# Endogenous formation of free trade agreements in vertically related markets

Yasushi Kawabata *

*Graduate School of Economics, Nagoya City University, 1 Yamanohata, Mizuho-cho, Mizuho-ku, Nagoya 467-8501, Japan*

## ARTICLE INFO

## ABSTRACT

We study the endogenous formation of free trade agreements (FTAs) in a symmetric three-country model with vertically related markets characterized by Cournot competition. We analyze the coalition-proof Nash equilibria in an FTA formation game in which each country forms an FTA with one, both, or none of its trading partners. We show that multilateral free trade is the unique stable equilibrium of the FTA formation game. In other words, FTAs act as building blocks for multilateral trade liberalization in the presence of vertical trade structures.

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## 1. Introduction

The rapid increase in the number of free trade agreements (FTAs) has resulted in an increase of theoretical studies that examine the relationship between FTAs and multilateral trade liberalization. The main question, addressed also in this work, is what kind of agreements can emerge in equilibrium and whether FTAs can act as *building blocks* for multilateral trade liberalization.

Yi (1996) has started the literature on custom unions in the presence of imperfectly competitive markets. More recently, Krishna (1998) uses a three-country model with exogenous tariffs to show that an FTA may reduce the incentives of member countries to support multilateral free trade. Ornelas (2005) also employs a model with endogenous tariffs to demonstrate that an FTA can induce a nonmember country to withdraw its support for multilateralism. Moreover, by using a repeated game framework, Saggi (2006) shows that an FTA reduces the incentive of a nonmember country to cooperate over multilateral free trade. Further, Goyal and Joshi (2006) and Furusawa and Konishi (2007) examine the formation of FTAs as a network formation game and find that the continued formation of bilateral FTAs can result in global free trade.[1] Aghion et al. (2007) develop a dynamic bargaining model where one country has agenda-setting power and show that FTAs can facilitate the achievement of global free trade. Finally, Saggi and Yildiz (2010, 2011) adopt a model of endogenous formation of FTAs and find that the pursuit of bilateral FTAs can lead to the attainment of multilateral free trade.

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* Tel./fax: +81 52 872 5014.
*E-mail address:* kawabata@econ.nagoya-cu.ac.jp

[1] Mukunoki and Tachi (2006) show that the sequential negotiation of bilateral FTAs among symmetric countries can result in multilateral free trade. By contrast, Nomura et al. (2013) demonstrate that the continued formation of bilateral FTAs among asymmetric countries may not lead to multilateral free trade.

However, these studies overlook one important aspect of world trade, namely that global trade in intermediate goods has been expanding rapidly over the past two decades.[2] In East Asia, for example, the development of the international division of production means that intermediate goods such parts and components are now actively traded among manufacturing bases located across the region. This increase in cross-border trading raises the question whether FTAs now act as *building blocks* or *stumbling blocks* to multilateral free trade, given the importance of trade in intermediate goods.[3]

This study explores the endogenous formation of FTAs in vertically related markets. We construct a symmetric three-country model in which downstream (final-good) firms engage in Cournot competition in each country's downstream market and upstream (intermediate-good) firms operate as Cournot competitors in each upstream market. In line with Saggi and Yildiz (2010, 2011), we analyze the coalition-proof (or stable) Nash equilibria of an FTA formation game. In the first stage of the FTA formation game, each country announces whether it wishes to sign an FTA with each of its trading partners. An FTA between two countries is formed when they both announce each other's name. Moreover, multilateral free trade arises when all countries announce each other's names. In the second stage, each country determines its tariffs based on the prevailing trade regime.

With regard to the effects of a bilateral FTA on tariffs and welfare, we obtain the following results. The formation of a bilateral FTA leads to a reduction in a member country's tariffs on both intermediate-good imports and final-good imports from a nonmember country, implying that the *tariff complementarity effect* of FTAs (Bagwell and Staiger, 1999) holds in a model with vertically related markets. Moreover, a bilateral FTA increases the welfare of all member and nonmember countries.

With regard to the FTAs' influence on multilateral free trade, we demonstrate that multilateral free trade is the unique stable equilibrium of the FTA formation game. In other words, the pursuit of bilateral FTAs achieves multilateral free trade, implying that FTAs act as *building blocks* for multilateral free trade in the presence of vertical trade structures. This result is in line with the findings of Kawabata and Takarada (2015), who show that, in a symmetric three-country model of Cournot competition without an intermediate-good sector, FTAs serve as *building blocks*.

The remainder of this paper is organized as follows. Section 2 describes the model. Section 3 derives the market equilibrium. Section 4 considers tariffs and welfare under four trade regimes: (i) no agreement, (ii) a bilateral FTA, (iii) a hub and spoke agreement, and (iv) multilateral free trade. Section 5 examines the determination of equilibrium FTAs. Section 6 concludes.

## 2. The model

We consider a model of intraindustry trade *à la* Brander and Krugman (1983) augmented with intermediate goods and trade policy. We assume that there are three symmetric countries (*A*, *B*, and *C*) and two goods: an intermediate good and a final good. Each country has one upstream firm that produces the intermediate good and one downstream firm that produces the final good. The three upstream (respectively downstream) firms engage in Cournot competition in the intermediate-good (respectively final-good) markets in countries *A*, *B*, and *C*. The markets in these three countries are assumed to be segmented. Country $i$ imposes a specific tariff $t_{ij}$ on intermediate-good imports from country $j$ and a specific tariff $T_{ij}$ on final-good imports from country $j$ ($i,j = A, B, C, i \neq j$).

Let $y_{ij}$ and $Y_i$ be the supply of country $j$'s downstream firm and the total supplies of the final good, respectively, to country $i$ ($i,j = A, B, C$). The price $p_i$ of the final good in country $i$ is determined by the inverse demand function, $p_i(Y_i) = \alpha - Y_i$ ($\alpha > 0$), where $Y_i \equiv \sum_{j=A,B,C} y_{ij}$. We assume that the production of one unit of the final good requires one unit of the intermediate good. Then, the profits of country $i$'s downstream firm are given by

$$\pi_i^D = (p_i - r_i)y_{ii} + \sum_{j \neq i} \left[ p_j - (r_i + T_{ji}) \right] y_{ji}, \quad i,j = A, B, C \tag{1}$$

where $r_i$ is the price of the intermediate good in country $i$.

Now, let $x_{ij}$ be the supply of country $j$'s upstream firm to country $i$ ($i,j = A, B, C$). The total supplies of the intermediate good to country $i$ are given by $X_i \equiv \sum_{j=A,B,C} x_{ij}$. We normalize the marginal costs of producing the intermediate good to zero. Thus, the profits of country $i$'s upstream firm are given by

$$\pi_i^U = r_i x_{ii} + \sum_{j \neq i} (r_j - t_{ji}) x_{ji}, \quad i,j = A, B, C. \tag{2}$$

The welfare of each country is given by the sum of the profits of the downstream and upstream firms, consumer surplus, and tariff revenue

$$W_i = \pi_i^D + \pi_i^U + CS_i + \sum_{j \neq i} T_{ij} y_{ij} + \sum_{j \neq i} t_{ij} x_{ij}, \quad i,j = A, B, C \tag{3}$$

where $CS_i \equiv \int_0^{Y_i} p_i(s)ds - p_i(Y_i)Y_i$ denotes consumer surplus in country $i$.

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[2] See Baldwin and Venables (2015) for a new approach to the role of intermediate goods in trade theory and policy. Previous works related to ours include the studies by Kawabata et al. (2010), Yanase et al. (2012) and Kawabata (2014): these works use a three-country model with vertical trade to investigate how an FTA influences tariffs and welfare, but do not deal with the endogenous formation of FTAs.

[3] The *building block* and *stumbling block* phraseology is borrowed from Bhagwati (1991).