Endogenous Rules of Origin, External Tariff Reduction and Market Structure*

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This paper considers the effects of the external tariff reduction on an endogenous rules of origin (ROO), firm behavior, and welfare in an oligopolistic two-way trade model of free trade area (FTA). We show that, in the presence of endogenously determined ROO, an external tariff reduction improves the domestic welfare of the FTA member countries if the market size of those countries is small enough. We also examine the relationship between market structure and the effects of external tariff reduction.

Key words: Rules of origin (ROO); Free trade area (FTA); External tariff reduction; Market structure; Two-way oligopoly
JEL codes: F12; F13; F15

Contents

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1 Introduction

In recent years, many countries have formed free trade areas (FTAs), and the proliferation of FTAs has emerged as a current trend in the world economy. To our knowledge, almost all FTAs have rules for evaluating whether or not a product is considered "originating in the area" in order to qualify for free trade among member countries. These rules are widely referred to as the rules of origin (ROO). The final-good producer located in a member country within an FTA can gain duty-free access if it uses a certain ratio of intermediates produced within the region; otherwise, it pays the external tariff of the designated member country.[1] Therefore, if the price (i.e., productivity in the production) of the intermediate-good in a member country is higher (or lower) than that of the outside, then the ROO functions as a protecting device for the less efficient country and many existing studies emphasize and examine this nature of ROO (e.g., Krishna and Krueger, 1995; Lopez-de-Silanes et al., 1996; Krueger, 1999; Rosellón, 2000; Falvey and Reed, 2002; Ju and Krishna, 2005; Takauchi, 2010, 2011, 2013).

However, a reduction in the external tariff needs to be examined when we consider FTAs as a step toward multilateral trade liberalization. Because FTAs are permitted as a means to archive multilateral trade liberalization, the FTA's member countries must reduce external tariffs after establishing the FTA. Furthermore, FTAs can independently set ROO, so that it may set a more restrictive ROO instead of a lower rate of external tariffs among member countries. Thus, it is important to examine the relationship between endogenously decided ROO and each member's external tariff. In other words, what conditions are needed to improve domestic welfare when the external tariff reduction is implemented.

The purpose of this paper is to consider the relationship between endogenously determined ROO and the external tariff rates among FTA member countries. To examine the condition where "a reduction in the external tariff improves domestic welfare," we introduce content-type ROO into three-country (symmetric two countries with final-good market are member countries of the FTA and one outside country of the FTA without final-good market) two-way oligopoly. We further consider the effects of number of exporting firms on the endogenous ROO and welfare: m (≥ 1) ROO-complying firms belonging to each member country and n (≥ 1) ROO-noncomplying firms belonging to the outside. In our model, the sequence of events is as follows: First, the uniform content rate of ROO is decided within the FTA. Second, to maximize domestic social surplus, each member country decides a level of its own content rate. Third, ROO-complying internal firms and ROO-noncomplying outside firms compete Cournot fashion in each member country's final-good market.

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1 There are at least three methods to determine the origin of the product: (a) value-added- (or content-) based definition; (b) changes in tariff headings; (c) technical definition. For more detail, for example, see Falvey and Reed (1998) and WTO (2002).

We show that a reduction in the external tariff increases intra-FTA trade but it decreases the profit of ROO-complying internal firms. Because the endogenously decided content rate of ROO and the external tariff have a complementary relation, the content rate decreases if the external tariff decreases. The content rate of ROO denotes the cost of internal firm's exporting, so the reduction in its cost increases exports. However, the tariff reduction decreases costs of outside firms, sufficiently. Since the domestic supply of the local firm is crowded out, the profit of the firm decreases as the external tariff decreases. We also show that the welfare of member countries improves due to an external tariff reduction only if the market size of those members is small enough. A larger market size implies a larger demand for the product. If the demand increases, the effect of tariff reduction on the profit of internal firms also increases, since the tariff reduction sharply decreases the profit of internal firms when the market size is large. Therefore, to improve welfare due to external tariff reduction, the market size must be small enough. Furthermore, we examine the relationship between the number of inside and outside exporting firms (market structure) and the effects of external tariff reduction.

This paper is closely related to some studies that examine the relationship between ROO and other trade policies including external tariff (Falvey and Reed, 2002; Takauchi, 2010, 2011; Chang and Xiao, 2011).[2] Falvey and Reed (2002), Takauchi (2011), and Chang and Xiao (2011) consider the effects of a given requirement level of ROO on the importing country's external tariff policy, and thus, they do not treat ROO endogenously. In contrast, Takauchi (2010) examines endogenously decided ROO. However, he focuses on the relationship between an endogenous ROO and another country's subsidy policy. Although all these studies employ different models and present interesting insights, they do not consider the relationship among endogenous ROO, the rate of external tariff, and the number of exporting firms.

The remainder of the paper comprises five sections. In the next section, we describe the model setup. In section three, we calculate the equilibrium of the model. In section four, we examine the effects of external tariff reduction and the relationship between the effects of the external tariff reduction and market structure. Finally, section five offers the conclusion.

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2 There are few studies that focus on the other issues of ROO. In contrast to the existing studies, Mizuno and Takauchi (2013) focus on an uncertain production cost that is induced by meeting ROO. They mainly show that uncertain production cost of ROO yields different action (some exporters comply with ROO but the others do not) among homogeneous exporters. Ishikawa et al. (2007) emphasize that a product which is produced meeting ROO is discriminated from the other. They focus on the price discriminative behavior of firms in the final-good market. By using an input-sourcing model (final-good is produced with a continuum of inputs on the unit interval), Yeaple (2008) consider the effects of ROO on multinationals' FDI strategy.

2 Model

Let us consider Brander and Krugman (1983)-type intra-industry FTA model with content-type ROO. There are three countries 1, 2, and O in the world. Countries 1 and 2 are symmetric and have a final-good market;[3] these two countries are members of an FTA.[4] Country O denotes the outside country of this FTA, which does not have the final-good market. In each member country i ($i = 1, 2$), m (≥ 1) firms produce a homogeneous final-good X for supply in the domestic and other member country's market j ($\neq i$). In contrast, there are n (≥ 1) firms outside of the FTA, and these firms export the final-good to each member country imposing an external tariff t^i. We assume that the number of firms is fixed and constant and that the final-good market of both countries is characterized by Cournot oligopoly. In contrast to the final-good producers, there are competitive intermediate-good producers in both inside and outside the FTA. To focus on the protecting nature of ROO, we assume that the price of the intermediate-good within the FTA k is higher than that of the outside k^O, $k > k^O$.

When the firms located in each member country i (= 1, 2) export the final-good to the other member country's market, they always comply with the ROO and use a certain volume of the other member's intermediate-good. Each ROO-complying internal firm chooses a mixed proportion of intermediate-goods produced in the other member country and the outside FTA.[5] Let us denote the content rate of ROO as δ^j, $0 < \delta^j \leq 1$: δ^j is the content rate for the other member country j ($j \neq i$; $i, j = 1, 2$).

In each member country i, the inverse demand for the final-good is assumed to be linear:

$$p_i = A - a(X_i^i + X_i^j + X_i^O), \quad i \neq j, \tag{1}$$

where A and a are positive constants. Moreover, we define $X_i^i \equiv \sum_{h=1}^{m} x_{ih}^i$, $X_i^j \equiv \sum_{h=1}^{m} x_{ih}^j$ and $X_i^O \equiv \sum_{\ell=1}^{n} x_{i\ell}^O$. Note that the notation x_i^i (x_i^j) denotes output of a firm located in the FTA member country i (j). We assume that one unit of the intermediate-good is required to produce one unit of the final-good. Thus, in each member country i, each firm's profit is defined by

$$\pi^i \equiv (p_i - k^O)\, x_i^i + (p_j - c_i(\delta^j))\, x_j^i. \tag{2}$$

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3 In many preferential trade areas (PTAs, including FTA) have been formed among similar countries, this setting is natural. Das and Gosh (2006) presents theoretical proof for this phenomenon.

4 We do not consider the endogenous formation of FTA.

5 Although this assumption is technical one, it is needed to obtain an interior optimum of the content rate of ROO in two-way oligopoly model.

For the domestic supply, there is no restriction, so firm i only uses cheaper intermediate-good produced on the outside. When firm i exports its product to the other member's market, it complies ROO and uses δ^j-fraction of the intermediate-good produced in the member country. Thus, the firm i's marginal production cost in the exporting becomes as[6]

$$c_i(\delta^j) \equiv \delta^j k + (1 - \delta^j)\, k^O, \quad k > k^O \geq 0, \tag{3}$$

In country O, each firm's profit is defined by

$$\pi^O \equiv \sum_i^{1,2} (p_i - k^O - t)\, x_i^O, \tag{4}$$

where t is a fixed (given) external tariff and $t = t^i > 0$.

Hereafter, for simplicity, we assume that the price of an intermediate-good produced outside of the FTA is normalized to zero ($k^O = 0$). Thus, from (3), the marginal cost where firm i exports from country i to country j is rewritten as $\delta^j k$. We also assume that the price of the intermediate-good produced in a member country within the FTA is not too large.

In our model, the sequence of events is as follows: (i) The FTA's content rate of ROO is decided. (ii) The governments of countries 1 and 2 independently and simultaneously choose a content rate of ROO δ^1 and δ^2, respectively. (iii) Each final-good producing firm independently and simultaneously chooses a quantity of the product.

Because the member countries are symmetric, the content rate which is imposed by each member's government is perfectly the same. Each member's content rate, δ^i (i = 1, 2), becomes the common requirement level of ROO within the FTA, that is $\delta = \delta^i$.

We use the subgame perfect Nash equilibrium as the equilibrium concept.

3 Equilibrium outcomes

The game is solved by using backward induction.

Second stage: In the second stage of the game, each firm maximizes its own output under the rival firm's output and δ^i, as given. From (1)–(4), we obtain equilibrium outputs in this stage.

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6 Similar setting is used in Lahiri and Ono (1998, 2003), Kayalica and Lahiri (2003), and Takauchi (2010, 2011, 2013).

$$x_i^i = \frac{A + nt + km\delta^i}{a\lambda};\ \ x_j^i = \frac{A + nt - \gamma k\delta^j}{a\lambda};\ \ x_i^O = \frac{A - \alpha t + km\delta^i}{a\lambda}, \tag{5}$$

where $i \neq j, \alpha \equiv 1 + 2m, \gamma \equiv 1 + m + n$, and $\lambda \equiv 1 + 2m + n$.

First stage: From (5), each country's social welfare is determined. The social welfare in country *i*, SW^i, is defined by the sum of consumer surplus, domestic firm's profit π^i, domestic input (or intermediate good) revenue *IR*, and tariff revenue *TR*.

Throughout this paper, we assume that there is unemployment in each member country *i* of the FTA (e.g., a similar setting is employed in Lahiri and Ono (1998, 2003), Kayarica and Lahiri (2003), and Takauchi (2010)). In this case, input costs paid to the member country are included in the member country's income. Therefore, both governments of member countries always have an incentive to impose a positive level of content rate, δ.

The social welfare in country *i*, SW^i, is

$$SW^i = \left(\frac{A - p_i}{2}\right) \times (mx_i^i + mx_i^j + nx_i^O) + m\left(\pi^i + \delta^i k x_i^j\right) + tnx_i^O. \tag{6}$$

From the first-order conditions, using equations (5) and (6), we obtain the equilibrium ROO requirement.

$$\delta = \delta^i = \frac{\alpha A + n(3\alpha + 2n)\, t}{k\Omega} > 0,\ \ i = 1, 2, \tag{7}$$

where $\Omega \equiv 2m^2 + 2(1 + n)^2 + m(5 + 6n) > 0$. We assume that the uniform content rate of the ROO δ satisfies $\delta \leq 1$. Then, we obtain the equilibrium outputs, final-good price, and profits. Each equilibrium value is given by

$$x_i^i = \frac{2(\gamma A + \lambda nt)}{a\Omega};\quad x_j^i = \frac{\beta A - \alpha nt}{a\Omega};\quad x_i^O = \frac{2\gamma A - [(5 + 2m)m + 2\mu]t}{a\Omega}, \tag{8}$$

$$p_i = \frac{2(\gamma A + \lambda nt)}{\Omega}, \tag{9}$$

$$\pi_i^i = \frac{4}{a}\left(\frac{\gamma A + \lambda nt}{\Omega}\right)^2;\quad \pi_j^i = \frac{1}{a}\left(\frac{\beta A - \alpha nt}{\Omega}\right)^2, \tag{10}$$

$$\pi^i = \frac{4(\gamma A + \lambda nt)^2 + (\beta A - \alpha nt)^2}{a\Omega^2}, \tag{11}$$

$$\pi_i^O = \frac{1}{a}\left\{\frac{2A\gamma - [(5 + 2m)m + 2\mu]t}{\Omega}\right\}^2, \tag{12}$$

where $\beta \equiv 1 + 2n$ and $\mu \equiv 1 + mn + n$.

To ensure a positive quantity in the output of firm *O*, we need the following assumption.

Assumption. *The rate of external tariff in the FTA member countries is not too high, that is,* $t < \widetilde{t} \equiv 2A\gamma/[(5 + 2m)m + 2\mu]$.

4 External tariff reduction

In this section, we examine the effects of (uniform) external tariff reduction in the FTA member countries. Let us assume that the governments of country 1 and 2 simultaneously decrease the external tariff level after the FTA was established.

From (8)–(12), we obtain the result of comparative statics with respect to a change in the external tariff:

$$\frac{\partial x_i^i}{\partial t} = \frac{2\lambda n}{a\Omega} > 0; \quad \frac{\partial x_j^i}{\partial t} = -\frac{\alpha n}{a\Omega} < 0; \quad \frac{\partial x_i^O}{\partial t} = -\frac{\Omega - 2\gamma n}{a\Omega} < 0, \tag{13}$$

$$\frac{\partial p_i}{\partial t} = \frac{2\lambda n}{\Omega} = a\left(\frac{\partial x_i^i}{\partial t}\right) > 0, \tag{14}$$

$$\frac{\partial \pi_i^i}{\partial t} = \frac{8n\lambda(\gamma A + \lambda n t)}{a\Omega^2} > 0; \quad \frac{\partial \pi_j^i}{\partial t} = -\frac{2\alpha n(\beta A - \alpha n t)}{a\Omega^2} < 0,$$

$$\frac{\partial \pi^i}{\partial t} = \frac{2n[4(\gamma A + \lambda n t)\lambda - \alpha(\beta A - \alpha n t)t]}{a\Omega^2} > 0, \tag{15}$$

$$\frac{\partial \pi^O}{\partial t} = -\frac{4[(5 + 2m)m + 2\mu](2A\gamma - [(5 + 2m)m + 2\mu]t)}{a\Omega^2} < 0. \tag{16}$$

From (13), a reduction in the external tariff undoubtedly increases the volume of intra-FTA trade. This result is contradictory to the following intuitive argument: because external tariff reduction reduces outside firms' trade cost and raises imports from the outside, intra-FTA trade will decrease with a reduction in the external tariff.

The logic behind this result depends on the complementarity between the optimal content rate δ and the external tariff *t*. To see this, the derivation of (7) yields

$$\frac{\partial \delta}{\partial t} = \frac{\partial \delta^i}{\partial t} = \frac{n(3\alpha + 2n)}{k\Omega} > 0, \quad i = 1, 2. \tag{17}$$

The intuition for the complementarity is as follows. When the external tariff *t* decreases, the trade

cost of firm *O* decreases and the imports from the outside increases. If no other conditions change, the profit of firm *i* sharply decreases. This is because, a tariff reduction decreases both the domestic supply and exports of firm *i* (see the outcome in the second stage of the game (5)). In contrast, since an increase in imports from the outside dominates negative effects, the industry output increases and consumer surplus increases. If δ does not change, the profit of firm *i* sharply decreases and input revenue (i.e., $k\delta x_i^j$) decreases, but consumer surplus increases; this possibly reduces domestic welfare.

On the other hand, a change in δ induces a different rent-shifting effect from the external tariff; a decrease in δ increases exports of firm *i* (and other member's firm *j*) but decreases domestic supply of firm *i* and imports from the outside. Because a decrease in δ partially cover a loss in the profit of the domestic firm *i* due to a decrease in *t*. To prevent a reduction in welfare, the government of member country (or countries) decreases δ as *t* decreases.

In equilibrium, a reduction in the external tariff increases intra-FTA trade but it decreases domestic supply (domestic firm's domestic supply x_i^i is crowded out by increasing in the exports of member's firm and outside firms) and the profit of the domestic firm decreases. This effect is summarized in a change of the domestic firm's output. From (13), we obtain

$$\frac{\partial x_i^i}{\partial t} + \frac{\partial x_j^i}{\partial t} = \frac{\alpha n + 2n^2}{a\Omega^2} > 0.$$

Furthermore, from (13), we find the following relation:

$$\frac{\partial x_i^i}{\partial t} + \frac{\partial x_i^O}{\partial t} \begin{cases} \geq 0 & \text{if} \quad n \geq \sqrt{\dfrac{2+5m+2m^2}{2}} \\ < 0 & \text{otherwise} \end{cases} . \tag{18}$$

Clearly, $\partial x_i^i/\partial t + \partial x_i^O/\partial t < 0$ when $n = m$ holds. Hence, from (18), increasing imports (from the outside) cancels a decrease in the domestic production due to a tariff reduction if and only if the number of outside firms is small enough.

Summarizing these arguments, we establish the following results.

Proposition 1. *The external tariff reduction increases the volume of intra-FTA trade between two symmetric member countries, but it decreases the total output (domestic supply and export) of member countries' final-good producing firms.*

Similarly, from (6) and (8)–(12), we obtain equilibrium input revenue *IR*, tariff revenue *TR*, and welfare *SW*.

$$IR \equiv \delta^i k m x_i^j = \frac{m(\beta A - \alpha n t)[\alpha A + (3\alpha + 2n)nt]}{a\Omega^2}, \tag{19}$$

$$TR \equiv t n x_i^O = \frac{[2\gamma A - (\Omega - 2\gamma n)t]nt}{a\Omega}, \tag{20}$$

$$SW \equiv SW^i = \frac{A^2\Lambda + 8A\Gamma t - \Psi t^2}{2a\Omega^2}, \tag{21}$$

where

$$\Lambda \equiv \left[\begin{array}{l} 12m + 29m^2 + 20m^3 + 4m^4 + 4(10m + 17m^2 + 8m^3)n \\ +4(1 + 13m + 11m^2)n^2 + 8(1 + 4m)n^3 + 4n^4 \end{array} \right],$$

$$\Gamma \equiv (1 + 4m + 5m^2 + 2m^3)n + 2(1 + 3m + 2m^2)n^2 + \alpha n^3, \text{ and}$$

$$\Psi \equiv \left[\begin{array}{l} 2(4 + 20m + 33m^2 + 20m^3 + 4m^4)n + 4(5 + 18m + 18m^2 + 4m^3)n^2 \\ +8(2 + 4m + m^2)n^3 + 4n^4 \end{array} \right].$$

From (19)–(21), we have

$$\frac{\partial IR}{\partial t} = \frac{[(3\alpha + 2n)m\beta - \alpha^2]nA - 2\alpha(3\alpha + 2n)n^2 t}{a\Omega^2}, \tag{22}$$

$$\frac{\partial TR}{\partial t} = \frac{2n\gamma - (\Omega - 2\gamma n)t}{a\Omega^2}, \tag{23}$$

$$\frac{\partial SW}{\partial t} = \frac{4A\Gamma - \Psi t}{a\Omega^2}. \tag{24}$$

Thus, from (22)–(24), we can establish the following result.

Proposition 2. *A reduction of external tariff has the following effects: (i) an increase (or decrease) in the input revenue IR if* $n \leq n^*(m)$, *or* $n > n^*(m)$ *and* $A < A^{IR}$ ($n > n^*(m)$ *and* $A \geq A^{IR}$) *where* $n^*(m) \equiv (1/2)[\sqrt{2 + 10m + 13m^2} - (2 + 3m)] \geq 0$*; (ii) an increase (or decrease) in the tariff revenue TR if the market size A is smaller (or larger) than* A^{TR}*; (iii) an increase (or decrease) in the social welfare SW in both member countries if the market size A is smaller (or larger) than* A^{SW}.

Proposition 2 implies that an incentive for the formation of an FTA will be small if both countries' market sizes are large enough. When both members' market sizes increase, the consumer surplus increases too. Hence, a change in the consumer surplus due to tariff reduction becomes large. An

external tariff reduction decreases the final-good price, so that consumer surplus always rises. Therefore, one can intuitively predict that an external tariff reduction causes an increase in the domestic welfare if the market size is large enough. In contrast, this proposition states the opposite. An external tariff reduction always decreases the domestic firm's profit. When the market size increases, a loss in profit increases too. Therefore, the condition for welfare improvement due to an external tariff reduction is that the market size should be small enough.

Market structure

Finally, we consider the relationship between a pair of firm numbers (n, m) and the order of each threshold value—A^{IR}, A^{TR}, and A^{SW} —in Proposition 2.

From the results of comparative statics, we obtain the following each threshold value of the sign $\partial IR/\partial t$, $\partial TR/\partial t$, and $\partial SW/\partial t$, respectively.

$$\frac{1}{t}\cdot A^{IR} = \frac{[3(1+4m+4m^2)+2(1+4m)n]n}{1+m+2[(2+3m)n+(n^2-m^2)]}, \tag{25}$$

$$\frac{1}{t}\cdot A^{TR} = \frac{\xi+2(1+m)n}{\gamma}, \tag{26}$$

$$\frac{1}{t}\cdot A^{SW} = \frac{\xi^2+2\alpha(5+2\zeta m)n+4(2+\zeta m)n^2+2n^3}{2\alpha\gamma^2}, \tag{27}$$

where $\zeta \equiv 4+m$ and $\xi \equiv 2+5m+2m^2$.

Forming pairs of $A^{IR}=A^{TR}$, $A^{IR}=A^{SW}$, and $A^{TR}=A^{SW}$ and implementing numerical calculation, from (25)–(27), we obtain the following order of each threshold value. These relations are depicted in table 1 and figure 1.

Table 1: The order of each threshold values.

Region I	$A^{IR} < A^{SW} < A^{TR}$
Region II	$A^{SW} < A^{TR} < A^{IR}$
Region III	$A^{SW} < A^{IR} < A^{TR}$
Region IV	$A^{IR} < A^{TR} < A^{SW}$

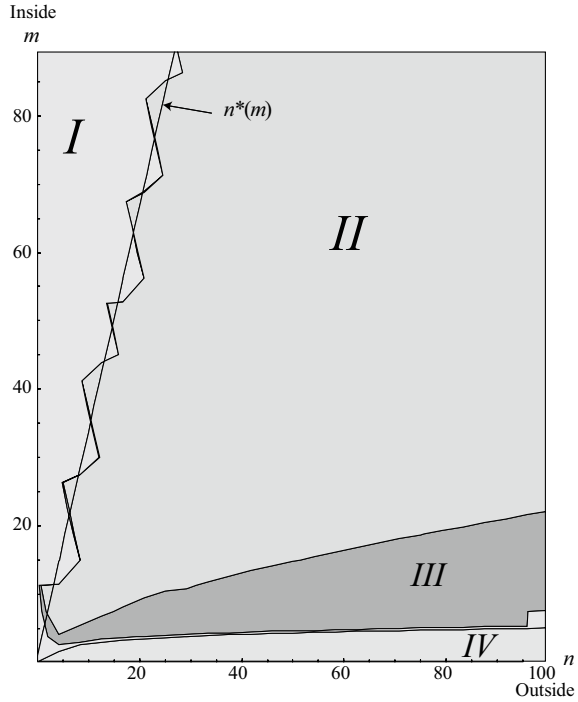

Figure 1: Market structure (n, m) and the order of each threshold values: $(n \leq 100, m \leq 90)$.

In figure 1, the vertical (horizontal) axis denotes the number of each member (the outside) country's firms. We compare the size of A^{IR}, A^{TR}, and A^{SW} in this figure.

The longitudinal curve labeled $n^*(m)$ is a condition that decides whether input revenue IR increases or decreases due to an external tariff reduction. The left-hand side of $n^*(m)$ is $n \leq n^*(m)$ and the right-hand side of $n^*(m)$ is $n \geq n^*(m)$.

In figure 1, the widest regions are regions II and III. In particular, in these two regions, we can clearly verify that the market size must be sufficiently small in order to compensate for a loss of the domestic firm's profit due to a tariff reduction. Since the difference between the number of inside and outside firms in these regions is relatively small, the feature of Proposition 2 (i.e., social welfare improves only if the loss of the domestic firm's profit due to tariff reduction is relatively small) appears strongly. Is it the same case for other regions?

For example, let us consider about region IV. In this region, the same result as $A < A^{SW}$ holds in the regions II and III and occurs when $A < A^{IR}$ holds. However, in this region, the uniform external tariff reduction reduces all components of social welfare, except for consumer surplus, when $A^{TR} < A < A^{SW}$ holds. Since the number of the outside firms is relatively large, the production of final goods is

substituted by imports from outside the FTA. This increase of imports from outside sufficiently reduces the price of the final-good and increases consumer surplus, so that social welfare improves as a result if $A^{TR} < A < A^{SW}$.

On the other hand, in region I, the number of the member country's firms is relatively large. In this region, an increase of consumer surplus due to an increase in imports from the outside becomes small. That is, the number of the outside firms n is relatively small, so that the effect of increasing imports becomes small. The price of the final good does not sufficiently fall due to a tariff reduction, and the loss of the domestic firm's profit is not canceled out. Therefore, when $A^{SW} < A < A^{TR}$ holds, social welfare decreases even if tariff revenue increases due to an external tariff reduction.

These results are summarized in the following two corollaries of Proposition 2 (also see figure 2).

Corollary 1. *(i) Suppose that a pair of the number of outside-inside firms* (n, m) *belongs to regions II or III and the condition* $n > n^*(m)$ *holds. If* $A < A^{SW}$*, all components of welfare, except for the domestic firm's profit, improve due to a decrease in the external tariff. (ii) In region IV, external tariff reduction decreases all components of welfare, except for consumer surplus, if* $A^{TR} < A < A^{SW}$ *. (iii) In region I,*

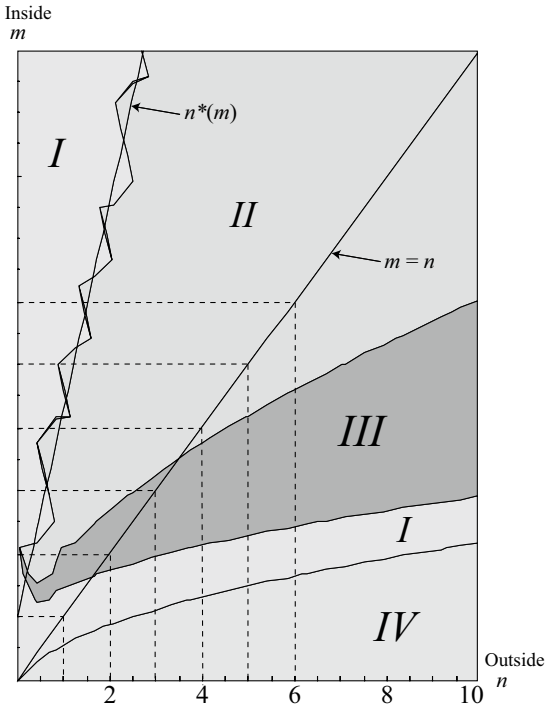

Figure 2: Change in economic structure: ($n \leq 10$, $m \leq 10$).

external tariff reduction decreases welfare; however, it increases tariff revenue if $A^{SW} < A < A^{TR}$.

Corollary 2. *At the same competitive condition (on the line* $n = m$*), the order of threshold values in both member countries changes from* $n = m = 1$ *to* $n = m = 2$*, and from* $n = m = 3$ *to* $n = m = 4$.

5 Conclusion

In this paper, we examined the market access and welfare effects of external tariff reduction under two-way oligopolistic FTA model with endogenously decided ROO.

Our main results are as follows. First, under an endogenous ROO with unemployment in member countries setting, external tariff reduction increases intra-FTA trade volumes. Second, as mentioned in Proposition 2, external tariff reduction improves the social welfare of the FTA member countries if and only if the market size of those countries is small enough. Third, even if the number of firms inside and outside the FTA differs significantly, it is possible to improve social welfare within the FTA. For example, when the number of outside firms is extremely large, external tariff reduction improves the FTA member countries' social welfare through import substitution.

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