Third-Country Effects on the Formation of Free Trade Agreements

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Abstract

The recent proliferation of free trade agreements (FTAs) has resulted in an increasingly complex network of preferential trading relationships. The economics literature has generally examined the formation of FTAs as a function of the participating countries' economic characteristics alone. In this paper, we show both theoretically and empirically that the decision to enter into an FTA is also crucially dependent on the participating countries' existing FTA relationships with third countries. Accounting for the interdependence of FTAs helps to explain a significant fraction of FTA formations that would not otherwise be predicted by countries' economic characteristics.

Key words: free trade agreements, third-country effect, loss sharing, concession erosion

JEL codes: F11, F12, F15

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1 Introduction

The international trading system has experienced a dramatic increase in the number of free trade agreements (FTAs) in recent decades. Figure 1(a) shows that new FTAs went into force every year during the period of 1991-2005. In 2004 alone, eighteen new FTAs were established. A parallel development is the increasing number of FTA partners for each country (Figure 1(b)). In 1991, each nation had on average 1.8 FTA partners. In 2005, the average had risen to 9.9.

In this paper, we examine how existing FTA relationships affect countries' incentives to form new FTAs. Previous studies have generally viewed the decision to enter into an FTA as a function of the participating countries' economic characteristics alone (e.g., market size, production cost, and distance), ignoring any potential effect of existing FTAs. Our analysis shows that a country pair's incentives to establish an FTA with each other depend crucially on their existing FTA relationships with third countries.

We first develop a three-country theoretical model to highlight the importance of third-country effects. In this model, we examine how the incentives of a country pair to enter into an FTA with each other vary depending on whether the two countries already have existing FTAs with the third country. We begin with a benchmark "no-FTA" case in which neither country in the pair has an FTA with the third country. This benchmark case is then compared with two alternative scenarios: (a) a "one-FTA" case in which only one country in the pair has an FTA with the third country, and (b) a "two-FTA" case in which both countries in the pair have FTAs with the third country.[1] This comparison enables us to show how existing FTAs influence a country pair's decision to establish an FTA with each other and how the effect varies with the structure of existing FTA relationships.

Comparing the one-FTA case with the benchmark, we find that when only one country in the pair has a pre-existing FTA, that country has an unambiguously stronger incentive to form a new FTA with the other country in the pair. But the incentive for the other country (without a pre-existing FTA) to join the agreement is strictly lower. The theoretical results suggest that the country pair will jointly support an FTA only if the country with a pre-existing FTA offers a sufficiently attractive export market, which requires the country to have relatively large market size, a high-cost domestic firm, and low transport costs. Comparing the two-FTA case with the benchmark, we find that the incentives to enter into an FTA with each other are unambiguously stronger for both countries when they both have pre-existing FTAs with the third country.

The theoretical results can be explained by examining the trade-offs involved from forming

[1] As an example of the one-FTA case, consider the U.S., South Korea, and Mexico. The U.S. has an FTA with Mexico since 1994, while South Korea does not have FTA with Mexico. An example of the two-FTA case includes the U.S., Chile, and Mexico. As of 1999, both the U.S. and Chile had an FTA with Mexico even though the two did not have an FTA with each other until 2004.

an FTA. When a country pair establishes an FTA, both countries experience gains in export profit and consumer surplus as well as reductions in home profit and tariff revenue. The country pair will jointly support the FTA only if the net welfare change is positive for each country. Our analysis shows that the magnitude of the net welfare change depends on whether the two countries already have pre-existing FTAs with a third country. Two third-country effects are particularly important in determining the net welfare change. The first effect is a *loss sharing* effect and applies to countries with a pre-existing FTA. When a country already has a pre-existing FTA, the fall in its home-market profit from forming a new FTA will be smaller because part of the profit reduction is deflected to its existing FTA partner. The second effect is a *concession erosion* effect. It applies to countries whose potential FTA partner has a pre-existing FTA. A pre-existing FTA of the potential partner reduces the export profit gain that a country can achieve from a new FTA.

In the one-FTA case where only one country in the pair has a pre-existing FTA, that country's firm will achieve the same gain in export profit as in the benchmark case when the country forms a new FTA. But the decrease in its home-market profit will be smaller due to the loss sharing effect. This raises the incentive of the country to form a new FTA relative to the benchmark case. In contrast, the incentive for the other country in the pair (without a pre-existing FTA) to join the agreement is strictly lower than the benchmark since its firm will experience the same loss in home profit but a smaller gain in export profit due to the concession erosion effect. In the two-FTA case where two countries both have pre-existing FTAs with the third country, both countries are symmetrically affected by the loss sharing and concession erosion effects. The net effect of the existing FTAs is to raise both countries' incentive to enter into an FTA with each other relative to the benchmark case.

Our empirical results are broadly consistent with the theoretical predictions. We estimate countries' decision to form an FTA with each other as a function of not only their economic characteristics but also their existing FTAs with third countries. The results provide strong evidence that existing FTA relationships significantly affect countries' incentives to establish new FTAs. Countries with similar economic characteristics but different FTA structures display strikingly different propensities to form new FTAs. Accounting for third-country effects significantly raises the predictive ability of the empirical model, increasing the number of successfully predicted FTAs by 31 percent.

Our paper builds on a large body of theoretical literature that examines the determinants of FTA formation (e.g., Baldwin, 1999; Bond et al., 2004; Bond and Syropoulos, 1996; Frankel, 1997; Furusawa and Konishi, 2007; Krugman, 1991; Yi, 1996).[2] Ethier (1998), Bagwell and Staiger (2004), and Goyal and Joshi (2006), in particular, have anticipated the "concession erosion" effect we identify here. Bagwell and Staiger (2004) show, for example, that the formation

[2] A thorough review of the theoretical literature is beyond the scope of this paper. We limit our discussion to studies that are particularly relevant to our paper. See Krishna (2004) and Baier, Bergstrand and Egger (2007) for excellent surveys of the literature.

of trade agreements between two countries can erode the value of concessions to an outsider country because of adverse movement in the outsider's terms of trade.[3] This hypothesis has not been examined empirically and this study seeks to fill that gap.[4]

Our paper is also closely related to the growing empirical literature on FTA formation. Baier and Bergstrand (2004) and Magee (2003) are the first studies to estimate the economic determinants of FTAs. Both papers find that trade creation is a major motive for forming FTAs. They show that countries with relatively similar market size, similar factor endowments, and geographic proximity are more likely to have FTAs in place. A recent study by Egger and Larch (2008) extends the literature by estimating the spatial relationship of preferential trade agreements (PTAs) including both customs unions and FTAs. In particular, they focus on the enlargement of existing PTAs, such as the EU and NAFTA, and the formation of new PTAs between outsider countries. Our paper differs from Egger and Larch (2008) in three ways. First, we examine the effect of countries' existing FTAs on their incentives to establish new FTAs. Second, we allow the effect of existing FTAs to vary with the structure of FTA relationships. Finally, we offer evidence on third countries' potential loss sharing and concession erosion effects and investigate the conditions under which each type of FTA relationship generates a positive effect.

The paper is organized as follows. Section 2 develops a three-country theoretical model and derives the paper's main hypotheses. Section 3 describes the data to be used in the empirical analysis. Section 4 presents the econometric framework and empirical evidence. Section 5 discusses sensitivity analyses and Section 6 examines the predictive ability of the empirical model. Section 7 concludes.

2 The Model

In this section we construct a three-country theoretical model to examine how a country pair's incentives to form an FTA with each other depend on that country pair's existing FTA relationships with a third country.[5] We first analyze a benchmark case, denoted as F_0, in which neither country in the pair has an FTA with the third country. This benchmark case is then compared

[3] Bagwell and Staiger (2004) obtain the "concession erosion" effect using a perfectly competitive general-equilibrium model, while we show the same result in a standard Cournot setting (see Krishna, 1998; Freund, 2000; Ornelas, 2005; Saggi, 2006; Goyal and Joshi, 2006 for other FTA studies using Cournot models). This implies that concession erosion is a robust phenomenon that is not exclusive to a specific type of theoretical model.

[4] Our paper is also related to the theoretical work of Aghion, Antras and Helpman (2007), who address the potential externalities in sequential negotiation of FTAs. Their focus, however, is on how the structure of coalition externalities shapes countries' choices between sequential and multilateral bargaining. Their results indicate that the leading country strictly prefers sequential bargaining when the coalition externalities are negative in at least one of the follower countries and multilateral bargaining when the coalition externalities are positive in both follower countries.

[5] In an earlier working paper version of our paper (Chen and Joshi, 2009), we offered additional analysis dealing with endogenous MFN tariffs and N countries. The main implications of the model are similar.

with two alternative scenarios: (a) a one-FTA case, denoted as F_1, in which one country has an FTA with the third country but the other country does not, and (b) a two-FTA case, denoted as F_2, in which both countries have FTAs with the third country. This comparison shows how existing FTAs influence the country pair's decision to establish a new FTA with each other.

2.1 Basic setup

Each country produces two homogeneous goods, x and y, with constant returns to scale technologies. Good x's market is oligopolistic, while good y's market is perfectly competitive. Good y is freely traded across countries and serves as the numeraire.

Consumers' preferences over the two goods are represented by a quasilinear utility function, $U_i(X_i, Y_i) = u_i(X_i) + Y_i$, where X_i and Y_i denote, respectively, the aggregate consumption of good x and good y in country i. Assuming $u_i(X_i)$ has a quadratic form, this utility function generates a linear demand function for good x, $P_i(X_i) = \alpha_i - X_i$, where $P_i(X_i)$ is country i's inverse demand and $\alpha_i > 0$ denotes country i's market size.

There is one firm in each country (also indexed by i) that produces good x at constant marginal cost γ_i. We allow the marginal costs to differ across countries. Firms face unit specific trade costs, including both transport cost and tariff, when they export to foreign countries; τ_{ij} and T_{ij} denote, respectively, the levels of transport cost and tariff required to export one unit of x from country i to country j with $\tau_{ii} = 0$ and $T_{ii} = 0$. We assume that the transport costs are symmetric for each pair of countries, i.e., $\tau_{ij} = \tau_{ji}$, while tariffs can be asymmetric between two countries.

The binary variable $g_{ij} \in \{0, 1\}$ denotes whether an FTA exists between countries i and j. This binary variable takes the value 1 if the given country pair has an FTA and 0 otherwise; by definition, $g_{ij} = g_{ji}$. When there is an FTA between a country pair, tariffs are zero between that pair. For all other country pairs, the importing country sets a non-discriminatory tariff T_i. We assume the tariff to be non-prohibitive so that firms from each country sell to all three markets. The effective tariff imposed by country i on country j, i.e., T_{ij}, can be expressed as $T_i(1 - g_{ij})$.

Firms compete as Cournot oligopolists and treat each country as a separate market. Each firm's objective in its home market is to maximize the domestic profit given by:

$$\pi_{ii} = (P_i - \gamma_i)x_{ii}, \tag{1}$$

where π_{ii} and x_{ii} represent the profit and output, respectively, of firm i in market i. In a foreign market, say country j, a firm maximizes

$$\pi_{ij} = [P_j - \gamma_i - \tau_{ij} - T_j(1 - g_{ij})]\, x_{ij}, \tag{2}$$

where π_{ij} and x_{ij} represent the profit and output, respectively, of firm i in market j. The

Cournot-Nash equilibrium output of each firm in its home market is given by:

$$x_{ii} = \frac{1}{4}\left[\alpha_i - 3\gamma_i + \sum_{l \neq i}(\gamma_l + \tau_{li} + T_i(1 - g_{li}))\right], \tag{3}$$

and the corresponding profit by $\pi_{ii} = {x_{ii}}^2$. The Cournot-Nash equilibrium output in each foreign market is given by:

$$x_{ij} = \frac{1}{4}\left[\alpha_j - 3\left(\gamma_i + \tau_{ij} + T_j(1 - g_{ij})\right) + \sum_{l \neq i}(\gamma_l + \tau_{lj} + T_j(1 - g_{lj}))\right] \tag{4}$$

and the corresponding profit by $\pi_{ij} = {x_{ij}}^2$.

The profit function exhibits several important properties with respect to FTAs. First, consider the home-market profit. Let n_i denote the number of foreign countries with which a country has an FTA, i.e., $n_i \equiv \sum_{l \neq i} g_{li}$. Then, given equation (3), each firm's home-market profit can be written as

$$\pi_{ii} = \frac{1}{16}\left[\alpha_i - 3\gamma_i + \sum_{l \neq i}(\gamma_l + \tau_{li} + T_i) - n_i T_i\right]^2. \tag{5}$$

Examining equation (5), we first observe that the home-market profit is strictly decreasing in the home country's number of FTAs. When the home country forms an FTA with a foreign country, it removes the tariff on the foreign firm and increases the level of imports. The increased import competition lowers the domestic firm's profit in the home market.

Equation (5) also indicates that the home-market profit is a strictly convex function of the home country's number of FTAs. In other words, the decrease in the domestic firm's home-market profit from a new FTA will be smaller when the home country already has an FTA with a third country. The reason is that when there is an existing FTA between the home and a third country, the third-country firm will have a larger market share in the home country than if there were no existing FTA. As a result, when the home country forms a new FTA, the third-country firm will also absorb a larger share of the domestic profit loss. We label this effect as a third-country *loss sharing* effect.[6]

Export profits also vary systematically with the pattern of FTAs. A firm will earn a greater profit in a foreign market when the foreign country signs an FTA with the home country and grants that firm preferential market access. But this gain in export profit is smaller when the foreign country already has an FTA with a third country. This is because the third country's pre-existing preferential market access to the foreign country dilutes the potential profit gain that the new partner country's firm can achieve by also gaining preferential market access.

[6] This result has also been anticipated by Krishna (1998), who points out that an FTA is more likely to gain political support when there is a greater volume of imports from third countries.

This effect has also been noted in Ethier (1998), Bagwell and Staiger (2004), and Goyal and Joshi (2006). We label it as the third-country *concession erosion* effect.[7]

The aggregate consumption in each country is given by $X_i = x_{ii} + \sum_{l \neq i} x_{li}$, where x_{ii} and x_{li} are defined in equations (3) and (4). Given the inverse demand function $P_i(X_i)$, each country's consumer surplus is $CS_i = {X_i}^2/2$, and is strictly increasing in the number of FTAs formed by the country. The tariff revenue of each country is given by $\sum_{l \neq i} T_i(1 - g_{li})x_{li}$ and decreases when the country forms a new FTA.

The total welfare of each country is defined as the sum of consumer surplus, producer profits, and tariff revenue, i.e.,

$$W_i = CS_i + \pi_{ii} + \sum_{l \neq i} \pi_{il} + \sum_{l \neq i} T_i(1 - g_{li})x_{li}. \tag{6}$$

We assume that two countries will engage in an FTA if and only if the agreement raises the welfare of both countries.

2.2 The benchmark case

We now examine how the decision of two countries, denoted as i and j, to form an FTA with each other depends on their existing FTA relationships with the third country. We begin with the benchmark case F_0 in which neither country has an FTA with the third country (shown in Figure 2(a)). Country i will be willing to form an FTA with country j, given F_0, if and only if its welfare increases after the new FTA:

$$W_i(g_{ij} = 1|F_0) > W_i(g_{ij} = 0|F_0). \tag{7.a}$$

Similarly, country j will be willing to form an FTA with country i if and only if

$$W_j(g_{ij} = 1|F_0) > W_j(g_{ij} = 0|F_0). \tag{7.b}$$

These conditions require that for both countries i and j, the increase in consumer surplus and export profit offset the loss in home-market profit and tariff revenue.

Let

$$\begin{aligned} \psi_{ij} &\equiv \frac{6T_j(\alpha_j + \gamma_k - 3\tau_{ij} + \tau_{kj} - T_j/2) - T_i(3\alpha_i + 7\gamma_k - 9\tau_{ij} + 7\tau_{ki} + T_i/2)}{18T_j - T_i} \\ \varphi_{ij} &\equiv (6T_j + 9T_i)/(18T_j - T_i), \end{aligned}$$

[7] While the theoretical setup adopted here is fairly standard in the literature (see Krishna, 1998; Freund, 2000; Ornelas, 2005; Saggi, 2006; Goyal and Joshi, 2006 for other FTA studies using a similar setup), Goyal and Joshi (2006) show that the above properties of the profit function are not exclusive to the adopted framework and also obtain under fairly general demand and cost specifications and with each country having more than one firm.

and similarly for ψ_{ji} and φ_{ji}. Conditions (7.a) and (7.b) are, respectively, equivalent to:

$$\gamma_i < \psi_{ij} + \varphi_{ij} \cdot \gamma_j \quad (8.a)$$

$$\gamma_j < \psi_{ji} + \varphi_{ji} \cdot \gamma_i. \quad (8.b)$$

Conditions (8.a) and (8.b) capture in compact form the parametric ranges under which countries i and j, respectively, are willing to form an FTA with each other. Condition (8.a) states that, ceteris paribus, country i will have an incentive to form an FTA with j if and only if i's marginal cost of production (γ_i) is below some threshold value defined as a linear function of country j's marginal cost (γ_j). An analogous condition for country j is shown in (8.b). To satisfy both conditions, the difference in countries i and j's marginal costs must be within an intermediate range.

Examining conditions (8.a) and (8.b) and, in particular, the components of ψ_{ij} and ψ_{ji} also allows us to evaluate the role of the other parameters in i and j's decision to form an FTA. For example, country i's incentive to form an FTA increases in country j's market size (α_j) but decreases in its own (α_i). As a result, countries will have incentives to enter into an FTA with each other when they have relatively large and similar market sizes. With respect to transport costs, when tariffs T_i and T_j are sufficiently similar ($T_j/2 < T_i < 2T_j$) countries with a lower transport cost τ_{ij} are more likely to experience a welfare increase from an FTA.

These results are also the main predictions of Baier and Bergstrand (2004) and are summarized below:

Proposition 1 *In the benchmark case where there is no FTA with the third country, countries i and j will have incentives to form an FTA with each other when they have (a) relatively large and similar market sizes, (b) sufficiently similar marginal costs, and (c) low transport costs.*

2.3 The one-FTA case

Next we examine countries i and j's decision to enter into an FTA in the one-FTA case F_1 where i already has an FTA with the third country but j does not (shown in Figure 2(b)), and contrast it with the benchmark case F_0. This allows us to establish the role of the third country when only one country in a pair has an existing FTA with the third country. Countries i and j will be willing to form an FTA with each other given F_1 if and only if the following conditions hold for i and j, respectively:

$$W_i(g_{ij} = 1|F_1) > W_i(g_{ij} = 0|F_1) \quad (9.a)$$

$$W_j(g_{ij} = 1|F_1) > W_j(g_{ij} = 0|F_1). \quad (9.b)$$

Conditions (9.a)-(9.b) are, respectively, equivalent to:

$$\gamma_i < \psi_{ij} + \varphi_{ij} \cdot \gamma_j + \mu_i(F_1) \quad (10.a)$$

$$\gamma_j < \psi_{ji} + \varphi_{ji} \cdot \gamma_i + \mu_j(F_1), \quad (10.b)$$

where

$$\mu_i(F_1) \equiv 11T_i^2/(18T_j - T_i), \quad \mu_j(F_1) \equiv -6T_i^2/(18T_i - T_j).$$

Compared to conditions (8.a) and (8.b) in the benchmark case, conditions (10.a) and (10.b) have two new additive terms, $\mu_i(F_1)$ and $\mu_j(F_1)$. These two terms capture the effect of country i's existing FTA with the third country on countries i and j's incentives to establish an FTA with each other. When countries i and j's tariffs are sufficiently similar, i.e., $T_j/18 < T_i < 18T_j$, we have $\mu_i(F_1) > 0$ and $\mu_j(F_1) < 0$. This indicates that the parametric range in which country i is willing to form an FTA with country j is strictly greater relative to the benchmark case, while the range for j to reciprocate the FTA is unambiguously smaller. In other words, i's incentive to form an FTA with j is strictly greater when it already has an FTA with the third country while j's incentive to reciprocate the agreement is strictly lower.

This differing effect is due to the asymmetric impact of the third country on i and j. When country i already has an FTA with the third country, country i's firm will experience the same gain in export profit from a new FTA as in the benchmark case, but a smaller decrease in home-market profit. This latter result is the third-country loss sharing effect described in Section 2.1 and makes an FTA with country j more attractive to country i. The loss sharing effect is further complemented by a smaller decrease in country i's tariff revenue. Because country i's FTA with the third country lowers country i's imports from country j, country i's potential tariff revenue loss from forming an FTA with country j is smaller. The effect of the third country is opposite on j's incentive to form an FTA with i. Country j's firm will experience the same loss in home profit from a new FTA as in the benchmark case, but a smaller gain in export profit in i's market due to the third country's existing preferential market access. This is the concession erosion effect discussed in Section 2.1 and makes an FTA with country i less attractive to country j.

Given the opposing effects of the third country on countries i and j, it is important to delineate the conditions under which both i and j will agree to form an FTA. Since country i's incentive to form an FTA with country j is strengthened relative to the benchmark case, it is j's decision to reciprocate that is now binding. In order for the FTA to be welfare enhancing for country j, it will need sufficiently high export profit in i's market to offset the concession erosion effect. This requires country i to have a sufficiently large market size (α_i), high marginal cost of production (γ_i), and low transport cost (τ_{ji}).[8] We summarize these results below:

[8] Note that to complete the discussion, we also established the conditions under which both country i and the third country are strictly better off relative to the benchmark case. This is required to ensure that i's FTAs

Proposition 2 *In the one-FTA case, where country i already has an FTA with the third country and country j does not:*

(a) country i's incentive to form an FTA with j is strictly greater than in the benchmark case while country j's incentive to form an FTA with i is strictly smaller;

(b) countries i and j will jointly support an FTA if (1) country i has a sufficiently large market size relative to country j, (2) country i has sufficiently high marginal costs relative to country j, and (3) transport costs between i and j are relatively low.

2.4 The two-FTA case

Lastly, we examine countries i and j's decision to form an FTA in the two-FTA case F_2 where both i and j already have an FTA with the third country (shown in Figure 2(c)), and contrast it with the benchmark case F_0. Country i and j will be willing to form an FTA with each other given F_2 if and only if:

$$W_i(g_{ij} = 1|F_2) > W_i(g_{ij} = 0|F_2) \tag{11.a}$$

$$W_j(g_{ij} = 1|F_2) > W_j(g_{ij} = 0|F_2). \tag{11.b}$$

Conditions (11.a) and (11.b) are, respectively, equivalent to:

$$\gamma_i < \psi_{ij} + \varphi_{ij} \cdot \gamma_j + \mu_i(F_2) \tag{12.a}$$

$$\gamma_j < \psi_{ji} + \varphi_{ji} \cdot \gamma_i + \mu_j(F_2), \tag{12.b}$$

where

$$\mu_i(F_2) \equiv (11T_i^2 - 6T_j^2)/(18T_j - T_i), \;\; \mu_j(F_2) \equiv (11T_j^2 - 6T_i^2)/(18T_i - T_j).$$

Compared to conditions (8.a) and (8.b) in the benchmark case, (12.a) and (12.b) have two additional terms, $\mu_i(F_2)$ and $\mu_j(F_2)$. These terms capture the effect of both countries having an existing FTA with the third country. When T_i and T_j are sufficiently similar ($\sqrt{6}T_i/\sqrt{11} < T_j < \sqrt{11}T_i/\sqrt{6}$),[9] we have $\mu_i(F_2) > 0$ and $\mu_j(F_2) > 0$. The range of parametric values such that both countries i and j are willing to form an FTA with each other is unambiguously larger relative to the benchmark case.

This is because the third country affects i and j symmetrically in this scenario. First, the third country's FTAs with i and j decrease the pair's potential profit loss at home when

with both country j and the third country are a subgame-perfect outcome in settings where we allow countries to be forward-looking (such as the model of Dutta *et al,* 2005). In other words, it ensures that the third country will have an incentive to form an FTA with i even when it foresees the FTA between i and j. The conditions are described in Chen and Joshi (2009).

[9] As shown in Appendix A of Chen and Joshi (2009) where MFN tariffs are endogenously determined, this condition is satisfied for countries with similar market size and similar marginal cost of production, both of which are required for an FTA to be jointly supported.

they form an FTA with each other. This is the loss sharing effect described in Section 2.1. Second, the third country's FTAs with i and j decrease the pair's potential tariff revenue loss from entering into an FTA. Both the loss sharing and the tariff revenue effects only applied to country i in the one-FTA case (when country i has an FTA with the third country and country j does not), but are now applicable to both i and j. In addition to these effects, the third country's FTAs with i and j also dilute the potential profit gain the latter two can achieve in each other's market. This concession erosion effect was experienced by country j only in the one-FTA case, but now applies to both i and j. The theoretical results suggest that the concession erosion is offset by the loss sharing and the tariff revenue effects; consequently, countries i and j have an unambiguously stronger incentive to form an FTA with each other. We summarize this finding in:

Proposition 3 *In the two-FTA case, where both countries i and j have an FTA with the third country, the incentives for countries i and j to form an FTA with each other are strictly greater than in the benchmark case.*

3 Data

We employ a panel data of 78 countries and 3003 country pairs to evaluate the theoretical predictions outlined above.[10] We obtain the FTA status of each country pair for the period of 1991-2005 using the Tuck Trade Agreements Database and WTO Regional Trade Agreements Database.[11] The FTA information is used to identify (a) countries' decision to enter into an FTA at a given time, and (b) existing FTA relationships with third countries. Given the limited annual variation in the data, we define every three years as one time period.[12]

As in the theoretical model, we consider three types of third-country relationships for each pair of countries in each time period: (a) the benchmark case in which there is no FTA between the country pair and a third country; (b) the one-FTA case in which one country in the pair has an existing FTA with a third country; (c) the two-FTA case in which both countries have FTAs with a common third country. Note that all three types of third-country relationships can coexist for some country pairs. Consider, for example, Germany (or any other EU member) and Mexico. Mexico has an FTA with the U.S. while Germany does not. In the meantime, both Germany and Mexico have FTAs with Israel. We discuss how we construct variables for each type of third-country relationship in Section 4.

[10] The country coverage is determined mainly by the availability of data on economic characteristics, such as labor cost. Appendix 1 reports the country list.

[11] While the focus of this paper is on the formation of FTAs, we control for the potential effect of customs union membership on countries' incentives to enter into an FTA in the empirical analysis. To this end, we also collect the customs union membership status of each country in each period.

[12] For example, FTAs implemented between 1991 and 1993 are considered to enter into force in the same period.

Three main economic characteristics are considered for each country: (a) market size (α); (b) marginal cost of production (γ); and (c) transport costs (τ).[13] Countries' GDP, obtained from the World Development Indicators (WDI), proxies for market size. Each country's weighted average real unit labor cost is used as a measure of marginal cost of production.[14] The average real unit labor cost is constructed by weighing each industry by its share of national output. This variable captures not only a country's real wage rate but also its level of labor productivity. Labor cost and output data are taken from the World Bank Trade and Production Database, which covers a larger number of countries compared to sources such as International Labor Organization (ILO) and the U.S. Bureau of Labor Statistics (BLS). Finally, the distance between each country pair's capital cities is used as a proxy for transport cost, with data taken from the City Distance Calculator provided by VulcanSoft.

4 Econometric Framework and Results

Now we describe the econometric framework used in the empirical analysis and the empirical results. Propositions 1-3 in Section 2 form the basis of the hypotheses in our econometric framework. We evaluate each of the hypotheses below.

4.1 Effect of country-pair economic characteristics

The first hypothesis we examine empirically follows directly from Proposition 1 in Section 2.2. It predicts that two countries will have incentives to form an FTA with each other in the benchmark case when they have relatively large and similar market sizes, sufficiently similar marginal costs, and low transport costs. This prediction, which is also the main hypothesis of Baier and Bergstrand (2004) and Magee (2003), constitutes our baseline empirical specification. It has not taken into account the effect of existing FTA relationships.

To evaluate the first hypothesis, we use the following baseline equation:

$$\Pr(\Delta g_{ijt} = 1) = \Phi\left(X'_{ijt-1}\beta + \varepsilon_{ijt}\right). \tag{13}$$

where $\Delta g_{ijt} \equiv g_{ijt} - g_{ijt-1}$ is the binary dependent variable that takes the value 1 if countries

[13] Ideally, we would also like to include countries' lagged MFN tariff rates, as they, too, can affect countries' incentives to engage in FTAs. But because of the large number of missing values in panel tariff data, including this variable would substantially reduce the sample size. In Section 5.1, we address the potential bias that can arise in the absence of this variable by including country-period (and partner-period) fixed effects and controlling for all time-variant country-specific characteristics.

[14] As an alternative, we also followed Baier and Bergstrand (2004) and Magee (2003) in using countries' differences in factor endowment ratios as a measure of differences in comparative advantage. The results were qualitatively similar to the findings presented here. However, since this measure does not take into account countries' differences in factor productivity (see, Trefler, 1993; Davis and Weinstein, 2001; Maskus and Nishioka, 2009), we adopt real unit labor costs as the measure for our reported regressions.

i and j enter into an FTA in period t and 0 otherwise,[15] $\Phi(.)$ is the cumulative probability function, X'_{ijt-1} is a vector of explanatory variables, and ε_{ijt} is the vector of residuals.[16] All the explanatory variables are lagged by one period to mitigate endogeneity concerns.[17]

We consider a specification of $X'_{ijt-1}\beta$ similar to Baier and Bergstrand (2004):

$$\begin{aligned} X'_{ijt-1}\beta &= \beta_0 + \frac{1}{2}\beta_1(\alpha_{it-1} + \alpha_{jt-1}) + \beta_2|\alpha_{it-1} - \alpha_{jt-1}| + \beta_3|\gamma_{it-1} - \gamma_{jt-1}| \\ &\quad +\beta_4|\gamma_{it-1} - \gamma_{jt-1}|^2 + \beta_5\tau_{ij} + \beta_6\overline{\gamma}_{\text{row},t-1} + \frac{1}{2}\beta_7 \sum_{l=i,j} \overline{\tau}_{\text{row},l}. \end{aligned}$$

The X_{ijt-1} vector consists of the following country-pair economic characteristics. It includes, first, the country pair's average market size, $(\alpha_{it-1} + \alpha_{jt-1})/2$, measured by GDP, with the expectation that countries' average market size is positively correlated with their probability of entering into an FTA, i.e., $\beta_1 > 0$. It also includes the absolute value of the difference in GDP between the country pair, $|\alpha_{it-1} - \alpha_{jt-1}|$, because Proposition 1 suggests that countries with relatively similar market sizes are more likely to establish an agreement, i.e., $\beta_2 < 0$. In addition, the vector incorporates difference between the country pair in marginal production costs, in both absolute and squared values. Countries are expected to be more likely to form an FTA when their dissimilarity in costs, i.e., $|\gamma_{it-1} - \gamma_{jt-1}|$, is within an intermediate range, i.e., $\beta_3 > 0$ and $\beta_4 < 0$. The effect of distance, i.e., τ_{ij}, is also captured in $X'_{ijt-1}\beta$ and expected to be negative. Finally, following Baier and Bergstrand (2004), X_{ijt-1} includes third countries' average marginal cost, denoted as $\overline{\gamma}_{\text{row},t-1}$, and average distance from the country pair, denoted as $\sum_{l=i,j} \overline{\tau}_{\text{row},l}/2$, even though the effect of these variables is ambiguous.[18] The summary statistics of the above variables are reported in the upper panel of Table 1.

[Table 1 about here]

Column (1) of Table 2 reports the estimates of equation (13). The evidence is broadly consistent with the expectations from Proposition 1.[19] Countries with larger and relatively similar market sizes are significantly more likely to enter into an FTA with each other. For example, a 100-percent increase in countries' average GDP leads to 0.5 percentage point increase in the

[15] Since the establishment of an FTA between a country pair is an unrepeated event, country pairs that already formed an FTA before period t would not be considered when constructing the dependent variable in period t.

[16] We adopt in this section a fixed-effect logit model that controls for all time-specific factors. We also considered a Cox proportional hazards model and found the results were largely similar. A probit model is not used here because of the incidental parameter problem that would arise with the use of fixed effects. In Section 5, we consider alternative estimators, such as including country-pair and country-period fixed effects, to control for potential omitted variables.

[17] While the time lag helps reduce potential endogeneity, we adopt an additional measure in Section 5.2 to further address the issue.

[18] We follow Baier and Bergstrand (2004) and take into account whether the country pair is in the same continent. If they are, we use their average distance to the rest of the world as a measure of remoteness. Otherwise, we assume the value to be 0.

[19] The second column of Table 2 (and the following tables) summarizes our hypotheses.

probability of an FTA.[20] Countries are also more likely to form an FTA when their difference in marginal costs is within an intermediate range. The probability of an FTA initially increases by 0.2 percentage point when countries' difference in unit labor costs increases by 100 percent and reaches the peak around the unit labor cost differences of country pairs such as Belgium and Chile. Distance has an adverse impact: the probability of entering into an FTA is 2 percentage points lower for countries that are 100 percent farther apart. Finally, countries are more likely to enter into an agreement when the rest of the world has relatively competitive unit labor costs.

[Table 2 about here]

4.2 Effect of existing FTA relationships

We now consider the effect of existing FTA relationships with third countries. The next hypothesis we examine empirically follows directly from Proposition 2 in Section 2.3 and examines the conditions under which two countries will form an FTA with each other when one of them has an existing FTA with a third country. Proposition 2 predicts that when country i has an FTA with a third country, say k, but country j does not, countries i and j are more likely to establish an FTA when country i has a sufficiently large market size and high marginal cost relative to country j and the transport cost between the two is relatively low.

To evaluate this hypothesis, we add a new vector of variables, $X'_{1,ijt-1}\beta \cdot I(F_{1,ijt-1})$, to equation (13) where $I(F_{1,ijt-1})$ is an indicator variable that equals 1 if country i has an FTA with a third country k but country j does not. This gives us the following specification:

$$\Pr(\Delta g_{ijt} = 1) = \Phi\left[X'_{ijt-1}\beta + X'_{1,ijt-1}\widetilde{\beta} \cdot I(F_{1,ijt-1}) + \varepsilon_{ijt}\right]. \tag{14}$$

In the above equation, $X'_{1,ijt-1}\widetilde{\beta}$ is given by

$$X'_{1,ijt-1}\widetilde{\beta} = \widetilde{\beta}_0 + \widetilde{\beta}_1\left(\alpha_{it-1} - \alpha_{jt-1}\right) + \widetilde{\beta}_2\left(\gamma_{it-1} - \gamma_{jt-1}\right) + \widetilde{\beta}_3\tau_{ij},$$

where $\widetilde{\beta}_0$ is a constant, $\alpha_{it-1} - \alpha_{jt-1}$ represents the (relative) market-size difference between i and j, $\gamma_{it-1} - \gamma_{jt-1}$ measures the (relative) marginal-cost difference between the two, and τ_{ij} measures the distance. In contrast with $X'_{ijt-1}\beta$ where i and j enter the expression symmetrically, the terms in $X'_{1,ijt-1}\widetilde{\beta}$ measure the extent by which i's market size and production cost exceeds j's. Proposition 2 suggests that $\widetilde{\beta}_1 > 0$, $\widetilde{\beta}_2 > 0$, and $\widetilde{\beta}_3 < 0$.

It is noteworthy that in some cases both countries i and j have FTAs with separate third countries. Chen and Joshi (2009) provide a formal analysis of this case. The result is analogous to Proposition 2 in Section 2.3. The country that has FTAs with a relatively larger number

[20] The elasticity estimates discussed in the text are derived from the logit coefficients reported in the tables and evaluated at the means.

of third countries has a stronger incentive to form a new FTA, but the incentive of the other country, i.e., the country that has FTAs with a smaller number of third countries, is strictly smaller. Similarly, an FTA is more likely to be jointly supported when the country with more existing FTA partners has a sufficiently large market size and high marginal cost of production relative to the other country.[21]

The lower panel of Table 1 reports summary statistics for $X'_{1,ijt-1}I(F_{1,ijt-1})$. Among country pairs that formed an FTA, the country that had a pre-existing FTA with a third country (or a larger number of third countries) tends to have a relatively larger market size and higher unit labor cost than the other country in the pair.

Column (2) of Table 2 reports the estimation results.[22] It is evident that the decision to establish an FTA is crucially dependent on countries' existing FTA relationships with third countries. The net parameter of the dummy variable $I(F_{1,ijt-1})$, based on the four regressors in $X'_{1,ijt-1}I(F_{1,ijt-1})$, is positive and statistically significant. The probability that a country pair will establish an FTA is, on average, 0.5 percentage point higher when one of the countries has an existing FTA with a third country. To put this effect in perspective, the average predicted probability that a country pair will enter into an FTA when neither has an FTA with a third country is 0.01. Consistent with the predictions of Proposition 2, a country pair is more likely to support an FTA when the country with existing FTAs has a larger market size and higher unit labor cost relative to the country without.[23]

We next evaluate predictions of Proposition 3, which involves the case in which both countries i and j have an FTA with a common third country. Proposition 3 suggests that the incentive for countries i and j to establish an FTA is strictly greater in this scenario than in the benchmark case.

To evaluate this prediction, we include an indicator variable, $I(F_{2,ijt-1})$, in equation (14)

[21] We also considered two other treatments: (i) comparing the aggregate market size (instead of number) of two countries' FTA partners, and (ii) separating cases in which only one of the countries has existing FTAs from cases in which both countries have FTAs with different third countries. The results were similar and are available upon request.

[22] Even though our theory focuses on the role of existing FTA relationships and does not explicitly address the effect of customs unions, we control for the latter throughout the empirical analysis by including a dummy for each existing customs union. The estimated parameters of the customs union controls suggest that customs union members have a greater probability to form new FTAs with nonmembers. This positive effect of customs union is to some extent similar to the case of existing FTAs with third countries. Both types of agreements reduce member countries' potential losses at home when they form new FTAs. The agreements also dilute outside countries' potential profit gains in the member countries after they enter into an FTA. However, forming an FTA with a customs union member means obtaining market access to the entire union and thus offers more incentives. Since these results are not the main focus of the paper, they were suppressed in the tables but are available from the authors.

[23] When both countries have FTAs with different third countries, this result (and analogously for the following results) suggests that two countries are more likely to enter into an FTA when the country with a larger number of FTA partners has a sufficiently large market size and labor cost relative to the one with fewer partners. For expositional clarity, we discuss our results in the context of the scenario considered in Section 2.

and obtain

$$\Pr(\Delta g_{ijt}=1)=\Phi\left[X'_{ijt-1}\beta+X'_{1,ijt-1}\widetilde{\beta}\cdot I(F_{1,ijt-1})+\widetilde{\widetilde{\beta}}\cdot I(F_{2,ijt-1})+\varepsilon_{ijt}\right]. \quad (15)$$

The indicator variable $I(F_{2,ijt-1})$ equals 1 when both countries i and j have FTAs with a common third country k at period $t-1$ and 0 otherwise. The parameter of $I(F_{2,ijt-1})$, denoted by $\widetilde{\widetilde{\beta}}$, is expected to be positive. The summary statistics reported in Table 1 suggest that compared to the rest of the world, the percentage of country pairs that share common FTA partners is significantly greater among those that eventually entered into an FTA.

The last two columns of Table 2 report the parameter estimates of equation (15). The results suggest that relative to the benchmark case where there are no FTAs with third countries, countries are significantly more likely to establish an FTA when they have existing FTAs with the same third country. The likelihood increases by 2 percentage points on average.[24] This finding is also illustrated in Figure 3, where we plot the distribution of countries' fitted probabilities of forming FTAs. The distribution is shifted significantly rightward for countries that have existing FTAs with the same third countries.

[Figure 3 about here]

4.3 Effect of third-country characteristics

So far we have established the effect of FTA relationships on countries' incentive to form a new FTA. But how does the effect vary with third-country characteristics? The theoretical framework employed in this paper, albeit standard in the FTA literature, does not have direct predictions in this respect because of the linearity assumptions of cost and demand. But third-country characteristics can affect the extent of the third-country effects when non-linearities are present. We explore this issue empirically.

Similar to the country-pair characteristics, we take into account three third-country attributes: (i) market size; (ii) unit labor cost; and (iii) distance to the partner country in the country pair. In particular, for the case in which country i has an FTA with a third country k and country j does not, we calculate the cost difference between k and j, i.e., $\gamma_{kt-1}-\gamma_{jt-1}$. Proposition 2 in Section 2.3 predicts that given the FTA between countries i and k, country j is more likely to form an FTA with i when i's marginal cost of production is high relative to j's. An implication of this result is that the FTA between i and k will be less likely to dampen country j's incentive to enter into an FTA with i when k is also relatively less competitive than j. The reason is straightforward: less efficient third countries are less capable of diluting

[24] We also interacted $I(F_{2,ijt-1})$ with X_{ijt-1} to explore whether the effect of country-pair characteristics might vary given common FTA partners. We found that all interaction terms have a positive and significant parameter, suggesting that, at any given level of X_{ijt-1}, sharing a common FTA partner increases countries' probability of entering into an FTA.

country j's potential profit gain in country i's market.

[Table 3 about here]

The estimates in Table 3 are consistent with the above hypothesis. The probability that a country pair will enter into an FTA increases in third countries' unit labor costs when the third countries have existing FTAs with either one or both of the countries in the country pair.

5 Sensitivity analysis

In this section, we address two econometric concerns that can arise in the analysis and examine the robustness of the results. First, there may exist omitted variables that also affect countries' decisions to enter into an FTA. The other econometric issue involves the causality of existing FTAs. Countries might self-select into their existing FTA relationships because the agreements help enable future FTAs.

5.1 Omitted variables

To address the omitted variables concern, we employ various fixed effects. In column (1) of Table 4, we include a country-pair fixed effect in a linear probability model to capture the effect of all time-invariant country-pair factors such as common language and colonial ties.[25] The estimates are qualitatively similar to those reported in Table 2.[26] FTA relationships with third countries continue to have a statistically significant and expected impact on countries' incentives to establish FTAs. For example, relative to the benchmark case where there are no FTAs with third countries, countries' probability of entering into an FTA is 11 percentage points higher when they have existing FTAs with the same third country. In comparison to the estimates without the country pair fixed effect reported by either the logit model in Table 2 or a comparable linear probability model, the estimated effect of existing FTA relationships is larger when we control for all country-pair characteristics.

Next we address the possibility that a country's unobserved characteristics, such as trade policy, may drive both the country's existing FTA relationships and its incentives to form future FTAs. To this end, we include a vector of country-period and partner-period dummies in addition to the country-pair fixed effect. The results are reported in the last column of Table 4. Again, we find significant third-country effects even though the effect of other variables

[25] Again, a probit model is not used to avoid the incidental parameter problem that arises in the presence of fixed effects. A fixed-effect logit model is not an option either, because it functions as a conditional logit model and excludes all the groups (for example, country pairs in the case of a country-pair fixed effect) that have a constant value of the dependent variable. This would restrict our sample to country pairs that formed an FTA in the sample period and drop all the pairs that did not enter into an FTA.

[26] Note that the estimates in the linear probability model have different interpretations than those reported directly by the logit model. The former represent the marginal effect of the explanatory variables on the probability, i.e., the change in the probability given an infinitesimal change in each explanatory variable.

becomes less important. For example, country pairs that share common FTA partners are 9 percentage points more likely to enter into an FTA.

[Table 4 about here]

5.2 The causal effect of existing FTA relationships

To address the concern of causality between existing and future FTAs, we take a quasi-natural experimental approach by considering only the effect of existing agreements that involve more than two participating countries, also referred to as plurilateral agreements, on the probability of two countries forming a bilateral FTA. Two rationales motivate this approach. First, relative to the decision of two countries to establish a bilateral FTA, the decision to establish a plurilateral agreement, such as the FTAs between the EU and other countries and the ASEAN, is less likely to be driven by an individual country's incentive to reach a future FTA with an outsider. Second, many plurilateral agreements, such as the ASEAN and Andean FTAs, may be considered predetermined because of their long history.[27]

Since this approach does not consider the effect of existing bilateral agreements, country pairs that have only bilateral FTA partners are excluded from the analysis. Table 5 reports the results. The effect of sharing common FTA partners remains similar to the previous estimates, but countries have a lower probability of entering into an FTA when one of them has existing plurilateral FTAs with third countries. This is not surprising, since a country's potential profit gain in a foreign market is expected to decrease in that market's number of FTA partners. In other words, the concession erosion effect described in Section 2 increases in the number of third countries that already have existing preferential market access to the export market. This adverse effect is, however, smaller when the third countries have relatively high unit labor costs, a result consistent with Table 3.

[Table 5 about here]

6 Predicting the FTAs

In this section, we follow Baier and Bergstrand (2004) and examine how well the empirical model predicts the actual data. In particular, to what extent does taking account of existing FTA relationships with third countries improve predictive ability? To investigate this question, we obtain the fitted probabilities of two countries forming an FTA in a given period by first

[27] In Chen and Joshi (2009), we also employed a matching technique to address the causality between two countries' having an FTA with the same third country and their decision to form an agreement with each other. We found that country pairs that share a common FTA partner are significantly more likely to reach an agreement than pairs that have similar economic characteristics but do not actually have existing FTAs with a common third country.

excluding, and then controlling for, the effect of existing FTA relationships.[28] In the context of qualitative choice models, higher predicted probabilities of establishing an FTA are associated with greater predicted welfare gains. Like Baier and Bergstrand (2004), we consider all the country pairs for which the predicted probability of entering into an FTA in a given period exceeds 50 percent. However, while Baier and Bergstrand (2004) examine countries' probability of having an FTA by 1996, we predict both the existence and timing of FTAs.

We first exclude the third-country FTA variables. The associated predictions are summarized in the left panel of Table 6. The empirical model successfully predicts the formation of 45 percent (136) of the 304 agreements established between 1991 and 2005. For the remaining 55 percent (168 agreements), the fitted probabilities in the period in which the agreements were formed are less than 50 percent. We then control for existing FTAs with third countries. As shown in the right panel of Table 6, when we include the third-country FTA effects, the percentage of successfully predicted agreements rises to 59 percent, representing a 14 percentage-point (and equivalently 31 percent) increase in predictive ability. Taking into account existing FTA relationships helps us explain the formation of 43 additional agreements that would not otherwise be predicted by the model. For the remaining 123 agreements, we find the predicted welfare gains at the time the agreements were established to be low even after accounting for third-country effects.

[Table 6 about here]

Our empirical model also predicts that 4 percent (94) of the 2,313 country pairs that did not have an FTA before 2005 would derive a welfare gain from entering into a bilateral agreement in 2005. We notice that 32 percent (30) of these 94 country pairs have indeed either signed an agreement in 2006 or entered into FTA negotiations.[29]

7 Conclusion

The existing literature has generally viewed the decision to enter into an FTA as a function of the participating countries' economic characteristics alone and ignored the effect of existing FTAs with third countries. We show, both theoretically and empirically, that third-country effects play an important role in countries' decision to establish new FTAs. Moreover, the extent of these third-country effects depends crucially on the structure of the existing FTA relationships.

We first show theoretically that when one country has an existing FTA with a third country, the incentive of that country to form a new FTA with a new partner country is unambiguously

[28] We use the specification adopted in the last column of Table 5.

[29] The free trade agreements that were signed in 2006 were obtained from Tuck Trade Agreements Database. Those that are currently in the process of negotiation were compiled from online sources such as www.bilaterals.org.

stronger compared to a benchmark case of no pre-existing FTA. However, the incentive for the potential partner country to join the agreement is strictly lower than the benchmark case, if the potential partner does not have an FTA in place with the third country. This result arises from the distinctive effects of the third country on the country pair. For the country that already has an existing FTA with the third country, the potential loss in its home market from forming a new FTA will be smaller thanks to the third country. For the country without an existing FTA, the potential gain in the export market from forming a new FTA will be smaller, also because of the third country. An FTA will therefore be jointly supported only if the country with an existing FTA has a relatively large market size and high marginal cost so that the new partner country can still receive sufficient gains in export profit. This hypothesis is broadly consistent with the empirical evidence.

Our theoretical results also suggest that the incentives of two countries to form an FTA with each other are unambiguously greater when they both have FTAs with the third country. This hypothesis again is supported empirically. The empirical findings remain robust when we address the potential concerns of omitted variables and reverse causality between existing and future FTAs.

Based on the empirical evidence, we find that accounting for third-country effects significantly raises the predictive ability of the empirical model. Taking into account the existing FTA relationships helps to increase the number of successfully predicted FTAs by 31 percent.

Our analysis of third-country effects can be extended in two directions. First, countries' decision to establish more than one FTA at a time can be explored. It is possible that some FTAs considered in isolation are not beneficial to the country but would be if they were formed jointly. This type of interdependence has not been examined in the literature and poses an interesting area for future research. Second, this paper considered the potential for reverse causality between existing and future FTAs. However, this topic can be further explored both theoretically and empirically. Studies that allow countries to take a far-sighted view of FTA formation have the potential to deepen our understanding of how FTAs evolve over time.

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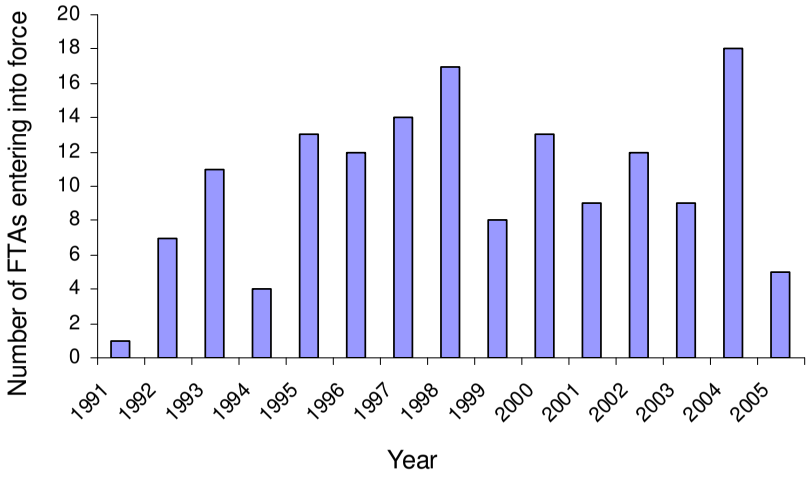
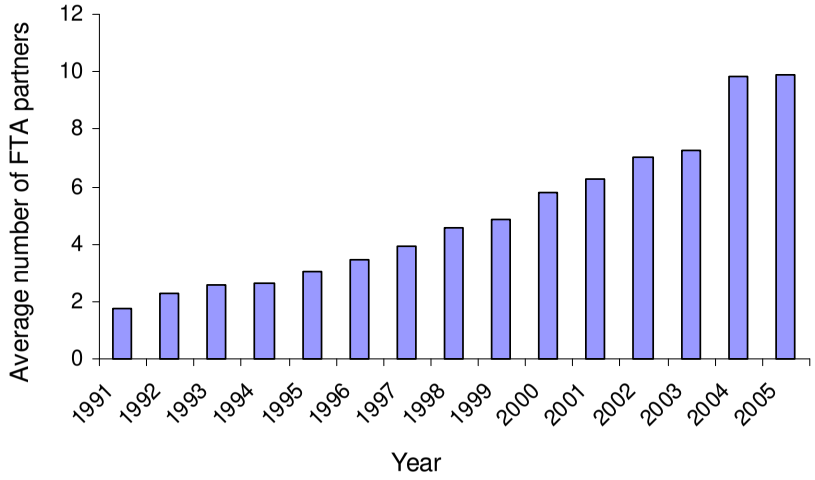
Appendix 1: Country Coverage (sorted by GDP per capita in 2005)

Luxembourg, Norway, Iceland, Switzerland, Ireland, Denmark, United States, Sweden, Netherlands, United Kingdom, Finland, Austria, Belgium, Japan, France, Canada, Germany, Australia, Italy, Singapore, New Zealand, Hong Kong, Spain, Greece, Israel, Slovenia, Portugal, South Korea, Malta, Czech Republic, Hungary, Slovakia, Mexico, Poland, Lithuania, Chile, Latvia, Turkey, Venezuela, Malaysia, Russian Federation, Uruguay, South Africa, Mauritius, Panama, Brazil, Argentina, Costa Rica, Romania, Bulgaria, Colombia, Algeria, Tunisia, Peru, Ecuador, El Salvador, Thailand, Jordan, Guatemala, Morocco, Ukraine, China, Armenia, Honduras, Indonesia, Sri Lanka, Egypt, Philippines, Bolivia, India, Pakistan, Kenya, Kyrgyz Republic, Bangladesh, Uganda, Nepal, Malawi, Ethiopia



(a) Number of FTAs entering into force



(b) Average number of FTA partners

Figure 1: Time trends in free trade agreements

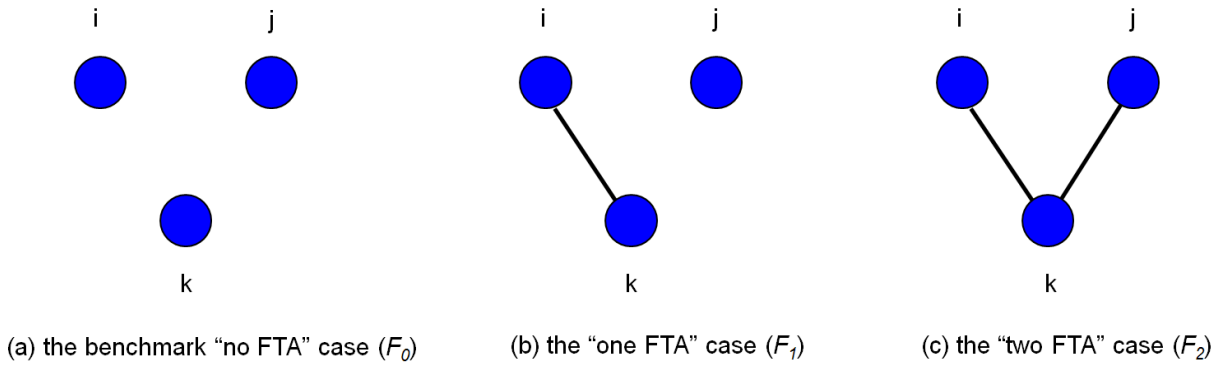


Figure 2: FTA relationships with a third country

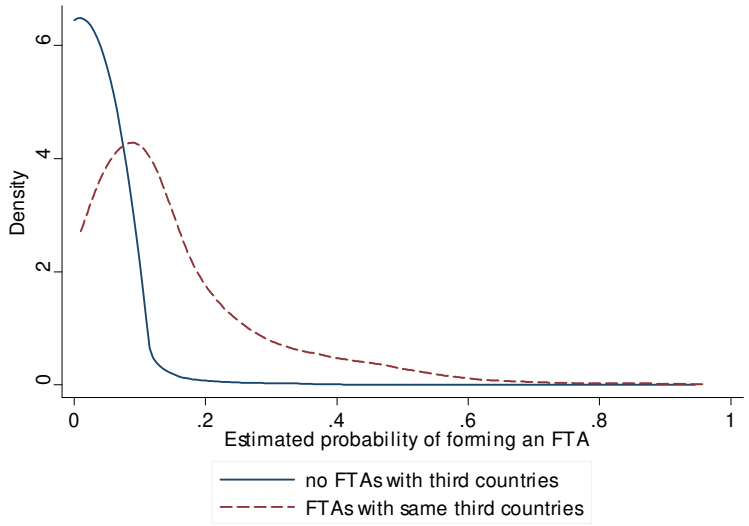


Figure 3: The effect of sharing common FTA partners on the probability of forming an FTA

Table 1: Summary statistics

	Country pairs without FTA obs=11565		Country pairs with FTA obs=1110	
	Mean	Std. Dev.	Mean	Std. Dev.
decision to form an FTA	0	0	0.27	0.44
average GDP	25.36	1.55	25.41	1.35
difference in GDP	25.41	1.99	25.36	1.88
difference in unit labor cost	0.76	1.58	0.64	1.19
squared difference in unit labor cost	3.08	19.56	1.83	13.81
distance	8.97	0.61	8.14	0.86
third countries' unit labor cost	-1.60	0.19	-1.55	0.16
remoteness	0.99	2.80	2.17	3.85
existing FTA relationships: one-FTA case	0.89	0.30	0.87	0.33
× country-pair diff. in GDP	0.14	1.95	0.48	1.84
× country-pair diff. in unit labor cost	0.14	1.11	0.27	0.96
× country-pair distance	8.03	2.81	7.19	2.79
existing FTA relationships: two-FTA case	0.05	0.23	0.17	0.38

Table 2: Third-country effects on the formation of FTAs

Dependent variable: decision to form an FTA	H_0	(1)	(2)	(3)	(4)
country-pair average GDP	+	0.40***	0.42***	0.34***	0.33***
		(0.08)	(0.08)	(0.08)	(0.08)
country-pair *abs.* diff. in GDP	–	-0.18***	-0.20***	-0.15***	-0.16***
		(0.06)	(0.06)	(0.06)	(0.06)
country-pair *abs.* diff. in unit labor cost	+	0.23**	0.27*	-0.10	-0.06
		(0.12)	(0.16)	(0.15)	(0.15)
country-pair sq. diff. in unit labor cost	–	-0.02*	-0.02*	0.005	0.001
		(0.01)	(0.01)	(0.01)	(0.01)
country-pair distance	–	-1.33***	-1.45***	-1.21***	-1.33***
		(0.12)	(0.27)	(0.12)	(0.26)
third countries' relative unit labor cost	+/–	-6.96***	-6.02***	-4.88***	-1.68*
		(2.14)	(2.07)	(2.14)	(0.85)
third countries' distance	+/–	-0.01	0.001	0.007	0.04*
		(0.02)	(0.01)	(0.02)	(0.02)
existing FTA relationships: one-FTA case	+/–		-0.62		-1.18
			(2.38)		(2.27)
× country-pair diff. in GDP	+		0.07***		0.07***
			(0.03)		(0.03)
× country-pair diff. in unit labor cost	+		0.10*		0.09*
			(0.06)		(0.05)
× country-pair distance	–		0.14		0.19
			(0.30)		(0.29)
existing FTA relationships: two-FTA case	+			1.13***	1.16***
				(0.14)	(0.15)
controls for customs union		no	yes	yes	yes
number of observations		12675	12675	12675	12675
Log-likelihood		-1190.7	-1183.9	-1160.1	-1140.3

Notes: (i) Logit estimates are reported in the table; (ii) Standard errors are reported in the parentheses and clustered at the country pair level; (iii) ***, **, and * represent statistical significance at, respectively, 1%, 5%, and 10%.

Table 3: Effect of third-country characteristics

Dependent variable: decision to form an FTA	H_0	(1)	(2)	(3)
existing FTA relationships: one-FTA case	+/–	-0.43		-1.92
		(2.33)		(2.41)
× country-pair diff. in GDP	+	0.08***		0.08***
		(0.03)		(0.03)
× country-pair diff. in unit labor cost	+	0.07*		0.12*
		(0.04)		(0.07)
× country-pair distance	–	0.25		0.45
		(0.29)		(0.31)
× third countries' GDP	+/–	0.16***		0.09***
		(0.03)		(0.03)
× third countries' relative unit labor cost	+	0.18***		0.56***
		(0.09)		(0.19)
× third countries' distance	+/–	-0.73***		-0.55***
		(0.10)		(0.11)
existing FTA relationships: two-FTA case	+		5.14	4.68
			(4.58)	(4.64)
× third countries' GDP	+/–		-0.10	-0.18
			(0.11)	(0.12)
× third countries' relative unit labor cost	+/–		1.07***	0.95***
			(0.30)	(0.32)
× third countries' distance	+/–		-0.15	0.17
			0.37	(0.36)
full set of controls		yes	yes	yes
number of observations		12675	12675	12675
Log-likelihood		-1141.1	-1101.0	-1035.9

Notes: (i) Logit estimates are reported in the table; (ii) Standard errors are reported in the parentheses and clustered at the country pair level; (iii) ***, **, and * represent statistical significance at, respectively, 1%, 5%, and 10%.

Table 4: Sensitivity analysis: omitted variables

Dependent variable: decision to form an FTA	H_0	(1)	(2)
country-pair average GDP	+	0.06***	-0.04
		(0.02)	(0.03)
country-pair *abs.* diff. in GDP	–	-0.003	-0.001
		(0.004)	(0.004)
country-pair *abs.* diff. in unit labor cost	+	0.01**	0.02**
		(0.005)	(0.01)
country-pair sq. diff. in unit labor cost	–	-0.001*	-0.001*
		(0.000)	(0.000)
country-pair distance	–	—	—
third countries' relative unit labor cost	+/–	0.13	44.09
		(0.13)	(34.73)
third countries' distance	+/–	—	—
existing FTA relationships: one-FTA case	+/–	0.37***	0.36***
		(0.09)	(0.11)
× country-pair diff. in GDP	+	0.006***	0.002**
		(0.001)	(0.001)
× country-pair diff. in unit labor cost	+	0.003*	0.004*
		(0.002)	(0.002)
× country-pair distance	–	-0.04***	-0.04***
		(0.001)	(0.01)
existing FTA relationships: two-FTA case	+	0.11***	0.09***
		(0.01)	(0.01)
controls for customs union		yes	yes
country-pair dummies		yes	yes
country (partner)-period dummies		no	yes
number of observations		12675	12675
R square		0.07	0.24

Notes: (i) Linear probability estimates are reported in the table; (ii) Standard errors are reported in the parentheses and clustered at the country pair level; (iii) ***, **, and * represent statistical significance at, respectively, 1%, 5%, and 10%.

Table 5: Sensitivity analysis: the effect of plurilateral agreements on bilateral FTAs

Dependent variable: decision to form a bilateral FTA	H_0	(1)	(2)	(3)	(4)
existing FTA relationships: one-FTA case	+/–	-0.11**		-0.11**	-0.13**
(plurilateral)		(0.05)		(0.05)	(0.05)
× country-pair diff. in GDP	+	-0.0001		-0.0001	0.000
		(0.000)		(0.000)	(0.000)
× country-pair diff. in unit labor cost	+	0.001*		0.001*	0.001*
		(0.000)		(0.000)	(0.000)
× country-pair distance	–	0.01		0.01	0.01
		(0.01)		(0.01)	(0.01)
existing FTA relationships: two-FTA case	+		0.02***	0.02***	0.03***
			(0.006)	(0.006)	(0.01)
Full set of controls		yes	yes	yes	yes
country-pair dummies		no	no	no	yes
country (partner)-period dummies		no	no	no	yes
number of observations		11197	11197	11197	11197
R square		0.02	0.02	0.04	0.11

Notes: (i) Linear probability estimates are reported in the table; (ii) Standard errors are reported in the parentheses and clustered at the country pair level; (iii) ***, **, and * represent statistical significance at, respectively, 1%, 5%, and 10%.

Table 6: Predicting the FTAs

without third-country effects			with third-country effects		
Prediction	Actual		Prediction	Actual	
	$\Delta FTA_{ijt}=1$	$\Delta FTA_{ijt}=0$		$\Delta FTA_{ijt}=1$	$\Delta FTA_{ijt}=0$
$\Delta FTA_{ijt}=1$	0.45	0.06	$\Delta FTA_{ijt}=1$	0.59	0.04
$\Delta FTA_{ijt}=0$	0.55	0.94	$\Delta FTA_{ijt}=0$	0.41	0.96
Total	1.00	1.00	Total	1.00	1.00

Notes: The cells represent the percentage of observations for which $\Delta FTA_{ijt}=1$ or 0 are predicted to have $\Delta FTA_{ijt}=1$ or 0 with higher than 0.5 probability.