficiency. Nations increase global welfare from the Nash equilibrium by increasing their wage subsidies, holding other policies fixed. The increases in wage subsidies would lead to both nations being worse off if they respond strategically with their export taxes.*

3.4.3 Entry Policy

Now we turn to the entry policies. The goal here is to determine whether the availability of trade policies eliminates the terms-of-trade motive for the entry policy, as we have just shown for the wage subsidy.

First we consider the Nash entry policy choices. For brevity, we focus on the Home policy. We evaluate the first-order condition for the Nash entry subsidy at the Nash equilibrium trade taxes and wage subsidy. Some terms in the differentiated government objective (12) disappear: the effect on profits sans wage subsidy $(p_h - m)\frac{d(c_h n_h)}{dn_h}$ and the effect on import tariff revenue $\tau_I n_f \frac{dc_f}{dn_h}$. The remaining first-order effects of the entry policy on the government objective are the increase in consumption from the differentiated sector, the increase in inframarginal export tax revenue, and the marginal cost of the entry policy.

$$\frac{p_h c_h}{\sigma - 1} + \tau_E p_h \frac{d(n_h c_h^*)}{dn_h} = f'(n_h).$$

Substituting in the optimal export tax, we can simply the expression. The result takes a form that invites easy comparison with the global first-best entry condition (13):

$$\frac{p_h c_h}{\sigma - 1} + \frac{(1 + \phi)p_h c_h^*}{\sigma - 1} = f'(n_h). \tag{20}$$

When evaluated at first-best free trade policies, the first-best condition also simplifies to $\frac{p_h c_h}{\sigma - 1} + \frac{(1+\phi)p_h c_h^*}{\sigma - 1} = f'(n_h)$. Though the expression is the same as above, the firm levels will

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[31]We could also consider the joint strategic response of all policies, not just the export tax. Foreign would impose an import subsidy to collect subsidized products from Home in equilibrium, though this would also be undone by Home's export tax. The distortions in the pricing environment also reduce the benefits of encouraging entry. None of these effects work against the result that both countries are worse off.

[32]As mentioned in the introduction, Horn, Maggi, and Staiger (2010) find a similar result in a perfectly competitive environment.

be different, because the Nash export tax will be higher and the trade volume will be lower. The number of firms will be lower at the Nash equilibrium than at the first-best, because with the trade distortion in place, the benefit of entry will be lower.

For an intuitive derivation of the result, we write the Home export and entry policy conditions in terms of the price and quantity indices:

$$\bar{G}_{P_h^w}\frac{dP_h^w}{dp_h^w}\frac{dp_h^w}{d\tau_E} + \bar{G}_{D_h^*}\frac{dD_h^*}{dp_h^*}\frac{dp_h^*}{d\tau_E} = 0, \text{ and}$$

$$\bar{G}_{P_h^w}\frac{dP_h^w}{dn_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} + \frac{p_h c_h}{\sigma - 1} + \frac{(1+\phi)p_h c_h^*}{\sigma - 1} = f'(n_h).$$

We acquire these first-order conditions by differentiating (12). The $\frac{(1+\phi)p_h c_h^*}{\sigma-1}$ term derives from simplifying $-D_h^*(1+\phi)p_h\frac{dn_h^{\frac{1}{1-\sigma}}}{dn_h}$.

We can easily verify by log-differentiating (10) and (11),[33]

$$\frac{\frac{dP_h^w}{dp_h^w}\frac{dp_h^w}{d\tau_E}}{\frac{dP_h^w}{dn_h}} = \frac{\frac{dD_h^*}{dp_h^*}\frac{dp_h^*}{d\tau_E}}{\frac{dD_h^*}{dn_h}}, \tag{21}$$

so the export tax condition implies $\bar{G}_{P_h^w}\frac{dP_h^w}{dn_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} = 0$, leaving behind (20) as the entry policy condition.

The analogy with the wage subsidy case is clear. The first-order condition for the export policy completely eliminates the terms-of-trade motive for the Home government. We can interpret the ratios as implying that the combination of export taxes and firm counts that hold the terms of trade P_h^w fixed also hold the export composite D_h^* fixed. In the language of Bagwell and Staiger (2001) and Antras and Staiger (2012a), the Nash domestic policy choice is (unilaterally) optimal conditional on trade volume, though here trade volume must be the composite export volume and not the trade volume $n_h c_h^*$ (we discuss this further next section).

Having established that the level of the domestic policy is not efficient, we turn to evaluating the global efficiency condition at the Nash policies. Since $G_{n_h} = 0$ we have that $W_{n_h} = G_{n_h}^*$ This expression becomes

$$W_{n_h} = G_{n_h}^* = \frac{p_h^* c_h^*}{\sigma - 1} + \tau_E^* n_f \frac{dc_f}{dn_h}.$$

As usual, the first term is the positive externality of Foreign firm entry. The effect Home firm entry has on Foreign export tax revenue does indeed mitigate the positive externality

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[33]The Nash import tariff condition is used in evaluating the equality. Each ratio evaluates to $(1-\sigma)\frac{n_h}{p_h^w}$.

from Home entry, as entry has a negative effect on the Foreign per firm exports c_f. Further evaluating,

$$W_{n_h} = \frac{p_h^* c_h^*}{\sigma - 1} + \left(\frac{n_f}{n_h}\right) \frac{p_f c_f}{\sigma - 1} \left(\frac{\widehat{c_f}}{\widehat{p_h}} / \frac{\widehat{c_f}}{\widehat{p_f}}\right). \tag{22}$$

We can intuit that the expression will be positive because own-price elasticity for Foreign exports is larger in absolute terms than the cross price elasticity.

Imposing symmetry, we have

$$W_{n_h} = \varepsilon \frac{p_f c_f}{(\sigma - 1)} / \left(-\frac{\widehat{c_f}}{\widehat{p_f}}\right) > 0. \tag{23}$$

The ε arises because the net effects act like an increase in the whole Foreign price index and ε is the elasticity of consumption for the composite differentiated good.

Notice the analogy with the wage subsidy. In both cases, the larger firm entry or wage subsidy from Home benefits Foreign through a Foreign terms-of-trade gain and hurts Foreign through a reduction in Foreign's exports, with the terms-of-trade effect dominating.

The results raise an additional question, if governments attempt a second-best coordination of firm entry to increase trade in the absence of trade tax cooperation, will the benefits be undone by the strategic responses of other policies? In contrast to the wage subsidy results from the previous subsection, the answer is no. If both nations coordinate symmetrically so the firm counts in each nation remain equal, there is no strategic response from the other six policy choices, which do not depend on the number of firms. To verify this, one can write the expressions (15), (16), and (17) in terms of price elasticities of demand, and observe that the elasticities do not depend on the number of firms when $n = n^*$ under symmetry.[34] The results imply nations could achieve second-best gains by direct negotiations over the number of firms if cooperation over trade taxes were infeasible.[35]

Proposition 3 *When governments set the entry policy, taking the Nash equilibrium levels of other policies as given, they act as if they do not value their ability to affect either their terms of trade or their export bundle. The entry policy choices lead to firm counts lower than the first-best level. The entry policy choices do not satisfy the conditions for global efficiency. Nations increase global welfare from the Nash equilibrium by choosing entry policies that increase firm entry, regardless of whether nations can respond strategically with their other*

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[34]The elasticities depend only on the parameters ε and σ and market shares of consumption. This can be seen by totally differentiating the demand system, as in the Appendix of DeRemer (2013). The market shares in Equation (2) do not depend on the number of firms when $n = n^*$, because the total expenditure PD is also scaled by the number of firms in each country.

[35]If we were to embed this model in a richer model of contracting like Horn, Maggi, and Staiger (2010), one could compare the second-best contract here to shallow integration in the next section. We come back to this point in the conclusion.

policy choices.

Notice that the ease by which we have shown that the second-best contract improves welfare does depend on special features of the environment: the CES preferences, and the entry policy singly determining the number of firms in each nation. The model does still raise the possibility that domestic policies affecting extensive margins of production rather than intensive margins could generally motivate second-best contracts even in richer environments.

4   Shallow Integration

This section determines whether countries can achieve efficient policies without contracting directly over domestic policies, following Bagwell and Staiger (2001) and Antras and Staiger (2012a). We first consider whether shallow integration can preserve efficiency at first-best free trade policies. This simple case will give us insight into which shallow contracts will be optimal in the current setting. We then generalize the result beyond the free trade case. Lastly, we compare the efficient rules in the current setting to past theory and practice.

We first ask, what constraints on domestic policies and trade policies can preserve the first-best choices when governments optimize subject to the constraints? Recall the first-best policies at free trade are also the politically optimal policies from Section 3.3. We can easily determine that some constraint on domestic policies must be necessary for efficiency. Otherwise, a nation could cut its wage subsidy or reduce domestic firm entry to improve its terms of trade. The idea of shallow integration is that by constraining a nation's policies to preserve market access, they will also preserve the welfare of the trading partner, thus preventing the need to contract over any individual policy. The standard algorithm is that governments first negotiate over import and export taxes, and then the negotiated level of taxes and the prevailing domestic policies imply a commitment to market access. The question then remains, what is the appropriate measure of market access?

We show that an ineffective measure of market access here is trade volume, a measure common to the prior literature in a homogeneous good setting. Consider Foreign policy changes holding Home policies fixed at efficient policies. The Home objective as a function of the Foreign firm count and export price is

$$\frac{1}{\varepsilon - 1} P(n_f, p_f)^{1-\varepsilon} - f(\breve{n}_h),$$

where terms with the inverted hat are fixed, and we have omitted the objective's dependence on other constant Home policies. Clearly any change in Foreign policy mix that preserves

Home welfare cannot increase the Home price index. The objective can also be written as

$$\frac{1}{\varepsilon - 1}(\breve{p}_h \breve{n}_h \breve{c}_h(P(n_f, p_f)) + p_f n_f c_f(n_f, p_f) - f(\breve{n}_h)$$

where we have used that total expenditure $PD = P^{1-\epsilon}$, defined $\breve{c}_h(P) \equiv \breve{p}_h^{-\sigma} P^{\sigma-\epsilon}$, and omitted the dependence of c_f on fixed home policies.

Now consider Foreign selecting a small decrease in Foreign firms and a small increase in export subsidy such that Foreign's export volume to Home $n_f c_f$ is unchanged. The export subsidy increase implies the price p_f has fallen. With $n_f c_f$ unchanged, we must have a fall in expenditure on Foreign goods $p_f n_f c_f$. We now prove by contradiction that the Home objective must fall. Suppose the Home objective (weakly) increases from the status quo. Then the price index P must (weakly) decrease. Since c_h is increasing in P, c_h must (weakly) decrease, and $\breve{p}_h \breve{n}_h \breve{c}_h$ must (weakly) decrease. Then total expenditure $\breve{p}_h \breve{n}_h \breve{c}_h + p_f n_f c_f$ must strictly decrease because expenditure on foreign goods strictly decreases. If total expenditure decreases, the price index must have risen, so we have a contradiction. Foreign's small decrease in firms and small increase in export subsidy preserving $n_f c_f$ then makes Home worse off. The result reflects Home's love of variety.

We now show that a viable market access rule in the differentiated product setting is one that preserves either the price index $P_f^w = p_f^w n_f^{\frac{1}{1-\sigma}}$ or the composite Foreign export good

$$D_f = n_f^{\frac{-\sigma}{1-\sigma}} c_f(p_f, P(p_f, n_f)),$$

where we have again suppressed dependence of the Home price index on Home policies. We show now that changes in the Foreign policies that preserve these expressions do in fact preserve the Home objective. A key observation from totally log differentiating the Home price index P in equation (4) is that a Foreign policy mix preserves the price index if and only if the log differential effects of Foreign policies satisfy $\frac{1}{\sigma-1}\hat{n}_f = \hat{p}_f$. Log-differentiating P_f^w and D_f (note $\hat{p}_f^w = \hat{p}_f$), we get

$$\hat{P}_f^w = \hat{p}_f^w + \frac{1}{1-\sigma}\hat{n}_f, \text{ and}$$
$$\hat{D}_f = \frac{-\sigma}{1-\sigma}\hat{n}_f - \sigma \hat{p}_f + (\sigma - \varepsilon)(1 - S)(\hat{p}_f - \frac{1}{\sigma - 1}\hat{n}_f).$$

It is immediately clear then that at efficient policies, Foreign policy changes satisfying $\hat{P}_f^w = 0$ or $\hat{D}_f = 0$ then satisfy $\frac{1}{\sigma-1}\hat{n}_f = \hat{p}_f$ and therefore $\hat{P} = 0$, so the Home objective is preserved despite the Foreign policy changes.

For a more general interpretation, consider the first-order conditions for the export tax, wage subsidy, and entry policy in the constrained maximization problem such that Home optimizes policies subject to the constraint $D_h^* \geq \bar{D}_h^*$ with Lagrange multiplier $\lambda \geq 0$:

$$
\begin{aligned}
\lambda \frac{dD_h^*}{dp_h^*}\frac{dp_h^*}{d\tau_E} + \bar{G}_{P_h^w}\frac{dP_h^w}{dp_h^w}\frac{dp_h^w}{d\tau_E} + \bar{G}_{D_h^*}\frac{dD_h^*}{dp_h^*}\frac{dp_h^*}{d\tau_E} &= 0, \\
\lambda \frac{dD_h^*}{dp_h^*}\frac{dp_h^*}{ds_M} + \bar{G}_{P_h^w}\frac{dP_h^w}{dp_h^w}\frac{dp_h^w}{ds_M} + \bar{G}_{D_h^*}\frac{dD_h^*}{dp_h^*}\frac{dp_h^*}{ds_M} &= -\bar{G}_{p_h} \\
\lambda \frac{dD_h^*}{dn_h} + \bar{G}_{P_h^w}\frac{dP_h^w}{dn_h} + \bar{G}_{D_h^*}\frac{dD_h^*}{dn_h} &= f'(n_h) - \frac{p_h c_h}{\sigma - 1} - \frac{(1+\phi)p_h c_h^*}{\sigma - 1}.
\end{aligned}
$$

Because differential changes in τ_E and s_M that hold P_h^w fixed also hold D_h^* fixed as in (21), the wage subsidy and entry policy conditions reduce simply to the same conditions we found for the unconstrained Nash equilibrium:[36]

$$
\begin{aligned}
G_{p_h} &= 0, \text{ and} \\
f'(n_h) &= \frac{p_h c_h}{\sigma - 1} + (1+\phi)p_h c_h^*.
\end{aligned}
$$

Binding constraints leading to positive λ will then reduce the fundamental inefficiency in the export tax and drive results toward efficient policy choices.

Proposition 4 *If Foreign chooses optimal policies subject to a market access rule that requires Foreign to preserve either its terms of trade P_f^w or its composite export good D_f, then Foreign chooses domestic policies as if it did not value its ability to the manipulate its terms of trade or its composite export bundle..*

The market access constraint allows Home to internalize completely the local price and terms-of-trade effects of its policies, even as nations achieve trade tax cooperation. Absent trade cooperation, the export tax causes home to internalize the terms-of-trade effects. The constraint eliminates the "policy substitution" problem such that Home would start further distorting its entry policy once the export tax has been reduced. The results imply that contracting over a particular market access formula will eliminate the policy substitution problem if the market access measure satisfies the same proportionality condition as in Equation (21) with respect to the terms of trade. Or an alternative sufficient condition is

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[36]The result requires the Nash Foreign import tariff condition, unaffected by the constraint. If the import tariff caused terms-of-trade effects, there would be a market access rule helping Foreign exporters.

that changes in trade and domestic policies holding the terms of trade fixed also hold the market access measure fixed.[37]

When comparing market access rules here in theory to the GATT in practice, the immediate observation is that negotiations have typically focused on the market access of a nation's exporters (tied to import tariff commitments) rather than the market access of a nation's consumers (tied to export tariff commitments or, in theory, minimum export subsidy commitments). Commitments to exporter market access have been the focus of theory, namely Bagwell and Stagier (2001). The threat of an Article XXIII nonviolation complaint is what allows nations to maintain market access commitments, and these complaints have all regarded commitments implied by import tariff negotiations (see Staiger and Sykes forthcoming). In the current paper, a market access commitment for exporters accomplishes nothing, because there is no need to coordinate over import tariffs. Antras and Staiger (2012a) model market access commitments for consumers implied by export tax bounds but do not discuss any practical distinction between the two forms of market access. The market access rule based on export tax commitments should be understood as a theoretical proposal distinct from standard practice under the GATT.

5   Conclusion

This paper's first contribution is generalizing the shallow integration approach and the terms-of-trade theory of trade agreements to an imperfectly competitive, many good environment. In the setting here, many domestic policy choices have international implications, but as in the perfectly competitive case of Bagwell and Staiger (2001), all the cross-border externalities still depend on trade—if trade were shut down, the externalities would cease to exist. Once recognizing that all the international externalities depend on trade, it should then come as no surprise that terms-of-trade manipulation is a fundamental problem. The paper has also highlighted the fragility of shallow integration.

One interesting extension would be to embed this model in a richer costly contracting environment like Horn, Maggi, and Staiger (2010) to evaluate whether nations would ever choose the second-best direct negotiations on entry policies from Proposition 3 over the first-best shallow integration from Proposition 4. If the costs of shallow integration are larger than the direct contracting, then the first-best can become second-best. The simplicity of

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[37]We can see why market access constraints fail in the bilateral bargaining model of Antras and Staiger (2012a). In that model, the first-order effects of the Foreign domestic subsidy on the Foreign price and world price are equal, but the first-order effects of the export tax on the Foreign price and world price are not equal. And as the authors state, there are changes in trade and domestic policies that preserve the trade volume but do not preserve the terms of trade.

the shallow integration rules would seem to imply lower contracting costs, but a difficulty may lie in actually determining violations of shallow integration rules.

A valuable direction in understanding the pitfalls of shallow integration would be to better consider the realistic challenges in applying the Article XXIII nonviolation complaint, which is the type of dispute that enforces the shallow integration approach. In practice, much contracting over non-tariff measures appears to be over barriers to trade that could conceivably call for a nonviolation complaint (see WTO 2012). One potential obstacle is the challenge of filing successful Article XXIII nonviolation complaints.[38] Further exploration of the tradeoffs between the two approaches is necessary.

A challenge for the shallow integration approach is the lack of export tax commitments, implying a lack of consumer market access commitments via export tax commitments. Does the observed lack of export taxes imply that domestic policies with positive cross-border externalities arising through exports are just a theoretical curiosity? Or does deep integration substitute for the lack of consumer market access commitments? These are key questions for how trade agreements and the WTO should regulate non-tariff measures in the future.

A   The Political Optimum With a Fixed Wage Subsidy

This section shows that the political optimum with world price indices is still efficient even if governments do not correct the monopoly distortion. We impose an exogenous restriction looser than the complete absence of the wage subsidy. Suppose governments agree on an internationally harmonized wage subsidy at a fixed level in the interval $[0, \frac{m}{\sigma})$ that does not eliminate the monopoly distortion. We fix the local domestic prices at $\tilde{p}_h$ and $\tilde{p}_f^*$ greater than m and evaluate trade agreement problems. While such an agreement is ad hoc, much of the debate over domestic policy coordination concerns harmonization.[39] This appendix can then be interpreted as evaluating whether inefficient harmonization creates more trade agreement problems.

We derive the politically optimal policies to evaluate whether there are trade agreement problems aside terms-of-trade manipulation. As we derive the politically optimal policies, we compare them to the "second-best" efficient policies under the wage subsidy constraint.

We will use the politically optimal policies with price indices (as in Section 3.3) throughout. The politically optimal trade policy conditions are

$$\bar{G}_{p_f} = 0, \ \bar{G}_{D_h^*} = 0, \ \bar{G}_{p_h^*}^* = 0, \text{ and } \bar{G}_{D_f}^* = 0.$$

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[38] See, for example, Roessler F. and P. Gappah (2005) and Staiger and Sykes (forthcoming).

[39] See Bhagwati and Hudec (1996) for a wide range of views on the debate over harmonization.

These four conditions imply the global efficiency conditions for trade policies, $W_{p_f} = 0$ and $W_{p_h^*} = 0$ because

$$W_{p_f} = G_{p_f} + G_{p_f}^* = \bar{G}_{p_f} + \bar{G}_{D_f}^* \frac{dD_f}{dp_f} = 0, \text{ and}$$

$$W_{p_h^*} = G_{p_h^*} + G_{p_h^*}^* = \bar{G}_{D_h^*} \frac{dD_h^*}{dp_h^*} + \bar{G}_{p_h^*}^* = 0.$$

In satisfying these two global efficiency conditions for traded prices, the results match Bagwell and Staiger (2009), who also abstract from a domestic policy that can fix the monopoly distortion. Now we determine implicit expressions for the politically optimal policies. Using the condition $\bar{G}_{p_f} = 0$, we implicitly determine Home's politically optimal import tariff,

$$\tau_I = -(\frac{\tilde{p}_h - m}{p_f^w})(\frac{n_h}{n_f})(\frac{dc_h}{dp_f}/\frac{dc_f}{dp_f}) > 0, \tag{24}$$

and $\bar{G}_{D_h^*} = 0$ explicitly determines home's politically optimal export policy, which now is an export subsidy,

$$\tau_E = -(1 + \phi)(\frac{\tilde{p}_h - m}{\tilde{p}_h}) < 0. \tag{25}$$

Governments impose an export subsidy that eliminates the remaining distortion in the export prices. Governments select an import tariff that balances profit-shifting motives against the welfare loss of their own consumers. From the global perspective, the positive tariff corrects the distortion between unsubsidized domestic goods and traded goods.

Now we consider the politically optimal Home entry policy. The condition $\bar{G}_{n_h} + \bar{G}_{D_h^*} \frac{dD_h^*}{dn_h} + G_{D_f} \frac{dD_f}{dn_h} = 0$ simplifies to $\bar{G}_{n_h} + G_{D_f} \frac{dD_f}{dn_h} = 0$ using the politically optimal export subsidy condition. If the politically optimal condition is satisfied, then the actual effect on Home's objective must equal the omitted term in the politically optimal welfare condition:

$$\frac{dG}{dn_h} = G_{P_h^w} \frac{dP_h^w}{dn_h} = -\frac{p_h^w c_h^*}{\sigma - 1}.$$

To derive the effect of Home entry on Foreign, notice that we can ignore the effects on $G_{D_f}^*$ because these effects are zero due to the Foreign export subsidy condition. Home will not internalize the effect its entry has on foreign domestic sales, foreign tariff revenue, and

foreign consumer welfare. The expression evaluates to the additive inverse of $\frac{dG}{dn_h}$:[40]

$$\frac{dG^*}{dn_h} = (\tilde{p}_f^* - m)c_f^* \left(\frac{n_f}{n_h}\right) \frac{\widehat{\widehat{c_f^*}}}{\widehat{n_h}} + \tau_I^* p_h^w c_h^* \left(1 + \frac{\widehat{\widehat{c_h^*}}}{\widehat{n_h}}\right) + \frac{p_h^* c_h^*}{\sigma - 1} = \frac{p_h^w c_h^*}{\sigma - 1} = -\frac{dG}{dn_h}.$$

Thus we have that $\frac{dW}{dn_h} = 0$ so the number of firms is globally efficient. A similar proof shows that $\frac{dW}{dn_f} = 0$. The political optimum is globally efficient even in the presence of the monopoly distortion.

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[40]We can show the first two terms combine to equal $\frac{\tau_I^* p_f^w c_h^*}{\sigma - 1}$. The expression simplifies nicely because $\left(1 + \frac{\widehat{\widehat{c_h^*}}}{\widehat{n_h}}\right) = \frac{1}{1-\sigma}\left(1 + \frac{\widehat{\widehat{c_h^*}}}{\widehat{p_h^*}}\right)$ and $\frac{\widehat{\widehat{c_f^*}}}{\widehat{n_h}} = \frac{1}{1-\sigma}\frac{\widehat{\widehat{c_f^*}}}{\widehat{p_h^*}}$. The Nash import tariff first-order condition implies $\tau_I^* p_f^w c_h^* = -(\hat{p}_f^* - m)\left(\frac{n_f}{n_h}\right)c_f^*\frac{\widehat{\widehat{c_f^*}}}{\widehat{p_h^*}}/\frac{\widehat{\widehat{c_h^*}}}{\widehat{p_h^*}}$.

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