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ABSTRACT

Deepening of Regional Integration and Multilateral Trade Agreements?

We construct a three-country, two-bloc, multi-product trade model in which tariff agreements between customs union members are binding whereas inter-bloc tariff agreements are self-enforcing. Our main objective is to explore how the liberalization of trade between customs union members (i.e. the deepening of regional integration) affects the sustainability of tariff agreements with the rest of the world (ROW). We derive conditions under which Kemp-Wan (1976) adjustments in the external tariffs of union members result in self-enforcing tariff agreements with ROW and then use these adjustments to evaluate the general tariff-setting incentives of the two trading blocs.

JEL Classification: F02, F13, F15
Keywords: regional integration, sustainable tariff agreements, Kemp-Wan tariff adjustments, Europe '1992'

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NON-TECHNICAL SUMMARY

One of the major concerns about the recent spread and deepening of regional integration arrangements has been whether they undermine trends toward global trade liberalization. On spread, this has been expressed as a question of whether regional agreements are 'building blocs' or 'stumbling blocs' (Bhagwati (1991)), or whether there is a 'rebuttable presumption in favour of all the lateral reductions in trade barriers, whether they be multi, uni, tri, [or] plurilateral' (Summers (1991)). On deepening, economists and policy-makers have debated whether completing the single market in Europe would generate 'Fortress Europe'. Theoretical models have been developed to grapple with the spread of regionalism focusing, *inter alia*, on the increased market power that partners obtain *vis-à-vis* the rest of the world by coordinating their tariff policies. To our knowledge, however, no formal treatments exist of the deepening of an existing bloc – the 'Fortress Europe problem' – in which the partners have already agreed to set a common external tariff but may wish to vary it as they become more closely integrated. This Paper seeks to fill that gap.

We present a three-country model in which we analyse the effects of deepening integration between two of the countries on trade relations with the third. We suppose that the former countries have already formed a union with a common external tariff and focus on the effects of further intra-union trade liberalization, as represented by a reduction in the tariff between the two countries. Given the lack of effective international mechanisms for enforcing trade accords, we require tariff agreements between the union and the outside country to be self-enforcing – i.e. countries adhere to them because doing so is the best of their available policy options. We assume that the union and the non-member country interact frequently to negotiate tariffs and that the (credible) threat of a trade war in the future enables them to sustain trade agreements that yield pay-offs superior to those that would emerge if they negotiated only once. A trade agreement is termed 'incentive-compatible' (and hence self-enforcing) if its pay-offs exceed those obtained under an optimal deviation. The latter entails the deviating party reneging on the agreement by setting its short-run optimal tariff for one period (i.e. between two negotiations) followed by a period of trade war as its partner retaliates.

We use this framework to examine how tariff cuts within the union affect the incentive-compatibility of agreements with the outside country. It turns out that the so-called Kemp-Wan tariff reduction – the reduction in the union's external tariff that just leaves the outside country indifferent to the internal tariff reduction – is a useful benchmark for this. We show that under certain circumstances, this is precisely the external tariff reduction necessary to preserve the incentive-compatibility for both partners. That is, if, starting from

an agreement that is just on the border of sustainability, the union liberalizes trade internally and makes the corresponding Kemp-Wan reduction externally, the resulting agreement will also be sustainable.

For the outside country, the reduction in the union's internal tariffs reduces the attractiveness of an initial trade agreement because its trade with the union is reduced as intra-union trade increases. The Kemp-Wan reduction in the union's external tariff, however, will just restore incentive compatibility for the outside country because it restores both its welfare under the agreement and its incentive to violate it to their initial levels. For the union, a Kemp-Wan adjustment generates two conflicting forces. First, the initial trade agreement becomes more attractive to union members because the expanded volume of intra-union trade raises the welfare of member countries at the initial level of external tariff. This suggests that the union could 'live with' a lower tariff on the outside country. On the other hand, deviating from the agreement also becomes more attractive because the pay-off to cheating also rises. This suggests that the external tariff needs to rise in order to keep the union in the agreement. (A high tariff makes sticking to the agreement more attractive.) We find that the first effect almost always dominates the second, so that incentive-compatibility is consistent with a fall in the union's external tariff. To be precise, we show that these two forces on the union exactly offset each other if the share of union expenditure on union goods is invariant with respect to the external tariff. In that case, since the Kemp-Wan tariff reduction is incentive-compatible for both the union and the outside country, internal liberalization plus a Kemp-Wan reduction will generate a new sustainable agreement. Of course, many other agreements will also be sustainable, so there is no guarantee that the Kemp-Wan reduction in the external tariff will actually be chosen, but at least for one simple representation of the negotiating process we can show that it will be.

If the share of union expenditure on union goods rises as the external tariff rises (heuristically, if demand is elastic) the Kemp-Wan tariff reduction is not incentive-compatible for the union: that is, if the original agreement was just sustainable, internal liberalization plus a Kemp-Wan reduction will leave the union preferring to defect than to cooperate. As a result, the union, while likely to reduce its external tariff somewhat, will not be prepared to go as far as the Kemp-Wan reduction. Since the latter is necessary to keep the outside country at its initial level of welfare, the presumption is that, under these circumstances, the outside country will suffer from the union's internal liberalization. If the share of union expenditure on union goods decreases as the external tariff rises (inelastic demand) the argument is reversed: the Kemp-Wan reduction would leave the union inside its incentive-compatibility boundary and thus it would be able to make a larger tariff cut and still leave the resulting trade agreement sustainable.

We also extend our analysis to examine how tariff-setting incentives are affected by the existence of lobbying by special interests. Following Grossman and Helpman (1994) we assume that organized lobbies make campaign contributions to politicians in order to influence their policy choices. In these circumstances, the objectives of policy-makers may be thought of as being the product of national welfare (as studied in our benchmark model) and a term involving the share of income accruing to the organized special interests. We show that our result on the relationship between the Kemp-Wan tariff reduction and the incentives of the outside country remains qualitatively intact. However, the policy-making incentives of the union are now more complicated because a Kemp-Wan reduction in the external tariff affects not only welfare as above, but also the income share of special interests. Numerical analysis reveals that the incentive-compatibility of Kemp-Wan adjustments is conditioned by the organization of political markets and the degree of similarity in endowments between countries.

The model developed here is very specialized, but it helps to elucidate the forces on external trade policy that attend deepening internal integration. To our knowledge, this is the only formal analysis of the effect of the single European market program on the multilateral trading system. It suggests that '1992' will set up forces that lead the EU to liberalize its trade with the rest of the world (the Uruguay Round, perhaps?) but that, depending on economic parameters, this may or may not leave the rest of the world worse off as a result of the deepening integration.

1. Introduction

One of the major concerns about the recent spread and deepening of preferential trade arrangements has been whether they undermine trends toward global trade liberalization. This has been described as the question of whether regional trade agreements are "building blocks" or "stumbling blocks" (Bhagwati, 1992), or whether there is a "rebuttable presumption in favor of all the lateral reductions in trade barriers, whether they be multi, uni, tri, plurilateral" (Summers, 1991). In the same spirit, economists and policy makers have debated whether completing the single market in Europe would generate "Fortress Europe." The theoretical literature on the relationship between regional trade agreements and the multilateral trading system (e.g., Kennan and Riezman (1990), Krugman (1991), Bond and Syropoulos (1996a,b), Bagwell and Staiger (1997a,b)) has focused on the question of how the formation of trading blocs may affect trade relations with outside countries, using alternative assumptions about the tariff-setting game played between the union and the rest of the world (ROW). A key element in this literature has been how the formation of trading blocs affects the collective market power of their constituent members either through its impact on optimal external tariffs, the severity of "punishments" that may be imposed in the event of disagreement, or the bargaining power of the negotiating parties.[1]

One issue which, to our knowledge, has not been treated formally in the literature is how the "deepening" of integration in an existing trading bloc affects the multilateral trading system. This paper

[1] One branch of the literature--including Kennan and Riezman (1990), Krugman (1991), Bond and Syropoulos (1996a), and Syropoulos (1999)--examines the case in which external tariffs of trading blocs are set non-cooperatively in a single period tariff-setting game. A second branch (Bond and Syropoulos (1996b), Bagwell and Staiger (1997a,b)) places the issue of enforcement at center stage for inter-bloc trade by requiring inter-bloc tariffs to be determined in repeated games between trading blocs. In this literature, bloc members are assumed to be able to commit to internal free trade. Bagwell and Staiger (1998) study interactions between multilateral and regional agreements in a three-country model where two countries are more patient, and hence more inclined to engage in trade liberalization. Ludema (1996) allows trade agreements to be the result of explicit negotiations between trading partners and, treating preferential trade arrangements as outside options, examines how the formation of customs unions and free trade areas affects the bargaining power of the participating countries and the distribution of gains from cooperation.

seeks to fill this gap by providing a framework to analyze how further liberalization between two countries within a trade bloc affects the sustainability of tariff agreements with an outside country. By focusing on existing blocs, we abstract from the issue of market power in trade negotiations due to harmonization of external policies and emphasize instead the tensions on trade agreements generated by changes in trade patterns associated with deepening of integration. This is an important question because, even though Article XXIV of the GATT specifies that preferential trade arrangements should eliminate trade barriers on "substantially all trade" within a "reasonable time," the time lag between the initial formation of blocs and the completion of integration can be quite long in practice. And if one views the notion of trade barriers broadly, US-Canadian trade is far from being as free as internal trade in either country (Helliwell, 1998), and the European Union is still actively trying to reduce internal frictions even after the completion of its Single Market Programme. Similarly, the timetable for tariff reductions for most products under Mercosur spans a period of 10 years, and does not include any timetable for free trade in services.[2] The concern about the effects of integration on outside countries is reflected in the Article XXIV requirement that the common external tariff not be on the whole more restrictive than the "general incidence" of duties before the regulation. Our analysis allows us to formalize the relationship between the degree of internal trade liberalization and the adjustments in the external tariff that are necessary to maintain external trade agreements.[3]

To address these issues we utilize a three-country, three-good endowment model of international trade in which consumers have identical preferences with a constant elasticity of substitution, σ. Two of the countries are assumed to have formed a preferential trade arrangement with a common external tariff

[2] While the timetable for reductions may actually be included in preferential trade agreements, the fact that timetables have frequently not been met in practice suggests that successful completion of subsequent steps will in fact represent new information to the multilateral trading system that may generate new tensions on existing multilateral agreements.

[3] Baldwin and Venables (1995), and Winters (1999) are useful surveys of the literature on international economic integration.

and partial liberalization of internal trade. We model trade agreements between the union and the outside country as the outcome of an infinitely repeated game in which the (credible) threat of a trade war in the future enables the two parties to sustain tariff rates below those in the one-shot game. With the endowment structure we consider, the liberalization of intra-union trade causes trade diversion which reduces the attractiveness of the initial agreement to the outside country and raises its incentive to violate it. To prevent the breakdown in trade relations, the union has to reduce its external tariff. This raises the question of how large the external tariff reduction should be for the outside country's adherence to its initial tariff commitment to be incentive-compatible.

The notion of a Kemp-Wan tariff adjustment by the union (Kemp and Wan, 1976)--a reduction in the union's external tariff that just leaves the outside country indifferent to internal tariff cuts--turns out to be a valuable benchmark in answering this question. The Kemp-Wan tariff adjustment has played an important role in the customs union literature because it establishes the existence of a tariff reduction that leaves ROW unaffected by the formation of a customs union, and hence creates the potential for customs unions to raise welfare in the Pareto sense. For inter-bloc trade agreements to be self-enforcing, the requirement that payoffs in ROW remain unaffected as the harmonization of policies within a customs union proceeds is insufficient. To ensure that both parties prefer the payoff under the new trade agreement one must also examine the effect of such tariff adjustments on the payoffs each party can attain under the agreement, an optimal deviation, and retaliation.

We characterize the Kemp-Wan adjustment in the external tariff and show that the required reduction in it is a decreasing function of the elasticity of substitution in consumption.[4] We then utilize this result to derive conditions under which an agreement is initially incentive-compatible and remains incentive-compatible following the Kemp-Wan tariff adjustment. More specifically, we show that a

[4] Srinivasan (1997) derives a formula for the Kemp-Wan tariff adjustment in a three-country, two-good model where countries have a Ricardian production structure and Cobb-Douglas preferences. He also examines a local approximation for the case of a general production structure.

Kemp-Wan adjustment in the union's external tariff restores incentive compatibility for ROW because it leaves unaffected both its welfare under the agreement and its incentive to violate it. For the union, there are two conflicting forces of a Kemp-Wan adjustment with regards to its incentive constraint. First, the initial tariff agreement becomes more attractive to union members because the expanded volume of intra-union trade raises their welfare at the initial level of the external tariff. On the other hand, deviations from the agreement also become more attractive because the payoffs under cheating and under punishment both rise. We show that, in the case of Cobb-Douglas preferences, these forces exactly offset each other thus resulting in Kemp-Wan adjustments in external tariffs that are incentive-compatible. However, if the elasticity of substitution between member and nonmember goods exceeds unity, the payoff to deviating from the agreement increases by more than the payoff under the agreement, thus resulting in Kemp-Wan adjustments that are not incentive-compatible. These conclusions are based on the fact that the change in payoffs is proportional to the expenditure share of union goods in the union consumption bundle. When $\sigma > 1$ these shares are largest when external tariffs are high (i.e., under punishment and under an optimal deviation from the agreement), so the Kemp-Wan adjustment is not sustainable. If $\sigma < 1$ these rankings are reversed and the payoff to the agreement rises by more than the payoff under an optimal deviation from it.[5]

The paper is organized as follows. Section 2 presents the trade model and derives the preferences of countries over tariff rates. We illustrate the tariff negotiation problem using the tariff indifference curve approach of Mayer (1981). Section 3 begins with an overview of the repeated game and concludes with a derivation and description of the set of incentive-compatible tariff agreements for the two parties. Section 4 shows how this set of self-enforcing tariff agreements is affected by the liberalization of intra-

[5] Our analysis of Kemp-Wan tariff adjustments differs from Richardson's (1995a), who showed that it may be impossible for a customs union to find a tariff that leaves the outside country's welfare unaffected when this country sets its tariff against the union optimally, in that we study the effects of internal trade liberalization on the sustainability of incentive compatible inter-bloc tariff agreements.

union trade. Section 5 contains a brief discussion of how the basic insights of the paper are affected when political-economy considerations are brought into the picture. Section 6 offers some concluding remarks. The proofs to most lemmas and propositions can be found in the Appendix.

2. The Static Framework

We will analyze a three-country, three-good trade model in which there are two symmetric countries (countries 1 and 2) that have formed a customs union and a nonmember country (3). (Henceforth, we will refer to the nonmember country as "ROW" and will identify its variables interchangeably either with an asterisk "*" or with superscript "3"). The endowment trade model we consider is a version of the models used by Krugman (1991) and Bond and Syropoulos (1996a) who study the effects of customs unions on market power and world welfare. The symmetry assumption for the member countries simplifies the analysis: it allows us to represent union welfare by that of a representative union member and thus abstract from intra-union bargaining issues in trade negotiations. With this structure we can analyze trade interactions between the union and ROW using only three tariff rates: the common external tariff of the union, denoted by τ, its tariff on intra-union trade, t, and the nonmember country's tariff, τ^*.

In this section we show that the welfare of a country in the union can be represented by a utility function $U(\tau, \tau^*, t)$, and the welfare of the nonmember country by $U^*(\tau, \tau^*, t)$. We establish two major results regarding these functions. First, the utility of each country is increasing in its tariff on inter-bloc trade over the relevant range (i.e., $\partial U/\partial\tau > 0,\ \partial U^*/\partial\tau^* > 0$). This result indicates that our model retains the "prisoner's dilemma" feature of two-country trade models because it is not in the interest of either party to unilaterally reduce its external tariff. Second, we show that at initial world prices the deepening of integration in the union shifts demand toward the goods of member countries, which raises welfare of each union member and reduces the welfare of the nonmember (i.e., $\partial U/\partial t > 0,\ \partial U^*/\partial t < 0$). Lastly, we define a Kemp-Wan adjustment in the external tariff, which is the requisite change in the union's

external tariff following a change in its internal tariff so that world prices remain constant. Such adjustments in the union's tariffs preserve welfare of the nonmember country at its initial level but raise welfare of every union member.

2.1 The Trade Model

The world we consider consists of *N* regions and *N* traded goods. Each region *i* has an endowment of $1+z$ units of good i $(z > 0)$ and 1 unit of good j $(\neq i)$; hence, the world supply of each good is $N+z$. The regions are grouped into three countries: the customs union members, 1 and 2, each containing $\frac{n}{2}$ regions, and the nonmember country 3 which contains n^* $(= N - n)$ regions.

Preferences over goods are identical across all regions and are represented by the constant elasticity of substitution (CES) function $U^i = N^{\theta}\left[\sum_{j=1}^{N} (c_j^i)^{\theta}\right]^{1/\theta}$, where U^i and c_j^i denote the utility level and consumption of good *j* in region *i*, respectively. With p_j^i denoting the (local) price of good *j* in region *i*, consumer optimization implies

$$\frac{c_j^i}{c_k^i} = \left(\frac{p_j^i}{p_k^i}\right)^{-\sigma} \tag{1}$$

where $\sigma \equiv 1/(1-\theta)$ is the elasticity of substitution in consumption. Letting q_j be the world price of good *j* and choosing good *N* to be the numeraire, it is direct to verify that $q_j = 1$ for all *j* under free trade. Defining $\alpha \equiv z/N$, each region *i* will export $z - \alpha$ units of good *i* and import α units of goods $j \neq i$. Union members (ROW) will have a comparative advantage in the $\frac{n}{2}$ (n^*) goods associated with their (its) regions, with parameter α providing a measure of the degree of this comparative advantage. The relative size of the union (ROW) is captured by a unique parameter $\beta \equiv n/N$ $(\beta^* = n^*/N = 1 - \beta)$. The trade model can thus be characterized by the parameters α, β, and σ.

Hereafter we will also assume that (i) there are no export taxes, and (ii) country *i* imposes the same

ad valorem tariffs on all goods imported from country *j*.[6] Assumption (ii) along with the symmetric structure of the model guarantee that the demand for any two goods originating in country *j* is the same in every country *i*; consequently, the relative price of any goods associated with country *j* must be the same and we can define q_1 and q_2 as the world relative prices of exports to ROW by representative regions in union members 1 and 2, respectively.[7] Each country's optimization problem can be investigated simply by studying the problem of a representative region in it. Modifying our notation slightly, let c_j^i denote the consumption of a typical good in a representative region of country *i* originating in country *j*. Then, the utility function and budget constraint of country *i* (or, more precisely, of a typical region in country *i*) can be written as

$$U^i = \left[\frac{\beta}{2}(c_1^i)^\theta + \frac{\beta}{2}(c_2^i)^\theta + \beta^*(c_3^i)^\theta\right]^{\frac{1}{\theta}} \tag{2a}$$

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[6] It will be shown below that these assumptions are made without loss of generality, since the symmetry in endowments and preferences makes the optimal tariffs identical on all goods from a particular country.

[7] The budget constraint for country *i=1,2,** requires that

$$\sum_{j=1}^{N} q_j^i c_j^i = \bar{Y}_i \equiv q_i z + \sum_{j=1}^{N} q_j,$$

where $\bar{Y}_i$ is the value of country *i*'s income at world prices. Using (1), the demand functions become

$$c_k^i = \frac{[q_k(1+\tau_k^i)]^{-\sigma}\bar{Y}_i}{\sum_{j=1}^{N} q_j^{1-\sigma}(1+\tau_j^i)^{-\sigma}}$$

It can be readily verified that if $\sigma \geq 1$ and $z < \infty$, then all goods are gross substitutes (i.e., $\partial c_j^i/\partial q_k > 0$ for all *i,j* and *k* with $j \neq k$). This ensures that the equilibrium world price vector, denoted $\tilde{\boldsymbol{q}}$, is unique. Now consider two regions *j* and *k* that belong to the same country, and let $\tilde{q}_j$ and $\tilde{q}_k$ denote the equilibrium prices of their export goods. Under the assumption that all countries impose equal tariff rates on these goods, it can be seen by examination of the demand functions that the market-clearing conditions will also be satisfied by the price vector with elements $q_j = \tilde{q}_j$, $q_k = \tilde{q}_k$, and $q_i = \tilde{q}_i$ for $i,j \neq k$. Since the equilibrium price vector must be unique, it follows that $\tilde{q}_j = \tilde{q}_k$.

and

$$\sum_{j=1}^{3} \beta_j q_j c_j^i = \alpha q_i + \sum_{j=1}^{3} \beta_j q_j, \tag{2b}$$

respectively, where $\beta_1 = \beta_2 = \frac{\beta}{2}$ and $\beta_3 = \beta^* \ (= 1 - \beta)$. The budget constraint in (2b) requires the value of a country's consumption at world prices to be equal to the value of its income at world prices.

Union members adopt a common external tariff τ against their imports from ROW (i.e., $\tau = \tau_3^1 = \tau_3^2$). Since we wish to study the impact of internal trade liberalization on the ability of the union and ROW to sustain inter-bloc tariff agreements, we assume the existence of positive tariffs on intra-union trade. By symmetry, country members impose the same tariff rate t on trade with each other (i.e., $t = \tau_2^1 = \tau_1^2$). Lastly, we suppose that ROW imposes a uniform tariff τ^* on its imports from each union member (i.e., $\tau^* = \tau_1^* = \tau_2^*$).[8] Given these symmetry assumptions on tariffs, it can be shown, using an argument similar to that advanced earlier, that exports of union members 1 and 2 will have a common relative price $q = q_1 = q_2$. The equilibrium world price q can be found from the world market-clearing condition for good 1 (i.e., from $\frac{\beta}{2}(c_1^1 + c_1^2) + \beta^* c_1^* = 1 + \alpha$). Using the facts that $c_3^1 = c_3^2$ and $c_2^1 = c_1^2$, along with the budget constraint for ROW, this market-clearing condition can be equivalently written as

$$c_3^1 - 1 = q(c_1^* - 1). \tag{3}$$

Eq. (3) requires trade between a representative region in ROW and a representative region in the

[8] The assumption that intra-union tariffs are equal is based on the supposition that the bargaining process within the union that determines these tariffs treats countries of equal size symmetrically. Given this assumption, it can be shown that ROW's optimal tariff on imports from each of the member countries will be the same when tariffs are set non-cooperatively in a one-shot game. In the case where ROW's external tariff is negotiated with the union, the assumption of a uniform external tariff is based on an assumption of symmetric treatment of the member countries in the bargaining between ROW and the union.

union to be balanced. From it, and the symmetry assumptions on tariffs, the import demand functions for a representative region in ROW and a representative region in the union can be shown to be

$$c_1^* - 1 = \frac{\alpha + (1-\beta)\left(1 - [q(1+\tau^*)]^{\sigma}\right)}{\beta q + (1-\beta)[q(1+\tau^*)]^{\sigma}} \qquad c_3^1 - 1 = \frac{q(\beta+\alpha) - \beta q^{1-\sigma}\Phi}{(1-\beta) + \beta q^{1-\sigma}\Phi} \tag{4}$$

respectively, where

$$\Phi \equiv \frac{(1+\tau)^{\sigma}}{2}\left[1 + \frac{1}{(1+t)^{\sigma}}\right]. \tag{5}$$

Parameter Φ in (5) summarizes the effect of union tariffs, both internal and external, on demand for exports by ROW. Notice that if a fall in the internal tariff t is met with a corresponding reduction in the union's external tariff τ so that Φ remains constant, then the world demand for the nonmember country's exports (and, consequently, the world price q) will remain unaffected. We call this adjustment in the external tariff of the union to a change in its internal tariff a ***Kemp-Wan tariff adjustment***.

Substituting the import demand functions in (4) into the market clearing condition (3) gives

Lemma 1: *Under the symmetry assumptions on tariffs* $(\tau^* \equiv \tau_1^* = \tau_2^*,\ \tau \equiv \tau_3^1 = \tau_3^2,$ *and* $t \equiv \tau_2^1 = \tau_1^2)$, *union exports will have a common relative price* $q \equiv q(\Phi(\tau, t), \tau^*) = q_1 = q_2$ *and*

(a) $$-1 < \left(\frac{1+\tau^*}{q}\right)\left(\frac{\partial q}{\partial \tau^*}\right) < 0$$

(b) $$0 < \left(\frac{1+\tau}{q}\right)\left(\frac{\partial q}{\partial \tau}\right) < 1$$

(c) $$\frac{\partial q}{\partial t} < 0$$

(d) $$\left.\frac{d\tau}{1+\tau}\right|_{d\Phi=0} = \left[\frac{1}{1+(1+t)^{\sigma}}\right]\frac{dt}{1+t} \qquad (\textit{Kemp-Wan tariff adjustment}).$$

Parts (a) and (b) indicate that unilateral increases in inter-bloc tariffs improve the intervening party's terms of trade, though by less than the amount of the tariff. Part (c) shows that a reciprocal reduction in the union's internal tariffs causes the union's terms of trade to improve. This is so because, given world prices, the internal tariff reduction induces consumers in union countries to substitute toward union goods and away from ROW goods. Result (d) characterizes the Kemp-Wan adjustment of the external tariff in response to internal trade liberalization. Since $\sigma > 0$, a reduction in the internal trade barrier, (1+t), will require a less than proportional reduction in the external barrier, $(1+\tau)$, to keep world prices constant. Also, the reduction in the external tariff will be lower the higher is σ.

2.2 Preferences over Tariff Rates

We can now investigate the payoff functions of ROW and of a representative union member using the results of Lemma 1. Let $V^*(q,\tau^*)$ denote the indirect utility function of ROW. Substituting (1) and (4) into (2a) yields ROW's payoff function

$$U^*(\tau^*,\Phi) \;=\; V^*(q(\tau^*,\Phi),\tau^*) \;=\; c_1^*\left(\beta + (1-\beta)[q(1+\tau^*)]^{\sigma-1}\right)^{\frac{\sigma}{\sigma-1}} \qquad (6)$$

where $q = q(\Phi,\tau^*)$ is the equilibrium world price described in Lemma 1. ROW's preferences over tariff rates can be obtained by differentiating (6) and using Lemma 1. (Please see the Appendix for a formal derivation.)

Proposition 1: *Suppose that the tariffs of union members 1 and 2 are such that they do not cause trade with ROW to be eliminated. Then,*

(a) *ROW will have a unique best-response tariff* $\tilde{\tau}^*(\Phi)$, *such that* $d\tilde{\tau}^*(\Phi)/d\Phi < 0$*;*

(b) $U^*(\tau^*,\Phi(\tau,t))$ *has the following properties:*

(i) $\dfrac{\partial U^*(\cdot)}{\partial \tau^*} > 0 \;\forall\; \tau^* < \tilde{\tau}^*(\Phi)$;

(ii) $\dfrac{\partial U^*(\cdot)}{\partial \tau} < 0$;

(iii) $\dfrac{\partial U^*(\cdot)}{\partial t} > 0$;

(c) a simultaneous reduction in τ *and* τ^* *that keeps q constant will raise* $\Omega^*(\cdot)$.

Proposition 1 can be used to illustrate the trade-offs for ROW in trade negotiations with the union. If such negotiations raise ROW welfare, then a reduction in ROW's tariff must be accompanied by a reduction in the union's external tariff. Similarly, for ROW welfare not to be affected adversely, a reduction in the union's internal tariff must be accompanied by a reduction in its external tariff that is at least as large as the Kemp-Wan reduction.

The analysis of the payoff function of the representative union member is slightly more complicated because it is affected both by internal and external tariff changes. Let $V(q,\tau,t)$ be the indirect utility of a representative union member, say country 1. Substituting (1) and (4) into the utility function (2a) of this member yields

$$U(\tau^*,\tau,t) = V(q(\tau^*,\Phi),\Psi) = c_3^1\left[(1-\beta) + \beta q^{1-\sigma}\Psi\right]^{\frac{\sigma}{\sigma-1}} \tag{7}$$

where

$$\Psi \equiv \frac{(1+\tau)^{\sigma-1}}{2}\left[1 + \frac{1}{(1+t)^{\sigma-1}}\right]. \tag{8}$$

The relationship between tariff rates and union member welfare can be obtained by differentiating (7) and utilizing Lemma 1. The following result, which is proven in the Appendix, relies on arguments similar to those used in Proposition 1:

Proposition 2: *If ROW's tariff* τ^* *does not eliminate trade with union countries, then*

(a) *the union will have unique best-response tariff function* $\tilde{\tau}(\tau^*, t)$*, such that*

(i) $\dfrac{\partial \tilde{\tau}(\cdot)}{\partial \tau^*} < 0$*;*

(ii) $\dfrac{\partial \tilde{\tau}(\cdot)}{\partial t} > 0$ *;*

(b) *the utility of the representative union member has the following properties for* $\tau \geq t \geq 0$

(i) $\dfrac{\partial U(\cdot)}{\partial \tau^*} < 0$*;*

(ii) $\dfrac{\partial U(\cdot)}{\partial \tau} > 0 \quad if \quad \tau < \tilde{\tau}(\tau^*, t)$*;*

(iii) $\dfrac{\partial U(\cdot)}{\partial t} < 0 \quad if \quad \tau \leq \tilde{\tau}(\tau^*, t)$*;*

(c) *a simultaneous reduction in* τ *and* τ^* *that keeps q constant will raise* $\Omega(\cdot)$ *if* $\tau \geq t \geq 0$*;*

(d) *a Kemp-Wan adjustment in the direction of* $t = 0$ *must raise union welfare.*

Part (a) establishes that the ROW tariff τ^* and the union tariff τ are strategic substitutes for the union, and that a reduction in the internal tariff t makes the union less aggressive in its external tariff setting.[9] Part (b) shows that if $t \leq \tau$, we can also obtain the result that reductions in the union's external

[9] Bagwell and Staiger (1998) refer to this effect, where a reduction in the internal tariff results in a reduction in the optimal tariff against the outside country, as the tariff complementarity effect. They obtain this result in a three-country model with linear demand functions. A similar complementarity is noted by Richardson (1995b) in the case of a free trade area, where partner country may lower tariffs to steal tariff revenue in the absence of rules of origin. Utilizing a general equilibrium trade model with Cobb-Douglas preferences, Syropoulos (1999) showed that, depending on inter-country differences in relative endowments, this effect may dominate the terms-of-trade externality internalizing effect due to the formation of a customs union, thus causing all optimal tariffs to fall.

tariff τ must be accompanied by reductions in ROW's tariff τ^* to maintain union welfare constant. We will assume that $t \leq \tau$ since the essence of a customs union is preferential access of a member to the partner country's market. These results are similar to those obtained for the ROW indifference curves.

It is useful to present an explicit derivation of the welfare effect of a *Kemp-Wan tariff adjustment* to prove part (d) because this result will be critical in proving the main result of the paper. Differentiating (6) and substituting for the Kemp-Wan adjustment in external tariffs (Lemma 1(d)) in the definition of Ψ in (8) yields

$$\left.\frac{dU}{U}\right|_{d\Phi=0} = \frac{\sigma}{\sigma-1}\Theta\left.\frac{d\Psi}{\Psi}\right|_{d\Phi=0} \tag{9a}$$

$$\Theta \equiv \frac{\beta q^{1-\sigma}\Psi}{(1-\beta)+\beta q^{1-\sigma}\Psi} \tag{9b}$$

$$\left.\frac{d\Psi}{\Psi}\right|_{d\Phi=0} = (\sigma-1)\left[\frac{1}{1+(1+t)^{\sigma}} - \frac{1}{1+(1+t)^{\sigma-1}}\right]\frac{dt}{1+t}. \tag{9c}$$

It can be shown, using (1), that Θ represents a union member's expenditure share on union goods (i.e., $\Theta = \frac{\beta}{2}(p_1^1 c_1^1 + p_2^1 c_2^1)/\left[\frac{\beta}{2}(p_1^1 c_1^1 + p_2^1 c_2^1) + (1-\beta)p_3^1 c_3^1\right]$) and that this share is increasing in Ψ. For $t > 0$, the term inside the square brackets of (9c) is negative; therefore, the spending share on union goods Θ rises (falls), following a reduction in the internal tariff t accompanied by a Kemp-Wan adjustment in the external tariff τ, for $\sigma > 1$ $(\sigma < 1)$. Since by (9a) union welfare U is increasing (decreasing) in Ψ for $\sigma > 1$ $(\sigma < 1)$, it follows that the deepening of integration accompanied by a Kemp-Wan tariff adjustment raises union welfare. A similar argument can establish that if $t < 0$, welfare of the union can be improved by simultaneously raising internal and external tariffs so as to keep the world price of union goods q constant.

The implications of Propositions 1 and 2 are illustrated in Figs 1a and 1b. Propositions 1(a) and

2(a.i) establish the existence of a downward sloping best-response function for each country. The union (ROW) reaction function is shown by the curve ***GK*** (***FH***) in Fig. 1a, where ***G*** (***F***) is ROW's (the union's) prohibitive tariff. By Proposition 1(b), the ROW welfare contours must be positively sloped below ***FH***, with welfare decreasing in τ. By Proposition 2(b), the iso-welfare contours of a representative union member will be positively sloped to the left of ***GK*** and its welfare will be decreasing in τ^* assuming $\tau \leq \tilde{\tau}(\cdot)$. Parts (c) of Propositions 1 and 2 ensure that union iso-welfare contours are flatter than ROW iso-welfare contours at any intersection point in the region where they are both positively sloped. The deepening of integration causes the best-response functions of both parties to shift leftward.

Insert Figures 1a and 1b about here

Fig. 1b shows the iso-welfare contours of the union over its internal and external tariffs, given the tariff τ^* of ROW. Results (a) and (b) in Proposition 2 indicate that the iso-welfare contours must be upward sloping in (t,τ) space for external tariffs that are below their optimal level. The dark locus going through point ***J*** illustrates the union's best-response external tariff $\tilde{\tau}(\tau^*,t)$ as a function of the internal tariff t, which must be upward-sloping by Proposition 2(a). From Proposition 2(b) it follows that the maximum welfare point along this locus occurs at t=0, which corresponds to point ***J*** in Fig. 1b. Also, welfare of the union is increasing in the external tariff τ on the interval ***OJ***. Curves Φ_i in the figure (*i=1,2* with *i* describing different price levels) identify internal and external tariff pairs (t,τ) of the union that keep world prices constant. Each of the Φ_i reflect Kemp-Wan adjustments in the union's external tariff, and hence are iso-welfare contours for ROW in (t,τ) space.

Ethier and Horn (1984) showed that it is not optimal for two "small" union members to eliminate their internal tariffs when their common external tariffs are positive. Proposition 2(b) extends Ethier and Horn's analysis to situations in which union members are "large" (i.e., they have monopoly power in

world trade). Part (iii) of Proposition 2(b) reveals that full integration is not optimal as long as the common external tariff τ of union members is positive ***and*** at or below its best-response level $\tilde{\tau}(\tau^*, t)$.

3. Self-Enforcing Multilateral Tariff Agreements

As members of the union, countries 1 and 2 are assumed to be able to sign binding tariff agreements on intra-union trade. In contrast, the union and ROW are unable to sign binding contracts because there is no international mechanism to enforce such contracts.[10] Nevertheless, efficient inter-bloc tariff agreements might be sustainable if such agreements are self-enforcing. Our goal in this section is to identify the set of tariff pairs (τ_A, τ_A^*) constituting incentive-compatible agreements for the union and ROW. (Henceforth, subscript "A" identifies variables associated with an inter-bloc tariff agreement.)

We suppose that the union and ROW play an infinitely repeated tariff game in which they use trigger strategies to support targeted agreements. We view GATT as a coordination device that enables countries to coordinate their strategies to select one of the many constrained efficient trade agreements. If

[10] Because we do not require intra-union tariff agreements to be self-enforcing, we are in effect assuming that customs union members have a greater degree of commitment power in their intra-union than in their extra-union trade relations. This power can be thought of as arising from their interaction on a wide range of issues, so that a violation of the agreement would potentially result in severe retaliatory punishments. This contrast between the security of market access conditions for intra- and extra-bloc trade is greatest for the EU. If a member country feels that another member is restricting its market access--either explicitly, implicitly or unintentionally--it may raise the matter with the Commission which would advise the parties on whether the free circulation of goods has been impeded and what should be done to address it. If the Commission finds that a restriction exists and is unable to have it removed, it may take the offending government to the European Court of Justice. This is in contrast to trade under GATT rules where, outside OECD countries, most tariffs are immediately raisable (because they are not bound under the GATT or are bound at rates well above applied rates) and import surcharges are not uncommon. Even more striking is that trade subject to the GATT may legitimately be subjected to safeguard actions (including QRs), countervailing duties, or anti-dumping duties, not to mention the VERs that frequently arise from the last. In intra-EU trade these instruments are essentially unknown, their ostensible purpose being assigned to the much tenderer mercies of EU competition law.

Maggi (1999) argues that multilateralism has the advantage of allowing trading partners to coordinate punishments and obtain more effective enforcement in the presence of asymmetries between countries. While coordination of punishments under multilateral agreements may provide benefits, the fact that these punishments are limited to trade issues may make them less effective than punishments that can be achieved through regional agreements.

either of the two parties deviates from the agreement, a punishment phase is triggered in which all countries revert to their strategies in a Nash equilibrium of the single-period game. The choice of the single-period Nash equilibrium for punishment ensures that the equilibrium of the repeated game is subgame perfect. However, the players will have a choice of punishments to consider because tariff war games typically have both interior Nash equilibria in which trade persists and a continuum of tariff pairs which induce autarky (an autarkic Nash equilibrium). Because the autarkic Nash equilibrium delivers the more severe punishment for enforcing trade agreements and is, therefore, capable of sustaining the "most cooperative" outcomes, we choose reversion to it as the relevant threat point.

As before, the union acts as a single entity in its trade negotiations with ROW. Let U_A (U_A^*) be the per period payoff to the representative union member (ROW) under the tariff agreement (τ_A, τ_A^*), U_D (U_D^*) the per period payoff to the union member (ROW) when it deviates optimally from the targeted agreement while the other party abides by it, and U_N (U_N^*) the per period payoff of the representative union member (ROW) in the punishment phase.

The gain to the union (ROW) from deviating in the current period is $U_D - U_A$ $(U_D^* - U_A^*)$. The cost to a party of violating the agreement is the discounted payoff loss it would incur during the punishment phase. Let s be the number of periods over which the punishment phase lasts, and let δ be the (common) discount factor. Defining $\Delta \equiv \sum_{h=1}^{s} \delta^h$, the present value of the utility loss from breaking the agreement is $\Delta(U_A - U_N)$ for the union and $\Delta(U_A^* - U_N^*)$ for ROW. Consequently, both parties will abide by the trade agreement if

$$U_D^* - U_A^* \leq \Delta(U_A^* - U_N^*) \tag{10a}$$

$$U_D - U_A \leq \Delta(U_A - U_N) \tag{10b}$$

for ROW and the union, respectively. The complete set of self-enforcing tariff agreements will be the set

of tariff pairs (τ_A, τ_A^*) satisfying (10).

We will not attempt to model the bargaining process between ROW and the union here; instead, we will simply assume that this process results in agreements that are not Pareto-dominated. The central goal of our inquiry is to shed light on how the deepening of regional integration affects the set of self-enforcing tariff agreements the union and ROW may adopt. In the remainder of this section we identify this set and describe the payoff possibility frontier over which tariff agreements are implemented.

3.1 Incentive-Compatible Tariff Agreements for ROW

The internal tariff rate of the union t is taken as given by the contractual relationship between union members, so it is not an issue of negotiation in multilateral talks; hence $U_A^* = U^*(\tau_A^*, \Phi(\tau_A, t))$. If ROW were to deviate from an agreement (τ_A, τ_A^*) it would impose its best-response tariff $\tilde{\tau}^*(\Phi(\tau_A, t))$ and would thus attain the payoff $U_D^* = U^*(\tilde{\tau}^*(\cdot), \Phi(\tau_A, t))$. In the punishment phase, ROW's payoff U_N^* is independent of the union's tariff policies because ROW consumes only its own endowment bundle under autarky. (It is direct to show that $U_N^* = \left[\beta + (1-\beta)(1+\alpha)^{\theta}\right]^{1/\theta}$.) Substituting these payoffs into ROW's incentive compatibility constraint (10a), simplifying expressions, and rearranging terms gives

$$U^*(\tau_A^*, \Phi(\tau_A, t)) \geq \frac{1}{1+\Delta} U^*(\tilde{\tau}^*(\cdot), \Phi(\tau_A, t)) + \frac{\Delta}{1+\Delta} U_N^*. \qquad (11a)$$

The inequality in (11a) will always be satisfied if $\tau_A^* = \tilde{\tau}^*(\cdot)$ because welfare under optimal intervention can never fall below the autarky level. Thus, ROW's best-response function $\tilde{\tau}^*(\tau, t)$ in Fig. 1a must be in ROW's set of incentive-compatible tariff agreements. Since ROW's welfare is a single-peaked function of its tariff τ^*, there will be a range of tariff rates on either side of its best-response schedule for which (11a) is satisfied, provided the union's external tariff is not prohibitive.

The lower boundary of this set is obtained by solving for the value of τ_A^* (with $\tau_A^* \leq \tilde{\tau}^*(\cdot)$) at which (11a) holds with strict equality. Since $U^*(\tau^*, \tau, t)$ must be increasing in τ^* for $\tau^* < \tilde{\tau}^*(\tau)$, the value of τ

at which (11a) holds with equality will be unique as long as τ^* is not prohibitive. This yields:

$$\frac{\partial \tau_A^*}{\partial \tau_A} = -\left[\frac{(1+\Delta)(\partial U_A^*/\partial \Phi) - \partial U_D^*/\partial \Phi}{(1+\Delta)(\partial U_A^*/\partial \tau_A^*)}\right]\left(\frac{\partial \Phi}{\partial \tau_A}\right). \tag{12}$$

By Proposition 1(b), the denominator of the expression in the square brackets of (12) is positive. The sign of the numerator is ambiguous. Even though an increase in the union's external tariff τ_A causes ROW's payoff under the agreement U_A^* to fall, such a tariff increase also causes ROW's payoff under an optimal deviation U_D^* to fall. If the latter effect dominates, the net impact of an increase in the union's external tariff τ_A would be to make the agreement easier to sustain because ROW's payoff under cheating declines relative to its payoff under the agreement. In this case, an increase in ROW's tariff τ_A^* must be accompanied by a fall in τ_A to restore equality in (11a), and the boundary of the incentive-compatible set will be downward-sloping in the space of tariffs (τ, τ^*). On the other hand, if the effect of the union's tariff τ_A on the ROW's payoff under the agreement dominates the effect on ROW's payoff under cheating, the boundary will be upward-sloping.

We will concentrate on the case in which free trade is not sustainable for either party. This will arise in cases where the discount parameter Δ is too low to allow (11a) to be satisfied at the free trade agreement, which means that the lower boundary of ROW's incentive-compatible agreements has a positive vertical intercept, as illustrated by point ***A*** in Fig. 1a. Since point ***F*** (the point at which the union's external tariff becomes prohibitive) is also on the boundary of ROW's set of incentive-compatible agreements, it must be the case that the lower boundary of the incentive compatibility constraint (schedule ***AF*** in Fig. 1a) is downward-sloping on average.

3.2 Incentive-Compatible Tariff Agreements for the Customs Union

Given the union's internal tariff t and ROW's tariff τ_A^* under the agreement, we can write the union's

payoff under the agreement (τ_A, τ_A^*) as $U_A = U(\tau_A, \tau_A^*, t)$. If the union violated its agreement and ROW respected it, the union would impose its best-response tariff $\tilde{\tau}(\tau_A^*, t)$ and, consequently, would attain the payoff $U_D = U(\tilde{\tau}(\cdot), \tau_A^*, t)$. In the punishment phase, the payoff to the union is the utility it would attain if prohibitive tariffs eliminated its trade with ROW and intra-union trade were subject to the internal tariff t. In the Appendix we show that

$$U_N = U_N(t) = \left[\frac{\beta}{2}\left[1 + (1+t)^{1-\sigma}\right](c_1^1)^{\frac{\sigma-1}{\sigma}} + (1-\beta)\right]^{\frac{\sigma}{\sigma-1}} \tag{13}$$

where c_1^1 is determined from the market clearing condition

$$c_1^1\left[1 + (1+t)^{-\sigma}\right] = \frac{2(\beta+\alpha)}{\beta}. \tag{14}$$

Using the relevant payoffs for the union in the incentive-compatibility constraint (10b), we can now rewrite that constraint as

$$U(\tau_A, \tau_A^*, t) \geq \frac{1}{1+\Delta} U(\tilde{\tau}(\cdot), \tau_A^*, t) + \frac{\Delta}{1+\Delta} U_N(t) \tag{11b}$$

The set of tariff agreements (τ_A, τ_A^*) that satisfy (11b) has properties similar to those derived for the set of incentive-compatible agreements for ROW. Specifically, the reaction function of the union must be contained in the union's set of incentive-compatible tariff agreements and the lower boundary of this set may be either upward or downward sloping in (τ_A, τ_A^*) space for reasons similar to those discussed in connection with (12). The locus ***CG*** in Fig. 1a represents the lower boundary of this set for the case in which free trade is not sustainable for the union.

3.3 The Payoff Possibility Frontier

The set of incentive-compatible tariffs depicted in Fig. 1a can be used to characterize the set of incentive-compatible agreements in the payoff space (U, U^*). Since we assume that ROW and the union can negotiate over the trade agreement, our focus will be on the set of agreements that are not Pareto dominated. Any tariff agreement in the interior of the set of incentive-compatible agreements will be Pareto dominated by an agreement on the lower boundary, since it is possible to find a mutual tariff reduction from an interior point that holds q constant and hence improves welfare of all parties by Propositions 1 and 2. Therefore, in deriving the efficient frontier of incentive-compatible agreements, we can restrict attention to agreements with tariffs that are on the lower boundary of the set of incentive-compatible tariffs.

We will illustrate the payoff frontier for the case in which the lower boundaries of the respective sets of incentive-compatible tariffs are both downward sloping and have a unique intersection. First consider the payoffs to the two countries along the lower boundary of ROW's incentive constraint as illustrated by the locus ***AF*** in Fig. 1a. It is clear from (12) that for $\tau^* < \tilde{\tau}^*(\tau_A, t)$, the slope of this lower boundary must be less than that of a ROW indifference curve. Tariff agreements on the boundary of the set can thus be welfare-ranked from the point of view of ROW, with agreements that entail a higher value of τ_A yielding lower welfare for ROW. Since iso-welfare contours of the union are positively sloped for $\tau < \tilde{\tau}(\tau^*, t)$, union welfare will be increasing along ***AF*** for all points to the left of its intersection with the union's best-response function. Since welfare of the union falls to the autarky level at point ***F***, we can let point ***B*** in Fig. 1a be the level of τ at which union welfare is maximized along ***AF***. The payoffs to the two parties along this segment are illustrated in Fig. 2 by the negatively sloped segment ***AB*** in (U, U^*) space. Agreements on the segment ***BF*** in Fig. 1a will be associated with payoffs for both countries that are below those at point ***B***, with the payoff at ***F*** being equal to its autarky level. These payoffs lie along the ***BF*** locus in Fig. 2, and will not be selected under our assumption that the bargaining results in a Pareto-efficient agreement. Agreements that yield payoff values higher than those on ***AB*** will not be

incentive-compatible from ROW's perspective.

Insert Figure 2 about here

A similar argument can be used to illustrate the payoffs to the two parties along the union's incentive compatibility constraint ***CG*** in Fig. 1a, with point ***D*** denoting the agreement at which welfare of ROW is maximized along the union's incentive constraint. The payoffs to the countries along the union's incentive constraint can be thus illustrated by the locus ***CDF*** in Fig. 2, with the ***AB*** locus being steeper than the ***CD*** locus at their intersection point ***E*** which lies between the two extreme values, ***B*** and ***D***, on the frontier. This follows from the fact that the incentive constraint for each party in Fig. 1a must lie strictly below the respective country's best response function, so the intersection point must occur at a point below both countries' best response functions. However, the segments ***BF*** and ***DG*** in Fig. 1a lie strictly outside this region, so the intersection cannot occur in these segments in Figs 1a or 2. The actual trade agreement will be chosen from tariff points that belong to ***BED*** in Fig. 1a that yield payoffs along segment ***BED*** of the frontier in Fig. 2.

Figs 1a and 2 depict the payoff frontier for the case in which there is a unique intersection of the incentive constraints for the two parties. Although we have not presented a formal proof that there will be a unique intersection of the incentive constraints, simulations over a wide range of values of α, β, and σ yielded unique intersections in all cases. This included parameter values for which the lower boundary of the incentive constraints in Fig. 2 had upward sloping segments. Therefore, in the discussion that follows we will consider the effects of internal liberalization for the case in which the intersection is unique.

4. Deepening of Regional Integration

In this section we examine how a reduction in the union's internal tariff t affects the set of inter-bloc tariff rates that are incentive-compatible for each country. We also illustrate how these changes affect the

utility possibility frontier.

Consider the case of ROW first. From (6), the tariff t on intra-union trade flows affects payoffs U_A^* and U_D^* only through its impact on Φ. Therefore, a change in the union's internal tariff t, combined with a Kemp-Wan adjustment in the union's external tariff τ, does not alter ROW's payoffs under the agreement or under an optimal deviation from it. Since the punishment payoff to ROW is independent of the internal tariff t, we obtain the following result:

Proposition 3: *If an initial tariff agreement* (τ_A, τ_A^*) *is incentive-compatible for ROW, then deepening of regional integration accompanied by a Kemp-Wan external tariff reduction will also result in an incentive-compatible agreement for ROW.*

If the union reduces its internal tariff t, the set of incentive-compatible tariff agreements will shift leftward by exactly the amount of the Kemp-Wan tariff reduction as depicted by the schedule ***A'F'*** in Fig. 3. We discuss the proposition more extensively later on.

Insert Figure 3 about here

The effect of changes in the internal tariff t on the incentive constraint of the union is more complicated because the effects of union tariffs on the union's payoff cannot be summarized just by changes in $\Phi(\tau_A, t)$. As noted in the discussion of (9), a reduction in the internal tariff of the union accompanied by a Kemp-Wan adjustment in its external tariff maintains Φ constant but raises Ψ, thereby improving the union's payoff under the agreement. In addition, the autarky payoff of the union also depends on the internal tariff t. Consequently, all three terms in the incentive compatibility constraint of the union in (11b) will be affected by internal trade liberalization. Lemma 2 below helps evaluate the overall effect of internal tariff changes on the union's incentive constraint:

Lemma 2: *Suppose that the union reduces its internal tariff* t *and at the same time adjusts its external tariff* τ *in a Kemp-Wan fashion.*

(a) *If* $\sigma > 1$ $(\sigma < 1)$, *then the percentage increase in union welfare is increasing (decreasing) in the level of the external tariff.*

(b) *If* $\sigma = 1$, *then the percentage increase in union welfare is independent of the level of the external tariff.*

Proof: Part (a): Utilizing (7), we can rewrite (9a) as follows:

$$\left(\frac{(1+t)}{U}\frac{\partial U}{\partial t}\right)\Bigg|_{d\Phi=0} = \sigma\Theta\left[\frac{1}{1+(1+t)^{\sigma}} - \frac{1}{1+(1+t)^{\sigma-1}}\right] \tag{15}$$

where

$$\Theta \equiv \Theta(\tau,t) = \frac{(\beta/2)\left[1+(1+t)^{1-\sigma}\right]}{(1-\beta)\left[q/(1+\tau)\right]^{\sigma-1} + (\beta/2)\left[1+(1+t)^{1-\sigma}\right]} \tag{16}$$

from (9b) and (8). The expenditure share on union goods Θ is a(n) decreasing (increasing) function of the local relative price $q/(1+\tau)$ of such goods for $\sigma > 1$ $(\sigma < 1)$. From Lemma 1, $q/(1+\tau)$ is decreasing in τ. Therefore, (15) is increasing (decreasing) in τ for $\sigma > 1$ $(\sigma < 1)$.

Part (b): We treat this case in the Appendix. ||

For some intuition, observe that the spending share on union goods Θ is rewritten in (16) as a function of the relative price $p_1^1/p_2^1 = q/(1+\tau)$. The positive relationship between the external tariff τ and Θ for $\sigma > 1$ is simply a reflection of the fact that the expenditure share on union goods is decreasing in their relative price when $\sigma > 1$. Recall that Lemma 2 indicated that for $\sigma > 1$ the impact of internal

trade liberalization on the union's payoff is larger when the external tariff is larger, since in this case union goods form a larger share of the union's consumption bundle. If $\sigma < 1$ this effect is reversed because expenditure on union goods is higher when the external tariff is lower. This finding can now be used to prove our main result.

Proposition 4: *Suppose that* Δ *is sufficiently low so that the incentive compatibility constraint* (11b) *for the union holds with strict equality for an agreement* (τ_A, τ_A^*)*, and that the union reduces its internal tariff from an initial* $t > 0$.

(a) *If* $\sigma > 1$ $(\sigma < 1)$*, then the reduction in the external tariff required to maintain incentive compatibility is lower (greater) than the Kemp-Wan external tariff reduction.*

(b) *If* $\sigma = 1$*, then a Kemp-Wan external tariff reduction is incentive-compatible.*

The proposition is established by showing that if $\sigma > 1$ and the union makes a Kemp-Wan adjustment in its external tariff, then $\hat{U}_D > \hat{U}_A > 0$ and $\hat{U}_N > \hat{U}_A > 0$ where a hat (^) over variables indicates percentage change (e.g., $\hat{x} = dx/x$). These inequalities establish that the left-hand side (LHS) of (11b) increases by less than the right-hand side (RHS), therefore, the Kemp-Wan adjustment in the external tariff is not incentive-compatible. Since the LHS of (11b) is increasing in τ at the initial point, the value of τ that maintains incentive compatibility must exceed the Kemp-Wan tariff. For $\sigma < 1$, the payoff under the agreement rises by more than the payoff under punishment or cheating as the result of a Kemp-Wan reduction in the external tariff. This means that the LHS of (11b) increases by more than the RHS, so the external tariff must be reduced by more than the Kemp-Wan reduction to maintain strict equality in (11b).

Fig. 3 illustrates Propositions 3 and 4 in tariff space. The incentive constraint of ROW shifts leftward (from ***AF*** to ***A'F'***) by the amount of the Kemp-Wan tariff adjustment for each value of τ^*. The

initial incentive constraint for the union (not shown) goes through point ***E***. The incentive constraint for the union member shifts leftward by exactly the amount of the Kemp Wan adjustment (i.e., to ***C'E'G'***) for $\sigma = 1$, and by less (more) than the amount of the Kemp-Wan adjustment for $\sigma > 1$ ($\sigma < 1$). The case of $\sigma > 1$ is shown by the shift to ***E"*** in Fig. 3. Point ***E'*** represents the same level of welfare for ROW as point ***E*** because it is associated with a Kemp-Wan adjustment in union tariffs. In contrast, point ***E"*** represents a lower welfare level for ROW than the initial point ***E*** because its terms of trade deteriorate now that the common external tariff exceeds its Kemp-Wan level. Point ***E"*** also yields a higher level of welfare for every union member than the initial point ***E***.

These results indicate that internal liberalization will shift the segment ***AB*** of the utility possibility frontier, along which the ROW incentive constraint binds, rightward in Fig. 2. The segment ***DE*** of the payoff frontier, corresponding to the union's incentive constraint, shifts rightward by a smaller (greater) amount than does the ***BE*** schedule for $\sigma > 1$ ($\sigma < 1$).

It is important to keep in mind though that the outward shift in the payoff frontier does not necessarily imply that both parties will gain from the chosen agreement because the threat point payoffs are likely to shift in favor of the union. This point can be illustrated by considering the case where $\sigma = 1$ and the bargaining process is based on the generalized Nash bargaining solution, with autarky being the disagreement point. It is shown in the Appendix that $\hat{U}_A = \hat{U}_N = -\beta t\, dt/[2(1+t)(2+t)]$, therefore, the percentage change in the payoff under the agreement is independent of the initial tariff agreement (τ_A, τ_A^*). Since reductions in t cause a proportional increase in the payoff to the union members, the payoff frontier can be expressed as $U_A = \kappa(t) f(U_A^*)$, where $f' < 0$ and $\kappa' < 0$. The Nash bargaining solution can be modeled as choosing the value of an agreement that maximizes $[U_A - U_N]^{\eta}\left[\kappa(t)(f(U_A^*) - U_N^*)\right]^{1-\eta}$ where $\eta \in (0,1)$ is a parameter that reflects the relative bargaining power of the union. It is straightforward to show that the payoff to ROW that solves this problem is independent of t, so that in this case the bargained outcome will be a Kemp-Wan reduction in the external

tariff and all of the gains from internal liberalization will accrue to the union.

5. Political Economy Considerations

So far our analysis was based on the supposition that the objective of policy makers is to maximize national welfare. In this section we briefly discuss how the results are altered if the model is extended along the lines of Grossman and Helpman (1994) to examine how the presence of special interests affects the link between the deepening of regional integration and the sustainability of inter-bloc tariff agreements.

Suppose that each country is made up of households, indexed by *h*, and that each household has an endowment of one of the three goods. If each household's share of tariff revenues is proportional to its share of national endowment income, we can represent the preferences of all households owning good *j* by a single household that owns all of country *i*'s endowment of good *j*, ω_j^i. The share of country *i* income owned by households owning good *j* is denoted $s_j^i = (p_j^i \omega_j^i)/(\sum_k p_k^i \omega_k^i)$. Lobbies are organized according to the endowments of the households they represent, and each lobby *h* maximizes the welfare of good *h* owners through the offers of campaign contributions to politicians. If politicians maximize the weighted sum of national welfare and the (appropriately normalized) campaign contributions they elicit, then it can be shown using the approach of Grossman and Helpman (1994) that the policy maker's payoff function, *W*, will be given by

$$W = \left[\rho + (1-\rho)s_L\right]U \tag{17}$$

where $\rho \in [0,1]$ is the weight attached to national welfare *U*. Letting μ_j be the share of households that own good *j* and are organized as a lobby, s_L in (17) is the share of the endowment income owned by

organized lobbies (identified by the set index L) where $s_L = \sum_{j \in L} \mu_j s_j$.[11]

Turning to the analysis of interactions between the union and ROW, we assume that (i) the union attempts to dismantle all internal tariffs, and (ii) special interests within the union attempt to influence the size of the common external tariff, which is determined by an already established central policymaking authority in the union. We also adopt the following symmetry assumptions regarding lobbying power: import-competing lobbies in ROW are equally well organized (i.e., $\mu_1^* = \mu_2^*$); import-competing lobbies in union member countries are symmetrically organized (i.e., $\mu_3^1 = \mu_3^2$ and $\mu_2^1 = \mu_1^2$); and export lobbies are equally powerful in each union country (i.e., $\mu_1^1 = \mu_2^2$). These symmetry assumptions seem natural in light of the symmetry of the model.

Given these assumptions, it is shown in Bond, Syropoulos, and Winters (1998) that two main results are obtained from the introduction of political economy considerations. *First*, a deepening of integration accompanied by a Kemp-Wan adjustment of the external tariff is incentive-compatible for ROW (i.e., Proposition 3 continues to hold). *Second*, the incorporation of political economy considerations into the analysis introduces a second ambiguity in the way the deepening of regional integration affects the union's incentive constraint. In contrast with Proposition 4a, incentive compatibility for the union may require its external tariff to adjust by either more or less than the Kemp-

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[11] Following Grossman and Helpman (1994), we treat a country's policy choice as a menu auction in which lobbies offer campaign contributions to politicians to influence tariff policy. Politicians in a given country maximize

$$W = \rho U + (1 - \rho)\left[\sum_h \zeta(\boldsymbol{p})\lambda_h(\boldsymbol{\tau})\right] \qquad (*)$$

where $\lambda_h(\boldsymbol{\tau})$ is the contribution of lobby h as a function of the country's tariff vector $\boldsymbol{\tau}$, $\boldsymbol{p}$ is the vector of domestic prices and $\zeta(\boldsymbol{p})$ is a price index. Utilizing the arguments of Grossman and Helpman, it can be shown that the contributions offered by lobby h in a *truthful Nash equilibrium* are

$$\lambda_h(\boldsymbol{\tau}) = \max\left\{v_h(\boldsymbol{p}^e) - u_h^e,\ 0\right\}/\zeta(\boldsymbol{p}^e) \qquad (**)$$

where $v_h(\boldsymbol{p}^e)$ $(= \zeta(\boldsymbol{p}^e)y_h = \zeta(\boldsymbol{p}^e)s_h(\boldsymbol{p}^e)Y = s_h(\boldsymbol{p}^e)U)$ is the indirect utility of lobby h evaluated at the equilibrium domestic prices $\boldsymbol{p}^e$, and u_h^e is the equilibrium payoff of lobby h. The payoff in (17) can be obtained from substituting (**) in (*) and simplifying the resulting expression.

Wan adjustment even with Cobb-Douglas preferences. The exact adjustment depends on the relative organization of lobbies, the size of comparative advantage, and the relative size of the union.

6. Concluding Remarks

Our point of departure in this paper has been the observed efforts in the European Union to deepen the integration of the internal markets of country members. Taking it as a fact that international institutions equip members in integrated regions with greater ability to commit to trade agreements with other member than with nonmember countries, our main goal has been to shed light on the relationship between the deepening of regional economic integration and the nature of self-enforcing tariff agreements between union and non-union countries. Utilizing the theory of repeated games, we have derived conditions under which the deepening of integration in a customs union, accompanied by a Kemp-Wan reduction in its external tariff, will be incentive-compatible both for the union and outside countries. This result extends the existing literature on the Kemp-Wan theorem, which has primarily dealt with characterizations of the external tariff reductions that leave the rest of the world unaffected, by examining how this reduction affects incentives of union and outside countries to violate trade agreements.

Interestingly, the structure of endowments and the relative size of the union do not play a role in determining the incentive compatibility of the Kemp-Wan reduction in the model we consider. The sole determining factor is the elasticity of substitution in consumption, with the Kemp-Wan tariff reduction being incentive-compatible when $\sigma \leq 1$. This raises the question of what values of σ are most reasonable for describing existing customs unions. Since we have examined an endowment model, a literal empirical interpretation of σ as the elasticity of substitution in consumption is not appropriate. An alternative is to treat σ as embodying all of the substitution possibilities between domestic goods and imports, and then derive the value as the one that is consistent with observed import demand elasticities. For example,

suppose that we consider the customs union in the model to be the European Union. Perroni and Whalley (1994) survey the empirical literature on import demand elasticities and choose a value of -1.25 for the European Community when they parameterize a simulation model of trading blocs. We combined this estimate with the European Community's share of world income in 1986 (i.e., an estimate of β), external tariff, and exports/GNP ratio. We then solved the model to determine what values of σ and α would generate these observations. This yielded an estimate for the elasticity of substitution equal to 0.85, which suggests that a multilateral agreement would continue to be incentive-compatible if deepening of integration in the European Union were accompanied by a Kemp-Wan reduction in its external tariff.[12]

Naturally, there is much more that can be done in connection with this problem. Future research should scrutinize the political economy aspects of trade agreements further and should pay closer attention to possible asymmetries in the abilities of interest groups to influence policy. Moreover, the incorporation of production into the analysis should help clarify the role of technology. Lastly, the type of regional integration we have examined here is worth extending to consider the effects of deepening the integration of factor markets, and possibly the coordination of policies in a range of other areas including research and development and the environment.

[12] Using data from Perroni and Whalley (1994) for the European Community in 1986, we obtain a value of $\beta = 0.17$, $\tau = 0.12$, and an import/GNP ratio of 0.11 for trade with ROW. The equations for the union's elasticity of import demand ((A.2b) in the Appendix) and for the import/GNP ratio ($(1-\beta)(c_3^1-1)/(1+\alpha)$ using (4)) can then be solved simultaneously for the values of σ and α that are consistent with these parameter values. These solutions yielded values of $\sigma = 0.85$ and $\alpha = 0.16$. It should be noted that the value of σ estimated in this way is substantially lower than those used by Krugman (1991). This is due to the fact that Krugman's estimates were based on the assumption that observed tariff rates are the Nash equilibria of a one-shot tariff game. In the present model, observed tariff rates will be below those in the one-shot game as a result of the assumption that the tariff-setting game is repeated and can thus be consistent with values of σ derived from observed import demand elasticities.

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Appendix

Proof of Lemma 1: Define $m_3^1 \equiv c_3^1 - 1$ ($m_1^* \equiv c_1^* - 1$) to be imports of good 3 (1) by the representative country in the CU (ROW). Totally differentiating the market-clearing condition (3) yields

$$(\varepsilon + \varepsilon^* - 1)\left[\frac{dq}{q}\right] = \left[\frac{\partial m_1^*/\partial \tau^*}{m_1^*/(1+\tau^*)}\right]\frac{d\tau^*}{1+\tau^*} - \left[\frac{\partial m_3^1/\partial \Phi}{m_3^1/\Phi}\right]\frac{d\Phi}{\Phi} \tag{A.1}$$

where $\varepsilon \equiv \dfrac{\partial m_3^1/\partial q}{m_3^1/q}$, and $\varepsilon^* \equiv \dfrac{\partial m_1^*/\partial q}{m_1^*/q}$. Totally differentiating the import demand functions in (4) yields

$$\varepsilon^* = \frac{q\beta + \sigma(1-\beta)[q(1+\tau^*)]^\sigma}{q\beta + (1-\beta)[q(1+\tau^*)]^\sigma} + \frac{\sigma(1-\beta)[q(1+\tau^*)]^\sigma}{\alpha + (1-\beta)\left(1 - [q(1+\tau^*)]^\sigma\right)} \tag{A.2a}$$

$$\varepsilon = \frac{q(\beta+\alpha) + (\sigma-1)\beta q^{1-\sigma}\Phi}{q(\beta+\alpha) - \beta q^{1-\sigma}\Phi} + \frac{(\sigma-1)\beta q^{1-\sigma}\Phi}{(1-\beta) + \beta q^{1-\sigma}\Phi} \tag{A.2b}$$

$$\frac{\partial m_1^*/\partial \tau^*}{m_1^*/(1+\tau^*)} = -\sigma(1-\beta)[q(1+\tau^*)]^\sigma\left[\frac{1}{\beta q + (1-\beta)[q(1+\tau^*)]^\sigma} + \frac{1}{\alpha + (1-\beta)\left(1 - [q(1+\tau^*)]^\sigma\right)}\right] \tag{A.2c}$$

$$\frac{\partial m_3^1/\partial \Phi}{m_3^1/\Phi} = -\beta q^{1-\sigma}\Phi\left[\frac{1}{q(\beta+\alpha) - \beta q^{1-\sigma}\Phi} + \frac{1}{(1-\beta) + \beta q^{1-\sigma}\Phi}\right] \tag{A.2d}$$

$$\frac{d\Phi}{\Phi} = \sigma\left(\frac{d\tau}{1+\tau} - \frac{1}{1+(1+t)^\sigma}\frac{dt}{1+t}\right) \tag{A.2e}$$

Market stability requires $\varepsilon + \varepsilon^* - 1 > 0$. For $\sigma \geq 1$, we have $\varepsilon > 1$ and $\varepsilon^* > 1$ for all finite α and all $\beta \in (0,1)$. Substituting (A.2) into (A.1) yields the comparative statics results of Lemma 1. ||

Proof of Proposition 1: Part (a). Note that the optimal tariff formula for ROW can be written as $1/\tau^* = \varepsilon - 1$, where ε is given by (A.2b). This yields the condition

$$\frac{1}{\tau^*} = \frac{\sigma\beta\Phi}{q^{\sigma}(\beta+\alpha) - \beta\Phi} + \frac{(\sigma-1)\beta\Phi}{(1-\beta)q^{\sigma-1} + \beta\Phi}. \qquad \text{(A.3)}$$

The LHS of (A.3) is decreasing in τ^* and approaches 0 as $\tau^* \to \infty$. Since q is a decreasing function of τ^* and the RHS of (A.3) is a decreasing function of q, the RHS is positive and finite for all q at which trade exists, and is decreasing in τ^*. Therefore, there will exist a unique (finite) best-response tariff $\tilde{\tau}^*(\Phi)$ for $\sigma \geq 1$, which is decreasing in Φ. This follows from the fact that the RHS of (A.3) is increasing in Φ, and that q^{σ} rises less than proportionally to an increase in Φ (Lemma 1).

Part (b): The fact that there is a unique value at which $\partial U^*/\partial\tau^* = 0$ ensures that ROW's welfare is increasing in τ^* for all tariffs less than the best-response tariff rate, which establishes *(i)*. Differentiate (6) with respect to q to obtain

$$\frac{\partial V^*/\partial q}{V^*/q} = \beta q\left[\frac{1}{1-\beta+\alpha+\beta q} - \frac{1}{(1-\beta)[q(1+\tau^*)]^{\sigma} + \beta q}\right] - \qquad \text{(A.4)}$$

$$(1-\beta)\sigma\left[\frac{1}{1-\beta+\beta q^{\sigma-1}(1+\tau^*)^{1-\sigma}} + \frac{1}{(1-\beta)+\beta q^{1-\sigma}(1+\tau^*)^{-\sigma}}\right].$$

The first term in brackets will be negative if $\alpha + (1-\beta)\left(1 - [q(1+\tau^*)]^{-\sigma}\right) > 0$, which from (4a) will be satisfied if ROW imports goods 1 and 2. Since the second term in (A.4) is negative $V^*(q,\tau^*)$ must be decreasing in q. Application of Lemma 1 then yields parts *(ii)* and *(iii)* of part (b) of the proposition.

Part (c): Differentiation of (6) establishes that $\partial U^*/\partial\tau < 0$ for $\tau > 0$, so a reduction in τ with q constant will raise ROW welfare. ||

Proof of Proposition 2: Part (a): To prove this part of the proposition, we first derive the optimal (external) tariff formula for the representative union member 1, given the internal tariff t. With t kept

fixed, the ratio of consumption of good 1 to 2 in union member is, by equation (1), equal to

$$\frac{c_2^1}{c_1^1} = (1+t)^{-\sigma}. \tag{A.5}$$

Substituting this in the utility function of union member 1 yields

$$U = \left[\beta\mu(c_1^1)^{(\sigma-1)/\sigma} + (1-\beta)(c_3^1)^{(\sigma-1)/\sigma} + \right]^{\frac{\sigma}{\sigma-1}}$$

$$\textit{where} \quad \mu \equiv \frac{1}{2}\left[1 + (1+t)^{1-\sigma}\right].$$

Differentiating the above U totally and rearranging terms yields a condition that must be true for the policy that maximizes the representative union member's welfare, i.e.,

$$dU = 0 \Rightarrow -\left[\frac{\mu\beta}{1-\beta}\right]\left(\frac{dc_1^1}{dc_3^1}\right) = \left(\frac{c_3^1}{c_1^1}\right)^{-\frac{1}{\sigma}} = \frac{1+\tau}{q}. \tag{A.6}$$

The second equality in the RHS of (A.6) follows from (1) and the fact that $p_3^1/p_1^1 = (1+\tau)/q$. From the trade balance condition (3), we can write c_3^1 as a function of the world price q, i.e., $c_3^1 = q\left(c_1^*(q) - 1\right) + 1$ where $c_1^*(q)$ is ROW's demand function in (4a). Differentiating this condition with respect to q gives

$$\frac{dc_3^1}{dq} = -(c_1^* - 1)(\varepsilon^* - 1). \tag{A.7}$$

Utilizing the trade balance condition (3) and (A.6) in CU member 1's budget constraint (2b), we have

$$\beta\lambda c_1^1 = \frac{(1-\beta)(1-c_3^1)}{q} + \alpha + \beta = -(1-\beta)\left(c_1^*(q) - 1\right) + \alpha + \beta$$

$$\textit{where} \quad \lambda \equiv \frac{1}{2}\left[1 + (1+t)^{-\sigma}\right].$$

Differentiating this expression with respect to q, utilizing (A.7), and collecting terms yields

$$\frac{dc_1^1}{dq} = \frac{(1-\beta)(c_1^* - 1)}{\beta\lambda q}\varepsilon^*. \tag{A.8}$$

Substituting (A.8) and (A.7) into (A.6) gives the following best-response formula for the union:

$$1 + \tau = \frac{\mu}{\lambda}\frac{\varepsilon^*}{\varepsilon^* - 1}. \tag{A.9}$$

The existence of an optimal tariff satisfying (A.9) is illustrated in Fig. A.1. The LHS is represented by the ray *OL*. From the definitions of μ and λ, the ratio μ/λ is increasing in the internal tariff t and is equal to 1 for $t = 0$. If ROW's tariff τ^* is below the prohibitive level, the RHS of (A.9) will exceed 1 at $\tau = 0$. Moreover, the RHS is decreasing in ε^*, and ε^* is increasing in q as can be ascertained from (A.2). Since q is increasing in τ (Lemma 1), the RHS of (A.9) is decreasing in τ, as shown by the locus R_0 in Figure A.1. The intersection between loci *OL* and R_0 determines the unique optimal tariff schedule $\tilde{\tau}(\cdot)$ at which (A.9) is satisfied. It follows from (A.2a) and Lemma 1 that ε^* is an increasing function of τ^* (where the price adjustment is taken into account). An increase in τ^* thus leads to a leftward shift in the R_0 locus in Fig. A.1, so $\partial\tilde{\tau}(\cdot)/\partial\tau^* < 0$.

Insert Figure A.1 about here

Now consider the effect of an increase in the internal tariff t on the best-response (external) tariff of the union. At given τ, the increase in t will raise μ/λ $(= [1+(1+t)^{1-\sigma}]/[1+(1+t)^{-\sigma}])$ and by Lemma 1(b) will reduce $\varepsilon^*(q(\tau^*, \Phi), \tau^*)$. Both of these effects cause the *R* schedule to shift upwards from R_0 to

R_1 in Fig. A.1. We thus have $\partial\tilde{\tau}(\cdot)/\partial t > 0$.

Part (b): To prove this part, we differentiate (7) with respect to q to obtain

$$\frac{\partial V/\partial q}{V/q} = \left[\frac{(\beta+\alpha)q}{(1-\beta)+(\beta+\alpha)q} - \frac{\beta q^{1-\sigma}\Phi}{(1-\beta)+\beta q^{1-\sigma}\Phi}\right] + \sigma\beta q^{1-\sigma}\left[\frac{\Phi}{(1-\beta)+\beta q^{1-\sigma}\Phi} - \frac{\Psi}{(1-\beta)+\beta q^{1-\sigma}\Psi}\right]. \tag{A.10}$$

The term in the first brackets will be positive if and only if $(\beta+\alpha)q > \beta q^{1-\sigma}\Phi$, which from (4b) will be satisfied if the union imports good 3. The second bracketed term will be positive if an only if $\Phi > \Psi$. From the definitions of Φ and Ψ in (5) and (8), respectively, this is tantamount to requiring that $1+\tau > [1+(1+t)^{1-\sigma}]/[1+(1+t)^{-\sigma}]$ (or, equivalently, that $1+\tau > \mu/\lambda$). A sufficient condition for this inequality to be true is $0 \le t \le \tau$. This establishes the first part of Proposition 2(b). The remaining parts follow from the above and Lemma 1.

Part (c): Differentiation of (7) at fixed q yields

$$\frac{\partial U}{\partial \Phi}\frac{\Phi}{U} = \frac{-(1-\beta)q^{1-\sigma}\Phi}{\beta+(1-\beta)q^{1-\sigma}\Phi}, \qquad \frac{\partial U}{\partial \Psi}\frac{\Psi}{U} = \left(\frac{\sigma}{\sigma-1}\right)\frac{(1-\beta)q^{1-\sigma}\Psi}{\beta+(1-\beta)q^{1-\sigma}\Psi} \tag{A.11}$$

From (5) and (8) we have $d\Phi/\Phi = \sigma(d\tau)/(1+\tau)$ and $d\Psi/\Psi = (\sigma-1)(d\tau)/(1+\tau)$ at fixed t. Substituting these results in (A.11), it can be shown that U will be decreasing in τ (with τ^* adjusted to maintain q constant) if $\Phi > \Psi$. As established in the proof of part (b), $0 \le t \le \tau$ is a sufficient condition for this to hold. ||

Proof of Lemma 2(b): For the Cobb-Douglas case the demand functions are given by (4) with $\sigma \to 1$. Using (1) and these demand functions in the utility function of union member 1, $U = (c_1^1)^{\frac{\beta}{2}}(c_2^1)^{\frac{\beta}{2}}(c_3^1)^{1-\beta}$

yields

$$U = \left[\frac{(1-\beta)+q(\beta+\alpha)}{(1-\beta)+\beta\Phi}\right]\left[\frac{1+\tau}{q}\right]^{\beta}(1+t)^{-\frac{\beta}{2}}$$
$$\text{where} \quad \Phi \equiv \frac{1+\tau}{2}\left[\frac{2+t}{1+t}\right]. \tag{A.12}$$

A Kemp-Wan tariff reduction in the external tariff τ should keep Φ constant, therefore

$$\frac{d\tau}{1+\tau} = \frac{1}{2+t}\frac{dt}{1+t}. \tag{A.13}$$

If the Kemp-Wan tariff reduction is undertaken, the world price under the agreement will be unaffected. Recall that a hat (^) over variables indicates percentage change (e.g., $\hat{x} = dx/x$). Differentiating (A.12) and making use of (A.13), we obtain the effect of a Kemp-Wan adjustment in external tariffs on the utility of the union under the agreement to be

$$\hat{U}_A = -\frac{\beta}{2}\left[\frac{t}{2+t}\right]\frac{dt}{1+t}. \tag{A.14}$$

Since the RHS of the above expression (excluding dt) is negative for $t > 0$, a reduction in the internal tariff t will raise the welfare of the union under the agreement. This effect is independent of the magnitude of τ, thus establishing the result. ||

Derivation of Equations (13) and (14): Under no trade with ROW, the representative union member country 1 will consume its endowment of good 3. From (1), its consumption of goods 1 and 2 will be linked by the condition $c_2^1 = (1+t)^{-\sigma}c_1^1$. The autarky price of good 1 within the union, denoted q_N, will be determined by the requirement that the demand for a representative bloc 1 good, $\frac{\beta}{2}(c_1^1 + c_1^2)$, be equal

to the local supply of good 1, $\beta + \alpha$. Using (1) and the fact that $c_1^2 = c_2^1$, the market-clearing condition can be written as shown in (14) in the text. It is then direct to verify that the associated utility level is given by (13).

Proof of Proposition 4: Part (a): We show that if $\sigma > 1$ and the union makes a Kemp-Wan adjustment in its external tariff τ, then (i) $\hat{U}_D > \hat{U}_A > 0$ and (ii) $\hat{U}_N > \hat{U}_A > 0$. These inequalities establish that the LHS of (11b) in the text increases by less than the RHS, so that the Kemp-Wan adjustment in the external tariff is not incentive compatible. Since the LHS of (11b) is increasing in τ at the initial point, the value of τ that maintains incentive compatibility must exceed the Kemp-Wan tariff. To establish inequality (i), note that $\hat{U}_A$ is obtained by evaluating (15) at $\Theta(\tau_A, t)$. To calculate the effect of the deepening of integration on U_D, recall that $\partial U/\partial\tau = 0$ when the union chooses to deviate optimally from the tariff agreement. Since the local effect of the external tariff is zero, there is no loss of generality in assuming that the union makes a Kemp-Wan adjustment in its optimal tariff as a result of the change in t. Therefore, $\hat{U}_D$ is obtained from (15) evaluated at $\Theta(\tilde{\tau}(\tau_A, t), t)$. Since $\tilde{\tau}(\tau_A, t) > \tau_A$, Lemma 2 yields $\hat{U}_D > \hat{U}_A > 0$.

To show (ii), we differentiate (13) to obtain

$$\hat{U}_N = \left[\frac{\left(c_1^1\right)^{\frac{\sigma-1}{\sigma}}\left(1 + (1+t)^{1-\sigma}\right)}{(1-\beta) + \left(c_1^1\right)^{\frac{\sigma-1}{\sigma}}\left(1 + (1+t)^{1-\sigma}\right)}\right]\left(\frac{dc_1^1}{c_1^1} - \frac{\sigma}{[1 + (1+t)^{\sigma-1}]}\frac{dt}{1+t}\right). \qquad \text{(A.15)}$$

From (14),

$$\frac{dc_1^1}{c_1^1} = \left[\frac{\sigma}{1 + (1+t)^{\sigma}}\right]\frac{dt}{1+t}. \qquad \text{(A.16)}$$

Since $c_3^1 = 1$ under autarky, (1) implies that $(c_1^1)^{(\sigma-1)/\sigma} = (p_N)^{1-\sigma}$ under this state. Using this fact and

substituting (A.16) into (A.15), we have

$$\hat{U}_N = \left[\frac{(\beta/2)[1+(1+t)^{1-\sigma}]}{(1-\beta)\left(p_N\right)^{\sigma-1} + (\beta/2)[1+(1+t)^{1-\sigma}]}\right]\frac{d\Psi}{\Psi}. \qquad \text{(A.17)}$$

The autarky price q_N for the union will exceed $q/(1+\tau_A)$, so a comparison of (A.17) with (15) establishes that $\hat{U}_D > \hat{U}_A > 0$. This proves part (a) for the case $\sigma > 1$. The same argument can be applied to show that for the case of $\sigma < 1$ we will have $0 < \hat{U}_N < \hat{U}_D < \hat{U}_A$. This means that the Kemp-Wan tariff reduction raises the LHS of (11b) by more than the RHS, so that the external tariff must be reduced by more than the Kemp-Wan reduction to maintain strict equality in (11b).

Part (b): We establish the result by showing that under a Kemp-Wan adjustment of the external tariff we will have $\hat{U}_N = \hat{U}_D = \hat{U}_A$, so that the incentive constraint of the union is unaffected. The effect of the Kemp-Wan adjustment of the agreement is given by (A.13). To derive the payoff under cheating, we choose q to maximize welfare as in (A.6) which yields the necessary condition

$$dU = 0 \Rightarrow -\left[\frac{\beta}{1-\beta}\right]\left(\frac{dc_1^1}{dc_3^1}\right) = \frac{c_3^1}{c_1^1} = \frac{1+\tau}{q}. \qquad \text{(A.18)}$$

Substituting (A.7) and (A.8) into (A.18) yields the optimal tariff formula

$$\Phi = \frac{\varepsilon^*}{\varepsilon^* - 1}. \qquad \text{(A.19)}$$

When the union deviates from the agreement, the value of Φ is the same for all values of t, which indicates that the terms of trade in the optimal deviation is independent of the internal tariff t. Therefore, in the Cobb-Douglas case there is a Kemp-Wan adjustment in the external tariff that the union imposes in the event of cheating, so the change in τ under cheating is given by (A.13), which yields $\hat{U}_D = \hat{U}_A$.

To complete the proof, it remains to show that $\hat{U}_N = \hat{U}_A$. Substituting into (14) for the Cobb-

Douglas case yields $c_1^1 = 2\left[\frac{\beta+\alpha}{\beta}\right]\left[\frac{1+t}{2+t}\right]$. Substituting this result into the Cobb-Douglas utility function and using (1) we obtain the autarky utility level

$$U_N = 2\left[\frac{\beta+\alpha}{\beta}\right](1+t)^{\frac{\beta}{2}}(2+t)^{-\beta}. \tag{A.20}$$

Differentiating (A.20) yields

$$\hat{U}_A = -\frac{\beta}{2}\left[\frac{t}{2+t}\right]\frac{dt}{1+t}. \tag{A.21}$$

This is identical to the result obtained for the agreement and cheating effects. Since each of the payoff terms in (11b) increases by the same proportion under a Kemp-Wan tariff adjustment in the agreement, the Kemp-Wan tariff adjustment will be incentive compatible. ||

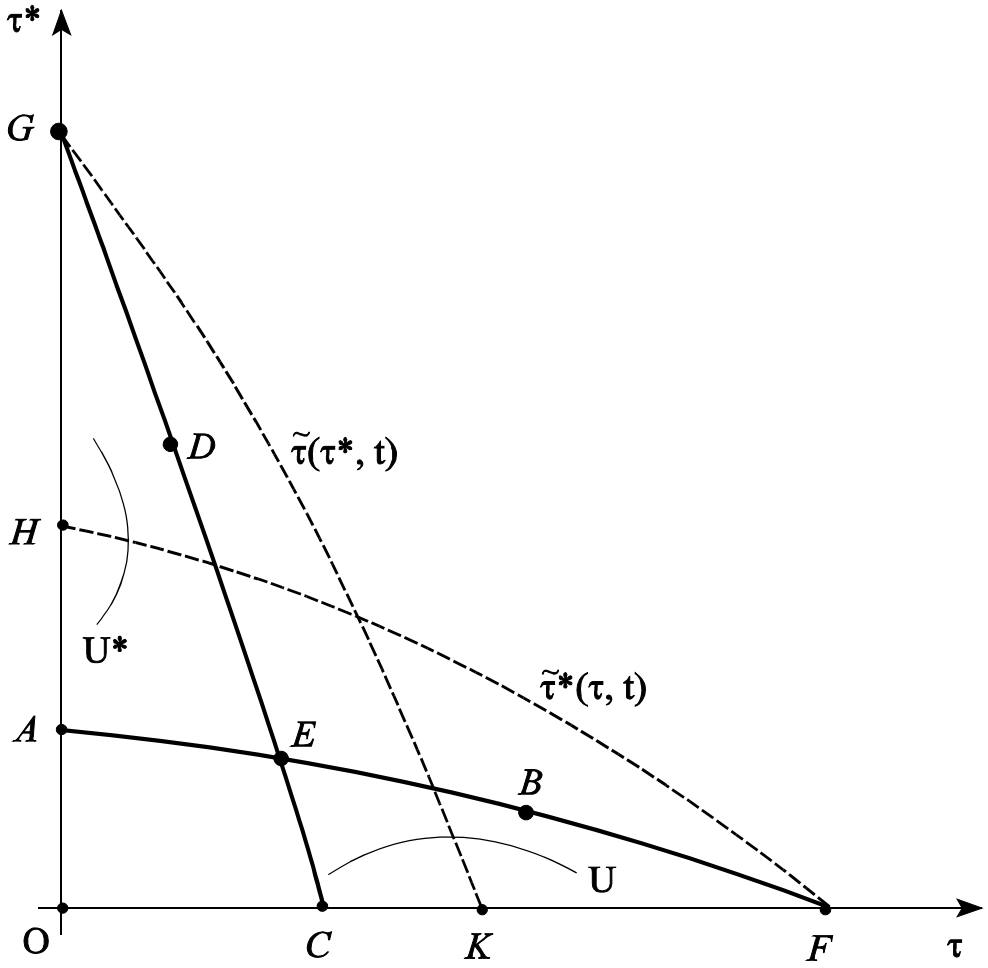

Figure 1a:

Tariff Reaction Functions and Incentive-Compatibility

Constraints in Tariff Space

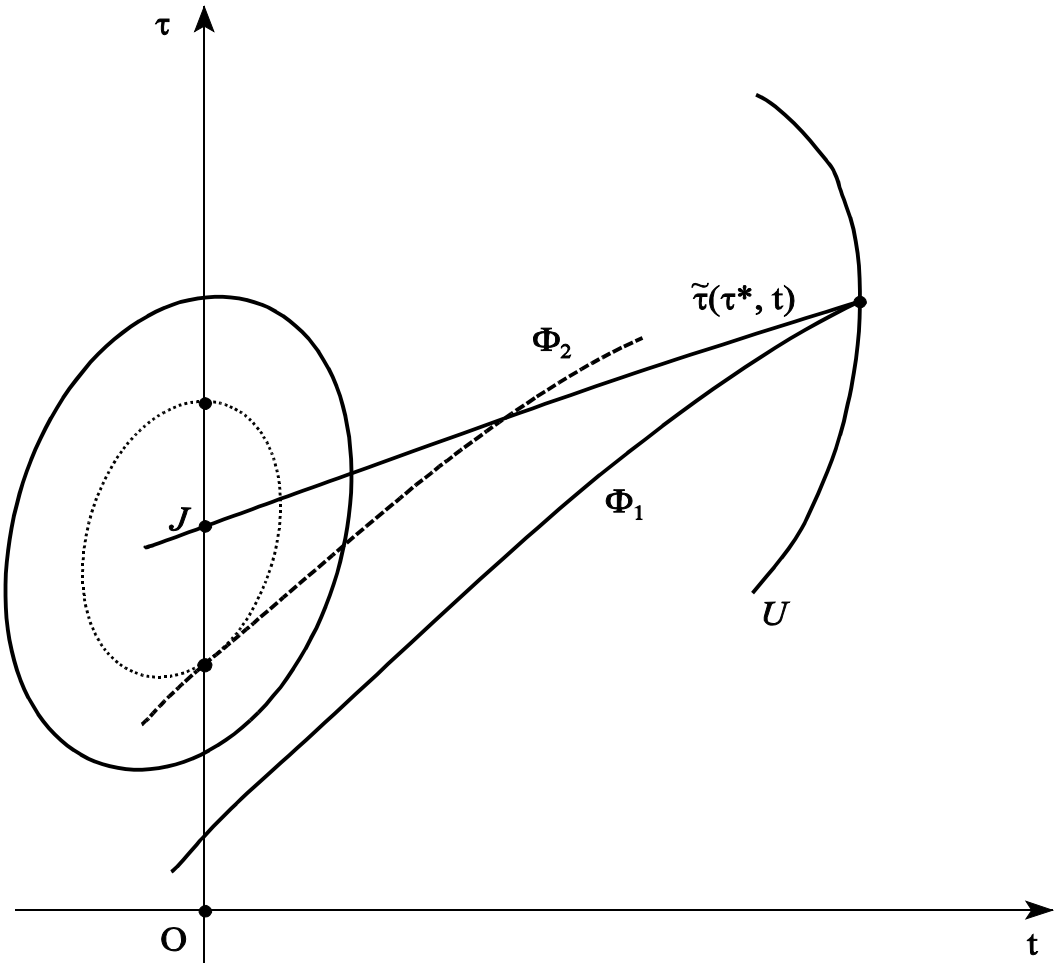

Figure 1b:

Optimal Tariffs and Kemp-Wan Tariff Adjustments in the Customs Union

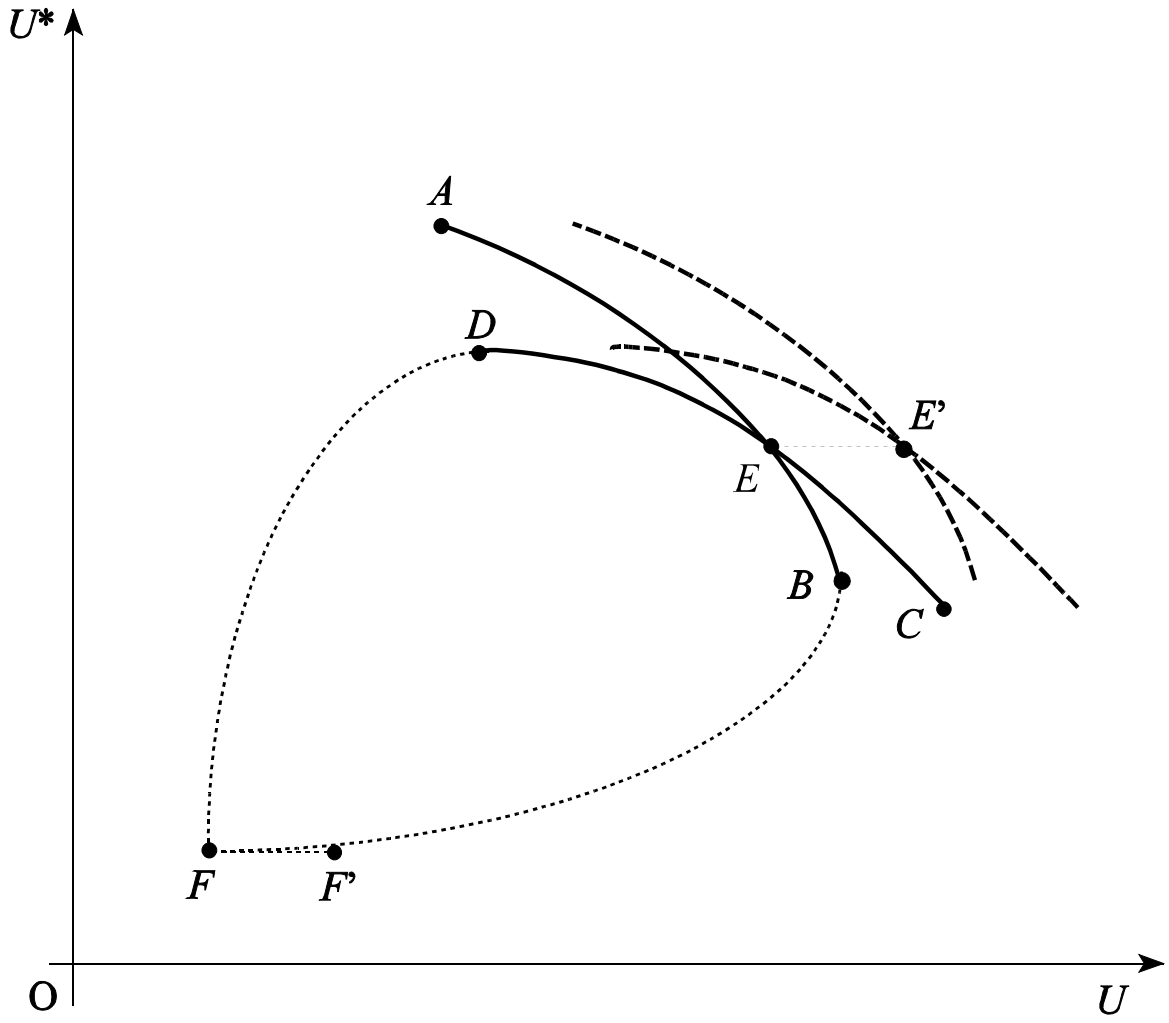

Figure 2:

Constrained-Efficient Payoff Frontier and the Effects of Internal Trade Liberalization (Deepening of Integration)

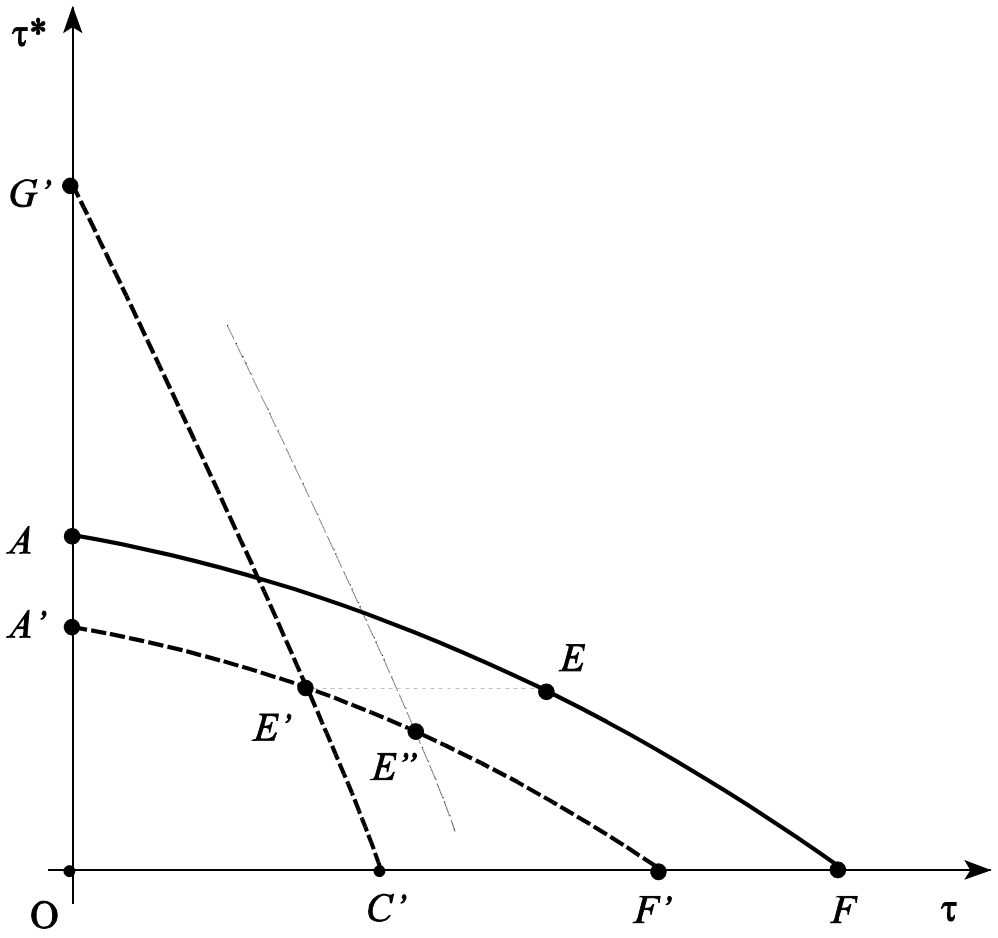

Figure 3:

Effects of Internal Trade Liberalization (Deepening of Regional Integration) on Incentive Constraints in Tariff Space

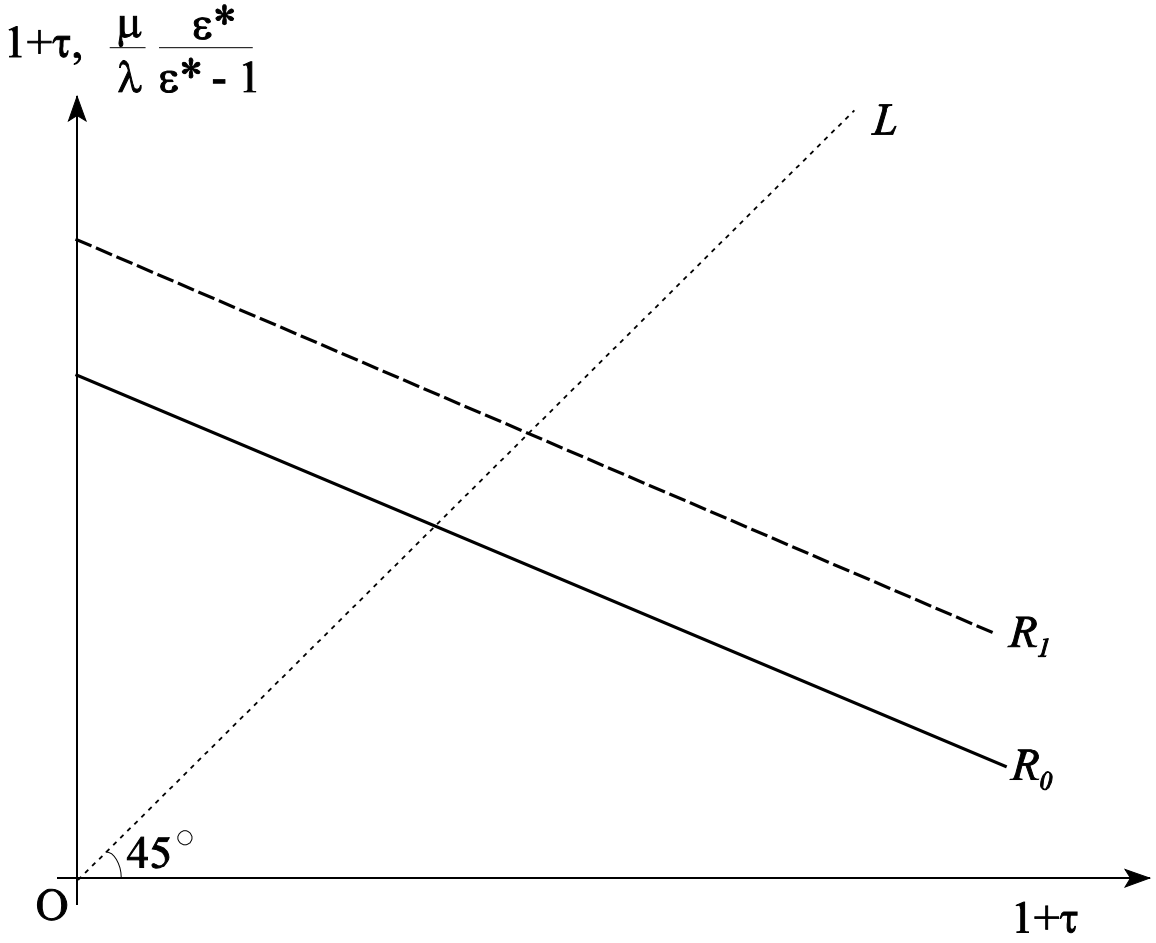

Figure A.1:

Existence of an Optimal Tariff for the Customs Union in the Presence of Tariffs on Internal Trade