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Free Trade Agreement with Endogenous Market Structure

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Abstract

We examine the incentives of free trade agreements (FTA) formation between two countries under endogenous market structure with leaders and followers. We demonstrate that establishing an FTA is neither an equilibrium outcome nor social optimum when consumer demand and fixed cost are intermediate and products are close substitutes. This is because the FTA induces exit of followers, which makes the market less competitive and shrinks the leader's production both in the domestic and foreign markets. We also show that developing countries are less likely to establish an FTA than developed countries.

Keywords: Free trade agreement, endogenous market structure, product differentiation

JEL Classification: F12, F13, D43

1 Introduction

In the recent decades, the world has witnessed a surge in the number of bilateral free trade agreements (FTAs), such as a European Union–South Korea FTA, and a China–Singapore FTA. A bilateral FTA is accepted as a mutually beneficial trade policy that helps firms access new markets and benefits consumers by increasing competition. There are nearly 300 FTAs in the world as of 2018. However, this number is quite small as compared to nearly $20,000$ country pairs (the number of United Nations members is nearly 200, meaning that $200 \times 199/2$ pairs). Therefore, there must exist good reasons why an FTA is not agreed.

One possible reason is as follows. As an important trade policy, an FTA generates a significant impact on firms' behavior and the market structure. Most markets are constituted by a few leaders that have a first-mover advantage and several followers that are ready to enter the market given

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any business opportunity. In many cases, leaders also enjoy a competitive advantage over followers in the international market. Furthermore, foreign leaders usually enter the market after domestic leaders do because the latter have more knowledge about the local market. How would the market structure change in response to an FTA? How would governments decide on the FTA formation in anticipation of such a market reaction?

To address these issues, we examine how the endogenous market structure affects the incentives to form an FTA between two countries in a differentiated good market. In each country, there is an international leader that sells in both the domestic and foreign markets, and domestic followers that freely enter or exit the market. We consider the following four-stage game. In stage 1, each country simultaneously makes a commitment to form an FTA or choose autarky. If the FTA is established, then each country offers the other free access to its domestic market. Otherwise, each country is self-sufficient. In stage 2, given the FTA or autarky, each leader determines the quantity of the differentiated good for the *domestic* market. In stage 3, each leader determines the export, i.e., the quantity of the differentiated good for the *foreign* market. In stage 4, knowing the outputs of the leaders, all potential domestic followers simultaneously decide whether to enter or not. Each domestic follower that enters the market simultaneously chooses its quantity to maximize its own profit.

We demonstrate that an FTA might not be established between two asymmetric countries with different fixed costs if the market structure is endogenized. Specifically, an FTA would be formed if it does not change the market structure, but might not be formed if it led to a *dramatic* change to the market structure. We divide our analysis into three cases. First, when the willingness to pay (WTP) is low, goods are close substitutes, and the fixed cost is high, no follower enters the market both with and without an FTA. In this case, an FTA would increase the domestic output and the leader's output with the expansion of leader's exports in each country. Consequently, the two countries establish an FTA, which is beneficial for social welfare. Second, when the WTP is high, goods are bad substitutes, and the fixed cost is low, there are some followers both with and without an FTA. In this case, an FTA is also established. Contrary to these two cases, when the WTP, product substitutability and fixed cost are intermediate, leaders produce the goods more aggressively in order to deter the entry both in free trade and autarky. Since the leader is a monopolist in autarky, he behaves more aggressively than in free trade, so that the price in autarky is lower, which favors the consumer surplus and social welfare. Thus, an FTA may not be established if the WTP and fixed cost were intermediate and products were close substitutes.

FTA formation has been addressed by a wide array of trade literature, but the interaction between the endogenous market structure and FTA policy has not received much attention. Existing literature mostly considers an exogenous market structure. A large amount of studies assume oligopolistic competition in all countries, and concur that bilateral FTAs are beneficial if countries are symmetric. These studies include Bagwell and Staiger (1999), Chen and Joshi (2010), Saggi (2006), and Saggi and Yildiz (2010). A few works that examine FTA and preferential trade agreement (PTA) policy under monopolistic competition also validate the incentives to form FTAs and PTAs if countries are

symmetric. Representative works include Furusawa and Konishi (2007) and Mossay and Tabuchi (2015). However, all these studies assume the same market structure before and after free trade. Contrary to these studies, we show that an FTA that leads to an endogenous change in the market structure might be detrimental, and hence, might not be established when products are close substitutes.

Regarding the market structure, this study draws closely on the literature on the Stackelberg model with endogenous entry. Etro (2004, 2006) establishes a framework with a Stackelberg leader and several followers that enter the market endogenously. He shows that the endogenous entry of followers would always induce aggressive behavior by the Stackelberg leader.[1] However, he restricts his analysis to the interaction between the leader and followers in a closed economy. We take a step further than Etro (2004, 2006) by taking into account the impact of FTAs on the endogenous market structure in an open economy. One important finding is that the FTA may generate a dramatic change in the market structure, which can be detrimental to welfare. Etro (2011) examines an optimal strategic trade policy whereby firms from different countries endogenously enter and compete in the international market. Our research question differs from his with respect to both the market structure and trade policy.

More broadly, this study complements the other theories on the endogenous market structure. One strand is the dominant firm model (Chen, 2003; Markham, 1951), where the leader is a dominant firm and the followers are infinitesimal price-takers. Our approach differs in that the followers also behave strategically. Some recent studies introduce a new framework with the coexistence of strategically behaving large firms and monopolistically competitive small firms (Pan and Hanazono, 2018; Parenti, 2018; Shimomura and Thisse, 2012). This framework characterizes the polarization in size between large and small firms. Nevertheless, assuming that all firms behave simultaneously, it does not capture the dynamic strategic behavior among different firms, which is a key element in our model.

The rest of this paper is organized as follows. Section 2 introduces the model of endogenous market structure with international trade. Section 3 investigates the incentives of FTA formation between two symmetric countries. Section 4 extends the discussion in Section 3 by introducing the asymmetry in the fixed cost between countries. Section 5 concludes.

2 Model

The economy consists of two countries 1 and 2 with the same population normalized to 1.

[1] Etro (2008) and Ino and Matsumura (2012) also examine the Stackelberg competition with endogenous entry in a closed economy in different aspects.

2.1 Consumers

Each consumer consumes two goods, a homogeneous good x and a horizontally differentiated good q. The utility of a representative consumer in country $i(=1,2)$ is represented by

$$U_i = a\left(q_{ii}^L + q_{ji}^L + \sum_{k=1}^{n_i} q_{ik}^E\right) - \frac{1-b}{2}\left[(q_{ii}^L)^2 + (q_{ji}^L)^2 + \sum_{k=1}^{n_i}(q_{ik}^E)^2\right] - \frac{b}{2}\left(q_{ii}^L + q_{ji}^L + \sum_{k=1}^{n_i} q_{ik}^E\right)^2 + x_i,$$

where x_i is the consumption of the homogeneous good. In the differentiated good market, we denote the leader by superscript "L" and the follower by superscript "E." Accordingly, q_{ii}^L is the consumption of the domestic leader's good, q_{ji}^L is the consumption of the foreign leader's good, and q_{ik}^E is the consumption of a domestic follower's good. The number of followers is represented by n_i, which is endogenously determined. The parameter a indexes the consumer's preference for the differentiated good relative to the homogeneous good, which measures the WTP for the differentiated good. The parameter $b \in (0,1)$ indexes the substitutability among varieties of the differentiated good.

The representative consumer maximizes utility U_i under the income constraint

$$y = p_{ii}^L q_{ii}^L + p_{ji}^L q_{ji}^L + \sum_{k=1}^{n_i} p_{ik}^E q_{ik}^E + x_i,$$

where y is his income, which is sufficiently large for the consumption of the homogeneous good x_i to be positive, and p_{ii}^L, p_{ji}^L, and p_{ik}^E are the prices of domestic leader i, foreign leader j, and domestic follower k in country i, respectively. Then, his inverse demand for the good of leader i, that of leader j, and that of follower i are given by

$$\begin{aligned} p_{ii}^L &= a - (1-b)q_{ii}^L - bQ_i, \\ p_{ji}^L &= a - (1-b)q_{ji}^L - bQ_i, \\ p_{ik}^E &= a - (1-b)q_{ik}^E - bQ_i, \end{aligned} \tag{1}$$

where

$$Q_i \equiv q_{ii}^L + q_{ji}^L + \sum_{k=1}^{n_i} q_{ik}^E \tag{2}$$

is the consumer's total consumption of the differentiated good in country i.

2.2 Firms

Labor is the only production factor. Homogeneous good x is produced with a constant returns to scale technology, requiring one unit labor to produce one unit of output. It is freely traded without tariffs across countries and serves as the numeraire.

Differentiated good q is produced in country i, where there is one leader i and n_i domestic followers. Leader i produces q for both the domestic and foreign markets, taking leadership in both countries. The followers produce q only in the domestic market. The non-negative number n_i of followers is endogenously determined by the free entry and exit of followers.

Each firm incurs a constant marginal cost c to produce one unit of good. The profit of leader i consists of the profits from the domestic and foreign markets given by

$$\pi_i^L = (p_{ii}^L - c)q_{ii}^L + (p_{ij}^L - c)q_{ij}^L, \tag{3}$$

where the second term vanishes in the case of autarky. The profit of domestic follower k $(= 1, ..., n_i)$ in country i is given by

$$\pi_{ik}^E = (p_{ik}^E - c)q_{ik}^E - F_i, \tag{4}$$

where F_i is the fixed cost to enter the market in country i. Assume $F_1 \leq F_2$ and $c = 0$ without much loss of generality.

2.3 Welfare

The consumer surplus of a representative consumer in country i is given by utility U_i. Social welfare in country i consists of the consumer surplus and leader's profit:

$$W_i = U_i + \pi_i^L. \tag{5}$$

Note that the followers' profits are zero owing to the free-entry condition. In order to observe whether the FTA is established or not, we compare the social welfare between free trade and autarky. We denote the changes by "Δ". If $\Delta W_i > 0$ is satisfied in each country, then the FTA is established.[2]

2.4 Game structure

The four-stage game is as follows. In stage 1, each country simultaneously makes a commitment to an FTA or imposes a prohibitive import tariff so that each country's market is an autarky.[3] In stage 2, given the FTA or prohibitive import tariff, each leader determines the quantity of the differentiated good for the *domestic* market. In stage 3, if the FTA is established, each leader determines the export quantity of the differentiated good for the *foreign* market; otherwise the leaders do not export.[4] In stage 4, knowing the quantities of the domestic and foreign leaders, all potential domestic followers simultaneously decide whether to enter or not. Each domestic follower that enters the market simultaneously chooses its quantity to maximize their own profit. We use the backward induction approach to solve the model.

[2] We could instead consider that the FTA is established only if both consumer and producer groups are better off, that is, $\Delta CS_i > 0$ and $\Delta\pi_i^L > 0$ for each country i (see section 4.1.2). However, by assuming that the leader's profit is redistributed to consumers equally, the FTA condition is simply given by $\Delta W_i > 0$.

[3] We could consider tariff competition between the two countries rather than autarky. We choose the latter because the overall results are almost the same, while tariff competition yields many complicated cases.

[4] If stages 2 and 3 are combined, then the two leaders produce their goods simultaneously. Then, under certain conditions, there exists a continuum of equilibria, with which the SPNE cannot be obtained. We thank the anonymous referee who points out this problem.

3 Symmetric countries

In this section, we assume that the two countries are symmetric in technology $F_1 = F_2 = F$. In section 4, we extend the analysis to the case of asymmetric countries $F_1 \neq F_2$. We consider stages 2 to 4 first, then we compare the welfares between autarky and FTA and examine the government's incentive to form an FTA in stage 1.

3.1 Autarky

The market structure in each country is endogenously determined by whether followers enter the market or not. Specifically, we have three regimes. First, there are domestic followers in the market. Second, the domestic leader deters the entry of domestic followers. Third, there are no domestic followers, and the leader produces as a monopolist. We consider these three regimes and identify the range of parameters for each regime. Since the two countries are symmetric, we focus on country i. We denote the equilibrium values in autarky with superscript "$*$."

3.1.1 Domestic followers

When the consumer's preference a for the differentiated product is sufficiently high, the market is large enough, so that domestic followers would enter the market. We denote the equilibrium values in this case with superscript "h".

Stage 4 Each domestic follower $k(= 1, ..., n_i)$ in country i maximizes its profit with respect to its quantity. The first-order condition is

$$a - 2q_{ik}^E - b\left(q_{ii}^L + q_{ji}^L + \sum_{z \neq k}^{n_i} q_{iz}^E\right) = 0. \tag{6}$$

In addition, the domestic followers freely enter or exit the market, which endogenously determines the number n_i^h of followers. The free-entry condition pins the equilibrium profit down to zero:

$$\pi_{ik}^E = 0. \tag{7}$$

Substituting equations (1), (2), (4), and (6) into (7), we obtain the optimal output of the follower in each country:

$$q_i^{Eh*} = \sqrt{F},$$

which is independent of the output of the leading firms.

The number of followers in country i is expressed as a decreasing function of the outputs of the two leading firms:[5]

$$n_i(q_{ii}^L, q_{ji}^L) = \begin{cases} \frac{a - b(q_{ii}^L)}{b\sqrt{F}} - \frac{2-b}{b} & \text{if } q_{ii}^L + q_{ji}^L < \overline{Q} \\ 0 & \text{if } q_{ii}^L + q_{ji}^L \geq \overline{Q} \end{cases}, \tag{8}$$

[5] We consider that there are followers even when $n_i(q_{ii}^L, q_{ji}^L)$ is less than 1. Furthermore, we disregard the integer problem for analytical simplicity.

where $q_{ji}^L = 0$ in autarky. Then, the total quantity consumed by a representative consumer is

$$Q_i^{h*} = \overline{Q} \equiv \frac{a - (2-b)\sqrt{F}}{b}$$

and the price of the follower in each country is given by

$$p_i^{Eh*} = \sqrt{F}.$$

Stage 3 There is no stage 3 because the foreign leader j does not export to country i, i.e., $q_{ji}^L = 0$.

Stage 2 The domestic leader i maximizes its profit in domestic country i given by (3), which yields

$$q_{ii}^{Lh*} = \frac{2-b}{2(1-b)}\sqrt{F}. \tag{9}$$

Since $q_{ii}^{Lh*} > q_i^{Eh*}$, the leader's quantity in the domestic market is larger than that of a follower, which is consistent with the Stackelberg competition in quantity. Anticipating the entry of domestic followers in stage 4, the domestic leader produces aggressively in stage 2.

Plugging (9) into (8) yields

$$n_i^{h*} = \frac{a}{b\sqrt{F}} - \frac{(2-b)^2}{2b(1-b)},$$

which is positive if

$$a > a_{\text{EN}}^* \equiv \frac{(2-b)^2}{2(1-b)}\sqrt{F}.$$

This implies that the market with domestic followers is an equilibrium when a is sufficiently large.

The price of leader i in the domestic market is

$$p_{ii}^{Lh*} = (1-b)q_{ii}^{Lh*} = \frac{2-b}{2}\sqrt{F}.$$

Then, the profit of leader i is

$$\pi_i^{Lh*} = \frac{(2-b)^2}{4(1-b)}F.$$

The consumer surplus is

$$U_i^{h*} = \frac{4a^2(1-b) - 4a(3-4b+b^2)\sqrt{F} + (2-b)^3F}{8b(1-b)} + y,$$

and the social welfare in country i is

$$W_i^{h*} = \frac{4a^2(1-b) - 4a(3-b)(1-b)\sqrt{F} + (2-b)^3(2+b)F}{8b(1-b)} + y.$$

3.1.2 No domestic follower

When the consumer's preference a for the differentiated product is sufficiently low, domestic followers would not enter the market. We denote the equilibrium values in this case with superscript "l".

There are no stages 3 and 4 because the foreign leader and domestic followers are absent in this regime. Therefore, the domestic leader only sells its product in the domestic market as a monopolist.

Stage 2 Domestic leader i maximizes its profit with respect to its quantity in country i:

$$a - 2q_{ii}^{L} = 0,$$

which yields the optimal quantity q_{ii}^{LM}:

$$q_{ii}^{Ll*} = \frac{a}{2}. \tag{10}$$

Substituting this quantity into (8), we get $n_i(q_{ii}^{L*}, 0) \leq 0$ if

$$a \leq a_{\text{NO}}^{*} \equiv 2\sqrt{F}.$$

The price of leader i in the domestic market is

$$p_{ii}^{Ll*} = \frac{a}{2}.$$

Then, the profit of leader i is

$$\pi_{i}^{Ll*} = \frac{a^2}{4}.$$

The consumer surplus is

$$U_{i}^{l*} = \frac{a^2}{8} + y,$$

Adding them up, the social welfare in country i is computed as

$$W_{i}^{l*} = \frac{3a^2}{8} + y.$$

3.1.3 Strategic entry deterrence

So far, we have shown that domestic followers enter if $a > a_{\text{EN}}^{*}$, while they do not enter if $a \leq a_{\text{NO}}^{*}$. Since $a_{\text{NO}}^{*} < a_{\text{EN}}^{*}$, we examine the market structure in the interval $a_{\text{NO}}^{*} < a \leq a_{\text{EN}}^{*}$. In this case, the domestic leader would produce its good more aggressively to deter the entry of domestic followers. The reason is as follows. If the domestic leader produces its good at the monopoly level $q_{ii}^{L} = a/2$, then it would be profitable for some domestic followers to enter the market because the number of followers given by (8) is positive as follows:

$$n_i(a/2, 0) = \frac{\left(a - 2\sqrt{F}\right)(2-b)}{2b\sqrt{F}} > \frac{\left(a_{\text{NO}}^{*} - 2\sqrt{F}\right)(2-b)}{2b\sqrt{F}} = 0.$$

Since entry of followers drives down the domestic leader's price, the domestic leader finds it more profitable to produce the quantity that deters the entry of domestic followers strategically. We denote the equilibrium values in this case with superscript "m".

Stage 2 We know from (8) that $n_i(q_{ii}^{L})$ is zero if $\overline{Q} < q_{ii}^{L}$ in the absence of q_{ji}^{L}. When a is intermediate, the domestic leader may deter the entry of all the domestic followers by producing at

$$q_{ii}^{Lm*} = \overline{Q}. \tag{11}$$

Then, the corresponding price is

$$p_{ii}^{Lm*} = \frac{(2-b)\sqrt{F} - a(1-b)}{b} \tag{12}$$

and the profit of leader i is given by

$$\pi_i^{Lm*} = \frac{[(2-b)\sqrt{F} - a(1-b)][a-(2-b)\sqrt{F}]}{b^2}.$$

The consumer surplus is

$$U_i^{m*} = \frac{[a-(2-b)\sqrt{F}]^2}{2b^2} + y,$$

Adding them up, the social welfare in country i is computed as

$$W_i^{m*} = \frac{[(2-b)\sqrt{F} - a(1-2b)][a-(2-b)\sqrt{F}]}{2b^2} + y.$$

In sum, the welfare in country i in autarky is given by

$$W_i^* = \begin{cases} \frac{3a^2}{8} + y & \text{if } a \le a_{\text{NO}}^* \\ \frac{[(2-b)\sqrt{F}-a(1-2b)][a-(2-b)\sqrt{F}]}{2b^2} + y & \text{if } a_{\text{NO}}^* < a \le a_{\text{EN}}^* \\ \frac{4a^2(1-b)-4a(3-b)(1-b)\sqrt{F}+(2-b)^2(2+b)F}{8b(1-b)} + y & \text{if } a > a_{\text{EN}}^* \end{cases}. \tag{13}$$

Since a_{NO}^* and a_{EN}^* are increasing in b and F, the three cases may be classified with respect to b or F. In other words, the first line of (13) corresponds to close substitutes and large fixed cost; the third line to bad substitutes and small fixed cost; and the second line to in between.

3.2 Free trade

If the two countries reach the FTA, the goods produced by the leaders are freely traded between the countries. We denote the equilibrium values in free trade with superscript "f."

3.2.1 Domestic followers

When a is high enough, domestic followers enter the market in each country. Stage 4 in free trade is the same as that in autarky. Therefore, the quantity of each domestic follower and the total quantity do not change after free trade, that is,

$$q_i^{Ehf} = q_i^{Eh*}, \qquad Q_i^{hf} = Q_i^{h*}.$$

Stage 3 Substituting Q_i^{hf} into leader j's profit (3), the first-order condition yields the optimal quantity of the foreign leader j :

$$q_{ji}^{Lhf} = \frac{2-b}{2(1-b)}\sqrt{F}.$$

Stage 2 The domestic leader i maximizes its profit in domestic country i given by (3), yielding

$$q_{ii}^{Lhf} = \frac{2-b}{2(1-b)}\sqrt{F}.$$

The number of domestic followers is

$$n_i^{hf} = \frac{1}{b}\left(\frac{a}{\sqrt{F}} - \frac{2-b}{1-b}\right),$$

which is positive if

$$a > a_{\mathrm{EN}}^f \equiv \frac{2-b}{1-b}\sqrt{F}.$$

Leader i's profit is computed as

$$\pi_i^{Lhf} = \frac{(2-b)^2}{2(1-b)}F$$

and the consumer surplus in country i is

$$U_i^{hf} = \frac{a[a-(3-b)\sqrt{F}]}{2b} + \frac{(2-b)(2-2b+b^2)}{4(1-b)b}F + y.$$

Then, the social welfare in country i is given by

$$W_i^{hf} = \frac{a[a-(3-b)\sqrt{F}]}{2b} + \frac{(2-b)(2+2b-b^2)}{4(1-b)b}F + y.$$

3.2.2 No domestic follower

When a is low enough, there is no domestic follower in each country, and thus, we set $q_i^E = 0$ and $n_i = 0$.

Stage 3 Foreign leader j maximizes its profit with respect to its quantity in country i, which yields the optimal quantity

$$q_{ji}^{Ll}(q_{ii}^{Ll}) = \frac{a - bq_{ii}^{Ll}}{2}.$$

Stage 2 Domestic leader i maximizes its profit with respect to its quantity in country i , plugging $q_{ji}^{Ll}(q_{ii}^{Ll})$ into the profit yields the optimal quantity

$$q_{ii}^{Llf} = \frac{a(2-b)}{2(2-b^2)}.$$

Then, the foreign leader's quantity is

$$q_{ji}^{Llf} = \frac{a(4-2b-b^2)}{4(2-b^2)},$$

Substituting these quantities into (8), we get $n_i^h(q_{ii}^{Llf}, q_{ji}^{Llf}) \leq 0$ if

$$a \leq a_{\mathrm{NO}}^f \equiv \frac{4\left(2-b^2\right)}{4-2b-b^2}\sqrt{F}.$$

The prices of the domestic and foreign leaders are

$$p_{ii}^{Llf} = \frac{a(2-b)}{4}, \qquad p_{ji}^{Llf} = \frac{a(4-2b-b^2)}{4(2-b^2)}.$$

Plugging the equilibrium values into (3) yields the leader's profits in the absence of followers in country i:

$$\pi_i^{Llf} = \frac{a^2(32-32b-8b^2+12b^3-b^4)}{16(2-b^2)^2}.$$

Substituting q_{ii}^{Llf}, q_{ji}^{Llf}, p_{ii}^{Llf}, and p_{ji}^{Llf} into the utility function, we obtain the consumer surplus in country i:

$$U_i^{lf} = \frac{a^2(32-32b^2+4b^3+5b^4)}{32(2-b^2)^2} + y,$$

Adding up π_i^{Llf} and U_i^{lf}, the social welfare in country i is given by

$$W_i^{lf} = \frac{a^2(96-64b-48b^2+28b^3+3b^4)}{32(2-b^2)^2} + y.$$

3.2.3 Strategic entry deterrence

We have shown that domestic followers enter if $a > a_{\rm EN}^f$, and do not enter if $a \leq a_{\rm NO}^f$, where $a_{\rm NO}^f < a_{\rm EN}^f$. In the interval $a_{\rm NO}^f < a \leq a_{\rm EN}^f$, the reaction function of foreign leader j can be written as

$$q_{ji}^L(q_{ii}^L) = \begin{cases} \frac{(2-b)\sqrt{F}}{2(1-b)} & \text{if } q_{ii}^L < q_{\rm EN} \\ \frac{a-(2-b)\sqrt{F}}{b} - q_{ii}^L & \text{if } q_{\rm EN} \leq q_{ii}^L < q_{\rm NO} \\ \frac{a-bq_{ii}^L}{2} & \text{if } q_{ii}^L \geq q_{\rm NO} \end{cases}, \tag{14}$$

where $q_{\rm EN} \equiv \frac{a}{b} - \frac{(2-b)^2}{2b(1-b)}\sqrt{F}$, which is the intersection of $q_{ji}^L = \frac{(2-b)\sqrt{F}}{2(1-b)}$ and $q_{ii}^L + q_{ji}^L = \overline{Q}$, while $q_{\rm NO} \equiv \frac{a-2\sqrt{F}}{b}$, which is the intersection of $q_{ji}^L = \frac{a-bq_{ii}^L}{2}$ and $q_{ii}^L + q_{ji}^L = \overline{Q}$. The first line is the case of domestic followers, the second line is the case of strategic entry deterrence, and the third line is the case of no domestic followers. Now we consider the case of entry deterrence of followers by the two leaders.

There is no stage 4 because domestic followers are deterred to enter.

Stage 3 The reaction function of foreign leader j is given by the second line in (14).

Stage 2 Anticipating the reaction function of foreign leader j in stage 2, the domestic leader maximizes its profit. Computing the first-order condition, we have

$$q_{ii}^{Lm_1f} = \frac{2-b}{2(1-b)}\sqrt{F},$$

which coincides with q_{ii}^{Lhf}. Then, the foreign leader produces

$$\begin{aligned} q_{ji}^{Lm_1f} &= \frac{a-(2-b)\sqrt{F}}{b} - q_{ii}^{Lm_1f} \\ &= \frac{a}{b} - \frac{(2-b)^2}{2b(1-b)}. \end{aligned}$$

Define $a^f_{\rm SD} \equiv \frac{4-2b-b^2}{2(1-b)}\sqrt{F}$. There are two subcases. First, when $a^f_{\rm SD} < a \leq a^f_{\rm EN}$, $q^{Lm_1 f}_{ii}$ is within the range of $(q_{\rm EN}, q_{\rm NO}]$ so that the equilibrium strategic entry deterrence is given by the above interior solution. The social welfare in country i is computed as

$$W_i^{m_1 f} = \frac{a^2(-2+6b-4b^2) + 2a(1-b)(2-b)^2\sqrt{F} - (2-b^2)(2-b)^2 F}{4(1-b)b^2} + y.$$

Second, when $a^f_{\rm NO} < a \leq a^f_{\rm SD}$, $q^{Lm_1 f}_{ii}$ is outside the range of $(q_{\rm EN}, q_{\rm NO}]$, and thus, the constrained maximizer is given by

$$q^{Lm_2 f}_{ii} = \frac{a - 2\sqrt{F}}{b}$$

and the quantity of foreign leader j is

$$q^{Lm_2 f}_{ji} = \sqrt{F}.$$

Then, the social welfare in country i is computed as

$$W_i^{m_2 f} = \frac{a^2(2b-1) + 4a(1-b)\sqrt{F} - (4-3b^2)F}{2b^2} + y.$$

In summary, the welfare in country i in free trade is

$$W_i^f = \begin{cases} \frac{a^2(96-64b-48b^2+28b^3+3b^4)}{32(2-b^2)^2} + y & \text{if } a \leq a^f_{\rm NO} \\ \frac{a^2(2b-1)+4a(1-b)\sqrt{F}-(4-3b^2)F}{2b^2} + y & \text{if } a^f_{\rm NO} < a \leq a^f_{\rm SD} \\ \frac{a^2(-2+6b-4b^2)+2a(1-b)(2-b)^2\sqrt{F}-(2-b^2)(2-b)^2F}{4(1-b)b^2} + y & \text{if } a^f_{\rm SD} < a \leq a^f_{\rm EN} \\ \frac{a[a-(3-b)\sqrt{F}]}{2b} + \frac{(2-b)(2+2b-b^2)}{4(1-b)b}F + y & \text{if } a > a^f_{\rm EN} \end{cases}. \tag{15}$$

3.3 First-stage FTA formation

In stage 1, each government compares the social welfare in autarky with that in free trade and decides whether to form the FTA or not.

From (13) and (15), we have four thresholds that determine the endogenous market structure in autarky and free trade: $a^*_{\rm NO}$, $a^*_{\rm EN}$, $a^f_{\rm NO}$, and $a^f_{\rm EN}$. It can be readily verified that $a^*_{\rm NO} < \min\{a^*_{\rm EN}, a^f_{\rm NO}\} \leq \max\{a^*_{\rm EN}, a^f_{\rm NO}\} < a^f_{\rm SD} < a^f_{\rm EN}$. We have

$$a^*_{\rm EN} \lesseqgtr a^f_{\rm NO} \Leftrightarrow b \lesseqgtr \widehat{b} \approx 0.714$$

so that there are two scenarios:

(I) $a^*_{\rm NO} < a^*_{\rm EN} < a^f_{\rm NO} < a^f_{\rm SD} < a^f_{\rm EN}$ hold for $b \in (0, \widehat{b})$ and

(II) $a^*_{\rm NO} < a^f_{\rm NO} \leq a^*_{\rm EN} < a^f_{\rm SD} < a^f_{\rm EN}$ hold for $b \in [\widehat{b}, 1)$.

Therefore, the market structure is determined by the WTP a, substitutability b, fixed cost F, and the free trade policy. We first consider Scenario I.

3.3.1 Scenario I: Bad substitutes: $b \in (0, \widehat{b})$

When goods are bad substitutes, we have the following five cases.

Case A: If $a \leq a^*_{\text{NO}}$, no domestic follower enters the market in both countries regardless of whether the FTA is reached.

Case B: If $a^*_{\text{NO}} < a \leq a^*_{\text{EN}}$, each leader deters the entry of domestic followers in autarky; no follower enters the market in both countries in free trade

Case C: If $a^*_{\text{EN}} < a \leq a^f_{\text{NO}}$, domestic followers enter the market in autarky, but not in free trade.

Case D: If $a^f_{\text{NO}} < a \leq a^f_{\text{EN}}$, domestic followers enter the market in autarky; each leader deters the entry of domestic followers in free trade.

Case E: If $a > a^f_{\text{EN}}$, domestic followers enter the market regardless of whether the FTA is reached.

Case A: $a \leq a^*_{\text{NO}}$ If $a \leq a^*_{\text{NO}}$, no domestic follower enters the market in both countries whether the FTA is reached or not. In this case, the leader benefits from the export to the foreign market. Nevertheless, the presence of the foreign leader after free trade intensifies the competition in both countries. Therefore, the leaders' profit may decrease after free trade because the decrease in the domestic profit owing to the competition with the foreign leader may dominate the increase in the export profit. The change in the leader's profit is

$$\Delta\pi_i^{LA} = \frac{(2-b)(8-12b-2b^2+5b^3)}{16(2-b^2)^2}a^2,$$

which is positive if $b < 0.748$. Note that the leader occupies a small market share and earns few profits in the foreign market as compared to the domestic market, because it is the second mover in the foreign market.

The consumer benefits from FTA with the consumption of more varieties and intensified competition among the firms:

$$\Delta U_i^A = \frac{(2-b)(8+4b-6b^2-b^3)}{32(2-b^2)^2}a^2 > 0.$$

The change in the social welfare after free trade is

$$\Delta W_i^A = \frac{48-64b+28b^3-9b^4}{32(2-b^2)^2}a^2 > 0.$$

Therefore, the FTA is always established.

Case B: $a^*_{\text{NO}} < a \leq a^*_{\text{EN}}$ If $a^*_{\text{NO}} < a \leq a^*_{\text{EN}}$, each leader deters the entry of domestic followers in autarky; no follower enters the market in both countries in free trade.

The leaders benefit from free trade due to the export profit from the foreign market. In addition, each leader no longer needs to deter the entry of domestic followers in free trade, and hence, enjoys more market power. The change in each leader's profit after free trade is

$$\Delta\pi_i^{LB} = \frac{2-b}{16b^2}\left[\frac{(2+b)(4-2b-b^2)^2}{(2-b^2)^2}a^2 - 16a(2-b)\sqrt{F} + 16(2-b)F\right] > 0.$$

Nevertheless, the consumer surplus may decrease due to the increased market power of the leaders after free trade. The change in consumer surplus after free trade is

$$\Delta U_i^B = \frac{1}{32b^2}\left[-\frac{(2-b)(4-2b-b^2)(8+8b-4b^2-5b^3)}{(2-b^2)^2}a^2 + 32a(2-b)\sqrt{F} - 16(2-b)^2F\right],$$

which decreases in a and increases in F. We can show that when $a \to a^*_{\rm NO}$, $\Delta U_i^B > 0$. We can also show that when $a = a^*_{\rm EN}$, $\Delta U_i^B > 0$ for $0 < b < 0.6$.

The change in the social welfare after free trade is given by

$$\Delta W_i^B = \frac{2-b}{32b^2}\left[\frac{(2-b)(4-2b-b^2)(4-2b-3b^2)}{(2-b^2)^2}a^2 - 32a(1-b)\sqrt{F} + 16(2-b)F\right] > 0,$$

implying that the FTA is always established.

Case C: $a^*_{\rm EN} < a \leq a^f_{\rm NO}$ If $a^*_{\rm EN} < a \leq a^f_{\rm NO}$, domestic followers enter the market in autarky, but not in free trade.

The leaders benefit from free trade due to the export profit from the foreign market:

$$\Delta \pi_i^{LC} = \frac{a^2(32-32b-8b^2+12b^3-b^4)}{16(2-b^2)^2} - \frac{(2-b)^2}{4(1-b)}F > 0.$$

On the other hand, the consumer surplus may decrease due to the reduction in the number of varieties and increased market power of the leaders after free trade. The change in the consumer surplus after free trade is

$$\Delta U_i^C = \frac{1}{32b}\left[\frac{-64+32b+64b^2-32b^3-12b^4+5b^5}{(2-b^2)^2}a^2 + 16a(3-b)\sqrt{F} + \frac{4(2-b)^3}{(1-b)}F\right],$$

which decreases in a and increases in F. When $a \to a^*_{\rm EN}$, $\Delta U_i^C > 0$ holds for $0 < b < 0.6$. When $a = a^f_{\rm NO}$, $\Delta U_i^C < 0$ holds.

The change in the social welfare after free trade is given by

$$\Delta W_i^C = \frac{1}{32b}\left[\frac{-64+96b-48b^3+12b^4+3b^5}{(2-b^2)^2}a^2 + 16a(3-b)\sqrt{F} - \frac{4(2-b)^2(2+b)}{(1-b)}F\right] > 0.$$

Hence, the FTA is always established.

Case D: $a^f_{\rm NO} < a \leq a^f_{\rm EN}$ If $a^f_{\rm NO} < a \leq a^f_{\rm EN}$, domestic followers enter the market in autarky; each leader deters the entry of domestic followers in free trade. In this case, although the total quantity does not change, i.e., $Q^f = Q^* = \overline{Q}$, the leaders drive out all the domestic followers after free trade. We have two subcases. First, when $a^f_{\rm SD} < a \leq a^f_{\rm EN}$, the equilibrium strategic entry deterrence is given by the interior solution. In this subcase, both leaders benefit from the FTA with higher profits from the foreign market:

$$\Delta \pi_i^{LD_1} = \frac{-4a^2(1-b) + 8a(2-b)\sqrt{F} - \frac{(2-b)^3(2+b)F}{1-b}}{4b^2} > 0.$$

Moreover, the consumer surplus also increases after free trade:

$$\Delta U_i^{D_1} = \frac{4a^2(1-b)^2 - 4a(4-3b)(1-b)\sqrt{F} + (2-b)^2(4+2b-b^2)F}{8(1-b)b^2} > 0.$$

Thus, the social welfare increases after free trade:

$$\Delta W_i^{D_1} = \frac{-4a^2(1-b)^2 + 4a(4-b)(1-b)\sqrt{F} - (2-b)^2(4+2b-b^2)F}{8(1-b)b^2} > 0.$$

Second, when $a^f_{\rm NO} < a \leq a^f_{\rm SD}$, the equilibrium strategic entry deterrence is given by the corner solution. The social welfare after free trade also increases:

$$\Delta W_i^{D_2} = \frac{-4a^2(1-b)^2 + 4a(4-5b+b^3)\sqrt{F} - (16-8b-16b^2+10b^3+b^4)}{8(1-b)b^2} > 0.$$

Therefore, the FTA is also always established.

Case E: $a > a^f_{\rm EN}$ If $a > a^f_{\rm EN}$, domestic followers enter the market in both countries whether the FTA is reached or not. In this case, the quantity of the leader in the domestic market does not change, i.e., $q_{ii}^{Lhf} = q_{ii}^{Lh*}$. in free trade, the leader also sells the same quantity in the foreign market, i.e., $q_{ji}^{Lhf} = q_{ii}^{Lh*}$. The total quantity and prices of the leaders do not change from autarky to free trade. Therefore, the leaders' profits double after free trade:

$$\pi_i^{Lhf} = 2\pi_i^{Lh*},$$

and the change of the leader's profit is given by

$$\Delta\pi_i^{LE} = \frac{(2-b)^2}{4(1-b)}F > 0.$$

Moreover, the consumer surplus also improves due to the import from the foreign leader who produces more aggressively than domestic followers:

$$\Delta U_i^E = \frac{(2-b)}{8(1-b)}F > 0.$$

The change in the social welfare after free trade is

$$\Delta W_i^E = \frac{(4-b)(2-b)}{8(1-b)}F > 0.$$

Hence, the FTA is always established.

3.3.2 Scenario II: Close substitutes: $b \in [\widehat{b}, 1)$

When goods are sufficiently substitutable, we have the following five cases.

Case A′: If $a \leq a^*_{\rm NO}$, no domestic followers enter the market in both countries regardless of whether the FTA is reached.

Case B′: If $a^*_{\rm NO} < a \leq a^f_{\rm NO}$, each leader deters the entry of domestic followers in autarky; no followers enter the market in both countries in free trade.

Case C′: If $a^f_{\rm NO} < a \leq a^*_{\rm EN}$, each leader deters the entry of domestic followers regardless of whether the FTA is reached.

Case D′: If $a^*_{\rm EN} < a \leq a^f_{\rm EN}$, domestic followers enter the market in autarky; each leader deters the entry of domestic followers in free trade.

Case E′: If $a > a^f_{\rm EN}$, domestic followers enter the market regardless of whether the FTA is reached.

Cases A′, B′, D′,and E′ are similar to cases A, B, D and E in Scenario I, respectively, in that the results are qualitatively the same.

Case C′: $a^f_{\rm NO} < a \le a^*_{\rm EN}$ If $a^f_{\rm NO} < a \le a^*_{\rm EN}$, each leader deters the entry of domestic followers regardless of whether the FTA is reached. In this case, the total quantity does not change, while the number of varieties increase in both countries. Both leaders earn more profits by product differentiation after free trade:

$$\Delta\pi_i^{LC'} = \frac{2(1-b)(a-2\sqrt{F})\sqrt{F}}{b} > 0.$$

Although the consumers also enjoy more diversified consumption, the consumer surplus decreases due to the increased price:

$$\Delta U_i^{C'} = -\frac{(1-b)(a-2\sqrt{F})\sqrt{F}}{b} < 0.$$

The change in the social welfare after free trade is

$$\Delta W_i^{C'} = \frac{(1-b)(a-2\sqrt{F})\sqrt{F}}{b} > 0.$$

Thus, the FTA is always established.

We summarize the foregoing analysis for symmetric countries as follows.

Proposition 1 *When the two countries are symmetric, an FTA is always established in spite of the change in the endogenous market structure. Nevertheless, the consumer surplus may decrease when the FTA results in a change in the market structure.*

4 Asymmetric countries

In the previous section, we assume that the two countries have the identical development level. Now we consider a more realistic situation of two asymmetric countries with different development levels $F_1 < F_2$ or $\phi \equiv F_1/F_2 \in (0,1)$, so that countries 1 and 2 are regarded as developed and developing countries, respectively. Each threshold in the previous section of symmetric countries involves F, which is split into F_1 and F_2. This means that while there were two thresholds in autarky $(a^*_{\rm NO}, a^*_{\rm EN})$ and three in free trade $(a^f_{\rm NO}, a^f_{\rm SD}, a^f_{\rm EN})$ in the previous section of symmetric countries, there are four thresholds in autarky $(a^*_{\rm NO1}, a^*_{\rm NO2}, a^*_{\rm EN1}, a^*_{\rm EN2})$ and six in free trade $(a^f_{\rm NO1}, a^f_{\rm NO2}, a^f_{\rm SD1}, a^f_{\rm SD2}, a^f_{\rm EN1}, a^f_{\rm EN2})$, respectively, that determine the endogenous market structure in this section of asymmetric countries. Note that the numeric subscript of each threshold corresponds the subscript of F, e.g., $a^*_{\rm NO1} \equiv 2\sqrt{F_1}$ and $a^*_{\rm NO2} \equiv 2\sqrt{F_2}$.

Autarky It is straightforward to show that $a^*_{\rm NO1} < \min\{a^*_{\rm EN1}, a^*_{\rm NO2}\} \le \max\{a^*_{\rm EN1}, a^*_{\rm NO2}\} < a^*_{\rm EN2}$. We have

$$a^*_{\rm EN1} \lesseqgtr a^*_{\rm NO2} \Leftrightarrow b \lesseqgtr \overline{b}^* \in (0,1),$$

where $\overline{b}^*$ is a unique solution of $a^*_{\rm EN1} = a^*_{\rm NO2}$ in the interval of $(0,1)$. That is, there are two scenarios, which of which has five regimes and identify the range of parameters for each regime. In the first scenario with $0 < b \le \overline{b}^*$,

Regime (i) : $a \leq a^*_{\text{NO1}} < a^*_{\text{EN1}} \leq a^*_{\text{NO2}} < a^*_{\text{EN2}}$. No domestic follower in both countries.
Regime (ii) : $a^*_{\text{NO1}} < a \leq a^*_{\text{EN1}} \leq a^*_{\text{NO2}} < a^*_{\text{EN2}}$. Strategic entry deterrence in country 1 while no domestic follower in country 2.
Regime (iiiA) : $a^*_{\text{NO1}} < a^*_{\text{EN1}} < a \leq a^*_{\text{NO2}} < a^*_{\text{EN2}}$. Domestic followers in country 1 while no domestic follower in country 2.
Regime (iv) : $a^*_{\text{NO1}} < a^*_{\text{EN1}} \leq a^*_{\text{NO2}} < a \leq a^*_{\text{EN2}}$. Domestic followers in country 1 while strategic entry deterrence in country 2.
Regime (v) : $a^*_{\text{NO1}} < a^*_{\text{EN1}} \leq a^*_{\text{NO2}} < a^*_{\text{EN2}} < a$. Domestic followers in both countries.

Note that "no domestic follower" corresponds to section 3.1.2, "strategic entry deterrence" corresponds to section 3.1.3, and "domestic followers" corresponds to section 3.1.1.

The regimes in the second scenario with $\overline{b}^* < b < 1$ are the same as those in the first except the third regime. It is replaced with
Regime (iiiB) : $a^*_{\text{NO1}} < a^*_{\text{NO2}} \leq a < a^*_{\text{EN1}} < a^*_{\text{EN2}}$. Strategic entry deterrence in both countries.

The social welfare in each country in each regime is computed similar to the previous section.

Free trade Similar to autarky, we have $a^f_{\text{NO1}} < \min\{a^f_{\text{EN1}}, a^f_{\text{NO2}}\} \leq \max\{a^f_{\text{EN1}}, a^f_{\text{NO2}}\} < a^f_{\text{EN2}}$ in the case of free trade. We also have $a^f_{\text{NO}i} < a^f_{\text{SD}i} < a^f_{\text{EN}i}$. However, we cannot sign $a^f_{\text{SD1}} - a^f_{\text{NO2}}$ and $a^f_{\text{SD2}} - a^f_{\text{EN1}}$ in addition to $a^f_{\text{EN1}} - a^f_{\text{NO2}}$, implying that there are quite a few regimes. Therefore, rather than enumerating all regimes, we resort to numerical simulations and obtain analytical results only for some extreme parameter values in the next section.

4.1 First-stage FTA formation

In this section, we compare the social welfare between autarky and free trade. In the numerical simulations, we assume that the fixed cost in developing country 2 is twice as large as that in developed country 1 (i.e., $\phi = 1/2$) and setting the cases of bad substitutes ($b = 0.1$) and close substitutes ($b = 0.9$).

4.1.1 Bad substitutes (b small)

Proposition 2 *When goods are independent $b \to 0$, an FTA is always agreed for any a and ϕ.*

Proof: When $b \to 0$, we have $a^f_{\text{NO}i} = a^f_{\text{EN}i} = a^*_{\text{NO}i} = a^*_{\text{EN}i} \to 2\sqrt{F_i}$, so that there are only three cases.

(i) When $a < 2\sqrt{F_1}$, no follower in each country in both autarky and in free trade. We can easily show that W^f_i on the third line of (15) is larger than W^*_i on the third line of (13).

(ii) When $2\sqrt{F_1} \leq a < 2\sqrt{F_2}$, followers in country 1 while no follower in country 2 in both autarky and in free trade. The social welfares in free trade are computed as

$$\begin{aligned} W_1^{fmA} &= \frac{a^2(2+b)\left(16-24b^2+10b^3+b^4\right)}{16b\left(2-b^2\right)^2} - \frac{a(3-b)\sqrt{F_1}}{2b} + \frac{(2-b)F_1}{2(1-b)b} \\ W_2^{fmA} &= \frac{a^2\left(64-32b-40b^2+20b^3+b^4\right)}{32\left(2-b^2\right)^2} + \frac{(2-b)^2F_1}{4(1-b)}. \end{aligned}$$

Then, W_i^{fmA} can be shown to be larger than W_i^* on the first line of (15) with $F = F_i$.

(iii) When $a \geq 2\sqrt{F_2}$, followers in each country in both autarky and in free trade. The social welfare in free trade is

$$W_i^{fh} = \frac{a^2}{2b} - \frac{a(3-b)\sqrt{F_i}}{2b} + \frac{(2-b)\left[2F_i + b(2-b)F_j\right]}{4b(1-b)}$$

which is larger than W_i^* on the first line in (13) with $F = F_i$ for $b \to 0$. ■

As a numerical example, we set $b = 0.1$ and $\phi = 1/2$ and draw Figure 1. The horizontal axis is a and the vertical one is the social welfare. The solid curves are the social welfares in free trade: the upper one is that in country 1 and the lower one is that in country 2. The dashed curves are the social welfares in autarky: the upper one is that in country 1 and the lower one is that in country 2. The welfares in the two countries are the same for small a because there is no follower who involves the fixed cost F_i.

The threshold values are $(a^*_{\rm NO1}, a^*_{\rm EN1}, a^*_{\rm NO2}, a^*_{\rm EN2}) = (2, 2.01, 2.83, 2.84)$ and $(a^f_{\rm NO1}, a^f_{\rm SD1}, a^f_{\rm EN1}, a^f_{\rm NO2}, a^f_{\rm SD2}, a^f_{\rm EN2}) = (2.10, 2.105, 2.111, 2.97, 2.98, 2.99)$. All the curves are increasing in a. It is obvious that *the FTA is always agreed for all* a, which is consistent with Proposition 2.

4.1.2 Close substitutes (b large)

Proposition 3 *When goods are perfect substitutes $b \to 1$, an FTA is not agreed by developing country 2 for all for all $a > a^f_{\rm NO2}$.*

Proof: When $b \to 1$, we have that $a^*_{\rm NO1} < \min\{a^f_{\rm NO1}, a^*_{\rm NO2}\} < \max\{a^f_{\rm NO1}, a^*_{\rm NO2}\} < a^f_{\rm NO2}$, and that $a^*_{{\rm SD}i}$, $a^*_{{\rm EN}i}$, $a^f_{{\rm SD}i}$ and $a^f_{{\rm EN}i}$ go to infinity. When $a > a^f_{\rm NO2}$, strategic entry deterrence in both autarky and free trade. The social welfare in country i in free trade is calculated as

$$\lim_{b\to 1} W_i^{fmB} = \frac{1}{2}(a^2 - 3F_i + 2F_j)$$

Then, W_2^{fmB} is shown to be smaller than W_2^* on the second line of (13) with $F = F_2$ for $b \to 1$. ■

Proposition 3 is for $b \to 1$. In more general, we can show that an FTA is not agreed by country 2 at $a = a^f_{\rm NO2}$ if $b > \overline{b}^*$ and $\phi < \frac{b(4-3b)}{4-2b-b^2}$, which includes $0.652 < b < 1$. That means that developing country 2 would not establish an FTA if its development level is sufficiently low compared to developed country 1 (ϕ small) and goods are sufficiently close substitutes (b large).

Specifically, we can show that when $a^f_{\rm NO2} \leq a \leq a^*_{\rm EN1}$, strategic entry deterrence takes place in each country in both autarky and free trade. The total consumption in country i is the same between autarky and free trade, and is given by

$$\overline{Q}_i \equiv \frac{a - (2-b)\sqrt{F_i}}{b}$$

This quantity is provided only by the domestic leader in autarky, whereas it is provided by the domestic and foreign leaders in free trade. As a result, the homogeneous good in autarky is produced

more than each differentiated good in free trade. Because of the downward sloping demand function, the price in autarky is lower than the prices in free trade. The free trade is unfavorable to consumers because of the higher prices, but it is in favor of consumers because of love for variety. In the case of strategic entry deterrence, the former dominates the latter in country 2.

Furthermore, in the entry deterrence case, the domestic leader produces less whereas the foreign leader produces more as F_i rises. Thus, the profit loss in its domestic market outweighs the profit from its export for the leader in developing country 2, whereas the opposite holds for developed country 1. Therefore, the developing country does not agree on the FTA unlike the developed country.

In the second example, we set $b = 0.9$ and $\phi = 1/2$. and depict Figure 2. The threshold values are $(a^*_{\mathrm{NO1}}, a^*_{\mathrm{NO2}}, a^*_{\mathrm{EN1}}, a^*_{\mathrm{EN2}}) = (2, 2.83, 6.05, 8.56)$ and $(a^f_{\mathrm{NO1}}, a^f_{\mathrm{NO2}}, a^f_{\mathrm{SD1}}, a^f_{\mathrm{SD2}}, a^f_{\mathrm{EN1}}, a^f_{\mathrm{EN2}}) = (3.42, 4.84, 6.95, 9.83, 11, 15.56)$, and all the curves are also increasing in a. It is observed that as before the welfare in free trade is higher than that in autarky in country 1. It is also observed that when $4.2 \leq a \leq 7.2$, country 2's social welfare in free trade is *lower* than that in autarky. Hence, the FTA is agreed for small and large a, but is not agreed by country 2 for intermediate values of a.

When a is rather small and $a \leq a^f_{\mathrm{NO1}} = 3.42$, we know that the FTA is established, i.e., $W^f_i > W^*_i$ for $i = 1, 2$. However, we can show that

$$\begin{array}{llll} U^f_1 < U^*_1 & \text{for } 3.26 < a \leq a^f_{\mathrm{NO1}}, & U^f_2 > U^*_2 & \text{for all } a \leq a^f_{\mathrm{NO1}}, \\ \pi^{Lf}_1 < \pi^{L*}_1 & \text{for } 2.83 < a \leq 2.93, & \pi^{Lf}_2 < \pi^{L*}_2 & \text{for } 2.15 < a \leq a^f_{\mathrm{NO1}}. \end{array}$$

That is, when a is just below a^f_{NO2}, consumers in developed country 1 prefer autarky because the price p_{11} is lower in autarky, whereas consumers in developing country 2 prefer free trade due to love of variety. On the other hand, the leader in developed country 1 prefers free trade in expectation of the higher export price p_{12} in developing country 2, whereas the leader in developing country 2 does not agree on the FTA prefers autarky in fear of market penetration of the foreign leader. Thus, if the consumer group or the leaders have the strong political power, the FTA is less likely to be established.

So far we have been considering different fixed costs F_i. In addition, if we consider different population sizes L_i, then F_i in each threshold of a is replaced with F_i/L_i, e.g., $a^f_{\mathrm{EN}i} \equiv \frac{2-b}{1-b}\sqrt{\frac{F_i}{L_i}}$. This implies that the results with different F_i in this section are similar to those with different L_i^{-1}: a country with small F_i is regarded as a country with large L_i. Thus, when the population sizes L_i are close, the two countries are likely to establish an FTA. On the other hand, When the population sizes L_i are different, the two countries are likely to establish an FTA only if goods are bad substitutes (b small).

However, it should be noted that the main reason for the failure to establish an FTA for intermediate WTP is not the same between different F_i and different L_i. In the former case, this outcome is because the consumer surplus in the developing country decreases owing to the price increase by the FTA, whereas in the latter case, it is because the consumer surplus in a large country decreases owing to the exit of followers by the FTA. Putting the two results together, we may say that countries with large population and high fixed cost do not prefer free trade. That is, *big developing countries*

are less likely to agree on an FTA than small developed countries. In fact, the former countries such as China and India are forming a smaller number of FTAs than the latter ones such as Singapore and Korea.

5 Conclusion

In this study, we examine the incentives for FTA formation between two countries with endogenous market structures. In each country, the endogenous market structure is composed of a domestic leader, a foreign leader and a number of potential domestic followers that endogenously enter the market. Our analysis demonstrates that two symmetric countries always establish an FTA.

We extend our analysis to the case in which the two countries are asymmetric in fixed cost. We show that an FTA is unlikely to be established for intermediate WTP if the fixed costs are very asymmetric between two countries and if products are sufficiently substitutable. That is, a developing country has less incentive to form an FTA with a developed country when traded goods are similar. This is because market penetration by the foreign leader raises the domestic price level, which decreases the consumer surplus.

By taking into account the endogenous market structure, we challenge the conventional wisdom that an FTA is always beneficial in the two-country scenario. Our study emphasizes the importance of the market structure when governments consider the economic consequences of an FTA.

Examining the FTA formation between two countries, this work attempts to provide a starting point for research on the interactions between FTAs and market structures. The next line of research to be addressed is the impact of third-country effects and the equilibrium path of FTA formation with more than two countries. Another extension would be to introduce multiproduct and heterogeneous firms.[6] In our model, the markets are segmented because followers do not export. Relaxing this assumption, we can examine transition from partially segmented to fully integrated markets. Last, it may also be worth investigating the impact of the number of leaders on the incentives of FTA formation.

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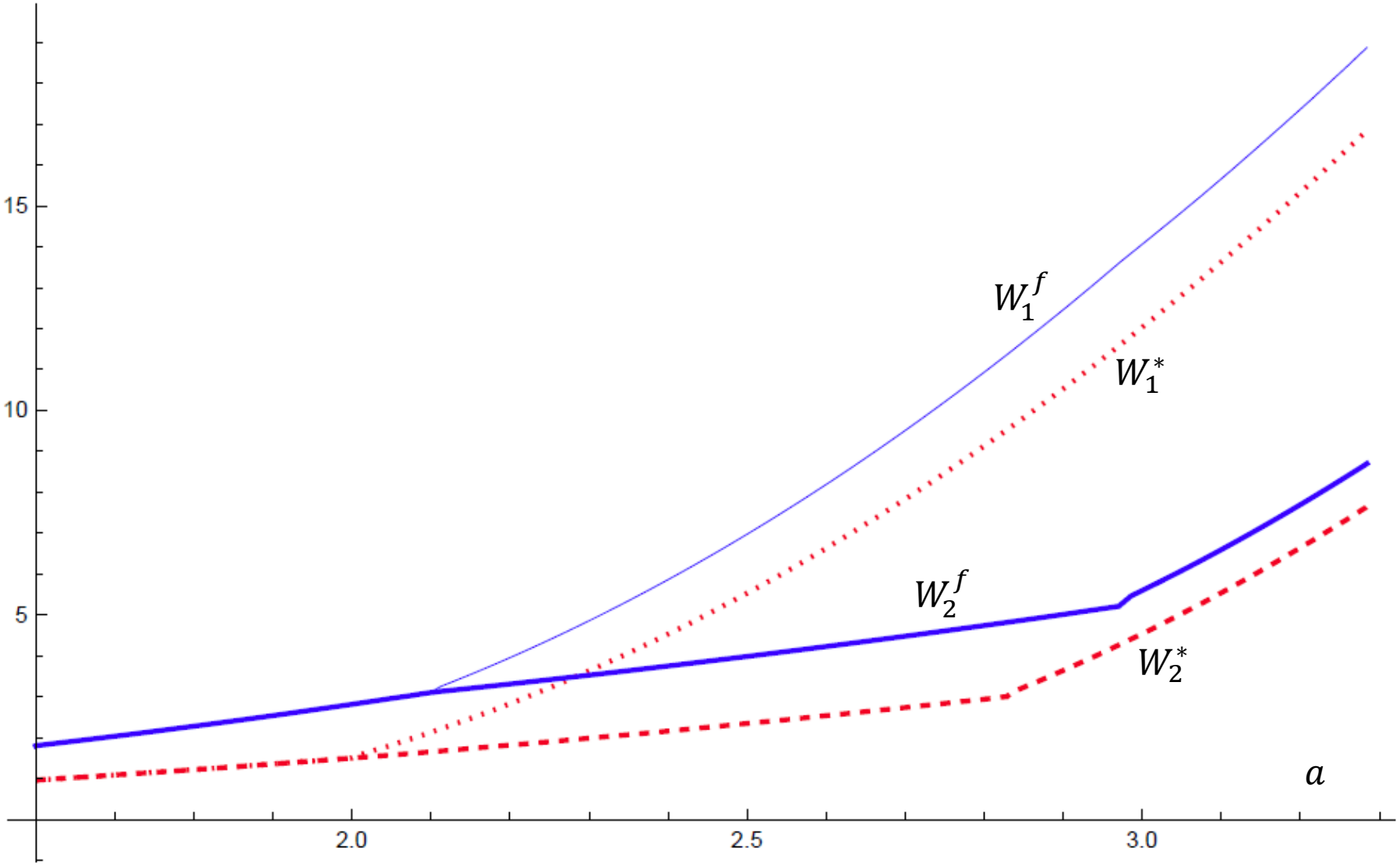

Figure 1: The social welfares in free trade (solid curves) and in autarky (dashed curves) for bad substitutes *b*=0.1

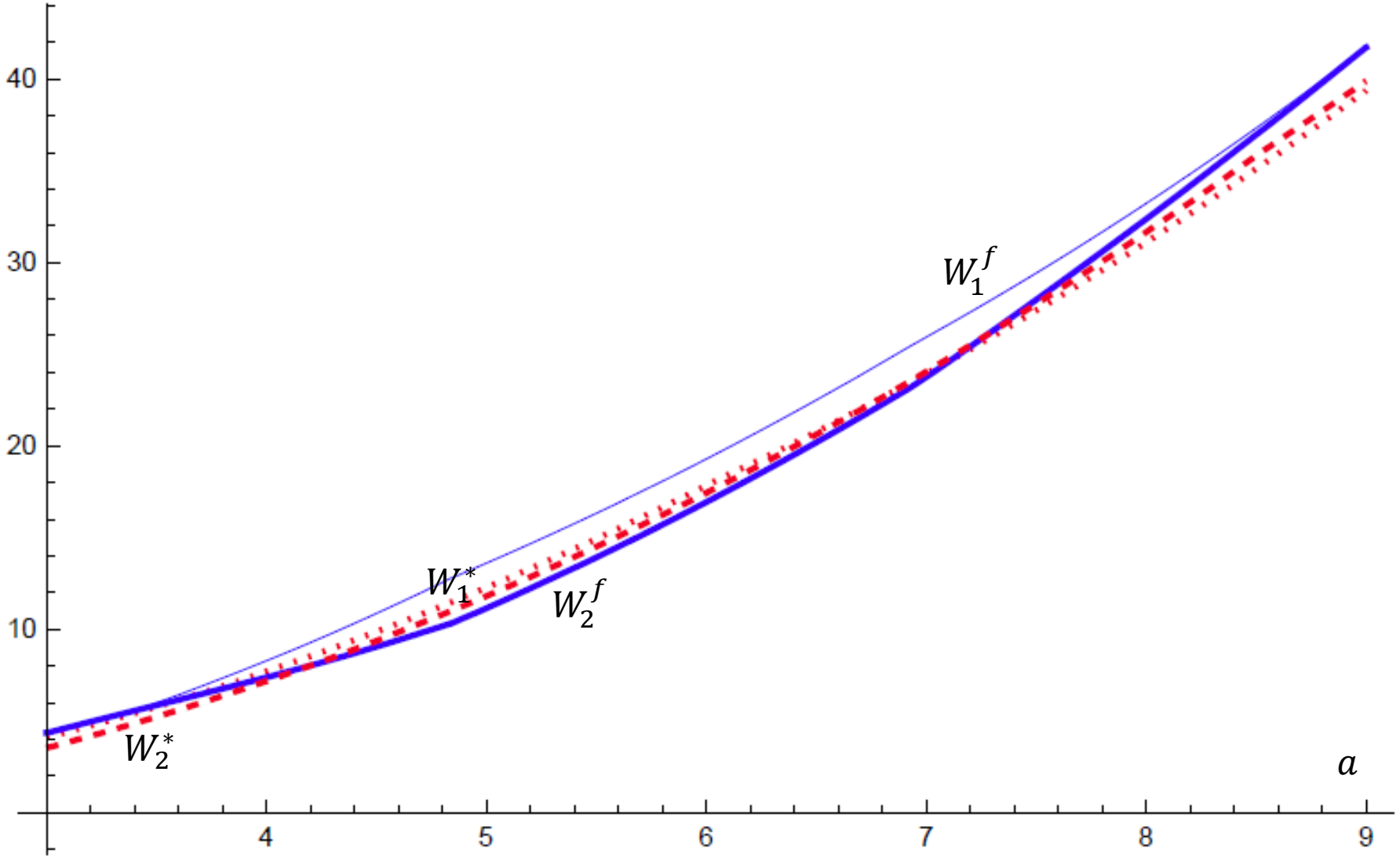

Figure 2: The social welfares in free trade (solid curves) and in autarky (dashed curves) for close substitutes *b*=0.9