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Production Patterns of Multinational Firms in a Four-Country Framework: Theory and Empirics

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How can a developing country attract foreign direct investment (FDI)? This question has long been the subject of debate among policy-makers in developing economies who regard FDI as an important catalyst for economic growth. As the global economy has become increasingly interdependent, multinational enterprises (MNEs) form multilateral production networks, where production processes are subdivided into several stages and some developing countries have successfully participated in certain parts of these networks.

While research on the activities of MNEs has widely been conducted since the late 1980s, a limited number of studies have comprehensively handled every operational pattern of MNEs in one model. Especially, the export-platform is not much discussed in the theoretical studies, even though its importance has been revealed by the empirical side. Because a low-cost developing country may play a significant role as an export-platform, an analytical model for this study must include this type in addition to the typical horizontal- and vertical-type MNEs.

One of the most sophisticated studies that consider typical types of MNEs including export-platforms in one consistent analytical framework was presented by Ekholm, Forslid, and Markusen (2007). Using a numerical simulation model, in which two market countries and one exogenously given developing country are considered, they explored the conditions under four types of firm strategy while gradually changing two types of costs, one for trading components and the other for assembling components. However, their model has only one factor of production, and the non-market country is just assumed to set exogenous factor pricing in a partial equilibrium framework. Another work that nests every type of MNE in one model is presented by Ito (2013). Extending the two-region, four-country (two countries in each region) model developed by Navaretti and Venebles (2004) to include export-platform, he showed that a reduction in trade costs, either inter-regional or intra-regional, induces firms to choose export-platform rather than other types. To enable the theoretical model to yield testable hypotheses for empirical testing, he incorporated only trade costs abstracting production costs away.

A good candidate for the base of an analytical model that includes both trade and production costs in a general equilibrium setting is the knowledge-capital model developed by Markusen (1997) and further extended by Zhang and Markusen (1999). Although export-platform is not taken into account, the computational model is able to verify effects of changes in firm-type on factor prices in the countries where the MNEs are active. As employment and labor wages in the host country are important factors MNEs use to decide on a production strategy, this feature based on the general equilibrium nature of the knowledge-capital model is essential for our study.

Empirical studies based on the Markusen's original knowledge-capital model are conducted by several authors, but the results are mixed. Some studies support the comprehensive model, whereas the others support the pure horizontal model. Little studies support the pure vertical model. Carr, Markusen, and Maskus (2001) predicted that volume of affiliate sales between countries is a function of each country's characteristics, namely market size of both home and foreign countries, difference in relative factor endowment, and the trade and investment costs, based on the hypothesis derived from the simulation analysis done by Marksuen (1997). The key variable for estimation is the one related to the skill difference in labor. They defined skill difference as the share of skilled labor to total labor in a home country minus that in a host country. Using panel data on the sales by foreign affiliates of the U.S. firms, and on the sales by the affiliates of foreign firms in the U.S. over the 1986-1994 period provided by the U.S. department of commerce, Carr et al. (2001) showed the evidence to support the knowledge-capital model, finding that affiliate sales increase when the skill difference and the market size of both countries are large, and decreases when the size of countries are different. Although Bloningen, Davies, and Head (2003) utilized the same data as used in Carr et al. (2001), they treated the skill difference as the absolute value. Thus, their results showed that skill difference negatively correlates with the volume of affiliate sales, which is in favor of the horizontal motives. In response to Bloningen et al. (2003), Carr, Markusen, and Maskus (2003) pointed out that estimating absolute skill difference makes no sense from the theoretical point of view. They claimed that the estimation can be interpreted as the test of the choice between horizontal and vertical FDI, but the estimation model is not based on the knowledge-capital model. Markusen and Maskus (2002) made comparison of the knowledge-capital model to the horizontal and vertical model, and showed that the pure horizontal and knowledge-capital models are better explaining the data than the vertical model. Branconier, Norbäck, and Urban (2005) expanded the data set in order to include small and skilled-labor-abundant countries. Their result strongly supported for the knowledge-capital model. Finally,

Tanaka (2011) used data on the U.S. and Japanese firms and found that the knowledge-capital model is supported in the pooled sample. However, once the data on each country are separately estimated, the data for U.S. supports horizontal whereas the data for Japan is in favor of vertical.

Under these circumstances, our research projects developed an extended version of the knowledge-capital model, and explored the factors and policies that may help to bring FDI into a developing country. Then, we tried to estimate the extended knowledge-capital model base on the data related to the Japanese MNEs.

1. Production Patterns of Multinational Enterprises: The Knowledge-Capital Model Revisited

To prepare an answer to the question of how a developing country can attract FDI, this study explored the factors and policies that may help bring FDI into a developing country, utilizing an extended version of the knowledge-capital model that includes six types of firms, national enterprises, horizontal MNEs, vertical MNEs, horizontal export-platforms, vertical export-platforms, and complexly integrated MNEs, and four countries grouped into market (developed) countries, in which MNEs are established and there are final markets for the commodity produced by those MNEs, and non-market (developing) ones, in which the final assembly process of multinational production may take place while the finished products are not sold locally but exported. Simulations with the model revealed conditions for which type of firm would be active in a given economic environment. With a special focus on the effects of a free trade agreement (FTA) and an economic partnership agreement (EPA) between a pair of market and non-market countries, the key findings can be summarized as follows.

1. When two non-market countries differ in size and relative factor endowment, lowering the trade cost (transportation cost or import tariff) of finished products concerning a trade-link between a pair of market and non-market countries motivates firms in a country "not" on the link to be an export-platform MNE operating in the non-market country on the link.

2. Complexly integrated MNEs emerge in a special case when a pair of market and non-market countries liberalize trade in the environment where transportation cost of components is low while the cost of finished products concerning the trade-link

between market countries are substantially high.

3. MNEs will not setup plants in non-market countries but go straight to a foreign market country if non-market countries are similar in relative factor endowments, even when some of those non-market countries liberalize trade with a market country. To attract inward FDI, a non-market country must have substantially cheap unskilled labor based on its rich relative endowment of the factor.

4. In the present setting wherein two market countries are perfectly symmetric, the choice of a FTA partner from market countries by a non-market country will not affect the production pattern of firms, welfare levels, or factor prices in the non-market countries. On the other hand, the welfare level in the market country that settles a FTA with a non-market country improves, whereas the market country being excluded from the FTA will be worse off.

5. Although FTA/EPA generally tends to increase FDI to a non-market country, the possibility to improve welfare through increased demand for skilled and unskilled labor becomes lower as the size of the country grows. This is because the rate of change in factor prices per unit increase of assembly plant becomes small in a large-sized country.

6. A non-market country may suffer severe welfare losses through FTA/EPA if the availability of skilled labor is extremely limited. To avoid this problem, policies to increase the availability of skilled labor in the country, such as investing in education, may help.

7. Because the additional implementation of cost-saving policies to reduce the firm-type/trade-link specific fixed cost tends to depreciate the price of skilled labor by saving its input, a non-market country, in which skilled labor is relatively scarce but not extremely scarce, can enhance welfare gains from a FTA, and it is even possible to recover the welfare effects from negative to positive, by making the arrangement to be an EPA. This tendency becomes strong when the total endowments for the non-market countries are large.

2. Estimating the Knowledge-Capital Model in a Four-Country Framework: Evidence from Japanese Multinational Firms

An empirical investigation with the extended knowledge-capital model is conducted. In the analysis, information on the FDI activities by Japanese firms in foreign countries published by RIETI is fully utilized. The main feature of the data is that the affiliate sales are compiled by destination market, such as sales on the local market in the host country, export sales from the host, exports back to Japan, and exports from the host to the third country. The data show the destination country to which the affiliates sell the final products, in addition to the information on the volume of affiliate sales by country. The data enabled us to explore the motives by each type of operational strategy derived from the theory.

Based on the estimation results of pooling regression, we can conclude that the most important motivation for Japanese firms to have foreign affiliates is the size of the markets represented by GDP of both home and host countries among four types of operational strategies: horizontal MNEs; vertical MNEs; horizontal MNEs; and vertical MNEs. The larger the country size is, the more the foreign affiliates make sales. Another important motivation implies that Japanese firms prefer moderately large countries to start affiliate business. In the case when the host country is rich in skilled labor, Japanese firms choose a moderately small market compared to Japan.

In the selection of the model from all possible models, trade costs never show up, although it plays important roles in the base model. Of course, it does not directly imply that trade costs will not motivate Japanese firms to setup plants in a foreign country. We suppose that this happened because we are not using the best data for trade costs. Since we used average tariff rates for all products levied by the host country this time, there should be better measure of trade costs, such as the information provided by Economic and Social Commission of Asia and Pacific (ESCAP). We will utilize the data in our next work.

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