

Firm Heterogeneity and Location Choice: The Case of South Korean Manufacturing Multinationals^{*}

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Previous studies of location choice have focused on country-level data more than firm-level data and been more concerned with host countries' distinctive features than with firm heterogeneity. Therefore, they do not answer the question of who will go where in terms of location choice. To analyze the role of firm heterogeneity in determining location choice, we develop a theoretical model and analyze data on 3,644 Korean manufacturing multinationals operating in 87 countries between 1982 and 2006. The results of our conditional logit analysis indicate that not only host country characteristics but also firm heterogeneous factors such as productivity, labor intensity, and size have considerable influence on the decision of where to locate FDI.

Keywords: FDI, Firm Heterogeneity, Multinationals, Location Choice

JEL Classification: F1, F2, R2

I. Introduction

The International Labor Organization (ILO) defines a multinational corporation (MNC) as a firm whose management headquarters are in its home country but whose affiliates operate in other countries. According to the United Nations

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Conference on Trade and Development (UNCTAD, 2010) MNCs generated approximately 16 trillion dollars in value added, accounting for more than a quarter of global GDP, and their foreign affiliates accounted for more than one tenth of global GDP and one third of global exports. Thus, it is clear that MNCs constitute a large proportion of the world economy.

With the increasing importance of MNCs' activities, there has been growing interest in what determines the location choice of Foreign Direct Investment (FDI). However, previous studies of location choice have focused on country-level rather than firm-level data, and been concerned more with host countries' characteristics than with firm heterogeneity. In other words, previous studies do not cover the question of which firms will go where in terms of location choice.

What is the purpose of FDI? Dunning (1993) suggested that firms engage in FDI to exploit resources (resource seeking), to open up new markets (market seeking), to employ cheaper or more skilled labor (efficiency seeking), and to obtain secure resources (strategy asset seeking). Accordingly, previous studies have considered market access, market size, labor cost, infrastructure, government policies, the agglomeration effect, and market potential as the determinants of location choice. That is, many such studies have considered the characteristics of the host country as the important determinants of FDI location choice.

Chen (1996) used data on Taiwanese MNCs operating in China and revealed that market size, the scale of taxation, and the length of railroads have a positive effect on location choice, whereas the wage level has a negative effect. Alegria (2006) showed that market demand, wage, and the degree of agglomeration of countries and regions are important determinants of location choice within the European Union. According to Priede (2010) market opportunities, labor quality/availability, real estate prices, and infrastructure are the key determinants. With regard to South Korean MNCs, Kang and Lee (2007) drew the conclusion that market size, government policies, labor quality, and transportation infrastructure have a positive effect, whereas wage and distance have a negative effect on location choice.

Previous studies have generally asserted that a host country's characteristics play an important role in MNCs' FDI location choices. However, intuition predicts that not only the distinctive features of the host country, but also of the MNC itself could be determinants of location choice. Melitz (2003) considered firm heterogeneity as a decisive factor in FDI location decisions and verified the importance of firm heterogeneity to entrance into foreign markets.

Furthermore, Helpman, Melitz, and Yeaple (2004) indicated that whether firms become MNCs is dependent on their productivity. That is, the least productive firms tend to remain in the domestic market, while relatively more productive ones export, and the most productive ones choose to make FDI. Tomiura (2007) used data on Japanese MNCs, and found that firms engaging in FDI are both larger and more productive than export-only ones. Aw and Lee (2008), considering Taiwanese MNCs' location choices, revealed that the most productive firms enter into tougher foreign markets, i.e. those with small size, high wages, long distances to travel, and poor institutions. Yeaple (2009) emphasized the importance of firm heterogeneity in determining an MNC's activities and argued that the more productive a U.S. firm is, the more likely it is to invest in many countries. Chen and Moore (2010) found that more productive French corporations tend to invest in less attractive countries. They also suggested that countries with relatively tough markets have higher cutoff productivities and attract more productive MNCs. These studies verify that whether a firm engages in FDI or not depends on the firm's productivity.

Hong (2009) suggested that both the host country's characteristics and firm heterogeneity have an important role in determining location choice. He analyzed data on 2,565 cases of FDI in the manufacturing industry that have flowed into China; he considered labor intensity, sales, and the quality of manpower as the heterogeneous characteristics of the firm that affect location choice. His results revealed that the higher the labor intensity of a firm, the stronger the impact of a country's wage level is. In addition, firms that are small in size and have low labor quality tend to invest in highly agglomerated countries. However, this study is limited as it did not consider firms' productivities, a key determinant of FDI location choice, and one which previous studies have mentioned consistently.

Similar to Hong (2009), Hur and Hyun (2011) considered the attributes of host countries as well as of firms. They analyzed data on South Korean firms and showed that firm heterogeneity plays a key role in determining FDI and location choice. By using the parent firm's total factor productivity and size as the characteristics of firm heterogeneity, this paper also found that more productive firms are more likely to advance into countries with small markets, high wages, low accessibility, and political instability. However, this paper only used a simple analysis with an interaction term, without deriving a specific model.

As the two studies mentioned above have done, this study considers both

host countries' characteristics and firm heterogeneity. To overcome the limitations of previous studies, we use productivity, size, and labor intensity as the firm heterogeneous factors. Many studies (Melitz, 2003; Helpman et al., 2004; Head and Ries, 2003; Aw and Lee, 2008; Yeaple, 2009; Chen and Moore, 2010) have used firms' productivities, and have established this factor hugely influences location choices. We consider firm size as another factor of firm heterogeneity because of *Chaebol* groups, a unique style of firm in South Korea; it seems to us that there must be some differences in the location choices of *Chaebol* firms and small/medium-sized firms. In other words, firm size will influence the FDI location choice. Shaver and Flyer (2000), Hong (2009), and Hur and Hyun (2011) also considered firm size as a determinant. The results of Shaver and Flyer (2000) and Hong (2009) indicate that smaller firms are more likely to enter countries that are highly agglomerated. In addition, as a middle-income country, Korea has a wide range of firms engaging in FDI, including labor-intensive industries, such as footwear, as well as capital-intensive ones, such as the semiconductor industry. Therefore, the importance of a host country's wage level may vary according to firms' labor intensity. That is, a country's wage level represents a higher cost burden for labor-intensive firms than for capital-intensive ones. Consequently, labor-intensive firms are more likely to invest in low wage countries, and labor intensity is expected to be an important determinant of location choice.

In this study, we develop a theoretical model that considers firm heterogeneity as well as host countries' attributes as affecting FDI location choice. In addition, using firm-level data, we analyze 3,644 Korean manufacturing multinationals operating in 87 countries between 1982 and 2006. In agreement with the findings of previous studies, we show that large markets, a well-established infrastructure, a high degree of agglomeration, and political stability have positive effects on location choice, whereas high wages and rental costs have negative effects. This study also confirms three conclusions with regard to firm heterogeneity: Firstly, more productive firms are less likely to invest in low wage countries. Secondly, labor-intensive firms do tend to enter low wage economies. Lastly, small firms are likely to establish their affiliates in highly agglomerated countries. Therefore, firm heterogeneity can influence firms' FDI location choice.

The rest of this paper is organized as follows: Section 2 proposes a theoretical model that has been developed from an existing model. Section 3 specifies the data and defines the explanatory variables and Section 4 presents the estimation results. Section 5 concludes the paper.

II. Model

This section will present a model, which has modified the model by Head *et al* (1999) and Hong(2009), on deciding firm heterogeneity as well as host country attributes when firm chooses the FDI location. First, we assume that all the consumers across countries have the same CES utility function as the following:

$$U = \left(\sum_{i=1}^n q_i^\alpha \right)^{\frac{1}{\alpha}}, \quad 0 < \alpha < 1 \tag{1}$$

Given this utility function, the demand function for product i in a particular country j is driven as

$$D(p) = q_{ij} = y_j^{\eta_y} p_{ij}^{-\sigma}, \quad \text{where } \sigma = \frac{1}{1-\alpha} > 1, \tag{2}$$

where, y_j is the income level of country j ; η_y is the income elasticity of demand; p_{ij} is the price of product i in a particular country j ; and σ is the price elasticity. The optimal pricing rule of firm under CES utility function is known as $p_{ij} = \frac{\sigma}{\sigma-1} c_{ij} = \frac{c_{ij}}{\alpha}$, that is, profit maximizing FDI firms select a price by considering a markup of $\frac{1}{\alpha}$ over a marginal cost(i.e., c_{ij}). Thus we obtain the profit function for product i in country j as the following

$$\pi_{ij} = (p_{ij} - c_{ij})q_{ij} = (p_{ij} - c_{ij})y_j^{\eta_y} p_{ij}^{-\sigma} = (1 - \alpha)y_j^{\eta_y} \left(\frac{c_{ij}}{\alpha}\right)^{1-\sigma} \tag{3}$$

In Equation (3), the marginal cost, c_{ij} , is determined by wage, rental cost, infrastructure, agglomeration, political stability and distance from headquarter. In particular, as either wage or rental cost arises, the cost increases but as infrastructure, agglomeration and political stability become stronger, it decreases. Hence, the cost function is given as

$$c_{ij} = w_j^{\alpha_w} r_j^{\alpha_r} I_j^{-\alpha_I} A_j^{-\alpha_A} P_j^{-\alpha_P} D_j^{\alpha_D} \tag{4}$$

where w_j , r_j , I_j , A_j , P_j and D_j represent the levels of wage, rental cost, infrastructure, agglomeration, political stability and distance from Korea to country j , respectively. And all subscripts, denoted by α_i represent associated elasticity coefficients. For instance, α_r represents rental cost elasticity and α_w does the wage elasticity of marginal cost and so on for the remainder α_i . By substituting Equation (4) into (3) and then converting this into the log form, we can obtain two types of profit function expressions respectively.

$$\begin{aligned}\pi_{ij} &= (1 - \alpha)y_j^{\eta_y} \left(\frac{w_j^{\alpha_w} r_j^{\alpha_r} I_j^{-\alpha_I} A_j^{-\alpha_A} P_j^{-\alpha_P} D_j^{\alpha_D}}{\alpha} \right)^{1 - \sigma} \\ \pi_{ij} &= (1 - \alpha)y_j^{\eta_y} \left(\frac{w_j^{\alpha_w} r_j^{\alpha_r} I_j^{-\alpha_I} A_j^{-\alpha_A} P_j^{-\alpha_P} D_j^{\alpha_D}}{\alpha} \right)^{1 - \sigma}\end{aligned}\quad (5)$$

$$\begin{aligned}\ln \pi_{ij} &= \ln(1 - \alpha) + (\sigma - 1)\ln \alpha + \eta_y \ln y_j - (\sigma - 1)\alpha_w \ln w_j - (\sigma - 1)\alpha_r \ln r_j \\ &\quad + (\sigma - 1)\alpha_I \ln I_j + (\sigma - 1)\alpha_A \ln A_j + (\sigma - 1)\alpha_P \ln P_j - (\sigma - 1)\alpha_D \ln D_j + e_\pi\end{aligned}\quad (6)$$

, where, $\sigma - 1$ is positive according to equation (2) and all the elasticity terms have positive value.

It is nature to relate α_A and α_w to specific characteristics of firm or country where the firm locates. First, for α_A , Shaver and Flyer (2000) find that smaller firm receives greater benefit from agglomeration. It suggests that α_A is negatively related to firm size. As such consequence, according to the finding of Shaver and Flyer (2000) and Hong(2009) built the following equation:

$$\alpha_A = a_A - b_A \ln FS_i + e_A \quad (7)$$

, where e_A is an unmeasured error in the estimate of α_A .

Second, the wage elasticity of cost, α_w , is also related to the firm's heterogeneous factors, which are the productivity and labor intensity of the firm producing product i in country j . Several existing researches (Aw and Lee, 2008; Yeaple, 2009; Chen and Moore, 2010; Hur and Hyun, 2011) has shown that more productive firms tend to enter into less attractive countries with smaller market size and higher labor costs. This implies that more productive firms have smaller

cost increase (α_w) when wage arises compared to less productive ones, and thus, can earn higher profit even in nations with higher wages relatively to less productive firms. Hence, there is a negative relationship between α_w and productivity of firms. On the contrary, Hong (2009) finds that firm's labor intensity is positively related to α_w . It means that as wage increases, labor intensive firms face cost burden more than capital intensive ones. Consequently, Hong (2009) introduces the following term, $-c_w \ln LI_i$, in equation (8) considering the positive relationship between a_w and the labor intensity of firm. In the same line, now we introduce the negative relationship between α_w and productivity by adding $-b_w Prod_i$ into the same equation.

$$\alpha_w = a_w - b_w Prod_i + c_w \ln LI_i + e_w \tag{8}$$

, where FS , $Prod$ and LI denote firm size, productivity and labor intensity, respectively. Substituting Equation (7) and (8) into (6) gives

$$\begin{aligned} \ln \pi_{ij} = & \beta_c + \eta_y \ln y_j - \beta_w \ln w_j + \beta'_w \ln w_j \times Prod_i \\ & - \beta''_w \ln w_j \times \ln LI_i - \beta_r \ln r_j + \beta_I \ln I_j + \beta_A \ln A_j - \beta'_A \ln A_j \times \ln FS_i \\ & + \beta_P \ln P_i - \beta_D \ln D_i + \mu_{ij} \end{aligned} \tag{9}$$

, where β_i is a function of a_w , b_w , c_w , a_A , b_A , and η_p has positive value, while μ_{ij} is determined by e_w , e_A and e_π .

Key findings in this section are that firm's productivity, wage level in each country, labor intensity and firm size are related in cross-product way. Equation (9) indicates that not only the host country's characteristics but also the interaction term between country and firm characteristics can influence the FDI firm's location choice. That is, the negative sign of β_w and β_r suggest that firm is less likely to choose a country with higher wage and higher rental cost. However, the positive sign of β'_w , opposite to the sign of β_w , indicates that more productive firm is likely to invest in a country with high wage. Similarly, the negative sign of β''_w shows that more labor-intensive firm tends to choose high wage country less. The positive sign of β_A suggests that highly agglomerated country contributes positively to FDI firm. Meanwhile the negative sign of β'_A , the estimate on the product term of log agglomeration and firm size, implies that as firm gets smaller, it receives greater benefit from investing in highly agglomerated countries. Consequently, by using the proposed model, we can

verify that not only host country attributes but also the firm's heterogeneity determines FDI location choice.

To analyze the above model, we use a conditional logit model. The dependent variable takes a value of 1 if firm i entered country j and 0 otherwise. In this paper, we assume that each firm chooses the country where it can maximize its profits among the available candidates. In addition, if the error term is independently and identically distributed according to Weibull density function, the probability p_{ij} of firm i choosing country j is given as follows (McFadden, 1974).

$$p_{ij} = \frac{\exp(\pi_{ij})}{\sum_{j=1}^J \exp(\pi_{ij})} \quad (10)$$

III. Data and Variables

This paper is based on data on Korean manufacturing firms collected from Korea Eximbank, which records the current state of FDI by Korean firms in relative detail, including the name of the firm, the country and industry being entered, the year of entry, and the amount invested. Financial statements and firms' balance sheets, including data such as the number of employees, sales, fixed assets, the cost of selling, and maintenance costs, are gathered from KISVALUE.

Based on the combined data, this paper analyzes 3,644 cases of FDI across 87 countries between 1982 and 2006. As shown in Table 1, 2,900 cases (about 79 percent) of Korean manufacturing FDI are within Asia. It seems that due to manufacturing firms' characteristics, their FDI is concentrated in Asian countries where there is abundant cheap labor. Meanwhile, 9 percent of FDI is made in North America, Europe receives 6.3 percent, and Central-South America 2.5 percent. In terms of host countries, FDI is overwhelmingly concentrated in China, with 1,949 cases (59.4 percent) located there. The other main recipients of Korean FDI have been the United States, with 348 cases (9.5 percent), Vietnam, with 191 cases (5.24 percent), and Indonesia, with 150 cases (4.1 percent).

The explanatory variables in the proposed model, which are the proposed determinants of FDI location choice, are a combination of host countries' attributes and firms' characteristics. The definitions and descriptions of the

explanatory variables are shown in Table 2. The explanatory variables comprise features of the host country (such as GDP, GDP per capita, the real interest rate, population density, infrastructure, political stability, and distance from Korea) and interaction terms between the host country and the firms' characteristics.

Among the attributes of host countries, the market size ($\ln y$) variable has considerable influence on FDI location choice. With regard to revenue, market size is an important factor to consider in location choice, as firms can earn higher profits in larger markets. Previous research (Friedman et al., 1992; Zhang, 2001; Basile, Zanfei and Castellani, 2003; Blonigen et al., 2004; Head and Mayer, 2004; Alegria, 2006; Kang and Lee, 2007; Hong, 2009; Hur and Hyun, 2011) has proven that a larger market has a positive effect on location choice. This paper uses GDP as the factor representing market size.

Concerning costs, the wage level and rental costs within a host country are also significant factors in determining FDI decisions. Manufacturing firms generally have to use labor, land, buildings, and equipment from the host country, and thus, wages and rental costs will have a strong influence on location choice. Previous research (Coughlin et al., 1991; Chen, 1996; Head et al., 1999; Cheng and Kwan, 2000; Zhang, 2001; Head and Mayer, 2004; Alegria, 2006; Kang and Lee, 2007; Hong, 2009; Hur and Hyun, 2011) used GDP per capita to demonstrate the negative relationship between high wages and FDI location choices. We use the host country's GDP per capita and real interest rate to represent the wage and rental cost, respectively.

In addition, the level of agglomeration can influence the location decision. Previous studies (Head et al., 1995; Zhang, 2001; Basile, Zanfei and Castellani,

Table 1. Distribution of the FDI of Korean Manufacturing Firms by Continent

Year/Continent	Oceania	North America	Asia	Africa	Europe	Central-South Africa	Middle East	Total (ratio)
1982~1990	2	18	78	3	12	12	1	126 (3.45)
1991~1999	13	114	809	9	77	32	4	1058 (29.03)
2000~2006	15	227	2013	5	143	48	9	2460 (67.50)
Total (Ratio)	30 (0.82)	359 (9.85)	2900 (79.58)	17 (0.46)	232 (6.36)	92 (2.52)	14 (0.38)	3644 (100)

2003; Head and Mayer, 2004; Alegria, 2006; Hong, 2009) have found a positive relationship between high agglomeration and location choice. In particular, using data on the investments of the Japanese manufacturing industry, Head, Ries, and Swenson (1995) concluded that the benefit from agglomeration, generated by industries in the same field gathering in the same area, is the key factor in location choice. Furthermore, Hong (2009) considered population density and proved that high population density has a positive effect on location choice. Following Hong (2009), this paper uses population densities.¹ Population densities are calculated by dividing the total population of a country by its surface area. Our population data were gathered from the Penn World Table and the data on countries' surface areas are from the World Bank Database.

With good infrastructure, the costs of transporting products and operating a firm can be reduced. Hence, the infrastructure of a host country is a significant determinant of the location chosen for FDI. Much research (Zhang, 2001; Basile, Zanfei and Castellani, 2003; Alegria, 2006; Kang and Lee, 2007; Hong, 2009; Hur and Hyun, 2011) argues that good infrastructure is a contributory factor in determining the selection of an FDI location. In our research, we take the number of internet users in a host country and the transportation density (railway + road / surface area) as indicators of the level of infrastructure, using data

Table 2. Definitions and Descriptions of Explanatory Variables

Explanatory Variables	Definition	Mean	
Market Size (lny)	ln(GDP)	24.016	
Wage (lnw)	ln(GDP per capita)	8.048	
Rental Cost(lnr)	Real interest rate	6.324	
Agglomeration (lnA)	ln(Population density)	4.228	
Infrastructure (lnI)	ln(Internet users)	12.668	
	ln(Road+Rail density)	5.908	
Political Stability (lnp)	ln(ICRG)	4.219	
Distance from Koran(lnD)	ln(Distance)	8.975	
interaction term	lnw*Prod	lnw*TFP	-0.814
	lnw*lnLI	lnw*ln(Labor intensity)	-87.401
	lnA*lnFS	lnA*ln(Firm size)	96.888

¹ We also used FDI stock and number of firms in each country to proxy for agglomeration effects, and we found that the results are very similar.

from the World Bank Database.

Lastly, political stability and the distance from Korea are crucial factors influencing location choice. This is because firms will likely avoid entering countries that are politically unstable, severely corrupt, or lacking well-established law and order. Furthermore, they may hesitate to make FDI far from Korea. This study uses CEPII data for the distances, and takes the ICRG index from the PRS group as measuring political stability. The ICRG index gives a score from 0 to 100 for 12 components of political stability, such as government stability, domestic and foreign conflicts, and law and order, etc.; a higher score indicates greater political stability.

As the factors of firm heterogeneity, which influence FDI location choice, we consider TFP, labor intensity, and the size of the parent firm. For the productivity variable, we obtain the residuals from the regression of Y (sales) on K (fixed assets) and L (number of employees) and take these as the total factor productivity, using data from balance sheets and financial statements. As an indicator of whether a firm is capital intensive or labor intensive, we consider the number of employees per one U.S. dollar of fixed assets (L/K) as the labor intensity. Lastly, we use Y (sales) as representing firm size.

IV. Analysis Results

Table 3 shows the estimation results of four models. Model 1 included only the characteristics of the host countries, and excluded the interaction term. The results from model 1 are consistent with the previous studies that considered country characteristics as the sole determinants of FDI location choice. The positive coefficient of market size ($\ln y$) indicates that countries with large GDP are more likely to attract FDI, and the negative coefficients of wage ($\ln w$) and rental cost ($\ln r$) signify that firms have a lower probability of investing in a country with higher wages and rental costs. These results are consistent with those of previous research (Head et al., 1995; Head and Mayer, 2004; Kang and Lee, 2007; Hong, 2009; Hur and Hyun, 2011). The results regarding infrastructure ($\ln I$), agglomeration ($\ln A$), political stability ($\ln p$), and distance ($\ln d$) are consistent with the model mentioned in Section 2 and the findings of previous studies. This indicates that firms tend to invest in countries with good infrastructure, that are part of a strong agglomeration, that have stable political circumstances, and that are geographically close to Korea. However, the coefficient of transportation density is negative, which is inconsistent with

the findings of previous research.

We added interaction terms in models 2, 3, and 4. Because the interaction terms indicated that FDI location choices are determined not only by host country characteristics but also by firm heterogeneity, it can be argued that the meaning of the sign of the interaction term is at the core of this paper. In model 4, the positive coefficient of $\ln w \times TFP$ corresponds to the sign we predicted from the derived model. This supports the assumption that more productive firms experience smaller cost changes when wages change, it is also consistent with the findings of previous studies that more productive firms are more likely to invest in high wage countries (Aw and Lee, 2008; Yeaple, 2009; Chen and Moore, 2010; Hur and Hyun, 2011). Similarly, the negative coefficient of

Table 3. Estimation Results of Conditional Logit Models

Variables	Model 1	Model 2	Model 3	Model 4
$\ln y$	0.764*** (0.032)	0.756*** (0.032)	0.751*** (0.032)	0.754*** (0.032)
$\ln w$	-1.215*** (0.041)	-1.200*** (0.042)	-1.745*** (0.152)	-1.691*** (0.153)
$\ln r$	-0.013*** (0.004)	-0.015*** (0.004)	-0.015*** (0.004)	-0.015*** (0.004)
$\ln A$	0.101* (0.054)	0.114** (0.055)	0.115** (0.055)	0.631*** (0.025)
$\ln I$ (Internet users)	0.304*** (0.024)	0.314*** (0.025)	0.319*** (0.025)	0.315*** (0.025)
$\ln I$ (Transportation density)	-0.378*** (0.053)	-0.390*** (0.054)	-0.391*** (0.054)	-0.397*** (0.054)
$\ln P$	6.532*** (0.383)	6.500*** (0.392)	6.547*** (0.394)	6.536*** (0.393)
$\ln D$	-0.510*** (0.038)	-0.496*** (0.039)	-0.493*** (0.039)	-0.493*** (0.039)
$\ln w * TFP$		0.034*** (0.010)	0.032*** (0.010)	0.023** (0.011)
$\ln w * \ln I$			-0.050*** (0.013)	-0.045** (0.013)
$\ln A * \ln FS$				-0.032*** (0.011)

Note: standard error in parentheses, *** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent

$\ln w \times \ln LI$ shows that the more labor intensive a firm is, the more likely it is to enter a low wage country. This result is in accordance with Hong's (2009) result that the negative impact of labor costs is greater when labor intensity is higher.

In addition, the negative coefficient of $\ln A * \ln FS$, as was assumed in equation (7), corresponds to the studies by Shaver and Flyer (2000) and Hong (2009), which argue that small firms gain more benefit from agglomeration. In other

Table 4. Estimation Results of Conditional Logit Models

Variables	Model 5	Model 6	Model 7
$\ln y$	0.750*** (0.033)	0.740*** (0.038)	0.750*** (0.033)
$\ln w$	-1.867*** (0.182)	-1.763*** (0.193)	-1.867*** (0.182)
$\ln r$	-0.015*** (0.004)	-0.018*** (0.005)	-0.015*** (0.004)
$\ln A$	0.684*** (0.181)	0.694*** (0.212)	0.684*** (0.181)
$\ln I$ (Internet users)	0.320*** (0.025)	0.337*** (0.029)	0.320*** (0.025)
$\ln I$ (Transportation density)	-0.397*** (0.054)	-0.416*** (0.063)	-0.397*** (0.054)
$\ln P$	6.517*** (0.393)	6.522*** (0.451)	6.517*** (0.393)
$\ln D$	-0.493*** (0.039)	-0.506*** (0.045)	-0.493*** (0.039)
$\ln w * \ln LI$	-0.051*** (0.014)	-0.019 (0.016)	-0.045*** (0.013)
$\ln A * \ln FS$	-0.035*** (0.010)	-0.035*** (0.012)	-0.035*** (0.010)
$\ln w * \text{ATFP}$	0.017* (0.010)		
$\ln w * \text{Value added}$		0.035*** (0.011)	
$\ln w * \text{Labor productivity}$			0.017* (0.010)

Note: standard error in parentheses, *** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent

words, the smaller the firm, the higher the probability of it entering a highly agglomerated country. Thus, from the results of model 4, it can be confirmed that a firm's features such as productivity, labor intensity, and firm size, as well as the host country's attributes, influence the decision regarding FDI location.

To check the robustness of our results, in model 5, instead of TFP, we use the approximate TFP, $\ln \frac{Y}{L} - \frac{1}{3} \ln \frac{K}{L}$, which Head and Ries (2003) and Tomiura (2007) used as a substitute variable for productivity. Additionally, we use values for value added and labor productivity instead of TFP in models 6 and 7, respectively. The results with $\ln w \times ATFP$, $\ln w \times \ln VA$, and $\ln w \times \ln LP$ also have the same positive sign as $\ln w \times TFP$. As various alternative variables for the firm's productivity also have the same positive coefficient, this reaffirms that productivity is an important determinant of FDI location choice.

V. Conclusion

Based on a theoretical model and firm-level data, this paper finds that host country characteristics and firm heterogeneity influence the choice of FDI location in the Korean manufacturing sector. It has been confirmed that the probability of FDI increases when a country has a large market, good infrastructure, is part of a large agglomeration, has stable politics, and is close in distance to Korea, whereas it decreases with high wages and rental costs. In addition, more productive firms are more likely to invest in high wage countries, while labor-intensive firms tend to enter low wage countries. Moreover, estimation results show that smaller firms tend to prefer countries with high agglomeration.

Therefore, this paper reveals that firms' characteristics also influence FDI location choices. In other words, because of firm heterogeneity, firms make different choices for their FDI locations.

In future research, conditional logit estimation should be developed further. We assume that countries are independent from one another, but this assumption is invalid in reality. Therefore, we believe that research on the robustness check to alleviate IIA should be added in future studies.

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