

Trade Coordination in Free Trade Agreements and Customs Unions*

Sihoon Nahm[†]

Department of International Business and Trade, Myongji University, South Korea

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Abstract

Purpose – This paper explains why free trade agreements (FTAs) are more popular than customs unions (CUs) in respect of tariff coordination.

Design/methodology – This paper employs an equilibrium theory of trade agreements with tariff coordination. I set up three-country partial equilibrium model with competing exporters. Domestic and exporting firms decide their optimal production under given tariffs and each country levies its tariff under the trade agreements. I found stability of implicit tariff coordination and preference of each country between an FTA and a CU.

Findings – I demonstrate that two FTA members can keep their external tariffs higher than separately decided external tariffs by keeping the status-quo. This implicit tariff coordination can benefit each member through trade diversion. In a CU, each member country must have a common optimal external tariff and it must incur costs because each country may seek different external tariffs for their own national welfare. The benefit of implicit coordination in an FTA and the cost of explicit coordination in a CU account for the popularity of the FTA.

Originality/value – This paper uses the idea of implicit tariff coordination in trade agreements. In a CU, tariff coordination is explicit and mandatory. All member countries must have a single common external tariff for each good. On the other hand, in an FTA, each country establishes its external tariff with the goal of maximizing its own welfare. However, each country can also coordinate “implicitly” by keeping the status-quo after establishing an FTA.

Keywords: Customs Union, Free Trade Agreement, Trade Liberalization

JEL Classifications: F12, F13, F15

1. Introduction

Countries in the World Trade Organization (WTO) have tried hard to lower tariffs imposed on one another and reach global tariff-free trade. Following completion of the Uruguay Round, a new major round, the Doha Round, was started in 2001. However, it was not successful. As multilateral talks slowed, each country turned its attention to preferential trade agreements (PTAs), which lower tariffs exclusively for PTA member countries. The two most common forms of PTAs are the free trade agreement (FTA) and the customs union (CU). In both, there are zero tariffs between members.¹ In the CU, only a common external tariff is imposed on goods from non-participating countries. In contrast, each participant can select a different external tariff in an FTA.

FTAs became more prevalent than CUs, especially after the Doha Round became slower. In reports by the WTO as of April 2015, 221 PTAs are notified to the WTO after January 2000, and only 11 cases are CUs. However, 206 cases are FTAs.² This is surprising given that CU countries can cooperate on deciding common optimal external tariffs to maximize the sum of their members' welfare, whereas FTA countries can impose optimal external tariffs independently without consideration on other members. Some propose that this property helps CU members acquire more welfare than would be possible under an FTA, at least in the

[†]Corresponding author: sihoon.nahm@gmail.com

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short-run.³

This paper addresses why FTAs are more popular than CUs by examining how member countries in trade agreements coordinate their actions. Each country can coordinate implicitly by setting their tariffs to the status-quo level, which is higher than their new optimal tariffs under the FTA. When both countries keep their external tariffs at the same level before formulating an FTA, they can improve the welfare for both countries. Because of GATT (General Agreement on Tariffs and Trade)/WTO Article XXIV, which mandates that FTA or CU members cannot raise external tariffs on average, keeping the status quo satisfies this Article XXIV constraint and becomes a focal point of optimization.

This paper applies tariff coordination elements to the trade liberalization with a three-country oligopoly model. To begin, this paper finds that implicit coordination is possible by endogenous decisions of members in an FTA when they can choose between two external tariff policies: a separate optimal tariff decision and implicit coordination that keeps external tariffs following the status-quo.

Next, this paper shows the preference of each country between an FTA and a CU when they establish a trade agreement with each other. I found three important factors: coordination, asymmetry, and the role of Article XXIV. First, an FTA with implicit tariff coordination becomes more profitable than an FTA without coordination. Next, forming a CU becomes costly as cost or demand size asymmetry increases. If each member country has a different demand or production cost, they will want a different external tariff. As these asymmetry differences increase, the difference between their optimal external tariffs and the cost of achieving a common external tariff also increase. Countries choose an FTA over a CU under implicit tariff coordination, and this explains the popularity of the FTA. In contrast, a CU is more popular without considering implicit coordination in the FTA. Also, this paper tests the role of GATT/WTO Article XXIV and finds that this regulation on external tariffs can be more costly to countries forming a CU and makes countries more favorable to forming an FTA.

This paper is based on a simple three-country oligopoly model. I analyze the endogenous decision of all three countries regarding external tariff policies under an FTA, a CU, and a type of trade agreement distinguished by multilateralism. Ornelas (2007), Saggi and Yildiz (2010) and Saggi et al. (2013) also assume a three-country oligopoly trade liberalization game without an international transfer. However, in contrast to my paper, these papers do not consider the possibility of implicit coordination.

This paper is heavily related to studies on “tariff complementarity” and “trade diversion”. Previous studies have found that FTA members tend to lower external tariffs after establishing an FTA. This is called “tariff complementarity”, which is explained through various mechanisms such as Bagwell and Staiger (1999b), Bond et al. (2004) and Richardson (1993). Empirical works such as Estevadeordal et al. (2008) and Limão (2006) showed conflicting results on the existence of tariff complementarity.⁴ When tariff complementarity appears, trade between members in an agreement does not increase much. That is, tariff

¹ Each PTA may have some exceptions on some goods and keep positive tariffs on them. I do not consider exceptions in this paper.

² Among 11 CUs, 4 cases are extensions of EU and 5 cases are overlapped CUs in Africa. Many proposed CUs are still not active. However, many countries including the United States, Canada, Republic of Korea, India, and Chile, are establishing only FTAs. Other trade agreements are partial scope agreements (PSAs).

³ See Baldwin and Venables (1995) or Richardson (1993) for an early contribution on this topic. Saggi (2006) proved that a CU provides higher welfare to its members than an FTA in the short-run, based on an oligopoly model.

⁴ To explain these conflicting results, Freund and Ornelas (2010) and Maggi (2014) assert that only developing countries with high external tariffs experience a strong tariff complementarity effect.

complementarity reduces the loss from trade diversion. My model has tariff complementarity and implicit coordination is impossible when the social welfare gained from lowering an external tariff is high enough for any one member. Otherwise, implicit coordination in an FTA becomes possible and then tariff complementarity disappears. That is, keeping the status-quo means keeping high external tariffs even when tariff complementarity exists in the model.

My paper is structured as follows: In Section 2, which presents my model, I explain market equilibrium and the optimal tariff choice of each country — that is, how, for a given trade agreement, each country decides its optimal tariffs. In Section 3, I analyze how two countries reach endogenous decisions about the type of trade agreements used. I present my conclusions in Section 4.

2. Model

This paper applies tariff coordination elements to an adapted version of the three-country partial equilibrium “competing exporters” framework developed by Bagwell and Staiger (1999b) and Saggi and Yildiz (2010). The model is simple and contains a tariff complementarity element. In this setup, each country wants to shift the profits of foreign firms in its domestic market to tariff revenues and domestic firm profits. Each country uses tariffs to maximize its total welfare, and the “profit-shifting” incentive and the “manipulating terms-of-trade” incentive appear.

My model progresses through three stages. Prior to stage 1, the social planner decides the rule of trade agreement among participating countries. There are four rules: (1) both the FTA and the CU are possible, (2) only an FTA is possible, (3) only a CU is possible, and (4) both possibilities are banned. In stage 1, countries can undertake the trade agreements permitted under the rules devised by the social planner and establish an FTA or a CU, but an agreement is made only if both of two countries agree with that. Each country wants to maximize its welfare as total surplus, which consists of consumer surplus, tariff revenue, and firm profits on domestic and foreign markets.

In my model, there are 3 countries, 1, 2, and 3, and these countries become players in a trade liberalization game. I denote {12} as one trade agreement between countries 1 and 2. Four types of game results are possible: (1) no agreement is made (Φ), (2) one agreement is made ({12}, {13}, {23}), (3) two agreements are made ({12-13}, {12-23}, {13-23}),⁵ and (4) three agreements are made and global tariff-free trade is achieved ({G}).

At stage 2, each country decides its tariff for the trade agreements established during stage 1. Each country wants to maximize its national total welfare with a constraint that depends on the result of stage 1. For example, in stage 1, when two of three countries establish an FTA or a CU, they will have a zero internal tariff and they must decide, independently or cooperatively, what external tariff to impose on non-member countries. Additionally, the Article XXIV regulation may bind tariff decisions in a CU.

Finally, in stage 3, each firm decides its optimal production under given tariff and demand conditions. This qualifies as a Cournot equilibrium, produced by firm production decisions. In stage 2, each country determines its tariff based on its expectations about firm decisions in stage 3. Likewise, in stage 1, the strategy of each country rests on the expectation about what decisions will be made from decisions in stages 2 and 3. Next, I explain the model, starting with stage 3 and moving backwards to stage 1. I first examine demand, production, and market equilibrium in the context of stage 3, and then the optimal tariff decisions of each

⁵ In {12-13}, country 1 becomes a “hub” of two FTAs {12} and {13}, and FTA countries 2 and 3 become the spokes. This “hub-spoke” structure is not possible with CUs.

country in stage 2.⁶ The full derivation of each calculation process and the proof of all lemma and propositions is on Appendix available upon request.

2.1. Market Equilibrium

2.1.1. Demand and Production

People in these countries have the same preference for 3 non-numeraire goods, A, B, and C, and numeraire ψ . Their utility function is additively separable for each good consumption:

$$U_i = \alpha_{iA}x_{iA} - \frac{1}{2}x_{iA}^2 + \alpha_{iB}x_{iB} - \frac{1}{2}x_{iB}^2 + \alpha_{iC}x_{iC} - \frac{1}{2}x_{iC}^2 + \psi_i \quad (1)$$

for each country $i = 1, 2$, and 3. Consequently, demand from each country for each good becomes linear, and I normalize the price of numeraire $p_\psi = 1$. Each demand is given by $d(p_{iX}) = \alpha_{iX} - p_{iX}$ in each country $i = 1, 2$, and 3, where $X=A, B$, and C. The slope of linear demand is fixed to 1. α_{iX} is the intercept of linear demand and represents market size for good X in country i.

Each country can produce numeraire good ψ and only two non-numeraire goods. Country 1 produces goods B and C but cannot produce good A. Country 2 produces only goods A and C, and country 3 produces only goods A and B. Each country has one domestic firm that produces the non-numeraire good and numerous firms that produce numeraire good ψ . The market for numeraire goods is perfectly competitive. Firms produce goods using only labor, and there is no capital. The production function is linear, and each unit that produces good X needs c_{jX} units of labor for the firm in country j. Similarly, each unit that produces a numeraire good needs one unit of labor. In this economy, there are six types of cost levels for production of non-numeraire goods: $\{c_{jX}\}_{j=1,2,3, X=A,B,C}^{X=A,B,C}$. When a wage is w, the profit for the firm producing good A in country j is $\pi_{jA} = p_{jA}q_{jA} - q_{jA}c_{jA}w_j$, but the wage is $w_j = p_\psi = 1$ because the numeraire goods market is competitive. Thus, profit for production of the numeraire good becomes zero.

I assume that when three countries begin trade, each country exports two goods that it produces, and imports three goods. For example, country 1 exports goods B and C to country 2 and 3, imports goods A and C from country 2, and import goods A and B from country 3. When optimal production is zero, each firm can choose zero production, but I constrain the parameter range that makes all production positive. Numeraire goods are freely traded and as a result overall trade become balanced even when non-numeraire good trade is imbalanced. Also, this arrangement keeps the wages of each country fixed to 1. Numeraire goods are produced sufficiently to ensure that trade balances are maintained. Each market reaches equilibrium through these trades of goods.

Also, each country levies a tariff on each import. I denote τ_{ijX} as the tariff that country i levies on good X imported from country j. The firm in country j that produces good X gets the profit

$$\pi_{ijX} = p_{iX}q_{ijX} - q_{ijX}(c_{jX} + \tau_{ijX}) \quad (2)$$

when it sells amount q_{ijX} in country i. Each firm identifies production goals that maximize its profit. There are no differences in quality between goods produced in different countries, but production cost c_{jX} can differ from one country to another, and this can offer absolute advantages to the three countries.

Under this market structure, three non-numeraire good markets exist in three countries. Each of the nine markets can be analyzed independently. A tariff on good B imported from

⁶ Stage 1 decisions and game equilibrium will be discussed in detail on my other research.

country 3 does not affect the market for goods A and C in country 3, or the non-numeraire goods markets in the other countries. Each demand for goods is independent. There is no general equilibrium effect from wage change or other factors because all changes are absorbed in the numeraire good market. Production is linear, and so each market is segmented from other firms. Each firm sets a production amount for each market and produces the sum of these. The domestic market for imported goods is under the oligopoly of two firms from two countries. Trade gains are made by the consumption of the good that a given country cannot produce, the absolute production cost advantage between countries, and changing a monopoly to a duopoly.

2.1.2. Equilibrium

People During stage 3, two firms compete in each market based on the optimal production decisions they have made for given tariffs. When a country cannot produce the good, two foreign firms compete in the domestic market. When a country can produce the good, one domestic firm and one foreign firm compete to produce and sell it. During stage 2, each country selects optimal tariffs on each foreign good in each market. Thus, to maximize total surplus, each country needs to set up four types of tariffs. For example, Country 1 will import good A from country 2 and 3, good B from country 3, and good C from country 2. As illustrated in (2), each firm maximizes profit for given tariffs, and equilibrium quantities and prices are determined.

Denote total sales of good X on country i as Q_{iX} . This is the sum of the production of goods in each country and sold in country i. For example, $Q_{iA} = q_{i2A} + q_{i3A}$ for $i=1,2,3$ because good A is produced in countries 2 and 3. Then each profit becomes

$$\pi_{ijX} = q_{ijX}(p_{iX} - c_{jX} - \tau_{ijX}) = q_{ijX}(\alpha_{iX} - c_{jX} - Q_{iX} - \tau_{ijX}) \quad (3)$$

Now each equilibrium depends on $\{\alpha_{iX}, c_{jX}, \tau_{ijX}\}_{i,j=1,2,3, jX \neq 1A, 2B, 3C}^{X=A,B,C}$. When two firms from country j and k compete in the market, the Cournot equilibrium productions are

$$q_{ijX} = \frac{1}{3}(\alpha_{iX} - 2c_{jX} + c_{kX} - 2\tau_{ijX} + \tau_{ikX}) \quad (4)$$

for each good $X=A,B,C$ and each country $i,j,k=1,2,3$ ($jX \neq 1A, 2B, 3C, kX \neq 1A, 2B, 3C$).

Next we identify consumer surplus, tariff revenue, and firm profits on each market as functions of $\{\alpha_{iX}, c_{jX}, \tau_{ijX}\}_{i,j=1,2,3, jX \neq 1A, 2B, 3C}^{X=A,B,C}$. Assume that tariffs should be zero or positive, and that subsidy as a negative tariff is banned. Tariffs cannot be levied on domestic goods. In other words, when each country i can produce good X, τ_{iX} must be zero. The domestic market equilibrium of good X in country i is given below. Assume that countries j and k produce good X in the market of country i. i can be the same country as j or k, but j and k must be different.

$$CS_{iX} = \frac{1}{2}Q_{iX}^2 = \frac{1}{18}(2\alpha_{iX} - c_{jX} - c_{kX} - \tau_{ijX} - \tau_{ikX})^2 \quad (5)$$

$$\pi_{ijX} = (P_{iX} - c_{jX} - \tau_{ijX})q_{ijX} = \frac{1}{9}(\alpha_{iX} - 2c_{jX} + c_{kX} - 2\tau_{ijX} + \tau_{ikX})^2 \quad (6)$$

$$\pi_{ikX} = \frac{1}{9}(\alpha_{iX} + c_{jX} - 2c_{kX} + \tau_{ijX} - 2\tau_{ikX})^2 \quad (7)$$

$$TR_{iX} = q_{ijX}\tau_{ijX} + q_{ikX}\tau_{ikX} \quad (8)$$

These elements depend on tariff τ_{ijX} and τ_{ikX} . When the tariff on an import from country j (τ_{ijX}) increases, profit π_{ijX} decreases and π_{ikX} increases due to the substitution decision of consumers. In this equilibrium, consumer surplus and tariff revenues are always one part of

domestic surplus. When a domestic firm produces good X, its profit becomes part of the surplus of country i. Profit is zero when a country does not produce that good. Denote $DS_{iX} \equiv CS_{iX} + TR_{iX} + \pi_{iX}$, which is the domestic surplus from only the domestic market of good X.

Country i can acquire more firm profits from exporting. Denote $EX_{iX} \equiv \pi_{jiX} + \pi_{kiX}$; this is the profit from exporting good X. Denote DS_i as the sum of the domestic surplus for three domestic markets, and EX_i the sum of two exports that country i produce. Total surplus TS_i is the sum of DS_i and EX_i . For example, when country i, j, k are different and i cannot produce good A, total surplus of country i is

$$\begin{aligned} TS_i &= \sum_{X=A,B,C} (CS_{iX} + TR_{iX} + \pi_{iX}) + \sum_{Y=B,C} (\pi_{jiY} + \pi_{kiY}) \\ &= \sum_{X=A,B,C} DS_{iX} + \sum_{Y=B,C} EX_{iY} \end{aligned} \quad (9)$$

TS_i represents total welfare of country i, and each country wants to maximize this total surplus. Note that EX_i does not depend on domestic tariff rates. On the other hand, foreign firm profits from import, which is the part of the foreign countries' welfare, depend on tariff decisions of the domestic country. All markets are separate, and the effect of the tariff on the market is segmented.

2.2. Optimal Tariff Choices in Trade Agreements

In this section, I explain how each country identifies the optimal tariff for each trade agreement. Optimization depends on the trade agreements a country agrees to in stage 1. Even though the internal tariff for a trade agreement is zero, a decision regarding external tariffs affects total surplus and it depends on the type of trade agreement. In stage 2, each country identifies an optimal tariff that will maximize its total surplus. Next we solve equilibrium for a given $\{\alpha_{iX}, c_{jX}\}_{i,j=1,2,3, X=A,B,C}$. In free trade, all tariffs between countries become zero. Before checking properties of each trade agreement, I add one assumption.

Assumption 1. $\alpha_{iX} - 2c_{jX} + c_{kX} \geq 0$ for all goods $X = A, B, C$ and countries $i, j, k = 1, 2, 3$

Under this assumption, each α_{iX} is higher than c_{jX} for any case, and equilibrium production under free trade $q_{ijX}(G) = (\alpha_{iX} - 2c_{jX} + c_{kX})/3$ becomes positive. Also, other productions under different trade agreements also become positive. I will add more assumptions if needed, but Assumption 1 is enough for this section.

2.2.1. Trade War: No Agreement

When there is no trade agreement, each country maximizes its own total surplus without specific conditions. DS_{iX} depends on a tariff levied on good X, but other elements in total surplus do not. Thus, the equation below is satisfied.

- $\{\tau_{ijX}(\Phi)\} \equiv \arg \max TS_i = \arg \max DS_{iX}$ when country i imports the good X from country j.

Each country cannot produce one good and import that good from two countries. Thus, each country will decide on four tariffs for three goods. For example, country 1 has two tariffs to maximize surplus on domestic market A, but country 1 has only one tariff on markets B and C. Then the given tariff for a trade war state is as below and these tariffs are positive.

- $\tau_{ijX}(\Phi) = \frac{1}{8}(2\alpha_{iX} - 3c_{jX} + c_{kX})$ for each $(i, X) = (1, A), (2, B), (3, C)$

$$\bullet \tau_{ijX}(\Phi) = \frac{1}{3}(\alpha_{iX} - c_{jX}) \text{ otherwise.}$$

When a firm from country j can produce product X at a low cost (c_{jX}), the firm from j acquires a large portion of the market by offering the same product at a lower cost. To obtain more tariff revenue or protect its domestic firm, country i 's government will levy a high tariff on the firm from j . When country k produces X at a low cost, imports from k to i increase and imports from j to i decrease. This substitution makes tariff revenue from country j decrease and the optimal tariff on good X from country j decrease. As a result, the domestic government places higher tariffs on a country that has the lower cost.⁷ Profits from the exporting firm in country j decrease from technology development of the competing firm in k but are partially covered by an optimal tariff decrease.

However, when country i can produce good X , the tariff on competing firm j does not depend on costs of the firm in i . In this case, if costs of domestic firm go up, the optimal tariff should decrease considering tariff revenue and consumer surplus, but it should increase considering domestic firm profits. These two effects offset each other in this model. Profits of exporting firms depend on tariffs from foreign countries. Using this tariff decision rule, the surplus of each country in a trade war regime can be calculated.

2.2.2. Free Trade Agreement with New Optimal External Tariffs

When one country reaches a free trade agreement with another, its tariff decisions change. In this section, I assume that each country decides its optimal external tariff separately. I denote (12|FTA) as the tariff or surplus value when countries 1 and 2 establish an FTA and follow this external tariff rule. Under this FTA, countries 1 and 2 levy zero tariffs on each other. The tariff that member countries 1 and 2 imposes, $\tau_{12X}(12|FTA)$, becomes zero for all good X that country 2 can produce, and $\tau_{21Y}(12|FTA)$ becomes zero for all good Y that country 1 can produce. Next, countries 1 and 2 decide optimal external tariffs on country 3 separately. The optimal conditions for determining tariffs $\tau_{13B}(12|FTA)$ and $\tau_{23A}(12|FTA)$ do not change because country 2 cannot produce good B and country 1 cannot produce good A .

For these cases, $\tau_{ijX}(12|FTA) = \tau_{ijX}(\Phi) = (\alpha_{iX} - c_{jX})/3$. The optimal condition to decide $\tau_{13A}(12|FTA)$ and $\tau_{23B}(12|FTA)$ changes. This tariff decision, which plays a role in this section, is generalized below

$$\bullet \tau_{ikX}(ij|FTA) \equiv \arg \max TS_i = \arg \max DS_{iX} \text{ with } \tau_{ijX}(ij|FTA) = 0.$$

Since the total surplus DS_{iX} equation is the same regardless of the regime, we can achieve the same first order condition as in trade war cases. Additional condition makes internal tariff zero and it represents the FTA. The optimal external tariff for each FTA member country i is

$$\tau_{ikX}(ij|FTA) = \frac{1}{11}(\alpha_{iX} + 4c_{jX} - 5c_{kX}) \quad (10)$$

The optimal external tariff result indicates that the external tariff under the FTA is lower than the tariff under a trade war state. This is called "tariff complementarity".

Lemma 1. (Tariff complementarity) Assume that country i imports good X from two countries, j and k . If country i and j establish an FTA, the external tariff on country k is less than the tariff in a trade war state. That is, $\tau_{ikX}(ij|FTA) < \tau_{ikX}(\Phi)$.

With condition $\tau_{12A}(12|FTA) = 0$ under an FTA between countries 1 and 2, optimal

⁷ This result is the same as Choi (1995) and Gatsios (1990).

tariff $\tau_{13A}(12|FTA)$ is lower than $\tau_{13A}(\Phi)$ under Assumption 1. In calculation, when τ_{12A} is given, optimal τ_{13A} is $(\alpha_{1A} - 5c_{3A} + 4c_{2A} + 7\tau_{12A})/11$. This equation indicates that when τ_{12A} is given, as τ_{12A} decreases, τ_{13A} decreases. When country 1 lowers its tariff on goods from country 2, the total unit cost of country 2 production, including production costs and tariffs, also declines. Country 2 then can take more demand from country 1, and imports from country 3 will decline by substitution. The import decrease also causes tariff revenues from country 3 to decrease. When tariff revenue decreases, lowering the tariff rate will increase the tariff revenue. This process explains tariff complementarity on the FTA in this setup.

In non-member country 3, domestic market conditions do not change even if countries 1 and 2 establish an FTA. Country 3 will levy the same tariff as in a trade war regime. ($\tau_{31X}(12|FTA) = \tau_{31X}(\Phi)$ and $\tau_{32X}(12|FTA) = \tau_{32X}(\Phi)$) Therefore, $DS_3(12|FTA)$, which does not change, will be the same as surplus $DS_3(\Phi)$. Next, export firm profits depend on tariff decisions of countries 1 and 2. Country 3 exports goods A and B to countries 1 and 2. Among these countries, π_{13B} does not change because country 2 does not produce that good, and, as noted above, $\tau_{13B}(12|FTA) = \tau_{13B}(\Phi)$. Similarly, π_{23A} does not change because $\tau_{23A}(12|FTA) = \tau_{23A}(\Phi)$.

π_{13A} and π_{23B} remain. $\pi_{13A} = (\alpha_{1A} + c_{2A} - 2c_{3A} + \tau_{12A} - 2\tau_{13A})^2/9$ indicates that profits depend on both tariffs τ_{12A} and τ_{13A} . On the one hand, imports from country 3 to country 1 decrease because τ_{12A} becomes zero under the FTA, and π_{12A} increases because of the zero tariff. On the other hand, as shown in Lemma 1, the tariff on goods from country 3 decreases, and then imports from country 3 increase. The lemma below shows that the latter effect is larger than the former is. An FTA can provide a positive gain to an outside country.

Lemma 2. (Non-member gains with absence of implicit coordination) If country i and j reach a free trade agreement and do not coordinate implicitly, then $TS_k(ij|FTA) > TS_k(\Phi)$.

In other words, the total surplus of country k increases when the external tariff of two countries decreases sufficiently to satisfy $2\tau_{ikX}(\Phi) - \tau_{ijX}(\Phi) > 2\tau_{ikX}(ij|FTA)$. Element $\tau_{ijX}(\Phi)$ indicates that an FTA of country i and j can be costly for a firm in country k that does not participate in an FTA. However, the relationship of $\tau_{ikX}(\Phi)$ and $\tau_{ikX}(ij|FTA)$ can produce gains for firms in country k . This is satisfied for all goods under Assumption 1, and then the surplus of country 3 increases through the FTA of countries 1 and 2. Country 3 does nothing in this process and gains some exports as a free-rider.

2.2.3. Free Trade Agreement with Coordination

External tariff levels on the FTA may vary; this paper stipulates the status-quo as a focal point for coordination. When two countries discuss an FTA in the real world, FTA is made from trade war state, and their optimal tariffs before reaching the FTA is the same as the optimal tariffs under a trade war regime. Member countries can keep the status-quo and consider this decision as a focal point. They choose whether to keep the status-quo first. Only if the country decides to move their external tariffs do they decide on a new tariff.

This high tariff on the status-quo is not optimal and cannot maximize domestic surplus. However, the high tariff increases trade inside FTA, and it can offset the loss of domestic surplus. Hence, this tariff policy is possible when both member countries agree to it. When one member does not keep its external policy high, the other member cannot earn export increases, and then setting its own separate external tariff becomes the best choice. That is why I call this policy "implicit coordination". As a result, trade among member countries increases and trade between members and non-members decreases following creation of an FTA. That is trade diversion.

I denote $(12|FTA-co)$ as the tariff or surplus value when countries 1 and 2 reach an FTA

and establish an external tariff comparable to that of a trade war regime. Under an FTA with this external tariff policy, $\tau_{12X}(12|FTA - co)$ and $\tau_{21X}(12|FTA - co)$ are zero for all goods $X=A,B,C$. $\tau_{13B}(12|FTA)$ and $\tau_{23A}(12|FTA)$ equal the tariff in a trade war state because they import the good from only country 3. So $\tau_{13B}(12|FTA - co) = \tau_{13B}(12|FTA)$ and $\tau_{23A}(12|FTA - co) = \tau_{23A}(12|FTA)$ are satisfied. Crucial tariffs are $\tau_{13A}(12|FTA - co)$ and $\tau_{23B}(12|FTA - co)$. Here, $\tau_{13A}(12|FTA - co) = \tau_{13A}(\Phi)$ and $\tau_{23B}(12|FTA - co) = \tau_{23B}(\Phi)$. When two countries use this implicit tariff coordination strategy, country 3 suffers reduced exports to member countries because trade increases between FTA member countries.

Lemma 3. (Non-member losses under implicit coordination) If country i and j reach a free trade agreement and coordinate implicitly ($\tau_{ikX}(ij|FTA - co) = \tau_{ikX}(\Phi)$ and $\tau_{jkX}(ij|FTA - co) = \tau_{jkX}(\Phi)$), then $TS_k(ij|FTA - co) < TS_k(\Phi)$.

When FTA member countries 1 and 2 can decide their external tariffs endogenously, they consider their total surplus $TS_1(12|FTA)$, $TS_2(12|FTA)$ and $TS_1(12|FTA - co)$, $TS_2(12|FTA - co)$ for two cases. I have already demonstrated that under an FTA $\tau_{13A}(12|FTA) = (\alpha_{1A} + 4c_{2A} - 5c_{3A})/11$ is the optimal external tariff to maximize total surplus of country 1. However, $\tau_{13A}(12|FTA)$ maximizes only domestic surplus because export from country 1 is unaffected by the tariff. When country 1 chooses $\tau_{13A}(12|FTA - co) = \tau_{13A}(\Phi)$, which is higher than τ_{13A}^{12F} , import from country 3 decreases while import from country 2 increases because of substitution. Next, when country 2 chooses $\tau_{23B}(12|FTA - co) = \tau_{23B}(\Phi)$, it imports less from country 3 and more from country 1. In short, under the implicit external tariff coordination, each country loses its domestic surplus, but it regains profits from export through trade diversion. Implicit coordination is made when both countries can gain more from coordination than separate decisions. Proposition 1 below shows when coordination is possible.

Proposition 1. (Condition for implicit tariff coordination) Suppose country i does not produce good X , and country j does not produce good Y . Then FTA with implicit coordination yields higher total surplus to both countries i and j than FTA without tariff coordination ($TS_i(ij|FTA - co) > TS_i(ij|FTA)$ and $TS_j(ij|FTA - co) > TS_j(ij|FTA)$) if and only if

$$\sqrt{\frac{77}{206}}(2\alpha_{iX} - 3c_{jX} + c_{kX}) < 2\alpha_{jY} - 3c_{iY} + c_{kY} < \sqrt{\frac{206}{77}}(2\alpha_{iX} - 3c_{jX} + c_{kX}), \quad (11)$$

that is, two external tariffs $\tau_{ijX}(\Phi)$ and $\tau_{jiY}(\Phi)$ are sufficiently similar.

This structure resembles the prisoner's dilemma. With or without coordination, lowering the external tariff is the best strategy for a one-shot game. However, the two participants will achieve a higher surplus from coordination if and only if they keep the status-quo through implicit coordination. Coordination is a crucial component of this strategy. Each country can help the other only if both agree to coordinate. If country 1 wants coordination but country 2 does not, country 2 will choose its own optimal external tariff, in which case country 1 will choose its own optimal external tariff, and coordination between the two becomes impossible.

If country 1 decides to lower its external tariff on country 3, country 1 will get more of its domestic surplus. In response, country 2 will lower its external tariff, and this produces a loss for both countries. I assume that the trade agreement is established during stage 1, and that the tariff decision is set during stage 2. However, global trade is not a one-shot

game, and arriving at a tariff decision takes much less time than negotiating a trade agreement. Each country can easily retaliate for defection by the other. In this sense, retaliation is assumed and coordination becomes sustainable.⁸

This result shows how tariff complementarity disappears even when there exist elements of tariff complementarity. Both countries will not lower their external tariffs if implicit coordination is better than setting optimal tariff independently. This is compatible with conflicting empirical research on tariff complementarity. Developing countries with high potential for trade diversion lower their external tariffs because the loss from trade diversion with implicit tariff coordination is high. In contrast, developed countries having lower gains from reducing external tariffs choose trade diversion with implicit tariff coordination.

Implicit tariff coordination changes also the attitude of country 3 toward global, tariff-free trade. The additional gain that comes from accepting free trade from a country outside the FTA is $TS_3(G) - TS_3(12|FTA)$, and this difference increases to $TS_3(G) - TS_3(12|FTA - co)$. Country 3 has a greater incentive to jointly reduce tariff levels from another FTA or free trade negotiation, and countries 1 and 2 incur less negotiation costs from this. This is a contagion effect of the FTA because one FTA makes non-members more active than in another FTA. Total welfare in my setup does not include this effect from tariff coordination. Hence, total gain is greater than the total surplus difference.

2.2.4. Customs Union

In previous sections, I demonstrated that implicit coordination can be sustainable in free trade agreements. In a CU, coordination of the external tariff is explicit; each member country must apply the same external tariff to the same good made in a given country. Once countries 1 and 2 establish a CU, the inside tariff of each becomes zero ($\tau_{12X} = \tau_{21X} = 0$ for $X=A,B,C$) and they need to decide what common external tariff to be placed on goods from external country 3. Since country 3 is assumed to export two goods, A and B, countries 1 and 2 need to agree on two external tariffs. I denote (12|CU) as a tariff or surplus value when countries 1 and 2 establish a CU. Countries 1 and 2 maximize the sum of the surplus for themselves by reaching an optimal decision regarding a common, external tariff.⁹

$$\bullet (\tau_{.3A}(12|CU), \tau_{.3B}(12|CU)) \equiv \arg \max TS_1 + TS_2 \text{ with } \tau_{12X} = \tau_{21X} = 0$$

In a free trade agreement, maximizing the total surplus involves the same process as maximizing the domestic surplus; export does not depend on the external tariff. In a CU, however, export inside the union also depends on a common external tariff. The export of good B from country 1 to 2 depends on an external tariff on country 2, $\tau_{23B}(12|CU)$. $\tau_{23B}(12|CU)$ or $\tau_{23B}(12|FTA - co)$ is the same as $\tau_{23B}(\Phi)$, but $\tau_{23B}(12|CU)$ is the same as $\tau_{13B}(12|CU)$ in a CU, and determined by agreement of both countries. Before identifying its optimal external tariff, country 1 considers this export. Thus, the maximization above can be expressed as

$$\bullet \tau_{.3A}(12|CU) \equiv \arg \max (DS_{1A} + DS_{2A} + \pi_{12A}) \text{ with } \tau_{12A} = \tau_{21A} = 0$$

$$\bullet \tau_{.3B}(12|CU) \equiv \arg \max (DS_{1B} + DS_{2B} + \pi_{21B}) \text{ with } \tau_{12B} = \tau_{21B} = 0$$

⁸ Saggi (2006) approached this problem as tariff 'cooperation' of all three countries to place some tariff values. However, this paper uses the coordination of trade agreement members to keep the status-quo. Also, Saggi (2006) used dynamic setup using discrete time and discount factors. However, I skip that process here.

⁹ It is possible to assume that each country in a CU sets its common tariff with variable weight on their surpluses, but I assume that each maximizes the sum of its surplus for the sake of simplicity.

Both countries cannot maximize their exports under either a trade war or free trade agreement. On the one hand, in a CU, two member countries can internalize some components (i.e., trade between CU members) of this externality, and this helps them maximize surplus. On the other hand, the two countries must have one common external tariff, and this produces a 'coordination cost'. In a CU, the optimal external tariff for country 3 is

$$\tau_{.3X}(12|CU) = \frac{1}{6}(\alpha_{1X} + \alpha_{2X} - 2c_{3X}) \quad (12)$$

for each good $X=A,B$.

If country 1 decides $\tau_{.3A}(12|CU)$, it wants to maximize DS_{1A} , at which point the tariff is $(\alpha_{1A} + 4c_{2A} - 5c_{3A})/11$. If country 2 wants to maximize $DS_{2A} + \pi_{12A}$, its optimal tariff is $(2\alpha_{1A} + 3\alpha_{2A} - 4c_{2A} - c_{3A})/7$. The former is less than the latter under Assumption 1. In a CU, each country wants a lower tariff for the good it cannot produce, and they also want a higher tariff for the good they can produce to protect their firms from firms in non-member countries. Optimal tariff $\tau_{.3A}(12|CU)$ is the weighted average of those two. Production costs of country 2, a member of the CU, do not have any effect on the optimal tariff because each effect on profit and domestic surplus offsets each other.

In this sense, each optimal tariff is determined in the middle of conflicting interests. As the common tariff becomes far from the optimal tariff for each country, the cost of the common tariff increases and can exceed the gain from trade between members. Also, this tariff decision has an effect on the domestic market of the goods that country can produce, and it makes welfare comparison complex. When both FTA and CU are possible, members compare the surplus under each type of agreement. Welfare comparison between FTA and CU is not as clear as Proposition 1. I explain this later in a simpler setup.

2.2.5. When Both Preferential Trade Agreements are Banned

When both CUs and free trade agreements are banned, two countries launch another kind of trade agreement to lower the tariff. Under the most-favored-nation (MFN) rule, they should lower their tariffs for all countries. This agreement is based on strict multilateralism. I denote (12|multi) as the tariff or surplus value when countries 1 and 2 make this type of trade agreement. Country 3 cannot produce good C, and thus countries 1 and 2 have a tariff of zero. Their optimal decision for other goods ($X=A,B$) is

- $\tau_{.A}(12|multi) \equiv \arg \max TS_1 + TS_2 = \arg \max (DS_{1A} + DS_{2A} + \pi_{12A})$
with $\tau_{.A}(12|multi) = \tau_{12A} = \tau_{13A} = \tau_{23A}$
- $\tau_{.B}(12|multi) \equiv \arg \max TS_1 + TS_2 = \arg \max (DS_{1B} + DS_{2B} + \pi_{21B})$
with $\tau_{.B}(12|multi) = \tau_{13B} = \tau_{21X} = \tau_{23B}$

This trade agreement can internalize externality between trade agreement partners as CU, but the members must lower their tariffs exactly for non-member countries too. Thus, a non-member country can increase its exports to members because lowered tariffs apply to both member and non-member countries. Country 3 can protect firms from the outside and maintain its tariff as in a trade war state. In contrast, trade increases inside a trade agreement are limited because members cannot discriminate members and non-members. The optimal, external tariff of trade agreement members to country 3 is

$$\tau_{.A}(12|multi) = \frac{1}{5}(\alpha_{2A} + c_{2A} - 2c_{3A}) \quad (13)$$

$$\tau_{.B}(12|multi) = \frac{1}{5}(\alpha_{1B} + c_{1B} - 2c_{3B}) \quad (14)$$

As is the case of the CU, country 1 wants to maximize DS_{1A} , and country 2 wants to maximize $DS_{2A} + \pi_{12A}$. Then, the optimal tariff for country 1 is $(2\alpha_{1A} - c_{2A} - c_{3A})/8$, and the optimal tariff for country 2 is $(-2\alpha_{1A} + 3\alpha_{2A} + 4c_{2A} - 5c_{3A})/7$. The former is more than the latter under Assumption 1, and τ_A (12|multi) is the weighted average of those two. Under the MFN rule, each country wants a lower tariff for the good it can produce. Unlike the CU, each country cannot protect its firms from firms in non-member countries. In this case, lower tariffs are helpful to increase trade between members because the internal tariff is non-zero. The demand size of a country that cannot produce that good does not affect tariffs because two effects on two countries offset each other. Therefore, each optimal tariff is determined in the middle of conflicting interests, as in a CU.

3. Preference on the Type of the Trade Agreement

I explained why implicit coordination is profitable for FTA members, and I identified possible coordination costs in a stage 2, tariff decision within a CU. In this section, I examine how the two countries choose the type of trade agreement for a given asymmetry. Assume countries 2 and 3 negotiate to establish a trade agreement, and any type of trade agreement is possible. What type of trade agreement do the two countries prefer? Is the answer conditioned by endogenously decided implicit coordination in the FTA? This comparison shows the preference of two members when they have different demand sizes or production costs and explains popularity of trade agreements in the process. Each considers losses and gains in markets and identifies a preference.

Before starting analysis, I add one assumption to their negotiation. When two countries express different opinions on the type of trade agreement, the result become uncertain without an assumption below. This assumption is helpful for calculations, but also realistic because in terms of economic integration, the CU exists at a higher level than the FTA.

Assumption 2. When two countries negotiate a trade agreement, they can establish a CU only if they both agree to do so. If one country wishes to establish a CU and the other wishes to establish an FTA, they reach an FTA, not a CU.

3.1. Symmetric Setup

There are several parameters in my setup, and it is difficult to observe all parameter changes in one graph. I add one assumption that there is no difference among goods in each country.

Assumption 3. $\alpha_{iA} = \alpha_{iB} = \alpha_{iC} = \alpha_i$ for all countries $i=1,2,3$ and goods. $c_{jX} = c_{jY} = c_j$ for all countries $j=1,2,3$ and for two non-numeraire goods, X and Y, that country j produces.

Now each country has the same demand size of all goods, and same cost for all goods that each country can produce. Each country may have only larger or smaller demand for all goods and more or less cost for all productions than other countries have.

In addition to Assumption 3, I add assumptions to clarify the description in each subsection. Below is the formal statement to assume symmetry between countries, but each country still cannot produce one non-numeraire good.

Assumption 3-1. $\alpha_i - c_j = e$ for all $i,j=1,2,3$

Then each tariff under each trade agreement can be calculated as below. When country 2 and 3 make a trade agreement, 1 cannot produce A, 2 cannot produce B, and 3 cannot produce C,

- $\tau_{21B}(\Phi) = \tau_{31C}(\Phi) = \frac{1}{4}e, \tau_{21C}(\Phi) = \tau_{31B}(\Phi) = \frac{1}{3}e$
- $\tau_{21B}(23|FTA) = \tau_{31C}(23|FTA) = \frac{1}{11}e, \tau_{21C}(23|FTA) = \tau_{31B}(23|FTA) = \frac{1}{3}e$
- $\tau_{21B}(23|FTA - co) = \tau_{31C}(23|FTA - co) = \frac{1}{4}e,$
 $\tau_{21C}(23|FTA - co) = \tau_{31B}(23|FTA - co) = \frac{1}{3}e$
- $\tau_{.1B}(23|CU) = \tau_{.1C}(23|CU) = \frac{1}{3}e$
- $\tau_{.B}(23|multi) = \tau_{.C}(23|multi) = \frac{1}{5}e$

Under all results of trade agreements, non-member country 1 sets the same tariff on each good. Also, tariffs between 2 and 3 follow the rule above in a trade war state, and all tariffs of country 2 and 3 become $e/5$ under multilateralism. In other cases, countries 2 and 3 make a PTA, and internal tariffs become zero. Next, we can calculate and compare total welfare under each trade agreement.

Proposition 2. Assume countries i and j establish a trade agreement under a symmetric setup (Assumption 3). Then,

$$TS_i(ij|CU) > TS_i(ij|FTA - co) > TS_i(ij|FTA) > TS_i(ij|multi) \quad (15)$$

The first inequality suggests that member countries favor CU regardless of coordination in a symmetric setup. Their welfare difference is small under coordination, but members can agree with making a CU because mandatory coordination in CU is not much more costly under a symmetric setup. I demonstrate that in a CU, each country wants to lower its tariff for the good it cannot produce. Country 2 cannot produce B, and its optimal tariff on CU is $e/11$. However, the tariff on CU is $e/3$, and Country 2 thinks that the tariff is too high. In contrast, country 3 can produce B, its optimal tariff on CU is $5e/7$, and it thinks that the common tariff is too low. In a symmetric setup, each country has same welfare from this CU, and it is higher than FTA. However, when each country has a different demand or cost, their welfare changes asymmetrically, and one country changes its preference and becomes favorable to the FTA.¹⁰

The second inequality is about implicit coordination in an FTA. This is a result from Proposition 1. As in (11), two countries favor coordination when their market sizes and costs are similar. The third inequality is about multilateralism. Then members cannot discriminate countries and cannot increase trade between members enough. It limits welfare of member countries, and in this case, it is less than any other trade agreements. In this sense, a trade agreement under multilateralism offers less welfare to members than any other trade agreements for an asymmetric setup, in subsections below too. This is the result from the same trial in two subsections below. I compare only FTAs (with or without coordination) and CUs for the next two subsections and skip trade agreements under multilateralism.¹¹ The role of the XXIV regulation appears in the last subsection.

3.2. Technology Difference

In this and the next subsection, I approach the preferences of countries in an asymmetric setup. For a better description, I denote relative technology development and demand size as

¹⁰ Any other asymmetry can change the third inequality. If the number of firms changes in each industry, or one of three countries can produce all three non-numerare goods, agreements on CU become impossible.

¹¹ This is because trade gains from discrimination are higher in this model setup.

$$t_k \equiv \frac{(\alpha_1 - c_k) - (\alpha_1 - c_1)}{\alpha_1 - c_1} \quad (16)$$

$$d_k \equiv \frac{(\alpha_k - c_1) - (\alpha_1 - c_1)}{\alpha_1 - c_1} \quad (17)$$

When t_k is high, country k has lower costs, or better technology, on all goods that country k produces than country 1. When d_k is high, country k has larger demand on all goods than country 1. Now I can compare relative cost and demand asymmetries in a similar setup regardless of real demand or cost values.

Assumption 3-2. Assume countries 2 and 3 establish a trade agreement and decide on their external tariff policy. Country 1 cannot produce A, 2 cannot produce B, and 3 cannot produce C.

- (i) $\alpha_1 - c_1 = e, \alpha = \alpha_1 = \alpha_2 = \alpha_3$
- (ii) $-0.2 < t_2, t_3 < 0.25, 4t_2 - 5t_3 < 1, -5t_2 + 4t_3 < 1.$

Under this assumption, the demand size of all markets in all countries are same. (ii) defines the parameter range, set to exclude negative tariffs and production. Using the definition above of t_2 , under Assumption 3-2, $\alpha_2 - c_2$ is between $0.8e$ and $1.25e$. Country 2 produces good A and C with this cost/technology. Then each external tariff under each trade agreement is

- $\tau_{21B}(\Phi) = \frac{1}{8}(2 - t_3)e, \tau_{31C}(\Phi) = \frac{1}{8}(2 - t_2)e, \tau_{21C}(\Phi) = \tau_{31B}(\Phi) = \frac{1}{3}e$
- $\tau_{21B}(23|FTA) = \frac{1}{11}(1 - 4t_3)e, \tau_{31C}(23|FTA) = \frac{1}{11}(1 - 4t_2)e,$
 $\tau_{21C}(23|FTA) = \tau_{31B}(23|FTA) = \frac{1}{3}e$
- $\tau_{.1B}(23|CU) = \tau_{.1C}(23|CU) = \frac{1}{3}e$
- $\tau_{.B}(23|multi) = \frac{1}{5}(1 - t_3)e, \tau_{.C}(23|multi) = \frac{1}{5}(1 - t_2)e$

External tariffs under the FTA with coordination are the same in a trade war state. Non-member country 1 levies the same tariff on each good in any case. Tariffs between 2 and 3 are determined from the rule above in a trade war state, and all tariffs of countries 2 and 3 become $e/5$ under multilateralism. Internal tariffs become zero when two countries make an FTA or CU.

Under this assumption, external tariffs on goods that each country can produce, τ_{21C} and τ_{31B} are the same in all cases. When each country cannot produce the good, an external tariff is highest with CU, next FTA with coordination, and lowest with FTA without coordination. Then we can calculate the total welfare for each case. To find whether two countries choose implicit coordination on an FTA, we can use equation (11). Then the condition of coordination is $\sqrt{\frac{77}{206}}(2 + 3t_2) < 2 + 3t_3 < \sqrt{\frac{206}{77}}(2 + 3t_2)$, and this is satisfied on all ranges of Assumption 3-2. Therefore, at any point of given space, countries 2 and 3 choose tariff coordination.

Next, we can calculate the condition for agreement on the CU over the FTA, as below. Both countries choose the CU if and only if

- $\sqrt{\frac{11}{20}}(2 + 3t_2) < 2 + 3t_3 < \sqrt{\frac{20}{11}}(2 + 3t_2)$ over the FTA without coordination

- $\sqrt{\frac{53}{62}}(2 + 3t_2) < 2 + 3t_3 < \sqrt{\frac{62}{53}}(2 + 3t_2)$ over the FTA with coordination.

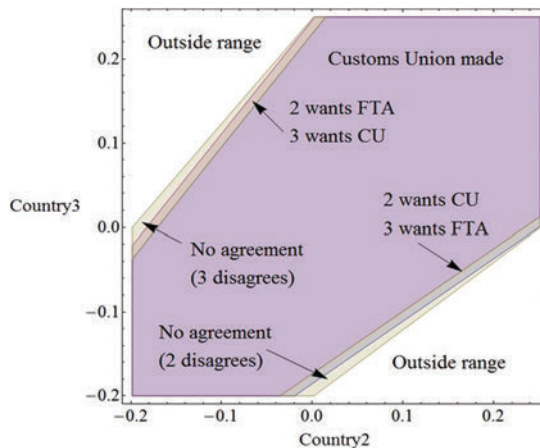
Condition for agreement with a CU is stricter when the FTA with coordination is considered. Therefore, we reach the next proposition.

Proposition 3. Assume countries *i* and *j* establish a trade agreement under a technology difference (Assumption 3-2). Then,

- (i) Implicit tariff coordination on the FTA is stable.
- (ii) An FTA becomes more attractive with implicit tariff coordination and it becomes harder to agree with a CU for both countries.

Fig. 1 and 2 represents these results. Fig. 1 demonstrates the welfare comparison between an FTA without coordination and a CU, and Fig. 2 is about the same comparison between an FTA with tariff coordination and a CU. The horizontal axis in each figure represents t_2 , and the vertical axis represents t_3 . Triangles on each corner represent outside given ranges for Assumption 3-2. The region in which two countries formulate a CU is much smaller in Fig. 2.

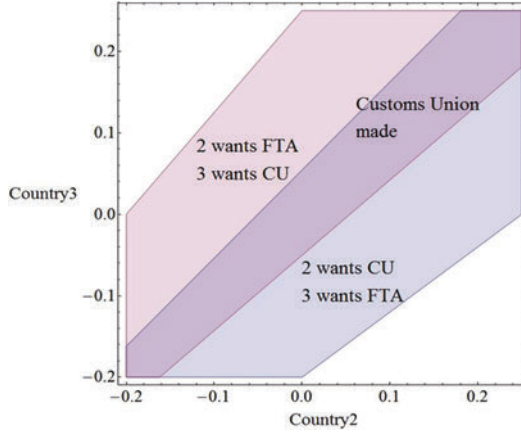
Fig. 1. Choice: FTA Without Coordination and CU for Cost Asymmetry



Check the case of good B, which country 2 cannot produce. The optimal tariff on CU for country 2 is $(1 - 4t_3)e/11$, and optimal tariff for country 3 is $(5 + 4t_3)e/7$. As t_3 increases, the gap widens. When $t_3 > t_2$, optimization on the CU that maximizes the sum of two total welfare favors country 3 but becomes costly for country 2. Therefore, when two countries have different levels of technology, it becomes difficult to agree on the CU, and it becomes much harder when an FTA becomes attractive from implicit coordination.

When two countries disagree, they choose an FTA under Assumption 2. However, an FTA without coordination can offer less welfare than an FTA with coordination and therefore, a CU becomes a better option for more cases. As shown in Fig. 1, an FTA without coordination may be less attractive than a trade war state, and then countries 2 and 3 cannot establish any trade agreement. In addition, when $t_2 = t_3$ and productivity increases equally, the gain from one industry is always higher than the loss from another. That is why two countries always choose CU when $t_2 = t_3$.

Fig. 2. Choice: FTA With Coordination and CU for Cost Asymmetry



3.3. Size of Demand Difference

In this subsection, I assess demand size asymmetry using relative size difference d_2 and d_3 and it needs different assumptions.

Assumption 3-3: Assume countries 2 and 3 establish a trade agreement and decide on their external tariff policy. Country 1 cannot produce A, 2 cannot produce B, and 3 cannot produce C.

- (i) $\alpha_1 - c_1 = e, \alpha = \alpha_1 = \alpha_2 = \alpha_3$
- (ii) $-0.5 < d_2, d_3 < 1, d_2 - 2d_3 < 1, -2d_2 + d_3 < 1$

In this subsection, technology levels for all goods produced in all countries are assumed to be the same. (ii) define the parameter range, and all tariffs and production are non-negative in this range. As a result, $\alpha_2 - c_2$ is between $0.5e$ and $2e$ in this subsection. Each tariff under each trade agreement is

- $\tau_{21B}(\Phi) = \frac{1}{4}(1 + d_2)e, \tau_{21C}(\Phi) = \frac{1}{3}(1 + d_2)e,$
 $\tau_{31B}(\Phi) = \frac{1}{3}(1 + d_3)e, \tau_{31C}(\Phi) = \frac{1}{4}(1 + d_3)e$
- $\tau_{21B}(23|FTA) = \frac{1}{11}(1 + d_2)e, \tau_{21C}(23|FTA) = \frac{1}{3}(1 + d_2)e,$
 $\tau_{31B}(23|FTA) = \frac{1}{3}(1 + d_3)e, \tau_{31C}(23|FTA) = \frac{1}{11}(1 + d_3)e,$
- $\tau_{1B}(23|CU) = \tau_{1C}(23|CU) = \frac{1}{6}(2 + d_2 + d_3)e$
- $\tau_B(23|multi) = \frac{1}{5}(1 + d_3)e, \tau_C(23|multi) = \frac{1}{5}(1 + d_2)e$

External tariffs under the FTA with coordination are the same as a trade war state, and tariffs levied by country 1 or internal tariffs follow the same rule as in the previous subsection. However, in this setup, external tariffs on goods that each country can produce, τ_{21C} and τ_{31B} , also become different in the CU case. This tariff depends on two demand sizes from both member countries. However, the tariff amount order is the same for the good that each country cannot produce. The tariff is highest with CU, next FTA with coordination, and

lowest with FTA without coordination.

In this setup, the condition of coordination in FTA is $\sqrt{\frac{77}{206}}(2 + 2d_2) < 2 + 2d_3 < \sqrt{\frac{206}{77}}(2 + 2d_2)$. Fig. 3 describes how countries 2 and 3 choose an external tariff policy of FTA. Two triangles in the two corners represent the region outside the range given in Assumption 3-3. As proposition 1 suggests, two countries choose implicit coordination when they are similar countries, but also FTA is possible only when making an FTA is better than a trade war state for both countries 2 and 3. An FTA can be a loss for domestic firms because they lose their portion in domestic markets. When market sizes are different, the country with the bigger markets loses more, and this loss makes the total gain from making an FTA negative. This is possible with both possible tariff policies.

Fig. 3. Choice: External Tariff Policy in FTA for Demand Size Asymmetry

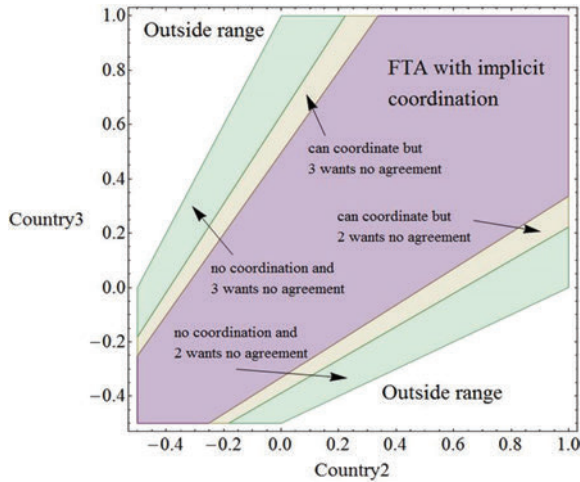
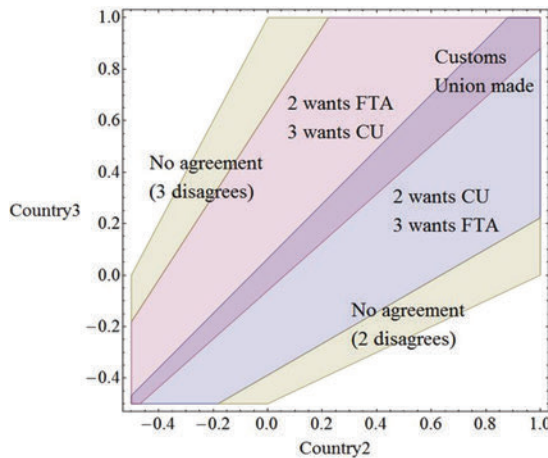


Fig. 4. Choice: FTA With Coordination and CU for Demand Size Asymmetry



The next step is the comparison between an FTA and CU. For the case of demand size asymmetry, it is impossible to get a simple condition of agreement on a CU as in the previous subsection. However, we know that implicit coordination can be chosen endogenously in a wide parameter region, and we can guess that the agreement on CU is harder when considering coordination in FTA. Fig. 4 describes how countries 2 and 3 choose between an FTA and CU. CU is made only when d_2 and d_3 is similar in the middle.

A domestic market size increase in one country is helpful to get more domestic welfare. A high external tariff in the CU makes the country keep its domestic market share easily. That is why a bigger country becomes more favorable to the CU, and without considering coordination, two countries agree with making a CU for all given parameter ranges. In conclusion, for both types of asymmetry, an implicit coordination policy can be chosen endogenously, explaining why an FTA is more popular than a CU.

3.4. Role of the Article XXIV Regulation

The GATT/WTO Article XXIV ruled that FTA or CU members cannot raise external tariffs on average. This works as a constraint for trade agreement members regarding an external tariff decision. However, this condition is binding only for CUs, not FTAs, in this setup. When making an FTA, each country has two options for an external policy. From Lemma 1, the model satisfies tariff complementarity; separately determined external tariffs are lower than a trade war state. Keeping the status quo under implicit coordination is also acceptable because it does not raise external tariffs.

The Article XXIV regulation has some effects only on CU. At first, let's use assumption 3-1 for a symmetric setup. Given this constraint, $\tau_{.1X}(23|CU)$ should not be greater than the weighted average of the tariffs of the two countries prior to the CU. Denote this tariff $\tau_{.1X}(23|CU - XXIV)$, the weighted average of the two external tariffs, ($\tau_{21X}(\Phi)$ and $\tau_{31X}(\Phi)$) and the weight is given as import amounts before a trade agreement is made. Under a symmetric setup, this constraint is binding, and it creates a welfare loss.

Proposition 4: Assume countries i and j establish a trade agreement under a symmetric setup (Assumption 3) and country k is a non-member. Then,

(i) The Article XXIV constraint is binding. ($\tau_{.kX}(ij|CU) > \tau_{.kX}(ij|CU - XXIV)$ for good X that only one member can produce)

(ii) This constraint lowers welfare but it still confirms that CU offers more welfare than FTA. ($TS_i(ij|FTA - co) < TS_i(ij|CU - XXIV) < TS_i(ij|CU)$)

In other words, when demand and cost conditions are symmetric, except that one country cannot produce one good, Article XXIV is binding, and the welfare of member countries declines. However, CU is still better for both members in a symmetric setup. Under the Article XXIV constraint and when two member countries coordinate their external tariff in the FTA, their welfare difference is minimized, but not enough to overturn that relationship.

I now apply assumptions 3-2 and 3-3 to find the result with asymmetry. Two tariffs below are optimal, external tariffs under each asymmetric assumption. Optimal, external tariffs without the tariff regulation, $\tau_{.1X}(23|CU)$, are higher than the tariffs below on the full ranges given in assumptions 3-2 and 3-3, meaning that the Article XXIV constraint is binding on CUs in any case.

- Assumption 3-2: $\tau_{.1B}(23|CU - XXIV) = \frac{-172+300t_3-27(t_3)^2}{24(-26+33t_3)}e$,
- $\tau_{.1C}(23|CU - XXIV) = \frac{-172+300t_2-27(t_2)^2}{24(-26+33t_2)}e$

- Assumption 3-3: $\tau_{1B}(23|CU - XXIV) = \frac{43+54d_2+27(d_2)^2+32d_3+16(d_3)^2}{12(13+9d_2+4d_3)} e,$
 $\tau_{1C}(23|CU - XXIV) = \frac{43+32d_2+16(d_2)^2+54d_3+27(d_3)^2}{12(13+4d_2+9d_3)} e,$

In both cases, when two countries have similar parameters, both do not want the regulation. However, when one country has developed technology or larger demand, the other becomes favorable to the regulation because CU maximizes the sum of welfare and constrained optimization provides higher welfare to the inferior country. These figures are helpful to understand the role of tariff regulation but note that implicit coordination on the FTA is made as an endogenous decision imposed on the two member countries, and the Article XXIV is given exogenously.

Fig. 5. Choice: FTA With Coordination and CU With Constraint for Cost Asymmetry

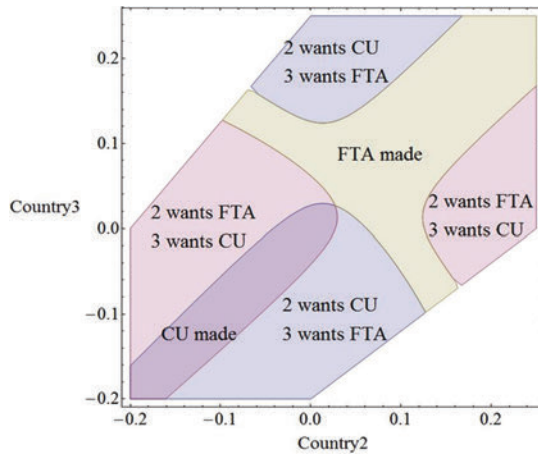


Fig. 6. Choice: FTA With Coordination and CU With Constraint for Demand Size Asymmetry

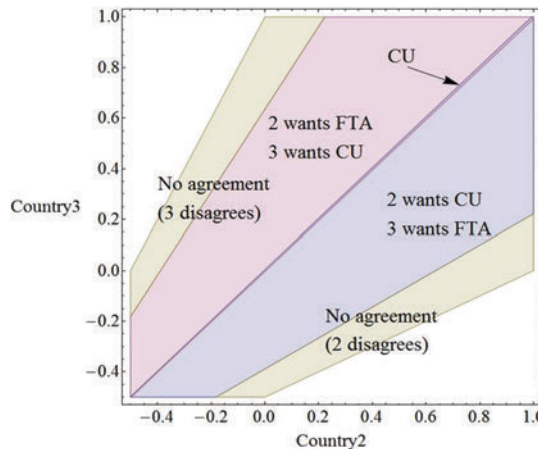


Fig. 5 and 6 describe choices of countries 2 and 3 between an FTA and CU with consideration on implicit coordination in the FTA, and the Article XXIV regulation is given. Agreement on making a CU becomes harder than the case without the constraint (see Fig. 2 and 4) because when two countries are similar, both get a loss from the constraint and it makes a CU with the tariff regulation less attractive. When two asymmetries are high, inferior countries gain welfare from the constraint and it can make inferior countries choose CU over FTA. This is described in figure 5, and in some regions, inferior countries become favorable to CU. However, in those regions, a superior country prefers an FTA, and agreement on a CU is still impossible. Comparing an FTA without coordination and CU with the tariff regulation, two countries prefer a CU for the full range given in both asymmetry setups.

In this section, I compared the choices of each country under varying conditions. Unless we consider implicit coordination, it is easier to establish a CU and the popularity of the FTA is difficult to explain. When two countries coordinate implicitly, welfare from FTA increases to a level close to that of the CU, and the coordination cost produced by participation in the CU increases as asymmetry increases, making agreement on the CU much harder. When the Article XXIV tariff regulation is considered, the popularity of the FTA is explained much better, as in the figures.

4. Conclusion

This paper describes tariff coordination in FTAs and CUs. FTA members establish external tariffs on non-member countries to maximize their surpluses, and they can coordinate implicitly by keeping the status-quo. This strategy works when both FTA members agree. Two FTA members can choose to coordinate endogenously when demand or technology differences between them are not high. In CU, tariff coordination is mandatory, though it incurs costs. When economic conditions of participant members differ, the CU option is costly, and this can render the option unattractive to at least one of the two members. Consequently, when member countries select an external tariff policy or a trade agreement type, an FTA with implicit tariff coordination becomes attractive.

This explains the popularity of the FTA with conflicting empirical research on tariff complementarity. This theoretical paper is compatible with other empirical findings but does not provide empirical results to prove the existence of implicit tariff coordination. There are several empirical works on tariff complementarity. However, more directed empirical research on a trade agreement is needed to support the theory in this paper. For example, tariff changes should be analyzed with the kind of trade agreement and the nature of counterpart member country.

The model in this paper contains trade gain from both comparative advantage and intra-industry trade and this provides a better understanding for much of the trade. However, this research does not detach when the two effect one another and cannot help the case of countries that have a different weight of intra-industry trade and inter-industry trade. Developed countries can be thought as being much similar each other than developing countries and that can be one reason why implicit coordination is a better option for developed countries but not for developing countries. However, this inference is limited because the effect of intra-industry trade and inter-industry trade is not distinguished in my setup.

This research focuses on the type of trade agreements, but it does not consider equilibrium results based on strategic choices of all three countries in stage 1. In the three-country oligopoly model, this research found how countries 2 and 3 choose the type of trade agreements but not how the trade agreement can be made between countries 1 and 2, or between countries 1 and 3. If three countries reach global free trade under the rule of a trade agreement from the social planner, that rule can be thought as helpful for free trade, which is the answer about the ideal

role of FTAs or CUs as building blocks or stumbling blocks in the WTO.

Implicit tariff coordination can affect the equilibrium result of the trade liberalization game. At first sight, if member countries of the FTA keep their external tariffs high, this policy is against global free trade. However, a non-member country losing from one FTA will try to join another FTA to moderate that loss and this channel is helpful to reach global free trade. In contrast, if a non-member country gains from one FTA as a free-rider, a non-member can reject global free trade. Therefore, implicit tariff coordination has two conflicting effects on globalization.

In empirical research, developed countries were not observed to lower their external tariffs. In contrast, developing countries have reduced their external tariffs. However, developing countries' gains from implicit tariff coordination also become larger than gains from lowering their external tariffs. As more countries care about implicit coordination, the role of tariff complementarity to reach global free trade weakens. Instead, contagion of the FTA will seize a more important role to reach global free trade. That is why tariff coordination and optimal rule for global free trade should be analyzed with an equilibrium model, which is an important follow-up research topic based on the results of this paper.

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