

FDI Externalities and the Response of the Korean Stock Market*

Sung Jin Kang** · Hongshik Lee*** · Joonhyung Lee****

This paper addresses foreign direct investment (FDI) externalities using capital market data of Korean stock exchange and examines the effects of FDI in both manufacturing and service sectors. The empirical findings in this paper are generally consistent with previous findings based on the traditional productivity measure from Cobb-Douglas production function: 1) the market value of listed stocks in the manufacturing sector responds to the Horizontal (intra-industry) effects in a positive way, and 2) the market value of listed stocks in the manufacturing sector benefits from foreign invested downstream manufacturing firms, which is often called backward linkages (i.e. supplying manufacturing goods to foreign invested firms generates positive externalities to domestic manufacturing suppliers. The new finding of this paper is that the market value of listed stocks in the manufacturing sector benefits from foreign invested service firms through forward linkages (i.e. service from foreign invested firms generates positive externalities to domestic manufacturing firms).

JEL Classification: F21, F23

Keywords: FDI Externalities, Multinationals, Technology Spillover

I. Introduction

This paper investigates the response of the stock market to foreign direct investment (FDI). Figure 1 gives a glance of the relationship between inward FDI into Korea and Korean stock index (KOSPI). In fact, FDI into service moves differently from FDI into manufacturing and it is relatively closely linked to KOSPI. In this paper, we distinguish FDI into service from FDI into manufacturing and

Received: Aug. 31, 2012. Revised: Dec. 11, 2012. Accepted: Dec. 28, 2012.

* We thank seminar participants in Korea University and in the annual meeting of Korea Economic Association. This work was supported by National Research Foundation of Korea- Grant funded by the Korean Government (NRF-2010-330-B00081).

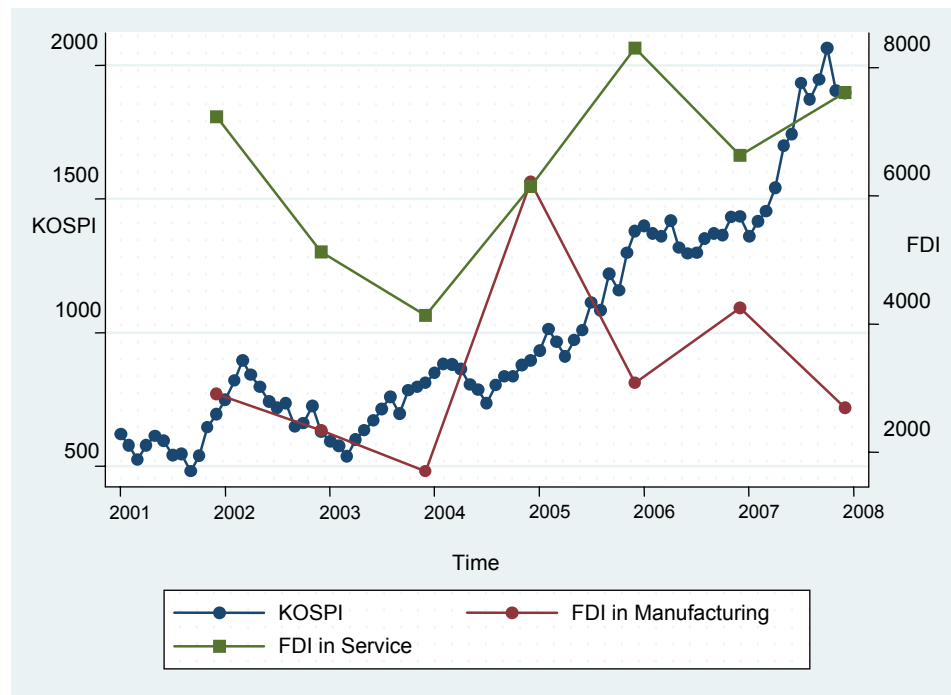
** Department of Economics, Korea University, E-mail: sjkang@korea.ac.kr

*** Corresponding Author: Department of Economics, Korea University, Anam-dong, Seongbuk-gu, Seoul 136-701, Korea, E-mail: honglee@korea.ac.kr, Tel: 82-2-3290-2224, Fax: 82-2-3290-2200.

**** Department of Economics, University of Memphis, E-mail: jlee17@memphis.edu

study whether the FDI into service matters for the market value of listed stocks in the manufacturing sector through the forward and backward linkages. Similarly, whether or not FDI into manufacturing matters for the market value of listed stocks in the service sector is examined. We also investigate the own sector effects, which is often called Horizontal effects.

[Figure 1] Korean Stock Index (KOSPI) vs. FDI



Source: Ministry of Knowledge Economy in Korea. The Y axis on the right side is in million dollars.

With the rapid expansion of multinational enterprises (MNEs) and foreign direct investment (FDI) in the global economy, the effect of FDI on the host economy has been of great interest and has remained a contentious issue. Theoretical studies on FDI posit that FDI has positive effects on a firm's performance not merely because it is a source of capital but also because it is an important source of externalities. The empirical studies studying the effect on output or productivity have not been able to provide a definite conclusion, however, as results vary depending on the samples and econometric methodologies.¹ At the same time, these mixed empirical findings have invoked another contentious issue with respect to whether the host

¹ See Navaretti and Venables (2004) and Görg and Greenway (2004) for surveys of spillover channels and empirical findings.

government's provision of favorable benefits to induce foreign direct investment is justifiable.

However, most empirical analyses have been limited in the sense that they have used only manufacturing samples. It is certainly worth empirically investigating the effect of FDI on manufacturing. However, after Rodriguez-Clare (1996), Javorcik (2004), and Rodriguez-Clare and Alfaro (2004) found the effects more general and reasonable in the vertical (inter-industry) direction, it may be problematic if analyses are still limited to manufacturing. It is simply because manufacturing and service are closely interrelated. In the globalization era, many manufacturing oriented firms offshore service units and many service oriented firms offshore manufacturing units. For example, Apple offshores almost all manufacturing units for iPhone and iPad and it focuses on R&D and marketing.² Moreover, considering that the world share of FDI into service is more than 65% (UNCTAD 2005) of total FDI, an analysis that ignores service may be misleading. Likewise, in the case of South Korea, which is the focus of this study, FDI into service is more than that of manufacturing (FDI into service is approximately 60%) as Table 1 shows. Therefore, this paper includes service as well as manufacturing and investigates the effects of FDI both horizontally (intra-industry) and vertically (inter-industry). In so doing, we give particular attentions to whether FDI into service influences manufacturing and whether FDI into manufacturing influences service.

[Table 1] FDI by Industry

Year	Manufacturing		Service		Other	
	Million \$	%	Million \$	%	Million \$	%
2001	2,911	26	7,231	64	1,158	10
2002	2,337	26	5,124	56	1,634	18
2003	1,699	26	4,132	64	639	10
2004	6,217	49	6,145	48	438	3
2005	3,078	27	8,301	72	221	2
2006	4,253	38	6,626	59	321	3
2007	2,692	26	7,612	72	195	2

Source: Ministry of Knowledge Economy in Korea.

As mentioned, empirical findings have contradicted with one another to date. Among many empirical studies that focused on the horizontal direction, Aitken and Harrison (1999) found that FDI negatively affects the productivity of domestically-owned plants in Venezuela, while Haskel, Pereira, and Slaughter (2007) and Görg and Strobl (2002) found positive spillovers from foreign to local firms in the U.K. and in Ireland, respectively.³ With these mixed results on the effects within the same

² See The Economist January 21st edition.

³ There are many studies based on aggregate country or industry level. Since aggregate level studies

industry, the next generation of empirical works investigated linkage effects across industries. They argued that multinationals would like to prevent information leakage to potential local competitors, but would benefit from knowledge spillovers to their local suppliers. This means that externalities from FDI will manifest themselves through forward or backward linkages; that is, contacts between domestic suppliers of intermediate inputs and their multinational clients in downstream sectors (backward linkage) or between foreign suppliers of intermediate inputs and their domestic clients in upstream sectors (forward linkage). Evidence for the existence of this type of linkage effects between MNEs and local firms has been found in prior researches: Javorcik (2004) in Lithuania, Rodriguez-Clare and Alfaro (2004) in Venezuela, Chile, and Brazil, Blalock and Gertler (2008) in Indonesia, and Lileeva (2010) in Canada. Further, Alfaro et al. (2007) explored the effects of financial markets on linkages and claimed that the development of local financial markets plays a key role in enabling FDI to promote growth.

As indicated, however, most empirical studies have focused on manufacturing. The biggest challenge in including service is the difficulty of measuring a firm's performance; that is, it is difficult to find a standard performance index that can be applied not only to manufacturing but also to service. While output, labor productivity, or total factor productivity (TFP) have been generally used for manufacturing in previous studies, applying the same indices for service would be inappropriate because firms' decisions on production or production factors can be quite different between manufacturing and service. Although we can forcibly use output, labor productivity, or total factor productivity, the following problems emerge. There would exist long and uncertain lags for FDI externalities to be realized by domestic firms and these lags would be different between manufacturing and service. Also, it is well known that, when using firm level data to estimate production function, the coefficient of production function can be different depending on the assumptions about the timing of inputs and the nature of input usages and that timing may be also quite different between manufacturing and service.

For this reason, this study uses a firm's market value, whose stock is listed in the capital market, as the firm's performance. Why might the market value of firms be a useful measurement of the effect of FDI? In this paper, we assume that a firm is composed of various assets, that FDI externalities are one of intangible assets, and that the firm is priced in the capital market as various assets are evaluated as a bundle. This implies that, as the private economic "value" of a good is reflected in the price at which it is traded in the marketplace, the price embodying all the tastes that consumers have for any particular asset or the technology to make that asset is

have some econometric issues as Hale and Long (2007) pointed out and our study is based on firm level panel data, those papers are not discussed here.

reflected in the capital market.

Many studies in industrial organization have used the market value as a firm's performance. After the pioneering work by Griliches (1981), economists have attempted to measure the private returns of innovation using market values of firms whose shares were publicly traded in the capital market based on the assumption that innovation is a sort of intangible asset. Jaffe (1986), Cockburn and Griliches (1988), and Hall (1993) studied innovation using market value. Also, Hall and Hall (1993) studied the relationship between market value and performance using U.S. corporations and confirmed that they were strongly correlated.

The capital market data have been used in international economics as well. Grossman and Levinsohn (1989) used stock market returns to provide evidence in favor of the specific factor model of trade, and some papers analyzed stock market reactions to trade policy announcements (e.g., Hartigan et al., 1986 and 1989; Hughes et al., 1997). Recently, Breinlich (2011) studies the response of the stock markets to news about regional trade agreements (RTAs) based on the assumption that the stock market automatically incorporates discounted expected future effects of RTAs. Moser and Rose (2011) investigates the stock price reactions to the trade policy under the assumption that unanticipated changes in the trade policies are sufficiently reflected in stock prices.⁴

Some empirical findings need to be mentioned. First, with the service sector in the analysis, we are generally not able to find any significant impact of FDI on a firm's market value, regardless of horizontal, forward, or backward linkages. This implies that a firm's market value does not respond to FDI externalities in any significant way. Once we focus on manufacturing, however, there are indeed positive FDI externalities in terms of horizontal linkages, but not vertical linkages. This implies that the market value of a manufacturing firm responds in a positive way as FDI takes place within the same industry. However, the lack of vertical linkages, particularly backward linkages, seems to be inconsistent with previous findings such as Javorcik (2004). If the market value is a good proxy to measure a firm's performance, its response to FDI should be consistent with previous findings. Note, however, that our linkage variables include interactions across all industries, not just manufacturing. When separating vertical linkages from manufacturing and from service, we found backward linkages among manufacturing. Indeed, the backward linkages by the manufacturing sector improved the market value of a manufacturing firm. This implies that when a manufacturing firm supplies intermediate goods to foreign invested manufacturing firms, the supplying firm's

⁴ There may also exist problems in using market value that is priced in the capital market. This is mainly because it only applies to private firms and those firms traded in well-functioning capital markets. However, using capital market valuation avoids the problems related to the timing of costs and revenues, makes forward-looking evaluations possible, and overcomes the weakness of the traditional productivity method.

market value improves.

The new finding of this paper is the service forward linkages to a manufacturing firm: the forward linkages by the service sector improve the market value of a manufacturing firm. This implies that the market value increases as foreign invested service firms deliver their services to the manufacturing firm. This finding is particularly interesting because previous studies could not provide the evidence of interactions between service and manufacturing.

This paper proceeds as follows. The next section discusses the theoretical background for the empirical analysis and the empirical strategy used in this paper. Sections 3 and 4 present data and empirical results respectively. Section 5 concludes.

II. Estimation Strategy

As indicated, labor productivity or TFP has been generally used for the analysis of FDI externalities. However, it is not easy to define a performance index for service, and a comparison between manufacturing and service using labor productivity or TFP is not appropriate. For this reason, we attempt to measure a firm's performance through the market value priced in the capital market.

One can appreciate the value of a good by the market price in the market economy, but the price of FDI externalities is not available because they are not explicitly priced in the market. One possible way to measure the value of intangible assets such as FDI, innovation, patent, and R&D is through the use of market value, a method that has been adopted in Industrial Organization. Hall (1993) defined the market value of a firm as a forward-looking index reflecting the present value of future dividends in an efficient capital market.

We assume that a firm's market value reflects the fact that publicly-traded corporations are bundles of assets whose values are determined every day in capital markets. Hence, the typical model of market value hypothesizes the market value of a firm as a function of a set of assets:

$$V(A_1, A_2, A_3, \dots) = f(A_1, A_2, A_3, \dots) \quad (1)$$

where f is an unknown function that describes how the assets (A) of a firm combine to create value. If the firm invests in the various assets according to a value-maximizing dynamic program, and the stock market is efficient, the function f will be the value function associated with that dynamic program.⁵ Since the functional

⁵ In the case with a single asset and constant returns to scale of the profit function, we will obtain the well-known result that the market value V is a multiple of the book value of the asset A , with a multiplier equal to Tobin's q .

form of equation (1) is not known, nor is it easy to compute one in a closed form, we will fall back on the fairly ad hoc Cobb-Douglas function like other studies in industrial organization. After taking log, we end up with a linear estimation. In other words, assuming the market value as a linear function of assets will produce the following:

$$\ln MV_{ijt} = \alpha_1 \ln A_{ijt}^1 + \dots + \alpha_N \ln A_{ijt}^N + \beta FDI_{jt} + D_i + D_t + \varepsilon_{ijt} \quad (2)$$

where MV_{ijt} represents market value of listed stocks in firm i industry j at time t . A 's stand for various assets constituting a firm. In general, if β is significantly positive, we can take it as the presence of FDI externalities. In this paper, we rely on a firm's balance sheet to measure A 's such as current assets, investment assets, and fixed assets, which are the basic asset items in a standard balance sheet.⁶ Additionally, i stands for a firm, j for an industry, and t for time.⁷ The estimation method is the panel estimation with fixed effects, which has been favored by many econometricians so that the firm fixed effects that would affect the firm's market value are controlled.⁸

As indicated, FDI externalities are composed of three variables, including horizontal, backward and forward linkages. Formally,

$$Horizontal_{jt} = \left[\sum_{i \text{ for all } i \in j} Ownership_{it} * Y_{it} \right] / \sum_{i \text{ for all } i \in j} Y_{it}$$

where Y_{it} measures total output of each firm i at time t . Thus, Horizontal captures the extent of foreign presence in sector j at time t and increases with the output of foreign invested firms and the share of foreign equity in these firms.

$$Backward_{jt} = \sum_{k \text{ if } k \neq j} \alpha_{jk} Horizontal_{kt}$$

where α_{jk} is the proportion of sector j 's output supplied to sector k taken from the input-output table. Note that inputs supplied within the same sector are not included because this effect is already captured by the Horizontal variable. The greater the foreign presence in sectors supplied by industry j and the larger the share of intermediates supplied to industries, the higher the value of the variable.

⁶ Though there are some other asset items in the balance sheet, there are too many missing values.

⁷ The above equation is similar to the general estimation equation based on Cobb-Douglas production function such as $\ln Y_{ijt} = \alpha_1 \ln K_{ijt} + \alpha_2 \ln L_{ijt} + \alpha_3 \ln M_{ijt} + \beta FDI_{jt} + D_i + D_t + \varepsilon_{ijt}$ where Y stands for firm output, K for capital, L for labor, and M for material inputs.

⁸ Hale and Long (2007) provided evidence on why panel estimation with fixed effect is the best method available as of now.

$$Forward_{jt} = \sum_{m \text{ if } m \neq j} \sigma_{jm} Horizontal_{kt}$$

where σ_{jm} is the share of inputs purchased by industry j from industry m . Likewise, the effect within the same sector is excluded. The value increases with the share of foreign presence in the output of upstream sectors. Note that FDI variables are sector-specific and time-varying because foreign presence is different across sectors and time.

Thus, the estimation equation is (2) including the above three FDI externalities variables. At the same time, we include other explanatory variables that might affect the market value of a firm. It has been argued that foreigners tend to select more productive firms; accordingly, the estimation will suffer from an endogeneity problem, particularly in the *Horizontal* variable. For this reason, we attempt to separate this self-selection issue by adding foreign ownership.⁹ Also, it is possible that foreigners' entry decreases industry concentration, which will lead to more competition and force domestic firms to improve their efficiency. To control this route of externalities, we include the *Herfindahl* index.¹⁰ Since dependent variables are more disaggregate than FDI externalities variables, the standard errors are clustered for all observation in the same industry, following Moulton (1990).

III. Data and Descriptive Statistics

The data are obtained from the Korea Information Service (KIS). The data contain information on all companies in the Korean stock market (KOSPI and KOSDAQ). Our sample is for 7 years between 2001 and 2007 before the financial crisis hit the Korean stock market in 2008. KIS started registering foreign ownership since 2001. Firms are classified by approximately 2-digit Korean Standard Industrial Classification codes that are closely related to 2-digit US Standard Industrial Classification codes. In our analysis, we include firms in the manufacturing and service sectors; that is, primary industries such as agriculture, fishing, and forestry are excluded. Therefore, we end up with 9,725 observations for 1,656 firms, which constitute an unbalanced panel.¹¹ The dataset provides the market value of firms

⁹ If foreigners decide to invest in more productive firms, the Horizontal variable will be correlated with the error term. We acknowledge, however, that adding foreign ownership separately will not control endogeneity issue completely. In the estimation section, we also report the results using domestic firms only that have no foreign investment to avoid this issue.

¹⁰ The index is defined as the sum of the squared market share in a given sector, and its value will range between 0 and 1. Both foreign ownership and *Herfindahl* index are included in Javorcik (2004).

¹¹ Some firms enter as they are qualified in the Korea Stock Exchange, but no firms exit in our data during the period.

whose stocks are listed in KOSPI and the information included in balance sheets and profit and loss statements. In particular, an individual firm's foreign ownership, total sales, and the book value of various assets are included.¹²

[Table 2] Distribution of Firms with Foreign Ownership by Industry in 2007

Industry	Foreign Ownership	Domestic Firms (1)	Firms with Foreign Investment (2)	All Firms (3)	(2)/(3)*100	horizon	bw	fw
Food products	6.95%	44	14	58	24.14%	15.37%	19.93%	17.50%
Tobacco	51.58%	0	1	1	100.00%	51.58%	13.35%	13.52%
Textile	1.54%	20	1	21	4.76%	0.21%	4.77%	19.23%
Apparel	3.88%	26	6	32	18.75%	4.35%	15.88%	10.11%
Leather, Bags, Footwear	0.00%	7	0	7	0.00%	0.00%	8.60%	15.54%
Timber	0.00%	3	0	3	0.00%	0.00%	10.71%	18.19%
Wood, Paper products	1.19%	30	2	32	6.25%	4.06%	16.79%	19.31%
Printing	4.25%	15	2	17	11.76%	19.89%	21.33%	13.21%
Petroleum	36.92%	1	4	5	80.00%	45.31%	16.13%	17.16%
Chemical	6.89%	125	42	167	25.15%	16.76%	13.83%	29.50%
Rubber, Plastic	2.16%	34	4	38	10.53%	17.30%	19.61%	17.17%
Non-metallic Mineral	9.74%	24	8	32	25.00%	17.96%	13.17%	20.99%
Primary Metal	2.54%	67	6	73	8.22%	26.34%	16.70%	20.39%
Fabricated Metal	3.06%	35	4	39	10.26%	4.10%	17.31%	23.38%
General Machinery	3.82%	105	17	122	13.93%	18.82%	20.68%	16.12%
Computer	4.42%	24	5	29	17.24%	11.69%	17.80%	10.38%
Electrical Machinery	4.08%	42	9	51	17.65%	5.53%	28.49%	15.09%
Electronics	3.56%	223	35	258	13.57%	36.11%	29.70%	9.26%
Precision Instrument	0.93%	36	2	38	5.26%	0.71%	16.77%	13.26%
Vehicle	6.60%	51	12	63	19.05%	33.43%	17.82%	16.77%
Other Transportation	14.93%	4	8	12	66.67%	24.41%	13.76%	16.66%
Furniture	2.90%	11	1	12	8.33%	4.97%	30.87%	10.49%
Recycle	0.00%	1	0	1	0.00%	0.00%	19.98%	14.10%

¹² Similar to previous studies, foreign invested firms were identified as those with at least 10% foreign ownership.

Industry	Foreign Ownership	Domestic Firms (1)	Firms with Foreign Investment (2)	All Firms (3)	(2)/(3)*100	horizon	bw	fw
Electricity, Gas Supply	7.02%	8	3	11	27.27%	17.36%	17.35%	26.30%
Vehicle Trade	15.74%	1	1	2	50.00%	31.25%	18.11%	18.89%
Wholesale Trade	3.06%	87	7	94	7.45%	5.42%	18.82%	19.69%
Retail Trade	10.19%	16	7	23	30.43%	29.11%	18.17%	18.95%
Accommodation, Food	11.16%	1	1	2	50.00%	20.86%	0.00%	16.61%
Transportation Service (Land)	2.56%	10	1	11	9.09%	9.62%	19.22%	34.49%
Transportation Service (Water)	13.77%	4	4	8	50.00%	18.38%	15.34%	26.58%
Transportation Service (Air)	6.36%	1	1	2	50.00%	8.99%	19.75%	28.56%
Travel Service	7.81%	9	3	12	25.00%	16.77%	15.99%	22.06%
Communication	18.22%	8	7	15	46.67%	35.21%	20.18%	20.58%
Finance, Insurance	12.08%	52	24	76	31.58%	31.85%	11.90%	18.12%
Real Estate	0.00%	44	0	44	0.00%	0.00%	21.81%	28.19%
Information Technology	4.21%	118	17	135	12.59%	11.52%	21.16%	20.63%
Research and Development	8.61%	2	2	4	50.00%	13.35%	19.86%	17.88%
Special and Scientific Service	11.61%	29	19	48	39.58%	18.27%	20.82%	20.10%
Business Service	7.67%	14	2	16	12.50%	30.51%	20.11%	17.32%
Education	13.82%	4	2	6	33.33%	30.53%	20.09%	20.40%
Theater, Broadcasting	2.73%	26	2	28	7.14%	5.28%	22.29%	18.31%
Culture, Sports	11.22%	3	2	5	40.00%	29.86%	18.15%	15.91%
Other Service	11.70%	2	1	3	33.33%	23.37%	16.46%	20.71%

Source: KIS.

To construct linkage variables, we rely on Korean input-output table 2000, which is published by the Bank of Korea.¹³ To merge the input-output tables and the KIS data, we have to concord the industry classifications because there is a slight variation between the sources; that is, the KIS dataset classifies industries into 43 sectors, while the IO table consists of 70 sectors. For example, the input-output table specifies food products and beverage separately, while both industries are classified into a single food products and beverage category in the KIS dataset. In these cases, we combine industries in the IO table to match the KIS classification.

Table 2 provides the distribution of firms with foreign ownership and FDI

¹³ Since the industry shares did not change much during the sample period, the 2000 table was used for all years. Alternatively, one could use the IO tables that were published with 2 to 3-year intervals. A drawback of going that route is that the classification also changes over the time period.

variables by industry for 2007. Noteworthy is that the foreign ownership is higher in service than in manufacturing, reflecting the results shown in Table 1, and that the ownership and FDI variables varied across sectors. Among the manufacturing sector with at least 5 firms, significant shares of foreign ownership are found in the Petroleum, Other transportation, and Non-metallic Mineral industries. Communication, Finance and Insurance, Transportation Service by water, and Vehicle Trade are also high in the case of the service sector. On the other hand, the Leather, Bags, and Footwear, Wood and Paper, Precision Instrument, and Textile industries do not seem to be attractive to foreign investors. Noteworthy is that these lower-ranked industries are mostly in manufacturing. The fifth column also shows that the ratio of foreign invested firms relative to all firms is higher in the former sectors than the latter sectors. This implies that the high or low foreign ownership in sectors is not just from a small group of foreign invested firms.

As for the FDI variables, It is interesting that Electronics and Vehicle manufacturing are highly Horizontal, although they do not show high foreign ownership. This implies that foreign investors prefer large size firms than medium size ones in these sectors. With respect to the Backward variable, the typical downstream industries such as Electronics, Electrical Machinery, and General Machinery in the manufacturing are highly ranked. Theater and Broadcasting and Information Technology are ranked high in the service sector. With respect to the Forward variable, Transportation Service, Chemical, and Metal industry are ranked high. On the other hand, the Leather, Bags, and Footwear, Wood and Paper, and Textile industries do not seem to have significant interactions with foreign invested firms.

[Table 3] Changes in FDI Variables over Time

Year	Horizontal	Backward	Forward
2001	16.12%	13.93%	12.34%
2002	16.82%	15.01%	14.24%
2003	19.78%	17.89%	19.63%
2004	22.40%	20.12%	23.13%
2005	21.92%	19.86%	22.16%
2006	20.13%	19.56%	21.21%
2007	18.74%	18.23%	19.92%

Source: KIS.

Table 3 shows the changes in the FDI variables between 2001 and 2007. Overall, all of the variables increase over time. The Horizontal variable increases from 16% in 2001 to a peak of 22% in 2004, slightly decreasing to 19% in 2007. The vertical linkages variables show higher level of increase than the Horizontal variable. The Backward variable increases from 14% to 20% and the Forward variable from 12%

to 23%.

[Table 4] Average Annual Changes in FDI Variables by Industry from 2001 to 2007

Industry	Horizontal	Backward	Forward	Industry	Horizontal	Backward	Forward
Food products	0.98%	2.81%	0.99%	Recycle	0.00%	2.17%	0.75%
Tobacco	5.79%	2.23%	0.80%	Electricity, Gas Supply	0.02%	1.00%	0.82%
Textile	0.03%	0.46%	0.92%	Vehicle Trade	5.12%	0.95%	0.83%
Apparel	0.47%	1.13%	0.52%	Wholesale Trade	-1.10%	1.12%	1.02%
Leather, Bags, Footwear	0.00%	0.60%	0.89%	Retail Trade	-0.26%	1.09%	1.00%
Timber	0.00%	0.69%	1.04%	Accommodation, Food	2.99%	0.00%	0.90%
Wood, Paper products	-0.63%	1.55%	0.94%	Transportation Service(Land)	1.40%	0.84%	1.12%
Printing	3.26%	1.90%	0.39%	Transportation Service(Water)	2.13%	0.35%	0.85%
Petroleum	0.66%	1.01%	1.02%	Transportation Service(Air)	-0.43%	1.55%	1.38%
Chemical	0.99%	0.75%	0.85%	Travel Service	2.79%	0.86%	0.75%
Rubber, Plastic	1.01%	0.69%	0.96%	Communication	1.81%	1.13%	0.65%
Non-metallic Mineral	0.25%	0.43%	0.94%	Finance, Insurance	3.18%	0.72%	0.56%
Primary Metal	-1.09%	1.01%	0.88%	Real Estate	0.00%	1.78%	2.27%
Fabricated Metal	0.68%	0.70%	-0.04%	Information Technology	1.51%	1.00%	0.98%
General Machinery	1.03%	1.14%	0.35%	Research and Development	2.23%	0.36%	0.99%
Computer	0.85%	0.73%	0.63%	Special and Scientific Service	-0.86%	1.12%	1.16%
Electrical Machinery	0.37%	-0.30%	0.82%	Business Service	-1.48%	1.39%	1.03%
Electronics	-1.49%	1.44%	0.64%	Education	5.09%	0.99%	0.96%
Precision Instrument	0.12%	1.04%	0.84%	Theater, Broadcasting	0.88%	1.68%	0.97%
Vehicle	0.81%	2.30%	0.55%	Culture, Sports	4.44%	1.08%	0.62%
Other Transportation	3.01%	1.11%	0.31%	Other Service	4.67%	1.36%	0.48%
Furniture	0.47%	1.51%	0.52%				

Source: KIS.

Table 4 shows the average annual changes in percent in the FDI variables by industry. The changes in FDI variables vary across sectors. Among the industries with at least 5 firms, Culture and Sports, Vehicle Trade, Finance and Insurance, and Education service reflect high levels of increases in the Horizontal variable, while the variable decreases for Electronics, Business Service, Primary Metal, and Wholesale Trade. For the Backward variable, the Food products and Vehicle industries see high increases, while Electrical Machinery shows decreases. Real Estate service shows high increases in the Forward variable, while General Machinery and Fabricated Metal industry are among those with a low level of increase or decrease.

IV. Estimation Results

Table 5 reports the estimation results. Columns (1), (2), and (3) show the results using all firms, while Column (4), (5), and (6) are based on domestic firms only.¹⁴ As mentioned, we investigated the effect of FDI in both manufacturing and service sectors. However, it is difficult to find a standard performance index that can be applied not only to manufacturing but also to service. Because firms' decisions on production or production factors can be quite different between manufacturing and service, general indexes of firm performance such as output, labor productivity, or total factor productivity (TFP) used in previous studies would be inappropriate. So that, we use a firm's market value, whose stock is listed in the capital market, as the firm's performance in this paper.

Columns (1) and (4) show the results without distinguishing between manufacturing and service. Columns (2) and (5) present results using only manufacturing and Columns (3) and (6) are based on only service. In other words, the dependent variable is the market value of manufacturing firms in Columns (2) and (5) and that of service firms in Columns (3) and (6). Note that, contrary to prior literature, this study constructs the Forward and Backward variables using both sectors. For example, the Forward variable indicates the foreign upstream influence not only from manufacturing but also from service. Therefore, the Forward variable in Column (2) and (5) indicates the upstream flow of foreign influence from manufacturing and service to manufacturing firms. Likewise, the same variable represents the foreign upstream influence from manufacturing and service to service firms in Column (3) and (6). The Backward variable can be also interpreted accordingly.

As equation (1) indicates, the variables representing various assets are significantly positive. Only fixed assets lose significance when the sample is separated into manufacturing and service. The *Herfindahl* index is generally positive and significant in some cases, which is consistent with previous studies. It becomes negative in manufacturing, although it is insignificant. Foreign ownership is also significantly positive. This confirms the widely held belief that foreign investors select better firms in terms of market value.

Turning to the variables of this study's interest, Column (1) shows that no FDI variables are significant, although positive. As shown in Column (4), this also applied to the sample of domestic firms. It seems that there are no FDI externalities in any direction (i.e. horizontal, backward, or forward). However, significance is found in Column (2) and (5) in which manufacturing firms only are analyzed as a dependent variable. There is a significant impact with respect to foreign presence within the same sector. In particular, the finding in Column (5) is important

¹⁴ Domestic firms are defined as those with less than 10% of foreign ownership.

because removing foreign invested firms from the analysis would have avoided the potential endogeneity problem. As the result show, the foreign presence indeed enhances the market value of domestic firms.

[Table 5] Estimation Results

	Domestic Firms					
	All	Manufacturing	Service	All	Manufacturing	Service
ln(Curent Asset)	0.334 [0.041]***	0.362 [0.042]***	0.315 [0.059]***	0.316 [0.038]***	0.322 [0.038]***	0.312 [0.057]***
ln(Investment Asset)	0.074 [0.015]***	0.059 [0.013]***	0.103 [0.027]***	0.086 [0.017]***	0.067 [0.013]***	0.127 [0.030]***
ln(Fixed Asset)	0.074 [0.033]**	0.029 [0.030]	0.105 [0.060]*	0.072 [0.034]**	0.038 [0.031]	0.088 [0.068]
Herfindahl	0.878 [0.401]**	-1.974 [3.589]	1.039 [0.399]**	0.732 [0.486]	-1.162 [3.696]	0.726 [0.491]
Foreign Ownership	1.206 [0.177]***	1.223 [0.222]***	1.186 [0.314]***			
Horizontal	0.88 [0.614]	1.982 [1.044]*	0.03 [0.484]	0.812 [0.581]	1.906 [0.949]*	-0.115 [0.494]
Forward	2.042 [3.029]	2.112 [3.153]	1.118 [5.213]	1.26 [2.755]	2.201 [2.785]	-1.975 [5.103]
Backward	0.31 [0.799]	0.146 [0.772]	-1.123 [2.337]	0.511 [0.738]	0.216 [0.715]	0.168 [1.666]
Observations	9725	6571	3154	7724	5288	2436
R-squared	0.49	0.49	0.51	0.49	0.48	0.52

The dependent variable is ln(market value). Each specification includes the firm fixed and year effect. Robust standard errors in brackets are clustered in the same industry. * significant at 10%; ** significant at 5%; *** significant at 1%.

As for other linkages variables, we did not find any significance. Does this result contrast other recent research that found significant backward linkages in the manufacturing sector such as Javorcik (2004)? The answer is no. The results in this paper should be interpreted differently from previous studies. Because previous studies have constructed linkages variables using only the manufacturing sector, they have ignored foreign influence in the service sector in any direction, forward or backward. This study constructed linkages variables using service as well as manufacturing. Hence, the findings of this study imply that foreign influence in downstream sectors as a whole does not affect upstream manufacturing firms. Accommodating our finding with the findings in the literature, the foreign influence from the downstream service sectors might not be significant enough though the impact from the downstream manufacturing sectors would be significant for the upstream manufacturing firms.

Further, it might also be possible that foreign invested upstream service firms might improve the value of downstream manufacturing firms though the foreign influence through the forward linkages of both manufacturing and service is not significant enough for the downstream manufacturing firms as Forward variable in Column (2) and (5) is insignificant. Therefore, to identify the true impacts of FDI externalities, it is necessary to distinguish manufacturing from service. As shown in Table 6, the FDI variables are decomposed by sector, which will enable us to determine whether the influence is different by sector.

[Table 6] Estimation Results of Manufacturing vs. Service Linkages

	All	Manufacturing	Service	Domestic Firms		
				All	Manufacturing	Service
ln(Curent Asset)	0.335 [0.040]***	0.358 [0.041]***	0.312 [0.059]***	0.317 [0.036]***	0.318 [0.038]***	0.31 [0.057]***
ln(Investment Asset)	0.073 [0.016]***	0.057 [0.014]***	0.105 [0.026]***	0.086 [0.017]***	0.066 [0.014]***	0.128 [0.030]***
ln(Fixed Asset)	0.075 [0.033]**	0.03 [0.031]	0.103 [0.060]*	0.073 [0.034]**	0.037 [0.031]	0.087 [0.067]
Herfindahl	0.94 [0.439]**	-2.422 [3.219]	0.945 [0.399]**	0.825 [0.568]	-1.4 [3.072]	0.671 [0.468]
Foreign Ownership	1.212 [0.177]***	1.215 [0.225]***	1.176 [0.302]***			
Horizontal	1.024 [0.659]	2.269 [0.902]**	-0.076 [0.457]	0.914 [0.619]	2.1 [0.795]**	-0.205 [0.536]
Forward by Manufacturing	1.336 [2.855]	0.014 [3.168]	4.385 [5.491]	0.515 [2.428]	0.114 [2.801]	-0.482 [5.257]
Forward by Service	3.669 [3.955]	13.398 [3.566]***	-1.31 [5.314]	2.681 [3.932]	13.732 [3.642]***	-2.977 [5.415]
Backward to Manufacturing	1.993 [1.038]*	2.382 [1.020]**	-0.326 [4.864]	1.62 [0.838]*	1.749 [0.904]*	-0.706 [4.769]
Backward to Service	0.268 [0.852]	0.056 [0.530]	-0.672 [2.012]	0.482 [0.800]	0.133 [0.594]	0.217 [1.601]
Observations	9725	6571	3154	7724	5288	2436
R-squared	0.49	0.49	0.51	0.49	0.49	0.52

The dependent variable is ln(market value). Each specification includes the firm fixed and year effect. Robust standard errors in brackets are clustered in the same industry. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6 separates the linkages variables between manufacturing and service. The non-FDI variables generally produce similar results. Various asset variables are significantly positive as well as the foreign ownership variable. Turning to the FDI variable, there are some important points that are not reflected in Table 5. Column

(1) of Table 6 shows that the Backward variable to manufacturing is significantly positive. This implies that the market value of upstream firms will improve as they deliver intermediate goods or service to foreign invested downstream manufacturing firms. Thus, foreign invested firms may set higher standards toward their intermediate goods suppliers or service providers, raising upstream firms' market values. It is interesting to note, however, that foreign invested downstream service firms do not affect upstream firms.

Column (2), where the dependent variable is the market value of manufacturing firms only, shows more interesting results. Some linkage variables become significant. First, the Backward variable to manufacturing is significant. This result is consistent with the findings of previous literature that are based on manufacturing only. That is, foreign invested downstream manufacturing firms affect upstream manufacturing firms in a positive way. Second, foreign invested upstream service firms also improve the value of downstream manufacturing firms. This implies that an advanced level of service by foreigners enhances the value of receiving manufacturing firms. Similar to Table 5, the Horizontal variable is also significant. However, foreign invested upstream manufacturing or downstream service firms do not significantly affect manufacturing firms. On the other hand, Column 3 does not produce any significance. In particular, there are no effects of FDI into manufacturing on service through vertical linkages. The results of Columns (4), (5), and (6), which focus on domestic firms, produce the similar results, implying that positive externalities are indeed realized by purely domestic firms. One can calculate the impacts of foreign presence on the market value in the capital market based on the results in Column (2). One standard deviation increase of linkages variables by forward service or backward manufacturing is associated with 16%-72% increase of market value of the firms in the manufacturing sector. Given that KOSPI increased by four-fold during the sample period, this range is feasible and implies the significant economic impacts of foreign presence through vertical link.

V. Conclusions

This paper addresses FDI externalities using market value and examines the effects of FDI into service on manufacturing and FDI into manufacturing into service. As such, this study adds some new findings to the literature such as foreign influence from service to domestic manufacturing firms.

However, this paper has the following limitations. This paper does not explain how FDI externalities take place. For example, we do not know how foreign invested upstream service firms affect downstream manufacturing firms. It may be

through the transfer of advanced technologies and better management know-how or through a direct movement of labor. In addition, we rely on the industry input-output table to determine the flows across sectors, even though the analysis is conducted at the firm level. Although firms listed in the Korea stock market are presumed to be the representative of Korean firms, and the flows among these firms were generally reflected in the input-output table, it would have been better if contracts or other micro level data to describe the flows between the firms had been available. These efforts remain the subject of future research.

References

- Aitken, B. and A. Harrison (1999), "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela," *The American Economic Review*, pp. 605-618.
- Alfaro, Laura & Areendam Chanda & Sebnem Kalemli-Ozcan & Selin Sayek (2006), "How Does Foreign Direct Investment Promote Economic Growth? Exploring the Effects of Financial Markets on Linkages," *NBER* 12522.
- Blalock, Garrick and Gertler, Paul J. (2008), "Welfare Gains from Foreign Direct Investment through Technology Transfer to Local Suppliers," *Journal of International Economics*, 74(2), pp. 402-421.
- Breinlich, Holger (2011), "Heterogeneous Firm-Level Responses to Trade Liberalisation: A Test Using Stock Price Reactions," *CEPR* 8600.
- Cockburn, Iain and Zvi Griliches (1988), "Industry Effects and Appropriability Measures in the Stock Market's Valuation of R&D and Patents," *American Economic Review*, 78(2), pp. 419-423.
- Economist (2012), "Trade Statistics iPadded," January 21st.
- Görg, Holger and Strobl, Eric (2002), "Multinational Companies and Indigenous Development: An Empirical Analysis," *European Economic Review*, 46(7), pp. 1305-1322.
- Görg, Holger and David Greenway (2004), "Much Ado about Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?," *World Bank Research Observer*, 19(2), pp. 171-197.
- Griliches, Zvi (1981), "Market Value, R&D, and Patents," *Economic Letters*, 7, pp. 183-187.
- Grossman, G. M. and J. A. Levinsohn (1989), "Import Competition and the Stock Market Return to Capital," *American Economic Review*, 79(5), pp. 1065-1087.
- Hale, Galina and Cheryl Long (2007), "Are there Productivity Spillovers from Foreign Direct Investment in China?," *Working Paper Series 2006-13, Federal Reserve Bank of San Francisco*.
- Hall, Bronwyn (1993), "The Stock Market's Valuation of Research and Development Investment During the 1980s," *American Economic Review*, 83, pp. 259-264.
- Hall, Bronwyn H., and Robert E. Hall (1993), "The Value and Performance of US Corporations," *Brookings Papers on Economic Activity*, 1993(2), pp. 289-344.
- Hartigan, J. C., Perry, P. R. and S. Kamma (1986), "The Value of Administered Protection: A Capital Market Approach," *Review of Economics and Statistics*, 68(4), pp. 610-617.
- Hartigan, J. C., S. Kamma, and P. R. Perry (1989), "The Injury Determination Category and the Value of Relief from Dumping," *Review of Economics and Statistics*, 71, 183.86.
- Haskel, Jonathan E., Sonia C. Pereira, and Matthew J. Slaughter (2007), "Does Inward Foreign Direct Investment Boost The Productivity of Domestic Firms?," *The Review of Economics and Statistics*, 89(3), pp. 482-496.
- Hughes, J. S., S. Lenway, and J. Rayburn (1997), "Stock Price Effects of U.S. Trade Policy Responses to Japanese Trading Practices in Semi-conductors," *Canadian Journal of Economics*, 30, 922.42.

- Jaffe, Adam B. (1986), "Technological Opportunity and Spillovers of R&D: Evidence from Firms' Patents, Profits, and Market Value," *American Economic Review*, 76(5), pp. 984-1001.
- Javorcik, B. S. (2004), "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages," *The American Economic Review*, 94, No. 3, pp. 605-627.
- Lileeva, Alla (2010), "The Benefits to Domestically-Owned Plants from Inward Direct Investment: The Role of Vertical Linkages," *Canadian Journal of Economics*, 43(2), pp. 574-603.
- Moser, Christoph and Andrew K. Rose (2011), "Who Benefits from Regional Trade Agreement? The View from the Stock Market," *NBER* 17415.
- Moulton, Brent R. (1990), "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Unit," *The Review of Economics and Statistics*, 72(2), pp. 334-38.
- Navaretti, Barba and Venables, Anthony J. (2004), "Multinational Firms in the World Economy," Princeton University Press.
- Rodriguez-Clare, Andres (1996), "Multinationals, Linkages, and Economic Development," *American Economic Review*, 86(4), pp. 852-73.
- Rodriguez-Clare, Andres and Alfaro, Laura (2004), "Multinationals and Linkages: An Empirical Investigation," 2004 Meeting Papers 145, Society for Economic Dynamics.
- UNCTAD (2005), World Investment Report, UN.