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Comparative Advantage, Outward Foreign Direct Investment and Average Industry Productivity: Theory and Evidence

Yong Joon Jang and Hea-Jung Hyun

KIEP Korea Institute for International Economic Policy

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Executive Summary

In this paper, we explicitly address the role of comparative advantage in effects of outward FDI on domestic productivity, both theoretically and empirically. In the theoretical framework, we place Irarrazabal, Moxnes and Opromolla's (2009) outward FDI model into Bernard, Redding and Schott's (2007) framework of international trade with heterogeneous monopolistically competitive firms and comparative advantage; and show that *ex ante* high average industry productivity triggered by firm self-selection enhances *ex post* average industry productivity during the process of increase in FDI. Using Korean industry-level data from 1992 to 2008, we also empirically test our theoretical predictions using the fixed effect model as a benchmark model, followed by system GMM estimation methods for sensitivity analysis. Our empirical findings suggest that Korean outward FDI is positively correlated with domestic productivity and this link is likely to take place in those sectors above median competitiveness measured as export-based RCA (Revealed Comparative Advantage). Thus, we find that the empirical results were consistent with previous theoretical predictions as well as our analysis.

Keywords: Foreign Direct Investment, Comparative Advantage
JEL Classification: F23, D22

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Comparative Advantage, Outward Foreign Direct Investment and Average Industry Productivity: Theory and Evidence

Yong Joon Jang* and Hea-Jung Hyun**

I. Introduction

The rapid growth of activities of multinational firms in the past two decades[1] has triggered significant research into the impact of Multinational Enterprises (MNE) business activities on the domestic economy of the home country. One of the factors driving the recent wave of studies is the controversy over the effects of outward FDI domestically. In many home countries where headquarters of MNEs are located, there exist widespread public concern on the potential negative effect of outward FDI on domestic output and employment when do-

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[1] The World Investment Report published in UNCTAD (United Nations Conference on Trade and Development) in 2007 and 2010 show that the number of MNEs (multinational enterprises) in the world has grown from approximately 40,000 in 1993 with 270,000 foreign affiliates to about 103,786 MNEs with 892,114 foreign affiliates in 2010, and their exports account for about one third of world exports, including both goods and services.

mestic activities are replaced by foreign operations. An alternative perspective is that MNEs are able to expand their domestic capacities and employment by improving firms' profitability and competitiveness (Desai *et al.* 2009). Thus, it seems that the effect of multinational activities is a viable subject for empirical analysis.

Previous empirical studies provide mixed results on domestic effects of outward direct investment. The negative association between outward direct investment and domestic performances are also documented in Brainard and Riker (1997a, 1997b), Hijzen *et al.* (2004) and Cuyvers *et al.* (2005). Brainard and Riker (1997a, 1997b) examined empirically the domestic effect of US MNEs between 1983 and 1992, and found that wages of foreign affiliates are positively associated with employment of parent firms, which implies negative impact of outward direct investment on domestic employment. As for productivity, Bitzer and Görg (2005) found that the effect of outward FDI on average productivity of 10 manufacturing industries in 17 OECD member countries between 1973 and 2000 was negative. In contrast, some literature identifies a complementary relationship between outward FDI and domestic activities (Lipsey *et al.* 2000; Becker and Muendler 2008; Castellani and Navaretti 2004; Masso *et al.* 2008). Yet, there is also a stream of literature suggesting that the effects of MNE activities on parent firm performances are conditional. The channels through which foreign production can influence domestic operations may be motivation of investment (Blomstrom *et al.* 1997; Mariotti *et al.* 2003) or destination of FDI (Konings and Murphy 2006; Braconier and Ekholm 2000). Using data on 700 Swedish MNEs and 3000 foreign subsidiaries between 1970 and 1994, Braconier and Ekholm (2000) found a substitutive relationship between employment at foreign subsidiaries in high income countries and that of parent firms whereas there was no evidence for trade-off between parent and subsidiary employment in low-income

countries in the long run. In sum, there seems to be no consensus among previous works on the impact of direct investment abroad on domestic economic activity, suggesting that the effects may be industry or country specific.

Existing studies, however, do not clearly identify the mechanism through which MNE's activities can affect domestic performances. Bernard, Redding and Schott (2007) investigated economic responses to trade liberalization from a theoretical perspective. They demonstrated that when trade costs fall and firms are heterogeneous, productivity growth occurs most strongly in comparative advantage industries because creative destruction of firms is highly concentrated in these sectors vis-à-vis comparative disadvantage sectors. However, their models abstract away FDI liberalization.

Our paper contributes to the growing body of literature in this field by theoretically and empirically investigating the conditions under which outward FDI influence domestic productivity in a given industry. We explicitly addressed the role of comparative advantage in the effects of outward FDI on domestic productivity. In fact, we show theoretically that heterogeneous MNEs facing the same conditions in their home countries experience differences in performance in domestic operations according to competitiveness of their industries.

Helpman, Melitz and Yeaple (2004) show that highly productive firms are more likely to perform FDI and enjoy higher profits, i.e., there is firm self-selection regarding foreign markets. Hence we expect that an increase in outward FDI for both extensive and intensive margins represents an establishment and expansion of a production facility, and a management system mainly established by firms with higher productivity. Here we place emphasis on firm self-selection in foreign markets in analyzing how outward FDI influence domestic industry productivity in the theoretical framework. In addition, Bernard *et al.* (2007) show

that firm self-selection in foreign markets is diverse across industries with comparative advantage and disadvantage. Hence we expect various impacts of outward FDI on domestic industry productivity, depending on different firm self-selection in foreign markets between industries with comparative advantage and disadvantage.

To build up a theoretical framework, we place Irarrazabal, Moxnes and Opromolla's (2009) outward FDI model with Bernard *et al.*'s (2007) framework of international trade with heterogeneous, monopolistically competitive firms and comparative advantage. As our data show that the relationship between export and outward FDI is complementary, we consider Irarrazabal *et al.*'s (2009) framework in setting up outward FDI in the model. Consequently, we show that *ex ante* high average industry productivity triggered by firm self-selection enhances *ex post* average industry productivity during the increase in FDI.

Using Korean industry-level data from 1992 to 2008 we also empirically test our theoretical predictions. The various studies that have looked at the relationship between FDI and its effects on domestic operations lack empirical investigation on the conditions under which the effects are accentuated or ameliorated.

The paper is organized as follows. Section 2 provides a simple theoretical model built upon Bernard *et al.* (2007) and Irarrazabal *et al.* (2009) to highlight that outward foreign direct investment tends to have a positive impact on productivity, especially, within an industry which possesses comparative advantage. Section 3 and 4 explain the dataset of Korean multinational activities by industry and present empirical results regarding the effect of outward FDI on domestic productivity and the role of industry competitiveness. Section 5 summarizes the findings and concludes with a future research agenda.

II. Model

In this chapter we develop the theoretical model which lays the foundations for empirical results in the following section. The feature of the basic setup is similar to Bernard *et al.* (2007). We, however, expand Bernard *et al.* (2007) into the topic on multinationals by introducing outward FDI into the model, based on Helpman *et al.* (2004). In addition, following Irarrazabal *et al.* (2009), we introduce intra-firm trade into FDI to be consistent with the facts that the relationship between export and outward FDI is complementary in our dataset[2]. We expand Irarrazabal *et al.* (2009) into two industries, comparative advantage and comparative disadvantage industries.

1. Demand

We assume that there are two countries, home (H) and foreign (F); two industries, 1 and 2; and one production factor, labor. We assume that both countries are symmetric in every respect, except that the home country has comparative advantage in industry 1, while the foreign country has comparative advantage in industry 2. Hence there are several differences in the nature of industries, de-

[2] Helpman *et al.* (2004) show that in response to trade liberalization, ODI can be a substitute for exporting, while Irarrazabal *et al.* (2009) show that it could be a complement, when considering intra-firm trade. As our dataset shows that the correlation between FDI and RCA which is calculated by exports is positive (0.2922), we follow Irarrazabal *et al.* (2009).

pending on comparative advantage and disadvantage across countries.

Each industry is populated by homogeneous consumers and heterogeneous firms, endowed with L_i units of labor with the wage level, w_i; and income I_i. ($i = 1\ or\ 2$). Following Bernard *et al.* (2007), consumption between two industries represents Cobb-Douglas, i.e., $U = C_1^{\beta_1} C_2^{\beta_2}$, where β_i is the expenditure share to industry *i*, and $\beta_1 + \beta_2 = 1$. β_i. is assumed to be the same for each country. In each sector a representative consumer has CES preferences over a continuum of differentiated goods indexed by *x*. A consumer's maximization problem is[3]:

$$\max_{q(x)} C_i = \left[\int_{x \in X} q_i(x)^{\rho} dx\right]^{\frac{1}{\rho}}, 0 < \rho < 1 \quad (1)$$

$$s.t. \int_{x \in X} p_i(x) q_i(x) dx = \beta_i I \quad (2)$$

where C_i is a consumption index, $q_i(x)$ is the demand for *x*, $p_i(x)$ is the price of *x*, X is the set of goods, I_i is the aggregate domestic industry income and ρ is the elasticity of substitution across goods with $\rho = \frac{\sigma - 1}{\sigma}$ and $\sigma > 1$. As represented in (1), ρ does not have the subscript *i*, implying that each country has the same elasticity of substitution across goods.

Then the demand function becomes

$$q_i(x) = \beta_i I P_i^{\sigma - 1} p_i(x)^{-\sigma} \quad (3)$$

where P_i is the aggregate price index which is the indirect utility of the CES function. i.e.,

[3] As each country represents the same type of utility function, we omit the country superscript, i.e., *H* or *F*, in this subsection.

$$P_i = \left[\int_{x \in X} p_i(x)^{1-\sigma} dx\right]^{\frac{1}{1-\sigma}} \quad (4)$$

We assume the aggregate price index in each country's comparative advantage industry is smaller than in its comparatively disadvantaged industry. i.e., $P_1^H < P_2^H$ and $P_1^F > P_2^F$.[4]

2. Production

We assume that there is a monopolistically competitive market with *X* firms in which each firm produces one different variety *x*. Production represents increasing returns technology and involves both variable and fixed costs. Each firm has the same fixed cost but the different variable cost, depending on its heterogeneous productivity and strategy for entering the foreign market. In addition, each industry in each country has different wage rates, assuming that the wage rate in each country's comparative advantage industry is greater than in its comparatively disadvantaged industry, i.e., $w_1^H > w_2^H$ and $w_1^F < w_2^F$.[5]

The marginal cost for each production mode is given by:

- Domestic: $C_{iD}^H = \frac{1}{\theta} w_i^H$ (5)
- Export: $C_{iX}^H = \frac{\tau}{\theta} w_i^H$ (6)
- ODI: $C_{iO}^H = \frac{1}{\theta}\left(\tau w_i^H\right)^{1-\alpha}\left(w_i^F\right)^{\alpha}$ (7)

[4] Intuitively this assumption comes from Proposition 7(b) in Bernard *et al.* (2007). As a comparative advantage industry has a higher productivity, it has a lower average price which renders a lower aggregate price index.

[5] Also this assumption comes from Proposition 7(a) in Bernard *et al.* (2007). The opening of trade renders the relative nominal reward in a comparative advantage industry to be higher, while that in a comparative disadvantage industry to be lower.

where $\theta \geq 1$ is the firm's heterogeneous productivity, α is the fixed ratio of affiliate labor expenditure to total variable costs, and $\tau > 1$ is a per-unit iceberg cost for exporting such as transportation costs, tariffs, insurance fee, storage fee and etc. α and τ are the same for each industry and country.

Following Irarrazabal *et al.* (2009), in performing outward FDI the parent firm in the home country produces the intermediate product and send it to the affiliate while paying the variable exporting cost, τ. Then the affiliate produces the final good by assembling the parts of the good with local labor. The relationship of the production between the affiliate and the final good is assumed to be a Cobb-Douglas production function with α. After entering the domestic market, a firm realizes its innate productivity θ, which is exogenously drawn from a Pareto distribution with the cdf function:

$$F(\theta) = 1 - \theta^{-\gamma},\ \gamma > \sigma - 1 \qquad (8)$$

where γ is the Pareto index which represents the measure of quality dispersion.

The firm's profit function in country *k* is:

$$\pi_{ih}^{k} = p_{ih}^{k} q_{ih}^{k} - C_{ih}^{k} q_{ih}^{k} - f_h,\ i=1 \text{ or } 2,\ h=D \text{ or } X \text{ or } O,\ k=H \text{ or } F \qquad (9)$$

where the subscript i, h, and k denotes an industry, a production mode and a country, respectively. *D*, *X*, and *O* denote domestic, export and outward FDI, respectively. f_h is the fixed cost for each production mode, which is same for each industry in each country.[6] Following Bernard *et al.* (2007) and Irarrazabal *et al.* (2009), we assume that

[6] As we consider intra-firm trade in the model, f_o includes the fixed cost for exporting, f_X. If we denote f_I to be the fixed cost for building production facilities in a foreign market, then we express it as $f_o = f_x^{1-\alpha} f_I^{\alpha}$.

$$\frac{P_i^F}{P_i^H} f_D < \tau^{\sigma-1} f_X < \left(\frac{w_i^F}{w_i^H}\right)^{\alpha(\sigma-1)} f_O \quad (10)$$

3. Equilibrium

A firm's profit maximization yields the equilibrium price of each production mode in the home country:

- Domestic: $p_{iD}^H = \frac{1}{\theta\rho} w_i^H$ (11)
- Export: $p_{iX}^H = \frac{\tau}{\theta\rho} w_i^H$ (12)
- FDI: $p_{iO}^H = \frac{1}{\theta\rho} \left(\tau w_i^H\right)^{1-\alpha} \left(w_i^F\right)^{\alpha}$ (13)

$\frac{1}{\rho}$ represents a firm's mark-up. Hence each equilibrium price is comprised of a firm's mark-up and marginal cost of each production mode.

From (3) and (11)-(13), the equilibrium output of each production mode in the home country is:

- Domestic: $q_{iD}^H = \beta_i I^H \left(P_i^H\right)^{\sigma-1} \left(\frac{\theta\rho}{w_i^H}\right)^{\sigma}$ (14)
- Export: $q_{iX}^H = \beta_i I^F \left(P_i^F\right)^{\sigma-1} \left(\frac{\theta\rho}{\tau w_i^H}\right)^{\sigma}$ (15)
- FDI: $q_{iO}^H = \beta_i I^F \left(P_i^F\right)^{\sigma-1} \left(\frac{\theta\rho}{\left(\tau w_i^H\right)^{1-\alpha} \left(w_i^F\right)^{\alpha}}\right)^{\sigma}$ (16)

Then the equilibrium revenue of each production mode in the home country is:

- Domestic: $r_{iD}^H = \beta_i I^H \left(\frac{P_i^H \theta\rho}{w_i^H}\right)^{\sigma-1}$ (17)
- Export: $r_{iX}^H = \beta_i I^F \left(\frac{P_i^F \theta\rho}{\tau w_i^H}\right)^{\sigma-1}$ (18)
- FDI: $r_{iO}^H = \beta_i I^F \left(\frac{P_i^F \theta\rho}{\left(\tau w_i^H\right)^{1-\alpha} \left(w_i^F\right)^{\alpha}}\right)^{\sigma-1}$ (19)

By symmetry we can also obtain similar equilibrium values for the foreign country (r_{iD}^F, r_{iX}^F and r_{iO}^F).

From (9) and (14)-(19) the equilibrium profit of each production mode in each country can be written as follows:

$$\pi_{ih}^k = \frac{r_{ih}^k}{\sigma} - f_h, i=1 \text{ or } 2, h=D \text{ or } X \text{ or } O, k = H \text{ or } F \quad (20)$$

4. Thresholds of Firm Productivity

Following Helpman *et al.* (2004), there exist three thresholds of firm productivity in each production mode such that, $\pi_{iD}^k = 0$, $\pi_{iX}^k = 0$ and $\pi_{iO}^k = \pi_{iX}^k$ respectively. For the home country these thresholds are[7]:

- Domestic: $\bar{\theta}_{iD}^H = \delta \frac{1}{P_i^H (\beta_i I^H)^{\frac{1}{\sigma-1}}} f_D^{\frac{1}{\sigma-1}} w_i^H$ (21)

- Export: $\bar{\theta}_{iX}^H = \delta \frac{1}{P_i^F (\beta_i I^F)^{\frac{1}{\sigma-1}}} f_X^{\frac{1}{\sigma-1}} \tau w_i^H$ (22)

- FDI: $\bar{\theta}_{iO}^H = \delta \frac{1}{P_i^F (\beta_i I^F)^{\frac{1}{\sigma-1}}} \left[\frac{f_O - f_X}{(\tau \omega_i^H)^{\alpha(\sigma-1)}} \right]^{\frac{1}{\sigma-1}} \tau w_i^H$ (23)

where $\delta = \frac{\sigma^{\frac{\sigma}{\sigma-1}}}{\sigma-1}$ and $\omega_i^H = \frac{w_i^H}{w_i^F}$ represent the property of market competition and relative wage rate, respectively.

If a firm's productivity is less than $\bar{\theta}_{iD}^k$, then it will exit the market due to $\pi_{iD}^k < 0$. On the other hand, a firm will operate in the domestic market if its

[7] Similarly, we can also obtain three thresholds for the foreign country.

productivity is greater than or equal to $\bar{\theta}_{iD}^{k}$. Similarly a firm will start to export as well as serve the domestic market if its productivity is greater than or equal to $\bar{\theta}_{iX}^{k}$. If a firm productivity is greater than or equal to $\bar{\theta}_{iO}^{H}$, then it will engage in FDI instead of exporting because a profit in the former is greater than that in the latter, i.e., $\pi_{iO}^{k} \geq \pi_{iX}^{k}$.

From (21) and (22),

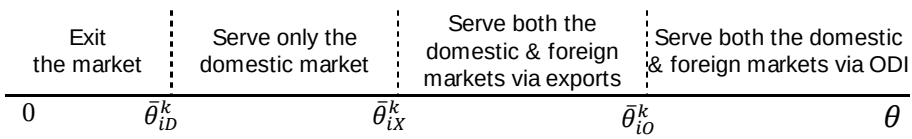
$$\frac{\bar{\theta}_{iX}^{H}}{\bar{\theta}_{iD}^{H}} = \tau \frac{P_i^H}{P_i^F} \left(\frac{f_X}{f_D}\right)^{\frac{1}{\sigma-1}} \tag{24}$$

As $\tau^{\sigma-1} f_X > \frac{A_i^F}{A_i^H} f_D$ in (10), the threshold of firm productivity for exporting is greater than that for domestic sales, i.e., $\bar{\theta}_{iX}^{H} > \bar{\theta}_{iD}^{H}$. From (22) and (23),

$$\frac{\bar{\theta}_{iO}^{H}}{\bar{\theta}_{iX}^{H}} = \left(\frac{f_O - f_X}{f_X\left(\left(\tau\omega_i^H\right)^{\alpha(\sigma-1)} - 1\right)}\right)^{\frac{1}{\sigma-1}} \tag{25}$$

As $\left(\frac{w_i^F}{w_i^H}\right)^{\alpha(\sigma-1)} f_O > \tau^{\sigma-1} f_X$, the threshold of firm productivity for engaging in FDI is greater than that for exporting, i.e. $\bar{\theta}_{iO}^{H} > \bar{\theta}_{iX}^{H}$, implying that there exists a trade-off between realizing economies of scale from exports and using tariff-jumping strategies from FDI in the model.

Figure 1. Three Thresholds of Firm Productivity



As a result, the condition, $0 < \bar{\theta}_{iD}^{k} < \bar{\theta}_{iX}^{k} < \bar{\theta}_{iO}^{k}$, confirms selection into markets in the model: after discovering its productivity, it appears that only a high productivity firm with $\theta \geq \bar{\theta}_{iO}^{H}$ serves both the domestic and foreign markets via FDI, an intermediate productive firm with $\bar{\theta}_{iX}^{H} \leq \theta < \bar{\theta}_{iO}^{H}$ serves both the domestic and foreign markets via exports and a low productive firm with $\bar{\theta}_{iD}^{H} \leq \theta < \bar{\theta}_{iX}^{H}$ serves only the domestic market. A firm with $\theta < \bar{\theta}_{iD}^{H}$ exits the market due to negative profits.

5. Comparative Advantage, Export and FDI

There are several analytical results that come from thresholds of firm productivity when a country's comparative advantage and three production modes are considered simultaneously. The result in the relationship between export and comparative advantage is very similar to Bernard *et al.* (2007). We, however, derive new analytical results in the relationship between FDI and comparative advantage in addition to Bernard *et al.* (2007)'s.

Proposition 1: Export and FDI Shares across Industries

(a) (Bernard *et al.* 2007) There is relatively greater exporting in a country's comparatively advantaged industries than those with comparative disadvantages.

(b) Similarly there is relatively greater outward FDI from comparatively advantaged industries in a given country than industries with comparative disadvantages.

Proof.

- Proposition 1 (a): From (24) and the country symmetry assumption,

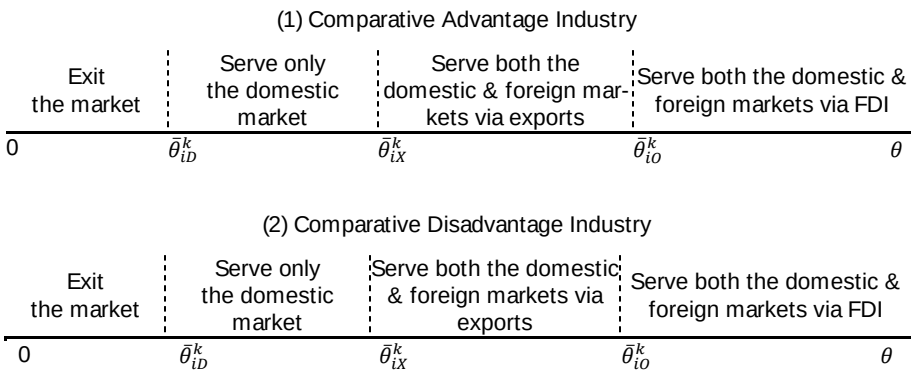
$\frac{\bar{\theta}_{1X}^{H}}{\bar{\theta}_{1D}^{H}} = \tau \frac{P_1^H}{P_1^F}\left(\frac{f_X}{f_D}\right)^{\frac{1}{\sigma-1}}$ and $\frac{\bar{\theta}_{2X}^{H}}{\bar{\theta}_{2D}^{H}} = \tau \frac{P_2^H}{P_2^F}\left(\frac{f_X}{f_D}\right)^{\frac{1}{\sigma-1}}$. Then $\frac{\bar{\theta}_{1X}^{H}/\bar{\theta}_{1D}^{H}}{\bar{\theta}_{2X}^{H}/\bar{\theta}_{2D}^{H}} = \frac{P_1^H}{P_1^F}\frac{P_2^F}{P_2^H}$. From the assumption, $P_1^H < P_2^H$ and $P_1^F > P_2^F$, we obtain $P_1^H P_2^F < P_1^F P_2^H$. Hence we derive $\frac{\bar{\theta}_{1X}^{H}}{\bar{\theta}_{1D}^{H}} < \frac{\bar{\theta}_{2X}^{H}}{\bar{\theta}_{2D}^{H}}$. Similarly, it shows straightforwardly that $\frac{\bar{\theta}_{1X}^{F}}{\bar{\theta}_{1D}^{F}} > \frac{\bar{\theta}_{2X}^{F}}{\bar{\theta}_{2D}^{F}}$ for the foreign country, given $P_1^H P_2^F < P_1^F P_2^H$.

- Proposition 1 (b): From (21) and (23), $\frac{\bar{\theta}_{1O}^{H}}{\bar{\theta}_{1D}^{H}} = \tau \frac{P_1^H}{P_1^F}\left(\frac{I_1^H}{I_1^F}\frac{f_O - f_X}{f_D\left(\left(\tau\omega_1^H\right)^{\alpha(\sigma-1)}-1\right)}\right)^{\frac{1}{\sigma-1}}$ and $\frac{\bar{\theta}_{2O}^{H}}{\bar{\theta}_{2D}^{H}} = \tau \frac{P_2^H}{P_2^F}\left(\frac{I_2^H}{I_2^F}\frac{f_O - f_X}{f_D\left(\left(\tau\omega_2^H\right)^{\alpha(\sigma-1)}-1\right)}\right)^{\frac{1}{\sigma-1}}$ and $\frac{\bar{\theta}_{1O}^{H}/\bar{\theta}_{1D}^{H}}{\bar{\theta}_{2O}^{H}/\bar{\theta}_{2D}^{H}} = \frac{P_1^H}{P_1^F}\frac{P_2^F}{P_2^H}\left(\frac{\left(\left(\tau\omega_2^H\right)^{\alpha(\sigma-1)}-1\right)}{\left(\left(\tau\omega_1^H\right)^{\alpha(\sigma-1)}-1\right)}\right)^{\frac{1}{\sigma-1}}$. It is straightforward to show $\frac{\bar{\theta}_{1O}^{H}}{\bar{\theta}_{1D}^{H}} < \frac{\bar{\theta}_{2O}^{H}}{\bar{\theta}_{2D}^{H}}$ as $P_1^H P_2^F < P_1^F P_2^H$ and $\omega_2^H < \omega_1^H$, given $P_1^H < P_2^H$ and $P_1^F > P_2^F$, and $w_1^H > w_2^H$ and $w_1^F < w_2^F$. Similarly, we obtain $\frac{\bar{\theta}_{1O}^{F}}{\bar{\theta}_{1D}^{F}} > \frac{\bar{\theta}_{2O}^{F}}{\bar{\theta}_{2D}^{F}}$ for the foreign country.

Two results, $\frac{\bar{\theta}_{1X}^{H}}{\bar{\theta}_{1D}^{H}} < \frac{\bar{\theta}_{2X}^{H}}{\bar{\theta}_{2D}^{H}}$ and $\frac{\bar{\theta}_{1X}^{F}}{\bar{\theta}_{1D}^{F}} > \frac{\bar{\theta}_{2X}^{F}}{\bar{\theta}_{2D}^{F}}$, show that the threshold for export is relatively closer to that for domestic sales in an industry with comparative advantages than in a comparative disadvantage industry. In other words, there are relatively greater exports from a comparative advantage industry in a country, which supports our estimates for a country's comparative advantage in the following chapter[8]. In addition to Bernard *et al.* (2007), this result is true even under the condition in our model where a firm can serve the foreign market via FDI as well as exports (see Figure 2).

[8] In the empirical part we estimate a country's comparative advantage by considering the Revealed Comparative Advantage (RCA), which is based on an industry's relative export share. A comparatively advantaged industry has relatively greater export share than a disadvantaged industry (See Balassa, 1965).

Figure 2. Three Thresholds of Firm Productivity Across Industries



The same analytical results apply to the case of FDI. Two results, $\frac{\bar{\theta}_{1O}^{H}}{\bar{\theta}_{1D}^{H}} < \frac{\bar{\theta}_{2O}^{H}}{\bar{\theta}_{2D}^{H}}$ and $\frac{\bar{\theta}_{1O}^{F}}{\bar{\theta}_{1D}^{F}} > \frac{\bar{\theta}_{2O}^{F}}{\bar{\theta}_{2D}^{F}}$, show that the threshold for FDI is relatively closer to that for domestic sales in a comparative advantage industry than in a disadvantage industry. Hence there are relatively greater FDIs from a country's advantaged industry, which is consistent with our statistical results in the following chapter.

6. The Effect of FDI on Productivity

In this section we show how average industry productivity interacts with the increase in FDI, which vary across industries and countries.

Proposition 2: The Effect of FDI on Productivity

(a) The increase in FDI effects an increase in average industry productivity in

both industries.

(b) Other things being equal, the increase in average industry productivity is relatively greater in a country's comparative advantage industry in response to the increase in FDI.

Proof.

- Proposition 2 (a): Based on Melitz (2003)[9], we define the average productivity as follows:

$$\tilde{\theta}_i^k = \left(\int_{\bar{\theta}_{iD}^k}^{\infty} \theta^{\sigma-1} dF(\theta) + \tau^{1-\sigma} \int_{\bar{\theta}_{iX}^k}^{\bar{\theta}_{iO}^k} \theta^{\sigma-1} dF(\theta) + \tau^{(1-\sigma)(1-\alpha)} \int_{\bar{\theta}_{iO}^k}^{\infty} \theta^{\sigma-1} dF(\theta) \right)^{\frac{1}{\sigma-1}} \quad \text{(A1)}$$

From (8) and (A1),

$$\tilde{\theta}_i^k = \left(\frac{\gamma}{\gamma - (\sigma - 1)} ((\bar{\theta}_{iD}^k)^{\sigma-\gamma-1} + (\tau^{1-\alpha} - 1)\tau^{1-\sigma}(\bar{\theta}_{iO}^k)^{\sigma-\gamma-1} + \tau^{1-\sigma}(\bar{\theta}_{iX}^k)^{\sigma-\gamma-1}) \right)^{\frac{1}{\sigma-1}} \quad \text{(A2)}$$

From (21), (23) and (25),

$$\bar{\theta}_{iD}^H = \frac{1}{\tau} \frac{P_i^F}{P_i^H} \left(\frac{f_D \left((\tau \omega_i^H)^{\alpha(\sigma-1)} - 1 \right)}{f_O - f_X} \right)^{\frac{1}{\sigma-1}} \bar{\theta}_{iO}^H \quad \text{(A3)}$$

$$\bar{\theta}_{iX}^H = \left(\frac{f_X \left((\tau \omega_i^H)^{\alpha(\sigma-1)} - 1 \right)}{f_O - f_X} \right)^{\frac{1}{\sigma-1}} \bar{\theta}_{iO}^H \quad \text{(A4)}$$

Substitute (A3) and (A4) into (A2), then

[9] Also see Baldwin and Robert-Nicoud (2004) and Meckl and Weigert (2011) for the definition of average industry productivity.

$$\tilde{\theta}_i^k = \left(\frac{\gamma}{\gamma-(\sigma-1)}\right)^{\frac{1}{\sigma-1}}\left(\frac{1}{\tau}\frac{P_i^F}{P_i^H}\left(\frac{f_D\left((\tau\omega_i^H)^{\alpha(\sigma-1)}-1\right)}{f_O-f_X}\right)^{-\frac{\gamma-(\sigma-1)}{\sigma-1}}+(\tau^{1-\alpha}-1)\tau^{1-\sigma}\right.$$

$$\left.+\,\tau^{1-\sigma}\left(\frac{f_X\left((\tau\omega_i^H)^{\alpha(\sigma-1)}-1\right)}{f_O-f_X}\right)^{-\frac{\gamma-(\sigma-1)}{\sigma-1}}\right)^{\frac{1}{\sigma-1}}(\bar{\theta}_{iO}^H)^{-\frac{\gamma-(\sigma-1)}{\sigma-1}} \tag{A5}$$

Therefore, for the home country,

$$\frac{\partial\tilde{\theta}_i^H}{\partial\bar{\theta}_{iO}^H} = -\left(\frac{\gamma}{\gamma-(\sigma-1)}\right)^{\frac{2-\sigma}{\sigma-1}}\left(\frac{1}{\tau}\frac{P_i^F}{P_i^H}\left(\frac{f_D\left((\tau\omega_i^H)^{\alpha(\sigma-1)}-1\right)}{f_O-f_X}\right)^{-\frac{\gamma-(\sigma-1)}{\sigma-1}}+(\tau^{1-\alpha}-1)\tau^{1-\sigma}\right.$$

$$\left.+\,\tau^{1-\sigma}\left(\frac{f_X\left((\tau\omega_i^H)^{\alpha(\sigma-1)}-1\right)}{f_O-f_X}\right)^{-\frac{\gamma-(\sigma-1)}{\sigma-1}}\right)^{\frac{1}{\sigma-1}}(\bar{\theta}_{iO}^H)^{-\frac{\gamma}{\sigma-1}} \tag{A6}$$

As $\gamma-(\sigma-1)>0$ in (8), $w_1^H>w_2^H$, $\left(\tau\omega_i^H\right)^{\alpha(\sigma-1)}>1, \tau^{1-\alpha}>1$ and $f_O>f_X$ in (10), we obtain $\frac{\partial\tilde{\theta}_i^H}{\partial\bar{\theta}_{iO}^H}<0$. By symmetry, it straightforwardly shows $\frac{\partial\tilde{\theta}_i^F}{\partial\bar{\theta}_{iO}^F}<0$ for the foreign country.

- Proposition 2 (b): For the home country,

$$\frac{\partial\tilde{\theta}_1^H}{\partial\bar{\theta}_{iO}^H}-\frac{\partial\tilde{\theta}_2^H}{\partial\bar{\theta}_{iO}^H} = -\left[\tau\frac{P_1^H}{P_1^F}\left(\frac{f_O-f_X}{f_D((\tau\omega_1^H)^{\alpha(\sigma-1)}-1)}\right)^{\frac{\gamma-(\sigma-1)}{\sigma-1}}+(\tau^{1-\alpha}-1)\tau^{1-\sigma}\right.$$

$$\left.+\,\tau^{1-\sigma}\left(\frac{f_O-f_X}{f_X((\tau\omega_1^H)^{\alpha(\sigma-1)}-1)}\right)^{\frac{\gamma-(\sigma-1)}{\sigma-1}}\right]^{\frac{1}{\sigma-1}}$$

$$+\left[\tau\frac{P_2^H}{P_2^F}\left(\frac{f_O-f_X}{f_D((\tau\omega_2^H)^{\alpha(\sigma-1)}-1)}\right)^{\frac{\gamma-(\sigma-1)}{\sigma-1}}+(\tau^{1-\alpha}-1)\tau^{1-\sigma}\right.$$

$$\left.+\,\tau^{1-\sigma}\left(\frac{f_O-f_X}{f_X((\tau\omega_2^H)^{\alpha(\sigma-1)}-1)}\right)^{\frac{\gamma-(\sigma-1)}{\sigma-1}}\right]^{\frac{1}{\sigma-1}} \tag{A7}$$

As $\frac{P_1^H}{P_1^F} < \frac{P_2^H}{P_2^F}$, $\omega_1^H > \omega_2^H$ and $\frac{1}{\left((\tau\omega_1^H)^{\alpha(\sigma-1)}-1\right)} < \frac{1}{\left((\tau\omega_2^H)^{\alpha(\sigma-1)}-1\right)}$, the first two terms is less than the last two terms on the left side in (A7). Hence we derive $\frac{\partial\tilde{\theta}_1^H}{\partial\bar{\theta}_{iO}^H} - \frac{\partial\tilde{\theta}_2^H}{\partial\bar{\theta}_{iO}^H} > 0$.

Note that lower $\bar{\theta}_{iO}^k$ represents greater FDI (see Figure 1). Hence $\frac{\partial\tilde{\theta}_i^k}{\partial\bar{\theta}_{iO}^k} < 0$ implies that FDI increases average industry productivity. Also, note that only high-productivity firms perform outward FDIs by establishing and/or expanding a management system in a home country and production facilities in a foreign country.

Consequently, this *ex ante* high productivity triggered by firm self-selection enhances *ex post* average industry productivity in the process of the increase in FDI. Especially, as there are relatively more MNEs in a comparative advantage industry than a comparative disadvantage industry, the positive effects of the increase in FDI on average industry productivity growth would be more prominent in the former.

III. Data and Empirical Model

1. Data

This paper relies on three different merged datasets of 56 manufacturing industries in a 17-year period from 1992 to 2008. First, the data for outward FDI was drawn from the Korea EXIM bank (Export-Import Bank of Korea). Industries are classified based on KSIC (Korea Standard Industry Code) Rev. 6. Second, to capture the effects of industry characteristics on productivity, we built a dataset that includes information on the number of employment, total sales, wage, and capital stock collected from the '*Survey of mining and manufacturing*' conducted by the National Statistical Office of Korea. The size of the industry was measured as total sales. TFP is measured as the residual of the random-effect panel regression of the natural logarithm of output (i.e. sales) per worker on the logarithm of capital (i.e. fixed assets) per worker, the logarithm of the number of workers and the year dummies. Third, the index of comparative advantage of an industry is measured as an RCA (revealed comparative advantage) index. RCA is calculated as

$$RCA_{i,t}^{Kor} = \left(q_{iX}^{Kor} \Big/ \sum_i q_{iX}^{Kor} \right) \Big/ \left(q_{iX}^{World} \Big/ \sum_i q_{iX}^{World} \right)$$

where i and X denote industry i and export, respectively.

The export data is obtained from the United Nations Commodity Trade Statistics Database (UN COMTRADE). Table 1 shows the summary statistics of data used in our empirical studies.

Table 1. Summary Statistics

Variable	Observation	Mean	Std.	Min	Max
lnFDI	786	9.582	2.158	2.833	14.691
lnSales	916	15.126	1.814	8.519	18.615
lnCapital	916	14.274	1.781	6.979	18.142
lnLabor	863	9.970	1.621	3.178	12.773
lnLabor_Skilled	807	8.674	1.602	1.386	11.813
lnLabor_Unskilled	807	9.640	1.603	3.258	12.361
lnWage	863	2.849	0.427	1.814	4.322
lnWage_Skilled	807	2.918	0.372	1.445	4.121
lnWage_Unskilled	807	2.785	0.399	1.755	4.294
RCA	917	0.957	1.338	0.000	10.619

2. Empirical Model

For empirical test, we took into account TFP (total factor productivity) and natural log of sales as proxy for productivity and examined the interplay between the volume of outward investment and comparative advantage in affecting productivity. First, we measure TFP as the residual of the fixed effect panel regression of the natural logarithm of output on the logarithm of capital (fixed assets) per worker, the logarithm of the number of workers and the year dummies. Based on Bitzer and Görg (2005), we directly estimate the impact of FDI on TFP and the role of RCA as a potential channel through which FDI can affect TFP. Second, to confirm the role of outward FDI and industry comparative advantage in productivity, we estimated augmented Cobb-Douglas production function and

investigated how output of a specific industry responded to multinational activities and how these activities interact with industry competitiveness. The empirical model of augmented Cobb-Douglas production function can be derived as follows.

$$lnY_{it} = \beta_0 + \beta_1 lnK_{it} + \beta_2 lnL_{it} + \beta_3 lnFDI_{it} + \beta_4 lnFDI_{it} \times RCA_{it} + \tau_t + \mu_i + \varepsilon_{it}$$

Where *Y*, *K*, *L* is output (measured as total sales), capital (measured as fixed asset), and labor (measured as number of workers) respectively.

IV. Empirical Results

In the following section, we begin investigating empirically the effect of outward FDI on productivity and also the role of comparative advantage. As with other policy variables, lags are expected between FDI and its impact on productivity in Home industries. Thus, we test for the effect of lagged values of FDI and its interaction with RCA as well as contemporaneous values. As for establishing empirical strategy, it consists of several steps. First, using the panel dataset and controlling year fixed effects, we examine whether the outward FDI has any impact on productivity. Second, by interaction of FDI and RCA dummy variables on whether RCA of an industry is above or below the median value of RCA of an industry, we examine whether the effect of FDI on productivity can vary depending on sectoral comparative advantage. Lastly, we employ system Generalized Method of Moments (GMM) for robustness check to confirm the results of the fixed effect model.

1. Comparative Advantage, Outward FDI and Productivity

In this section, we investigated the role of comparative advantage on the effect of FDI on productivity. The results are shown in Table 2. Columns (1) through (4) show the coefficient estimates obtained by regressing the natural log of FDI of an industry on TFP. The estimation results reported in columns (2) through (4) appear to be in accordance with our theoretical prediction. All four

coefficients on the effects of FDI are significantly positive. Columns (5) through (8) show that positive impact of FDI on industry productivity remains effective when the role of industry competitiveness in FDI-TFP linkage is examined. The coefficient of the effect of natural log of FDI, however, is statistically significant in lag one and two. The coefficient estimates in contemporaneous and lagged one and two variables show that FDI is positively related to productivity in those industries possessing comparative advantage.

Table 2. Comparative Advantage, Outward FDI and Productivity (Fixed Effect)

Dependent Variable: Total Factor Productivity								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnFDI(t)	0.02**				0.011			
	(0.009)				(0.01)			
lnFDI(t-1)		0.028***				0.022**		
		(0.009)				(0.01)		
lnFDI(t-2)			0.021*				0.015**	
			(0.012)				(0.007)	
lnFDI(t-3)				0.022*				0.017
				(0.011)				(0.012)
lnFDI* RCA(t)					0.009**			
					(0.004)			
lnFDI* RCA(t-1)						0.007*		
						(0.003)		
lnFDI* RCA(t-2)							0.006**	
							(0.003)	
lnFDI* RCA(t-3)								0.006
								(0.005)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
within	0.551	0.571	0.545	0.531	0.559	0.576	0.549	0.534
between	0.0004	0.004	0.002	0.004	0.012	0.0006	0.002	0.02
Overall	0.152	0.14	0.135	0.13	0.177	0.158	0.155	0.148
Observation	709	659	608	557	709	659	608	557

Notes: Heteroskedasticity robust standard errors are in parentheses. The standard errors are robust to clustering at the industry level. ***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively.

To confirm the existence of positive impact of FDI in competitive industries, we further examined how the dummy variable for whether the industry has comparative advantage above the median interacts with FDI in affecting sectoral output. Table 3 corresponds to the specification in which Cobb-Douglas production function is estimated controlling for input variables such as natural logs of capital and labor. Columns (1) through (4) show that industries with more MNE activities abroad are more likely to increase production. The positive impact of lagged outward FDI becomes statistically significant while it is not significant for the case of the contemporaneous variable. From column (5) to (8), we also find that the positive relationship between FDI and output takes place in comparative advantage industries. The result is largely similar when firm productivity is measured using TFP. The coefficient estimates reported in column (5) to (8) have the same signs as those in Table 2 and are larger in absolute value for lagged variables.

Our model implies that outward FDI in Korea is positively associated with industry productivity and this effect is mostly driven by industry competitiveness. Overall, this result is consistent with Bernard *et al.* (2007) in explaining access to foreign markets in the context of comparative advantage but diverges from their model in that the FDI not being included in their model.

2. Robustness Checks

To check for the robustness of the results shown in Tables 2 and 3, we further estimated the effect of FDI and the role of comparative advantage on productivity. To control for potential endogeneity problems, we implement the system GMM method suggested by Arellano and Bover (1995), and Blundell and Bond (1997), Blundell *et al.* (2000). The fixed effect model, by eliminating time invariant variables,

Table 3. Comparative Advantage, Outward FDI and Output (Fixed Effect)

Dependent Variable: Natural Log of Total Sales								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnCapital(t)	0.207***				0.201***			
	(0.048)				(0.04)			
lnCapital(t-1)		0.149*				0.134*		
		(0.075)				(0.072)		
lnCapital(t-2)			0.053				0.04	
			(0.101)				(0.099)	
lnCapital(t-3)				0.011				0.001
				(0.113)				(0.111)
lnLabor(t)	0.899***				0.889***			
	(0.088)				(0.089)			
lnLabor(t-1)		0.866***				0.849***		
		(0.101)				(0.104)		
lnLabor(t-2)			0.821***				0.801***	
			(0.12)				(0.132)	
lnLabor(t-3)				0.737***				0.724**
				(0.137)				(0.138)
lnFDI(t)	0.012				0.007			
	(0.008)				(0.008)			
lnFDI(t-1)		0.022**				0.011		
		(0.009)				(0.01)		
lnFDI(t-2)			0.038***				0.027**	
			(0.012)				(0.012)	
lnFDI(t-3)				0.033**				0.024*
				(0.012)				(0.013)
lnFDI* RCA(t)					0.006*			
					(0.003)			
lnFDI* RCA(t-1)						0.013***		
						(0.004)		
lnFDI* RCA(t-2)							0.013**	
							(0.005)	
lnFDI* RCA(t-3)								0.011**
								(0.005)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
within	0.915	0.825	0.735	0.675	0.916	0.83	0.742	0.68
between	0.909	0.894	0.85	0.839	0.91	0.894	0.859	0.839
Overall	0.87	0.838	0.781	0.74	0.872	0.84	0.783	0.741
Observation	709	654	601	548	709	654	601	548

Notes: Heteroskedasticity robust standard errors are in parentheses. The standard errors are robust to clustering at the industry level. ***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively.

can control for omitted variable bias. However, the dynamic panel bias remains (Nickell 1981; Bond 2002) as well as the endogeneity problem. The introduction of system GMM can alleviate this problem by resolving the endogeneity problem and produce a consistent estimator. To propose a system GMM, however, error terms should be independent and valid instruments should be chosen. Under the assumption of no correlation between first-differences and industry-specific effects, the basic methodology of system GMM is to combine both equations in first-differences, using the lagged level variables as instruments, with equations in levels with lagged first-differences as instruments. To check the validity of instrumental variables, specification tests are implemented. The first test is to examine whether there is a serial correlation between error terms in a first-differenced equation. By the nature of construction, the difference errors may be first-order serially correlated (Carkovic and Levine 2002) and negative first-order serial correlation is expected in differences. Thus to check for first-order serial correlation, we further look for second-order correlation in differences, based on the idea that this will detect correlation between the lagged error term in differenced error term and the error term lagged two periods in lagged differenced error term. Second test is the Hansen test, in which the null signified that there is no overidentifying restrictions problem.

Table 4 confirms the previous findings. The impact of outward FDI on productivity is positive for both measures; TFP and output, and this effect occurs in industries with comparative advantage. The p-values of both the Hansen test and AR(1)/AR(2) tests do not reject the validity of the model specification. This result is consistent with the main implication of our theoretical model, where industries with more multinational activities enjoy a higher level of productivity at home. It also supports our second theoretical prediction that the FDI boosts per-

formance of comparative advantage industries.

Table 4. Comparative Advantage, Outward FDI and Productivity (System GMM)

Dependent Variable:	TFP		Output	
	(1)	(2)	(3)	(4)
lnCapital			0.687***	0.676***
			(0.008)	(0.009)
lnLabor			0.204***	0.194***
			(0.009)	(0.013)
lnFDI	0.018***	0.002***	0.063**	0.053***
	(0.001)	(0.001)	(0.002)	(0.003)
lnFDI* RCA		0.014***		0.014***
		(0.0004)		(0.002)
Observation	709	709	709	709
AR(1) (p-value)	0.09	0.083	0.01	0.013
AR(2) (p-value)	0.977	0.839	0.794	0.848
Hansen (p-value)	0.295	0.338	0.523	0.548

Notes: Standard errors are in parentheses.***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively.

V. Conclusion

There seems to be a consensus on the argument that outward FDI has significant impact on activities in the home country, though the direction and magnitude of the impact vary across industries and countries over time. What is less known is the mechanism through which FDI affects productivity in domestic industries. In this paper, we develop a theoretical model in which industry competitiveness plays a role in outward FDI-home performance nexus and empirically test the model. We estimate a simple model for productivity and output using the fixed effect model as a benchmark model followed by system GMM estimation methods for sensitivity analysis. Our empirical findings suggest that Korean outward FDI is positively correlated with domestic productivity and this correlation is likely to occur in those sectors with competitiveness above the median, measured as export-based Revealed Comparative Advantage (RCA). This result may be attributed to the complementary relationship between Korea's outward FDI and exports. The theoretical analysis also shows that there are greater share of exports and outward FDI in a country's comparative advantage industry.

The empirical finding of the current paper that outward FDI tends to strengthen the economic performance of Korean industries is supported by existing empirical literature such as Desai *et al.* (2009), Hijzen *et al.* (2006), Fedrico and Minerva (2008), Blomstrom *et al.* (1997). Another finding of this paper that outward FDI positively affects domestic activities in sectors possessing comparative advantage is in line with extant theoretical literature. A recent theoretical prediction

has been put forwarded by Bernard *et al.* (2007) which is an extension of Melitz (2003), and has considered comparative advantage as well as firm heterogeneity as a source of improvements in aggregate productivity and labor reallocation in response to trade liberalization. Given the complementary relationship between trade and FDI, the result of this paper can be interpreted in the context of interplay between industry competitiveness and foreign expansions. Thus, we found that the empirical results were consistent with previous theoretical predictions as well as our analysis. Theoretically we analyze that firm self-selection into foreign markets would play an important role in determining how different the effects of increases in outward FDI on domestic productivity would be across industries.

While we highlighted the role of industry competence, host country characteristics can also be one of important factors that can explain the domestic effect of FDI. However, due to data constraints concerning information on destinations in our industry-level data, we could not consider the host country attribute as a determinant of the impact of outward FDI on the home economy. If firm, industry and country specific characteristics can be jointly explored in one model, a more thorough understanding on the relationship between FDI and domestic performances will become available, which is a question we leave to future research.

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국문요약

본 연구에서는 이론적 · 실증적 분석틀을 이용하여 해외직접투자의 국내 산업별 생산성에 대한 효과를 살펴보고, 산업별 비교우위의 여부에 의해 그 효과가 어떻게 달라지는지를 분석하고 있다. 이론 분석에서는 기업별 이질적 생산성(heterogeneous productivity)을 다루는 Melitz(2003) 모형을 기초로 산업별 비교우위의 특성을 고려한 Bernard, Redding and Schott(2007)와 해외직접투자를 고려한 Irarrazabal, Moxnes and Opromolla(2009)를 동시에 고려하여 본 연구의 주제에 맞게 모형을 확장시켰다. 이론분석 결과, 해외직접투자는 모국 산업의 생산성에 긍정적인 영향을 미치고, 이러한 영향은 비교우위가 있는 산업에서 더욱 현저하게 나타났다. 또한 이를 증명하기 위해 본 연구에서는 1992~2008년 동안 우리나라의 산업별 생산성, 수출, 해외직접투자 데이터를 이용하여 본 논문의 이론에 대한 실증분석을 하였다. 실증분석 기법으로는 주로 고정효과모형을 고려하였으며, 내생성 및 자기상관 문제를 해결하는 System GMM 추정기법을 이용하여 주요 실증분석의 결과를 뒷받침하였다. 실증분석 결과, 우리나라의 해외직접투자는 국내 생산성 증대에 긍정적인 영향을 미친 것으로 나타났고, 특히 현시적 비교우위지수(RCA: Revealed Comparative Advanage)가 높은 산업에서 그 효과가 더욱 현저하게 나타났다. 따라서 실증분석 결과는 앞서 살펴본 이론분석의 결과와 일치하였다.

핵심용어: 해외직접투자, 생산성, 비교우위

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저서 및 논문

"The Impact of Bilateral Free Trade Agreements on Bilateral Foreign Direct Investment among Developed Countries" (*The World Economy*, 2011)

"Trade Liberalization, Heterogeneous Firms and the Soft Budget Constraint" (공저, *Journal of Comparative Economics*, 2010) 외

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"Firm Heterogeneity in the Choice of Offshoring: Evidence from Korean Manufacturing Firms" (*Asian Economic Papers*, Vol. 9, No. 1, pp. 157-178, 2010)

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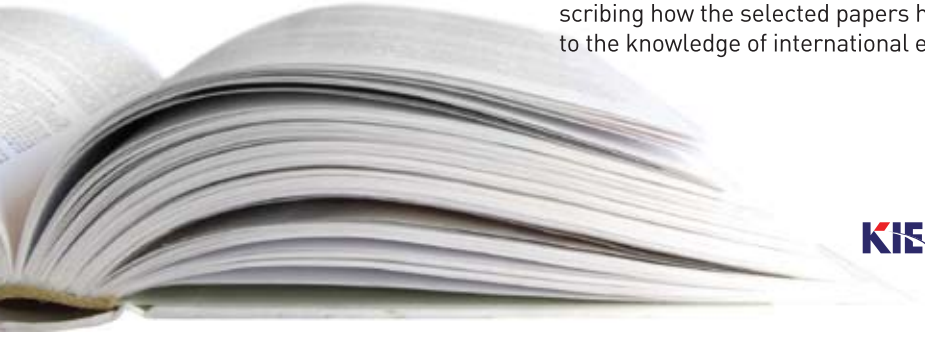

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Comparative Advantage, Outward Foreign Direct Investment and Average Industry Productivity: Theory and Evidence

Yong Joon Jang and Hea-Jung Hyun

In this paper, we explicitly address the role of comparative advantage in effects of outward FDI on domestic productivity, both theoretically and empirically. In the theoretical framework, we place Irarrazabal, Moxnes and Opromolla's (2009) outward FDI model into Bernard, Redding and Schott's (2007) framework of international trade with heterogeneous monopolistically competitive firms and comparative advantage; and show that ex ante high average industry productivity triggered by firm self-selection enhances ex post average industry productivity during the process of increase in FDI. Using Korean industry-level data from 1992 to 2008, we also empirically test our theoretical predictions using the fixed effect model as a benchmark model, followed by system GMM estimation methods for sensitivity analysis. Our empirical findings suggest that Korean outward FDI is positively correlated with domestic productivity and this link is likely to take place in those sectors above median competitiveness measured as export-based RCA (Revealed Comparative Advantage). Thus, we find that the empirical results were consistent with previous theoretical predictions as well as our analysis.

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