Effects of Inward and Outward Greenfield FDI on Employment by Domestic Firms: The Korean Experience[*]

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Through the construction of new facilities, greenfield FDI is certain to result in the hiring of new workers in the host country.   This paper empirically investigates the effects of inward greenfield on employment by domestic firms in South Korea.   We construct a panel of 1,328 Korean firms in 20 industries for the period 2004-2015 and link this to greenfield FDI data acquired from fDi Markets (Financial Times Ltd.).   We find that inward greenfield FDI leads to increased employment by domestic firms.   It is found to be particularly pronounced in the goods sector (i.e., primary and manufacturing).   This effect becomes stronger when the source countries of greenfield FDI are developed countries.

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1. INTRODUCTION

There is great consensus in the literature that inward foreign direct investment (FDI) is beneficial to host countries as it brings in capital and technology and hence spurs economic growth.   Among the two entry modes of FDI, greenfield FDI, as compared to cross-border M&A, is regarded as having a greater beneficial effect on economic growth of host countries.   For example, Wang and Wong (2009), using a sample of 84 countries for the period 1987-2001, find that greenfield FDI promotes economic growth of the host country, while cross-border M&As can be beneficial only when the host country has an adequate level of human capital.   For about 80 countries during the period 1987-2005, Harms and Méon (2011) also find that while greenfield investment substantially enhances growth, M&As have no substantial effect.

Greenfield FDI is also expected to be more beneficial for local employment because it necessitates the hiring of new workers to build new production facilities and offices, while M&A, through acquisition of existing local firms, may or may not have such an effect, depending upon its particular purpose.

Even if inward greenfield FDI directly creates new employment by foreign firms, its spillover effects on employment by domestic firms remain uncertain. They may be negative in the case that foreign firms act to crowd out the competing domestic firms in the same industry.   By contrast, they may be positive if foreign firms bring new business opportunities for both upstream and downstream domestic firms in the same industry.   However, the spillover (indirect) effects of FDI on employment by domestic firms have not been fully investigated, as discussed in Hale and Xu (2016).[1]

To the best of our knowledge, Jenkins (2006) is the only study that has investigated the effects of inward FDI on domestic employment.   He shows that the spillover employment effects of FDI in Viet Nam were minimal because of the limited linkages created by foreign investors.   He also shows

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[1] By contrast, there is a fair bit of consensus in the literature on technology spillovers of inward FDI to domestic firms.   See, for example, Javorcik (2004), Cheung and Lin (2004), and Haskel *et al*. (2007).

that the spillover employment effects were possibly negative because of the crowding out effects of domestic investment.

In contrast to inward FDI, policymakers often fear the negative employment effects of outward FDI.   Outward FDI (both greenfield and M&A) may have negative effects on the labor markets of the source countries as both types of FDI may be a result of the firms' efforts to move their plants or the entirety of their operations to foreign countries so as to avoid high labor costs in their home countries.   For example, a study by OECD (2007), using industry data from 12 OECD countries for the period 1995-2000, finds that international outsourcing has a negative impact on domestic employment in both the manufacturing and the service sectors.   Using Korea's firm-level data for the period 1980-1996, Debaere *et al*. (2010) also find that transferring production to less advanced countries with low labor costs can cause a reduction in domestic jobs.

However, as discussed by Kang and Whang (2018), outward FDI has two opposite effects on domestic employment.   One is a substitution effect which is associated with a decrease in domestic employment as some domestic workers employed by the MNE's parent firms are replaced by foreign workers. Another is a scale effect which is associated with an increase in domestic employment as a result of improving market access and efficient resource allocation.   Using Korean industry-level data for the period 2007-2014, Kang and Whang (2018) find little evidence of the impact of outward FDI on the overall employment of permanent workers in Korea.[2]   Similarly, Chun *et al*. (2018), using Korean firm-plant matched data for the period 2008-2013, find that Korean MNEs exhibit greater active job reallocation across their domestic manufacturing plants within firms, but this does not result in net job losses.

Ito and Tanaka (2014) also do not find any negative effects of Japanese manufacturing firms' overseas expansion on domestic suppliers' employment. Using industry-level data for 17 high-income OECD countries, Hijzen and Swaim (2007) also find that offshoring has no effect or a slightly positive effect

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[2] Kang and Whang (2018) further find that outward FDI leads to an increase in the number of jobs created for medium-skilled workers, whereas it is negatively associated with the temporary employment of low-skilled workers.

on sectoral employment in source countries. In addition, Brainard and Riker (2001) find that U.S. multinationals do not export U.S. jobs.

There also exist studies that show positive effects of outward FDI on employment in source countries. For example, Masso *et al*. (2008) find that outward FDI from Estonia, a low-cost transition economy, positively affected home-country employment growth during the period 1995-2002. Federico and Minerva (2008) also find that outward FDI from Italy is associated with faster domestic employment growth in Italy, relative to the national industry average. Thus, previous studies on the effects of outward FDI on employment in source countries have produced mixed results.

Against this background, this paper empirically investigates the effects of inward and outward FDI in the form of greenfield projects on employment by domestic firms in Korea. The main contribution of this paper is that it compares the effects of inward and outward FDI on employment in Korea, where both inward FDI and outward FDI are relatively large and equally important.[3] We also contribute to the literature by distinguishing not only the direction of greenfield FDI (inward vs. outward) but also the sectors (goods vs. services) and the partner country group (developed vs. developing countries).

For this purpose, we construct a panel dataset on employment for 1459 Korean firms in 20 industries for the period 2004-2015 and link this to greenfield FDI data acquired from fDi Markets (Financial Times Ltd.). We find that inward greenfield FDI leads to increased employment by domestic firms. This positive effect is found to be particularly pronounced in goods industries (i.e., primary and manufacturing) and is also found to be stronger when the source countries of greenfield FDI are developed countries. In contrast, we find no significant results for the effect of Korean multinational firms' outward greenfield FDI on domestic employment.

The remainder of this paper is organized as follows. Section 2 describes the data on Korea's employment as well as inward and outward FDI. Section

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[3] In this regard, this paper complements Debaere *et al*. (2010), Kang and Whang (2018), and Chun *et al*. (2018), which investigate the effects of outward FDI on Korea's employment.

3 explains the empirical framework and section 4 reports and discusses the main results.   Section 5 offers a summary and conclusion.

2. DATA AND DESCRIPTIVE STATISTICS

In order to investigate the effects of inward and outward greenfield FDI on employment by domestic firms in Korea, we combine a Korean firm-level dataset with industry-level greenfield FDI data for the period 2004-2015. The Korean data are obtained from KISVALUE, the online database of Korea Listed Companies Association (KLCA).[4]   KISVALUE compiles various sets of firm-specific data for all KOSPI-listed and KOSDAQ-listed firms.[5]   Our greenfield FDI data are acquired from fDi Markets (Financial Times Ltd.).[6]

Table 1 shows how we match the two datasets: firm-level Korean data and industry-level greenfield FDI data.[7]   We first divide the FDI data into the goods sector (comprising primary and manufacturing) and services sector. Some industries include characteristics of both the goods and the services sectors.   For example, "Food, Tobacco and Beverage" includes both products (goods) and stores (services).   We classify these industries as the "unclassified" sector, as reported in Panel C of table 1.   Of 39 industries in the fDi Markets data, we were able to match 20 industries with Korean data: seven in the goods sector, seven in the services sector, and six in the unclassified sector.   Out of all KOSPI- and KOSDAQ-listed firms, 1,459 firms were matched: 684 firms in the goods sector, 281 firms in the services sector, and 494 firms in the unclassified sector.

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[4] https://www.kisvalue.com/web/index.jsp
[5] The KOrea composite Stock Price Index (KOSPI) is the index of all common stocks traded on the Korea Stock Exchange.   It is the representative stock market index of Korea. KOSDAQ is an acronym for Korean Securities Dealers Automated Quotations, which represents an electronic stock market similar to NASDAQ in the U.S.
[6] https://www.fdimarkets.com/
[7] See also appendix table 1 for details.

Table 1   Industry Classification and Number of Firms

Sector	Industry	Number of firms
A. Goods (primary and manufacturing)	Chemicals	119
	Electronic components & semiconductors	308
	Medical Devices	42
	Metals	121
	Minerals	39
	Rubber & plastics	43
	Wood Products	12
	Goods Total	684
B. Services	Communications	24
	Financial Services	94
	Leisure & Entertainment	8
	Real Estate	71
	Software & IT services	58
	Transportation	21
	Warehousing & Storage	5
	Services Total	281
C. Unclassified (mixture of goods and services)	Automotive & non-automotive transport	115
	Coal, Oil and Natural Gas	18
	Food, Tobacco & Beverages	69
	Paper, Printing & Packaging	128
	Pharmaceuticals	113
	Textiles	51
	Unclassified Total	494
Total		1,459

Source: KISVALUE.

2.1. Korea's Employment

In our empirical analysis, the dependent variable is the number of employees in individual firms, as will be discussed in the next section.   Yearly patterns of the average number of employees for an individual firm in different sectors are reported in figure 1.   The dotted line, double solid line, and long dashed line represent the goods (primary and manufacturing) sector, services sector, and unclassified sector, respectively.   The goods sector does not show a distinct pattern during the sample period, while the services sector shows a growing pattern, particularly after the 2008 global financial crisis period. The services sector also appears to have experienced a quicker recovery from the financial crisis than the goods sector.

Figure 1   Trend of Firms' Average Employment by Sector (2003-2015)
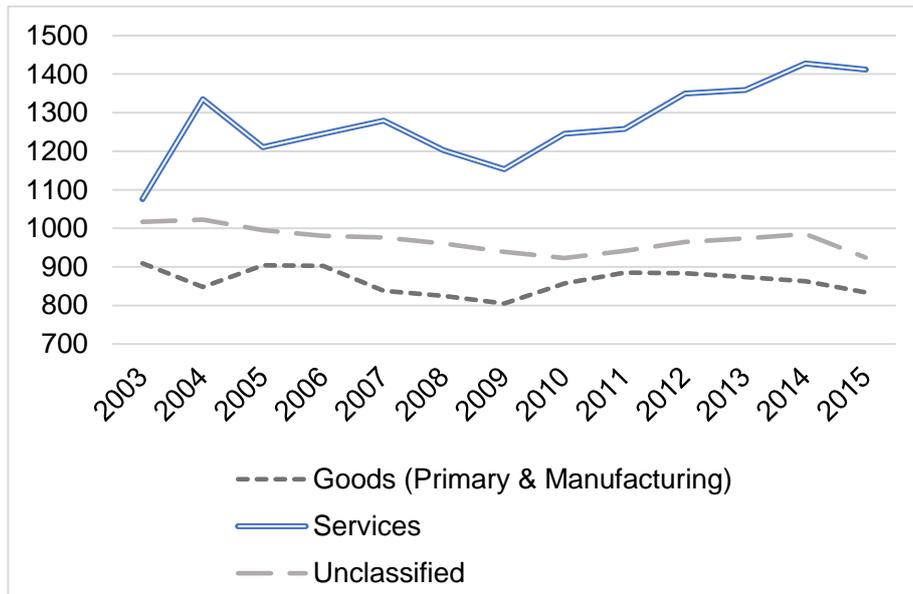
Source: KISVALUE.

Table 2 shows the average number of employees for individual firms by industry.   Firms in "Communications" industry turn out to hire the largest number (2,570) of workers on average, followed by "Transportation" and "Automotive & Non-automotive Transport" industries.   If we consider the total for each industry, the "Electronic Components & Semiconductors industry" turns out to hire the largest number of workers, followed by the "Automotive & Non-automotive Transport" and "Financial Services" industries.

**Table 2   Average Number of Employees for Individual Firms by Industry**

Sector	Industry	Average employment	Number of firms	Total employment
A. Goods (primary and manufacturing)	Chemicals	770.10	119	91,642
	Electronic components & semiconductors	1,124.21	308	346,257
	Medical Devices	202.22	42	8,493
	Metals	570.72	121	69,057
	Minerals	404.72	39	15,784
	Rubber & plastics	585.81	43	25,190
	Wood Products	327.46	12	3,930
B. Services	Communications	2,570.40	24	61,690
	Financial Services	1,729.91	94	162,612
	Leisure & Entertainment	826.86	8	6,615
	Real Estate	837.98	71	59,497
	Software & IT services	499.63	58	28,979
	Transportation	2,297.50	21	48,248
	Warehousing & Storage	883.00	5	4,415
C. Unclassified (mixture of primary, manufacturing, and services)	Automotive & non-automotive transport	2,270.81	115	261,143
	Coal, Oil and Natural Gas	1,798.13	18	32,366
	Food, Tobacco & Beverages	1,024.08	69	70,662
	Paper, Printing & Packaging	240.85	128	30,829
	Pharmaceuticals	385.15	113	43,522
	Textiles	409.36	51	20,877
All industries			1,459	1,391,805

Source: KISVALUE.

2.2. Greenfield FDI

The primary explanatory variables are inward and outward greenfield FDI. Figure 2 shows the trend of greenfield FDI inflows to Korea.   The figure also illustrates the trend of greenfield FDI outflows from Korea.   Panel A in figure 2 includes all countries as sources and destinations of FDI.   Throughout the entire period, outward FDI (blue solid line) remained greater than inward FDI (red dotted line).   During the global financial crisis, greenfield FDI inflows declined drastically, from US$ 11.2 billion in 2008 to US$ 4.4 billion in 2009.

Figure 2   Trend of Korea's Inward and Outward Greenfield FDI Flows (Billion USD, 2003-2015)
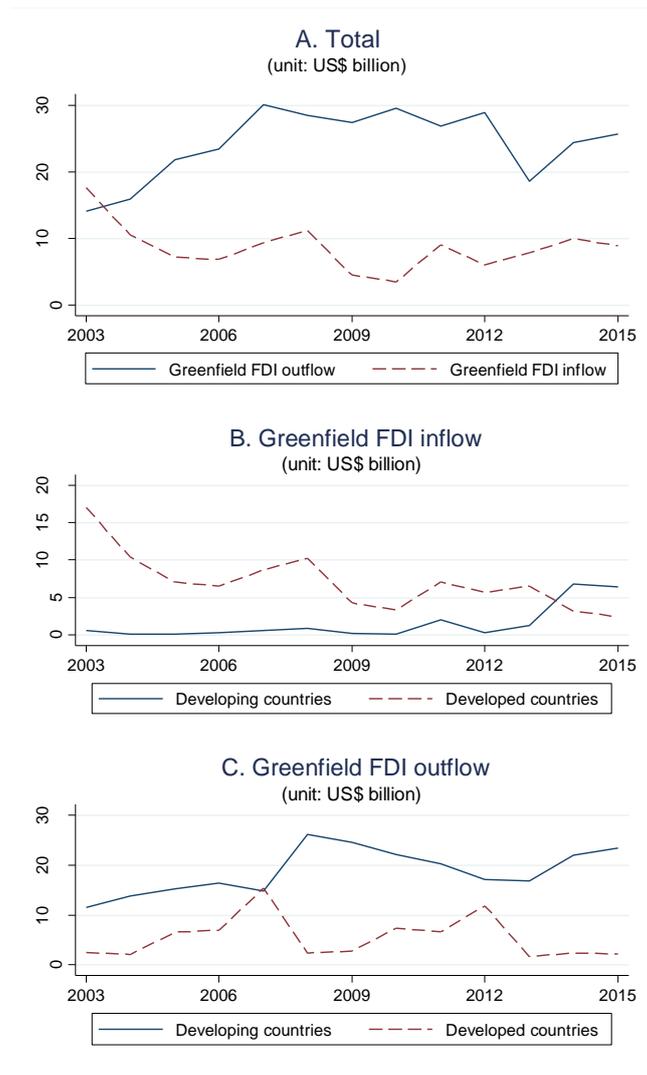
Source: fDi Markets.

However, it should be noted that Korea's outward greenfield FDI did not show any sign of contraction during that period.

Figures 2B and 2C display the trends of Korea's greenfield FDI inflows and outflows for developed and developing countries as their sources and destinations, respectively.[8]   The developed country group includes the OECD countries, Hong Kong, and Singapore.[9]   Until 2013, there were larger amounts of FDI inflows from developed countries than from developing countries.   In recent years, this trend reversed, largely due to the fact that China began to make large greenfield investments in Korea (as well as in many other countries).[10]   On the other hand, the developing country group has continued to be the major destination for the outward greenfield FDI of Korea.

Table 3 lists all 47 source countries (left panel) for Korea's inward greenfield FDI during the period 2004-2015.   During this period, the 47 countries conducted a total amount of US$ 94.6 billion of greenfield FDI projects in Korea.   With US$ 31.7 billion, the U.S. was the number one greenfield investor in Korea, followed by Japan, Germany, Saudi Arabia, and France. The U.S. alone accounted for about one-third of the total greenfield FDI in Korea.

During the period 2004-2015, Korean firms made a total amount of US$ 301.1 billion of outward greenfield FDI to 119 countries, over three times as large as inward greenfield FDI.   Table 3 also reports 47 major host countries (right panel) of Korea's outward greenfield FDI during the period 2004-2015.   These 47 host countries accounted for over 97% of the total value of Korea's outward greenfield FDI during the period.   China, Vietnam, the U.S., India, and Indonesia were the top five hosts of Korea's greenfield investments during the period.

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[8] Developing countries in this paper include "low income", "lower middle income", and "upper middle income" countries, while high-income countries include "high-income" countries classified by the World Bank (2015).

[9] The complete classification of developed and developing countries is reported in appendix Tables 2 and 3.

[10] China's greenfield FDI in Korea increased from US$ 59.4 million in 2013 to US$ 3.8 billion in 2014.   It also increased its outward greenfield FDI in the world, which increased from US$ 38.0 billion in 2013 to US$ 65.3 billion in 2014.

Table 3   Source and Host Countries of Korea's Greenfield FDI (Total, 2004-2015)

Sector	Industry	Inward FDI Value (KRW billion)	Outward FDI Value (KRW billion)
A. Goods (primary and manufacturing)	Chemicals	16,119	28,391
	Electronic components & semiconductors	34,167	63,674
	Medical Devices	339	720
	Metals	1,701	41,214
	Minerals	0	61
	Rubber & plastics	3,191	13,684
	Wood Products	0	1,149
	Goods Total	55,517	148,893
B. Services	Communications	2,700	10,226
	Financial Services	3,382	16,104
	Leisure & Entertainment	5,064	637
	Real Estate	17,399	15,280
	Software & IT services	2,056	854
	Transportation	3,263	5,129
	Warehousing & Storage	812	3,645
	Services Total	34,675	51,876
C. Unclassified (mixture of goods and services)	Automotive & non-automotive transport	10,193	58,409
	Coal, Oil & Natural Gas	9,821	36,532
	Food, Tobacco & Beverages	1,439	3,349
	Paper, Printing & Packaging	190	484
	Pharmaceuticals	853	1,783
	Textiles	374	3,815
	Unclassified Total	22,871	104,372
Total		113,063	305,141

Source: fDi Markets.

Table 4 summarizes the total amount of inward and outward greenfield FDI for the matched industries during the period 2004-2015. "Electronic Components & Semiconductors" was the industry with the largest amount of greenfield FDI in both inward and outward FDI. "Real Estate," "Chemicals,"

Table 4   Korea's Inward and Outward Greenfield FDI Stock by Industry (2004-2015)

Ranking	Inflows to Korea		Outflows from Korea	
	Source country	Value (US$ Mill)	Source country	Value (US$ Mill)
1	USA	31,702	CHN	68,313
2	JPN	16,517	VNM	35,237
3	DEU	6,626	USA	34,655
4	SAU	6,301	IND	27,365
5	FRA	5,849	IDN	12,682
6	CHN	5,206	HKG	12,224
7	NLD	4,138	MEX	9,713
8	GBR	3,580	BRA	9,402
9	MYS	2,359	RUS	7,050
10	SGP	1,934	SVK	5,429
11	RUS	1,931	UZB	5,227
12	BEL	1,043	PHL	4,524
13	CAN	903	SGP	4,178
14	PHL	821	CZE	4,045
15	IND	767	MYS	3,461
16	CHE	511	GBR	3,356
17	ESP	431	POL	3,287
18	SWE	423	TUR	3,252
19	FIN	387	NGA	2,988
20	NOR	356	MMR	2,715
21	ARE	343	SAU	2,580
22	AUS	286	JPN	2,542
23	OMN	273	ARE	2,435
24	MEX	256	HUN	2,301
25	ITA	170	OMN	1,742
26	KWT	169	KHM	1,676
27	AUT	154	AUS	1,305
28	HKG	119	THA	1,263
29	ISR	117	SEN	1,231
30	BRA	112	CAN	1,171
31	QAT	107	KAZ	1,169
32	LUX	103	PNG	1,084
33	IRL	83	ESP	1,067
34	DNK	77	JOR	1,025
35	TWN	77	TKM	1,000
36	ISL	76	NLD	967
37	VNM	76	CMR	951

38	CYP	70	AZE	917
39	NCL	35	EGY	892
40	MLT	35	PAK	857
41	NPL	35	TWN	846
42	CHL	14	UKR	830
43	GRC	10	IRQ	784
44	HUN	9	DEU	705
45	NZL	8	ROU	660
46	CZE	6	BHR	641
47	UKR	6	DOM	570
	47 countries total	94,608	47 countries total	292,314
			119 countries total	301,075

Source: fDi Markets.

and "Automotive & Non-automotive Transport" also received large amounts of inward greenfield FDI during this period.   Regarding outward FDI, "Automotive & Non-automotive Transport," "Metals," and "Coals, Oil & Natural Gas" were the largest industries.

3. EMPIRICAL SPECIFICATION

In order to assess the effects of inward and outward greenfield FDI on employment by domestic firms, we employ a panel regression with firm-specific fixed effects as well as year dummies, as follows:

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\begin{aligned}
\ln E_{ijt} = {} & \alpha_0 + \alpha_1 \ln(FDI\ in)_{jt-1} + \alpha_2 \ln(FDI\ out)_{jt-1} + \alpha_3 HHI_{jt-1} \\
& + \alpha_4 \ln Asset_{a_{jt-1}} + \alpha_5 \ln Asset_{ijt-1} \\
& + \alpha_6 \ln\left(\frac{K}{L}\right)_{ijt-1} + \alpha_7 \ln(Productivity)_{ijt-1} \\
& + \alpha_8 \ln(FDI\ in)_{jt-1} \times \ln Asset_{ijt-1} \\
& + \varepsilon_i + \varepsilon_t + \varepsilon_{it}.
\end{aligned}
\tag{1}
$$

$\ln E_{ijt}$ is the dependent variable measured by the natural logarithm of the number of employees of firm i of industry j in year t.   The dependent variable is a stock variable.   Therefore, our primary explanatory variables, $\ln(FDI\ in)_{jt-1}$ and $\ln(FDI\ out)_{jt-1}$, are also defined as the log values of the cumulative greenfield FDI in industry j at time $t-1$.

Specifically, because the fDi Markets' data on greenfield FDI flows are only available from 2003, we take the greenfield FDI inflows of 2003 as the previous year's greenfield FDI stock for year 2004.   We then obtain each year's greenfield FDI "stock" by adding the corresponding year's annual greenfield FDI inflows to the previous year's FDI stock.   We also formulate the outward greenfield stock variable in a similar manner.[11]

We include a number of control variables which are either industry-specific or firm-specific.   There are two industry-specific control variables. HHI_{jt-1} is the Herfindahl-Hirschman index of market concentration for industry j at year $t-1$. HHI is defined as the sum of the squares of market share of the individual firms within the industry.   Market share represents individual firms' sales divided by total industry sales.   The index ranges between 0 and 1, with higher values indicating greater market concentration.   In order to control the size of the industry, we also include the log value of total industry assets ($\ln Asset_{ajt-1}$).

Among the firm-specific variables, $\ln Asset_{ijt-1}$ is the logarithm of total assets for firm i at year $t-1$. $\ln(K/L)_{ijt-1}$ represents the capital-labor ratio of firm i in industry j in year $t-1$.   Capital-labor ratio is the log value of total assets divided by total number of workers. $\ln(Productivity)_{ijt-1}$ is calculated as the natural logarithm of total sales divided by total number of workers.

Finally, we include an interaction variable of inward FDI with the individual firms' assets to consider the firms' specific factors.   By including the interaction variable, we can test whether the FDI effect on employment become greater particularly in small firms.   Empirical results with interaction

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[11] Note that with inclusion of firm-specific dummies, our fixed effects specification estimates within-firm and within-industry variations and hence will capture the relation between changes in employment and annual flows of greenfield FDI.

variables are reported in section 4.2.

ε_i is a firm-specific fixed effect, ε_t is a year-specific effect, and ε_{it} is an idiosyncratic error term.   Note that we include one-year lagged values of all of the explanatory variables in order to attenuate the possible endogeneity problems.

In a separate specification, we will divide inward and outward FDI stocks into two groups, depending upon whether the sources and destinations of FDI belong to a group of developed or developing countries. [12]   FDI from developed countries differs from that from developing countries in terms of motives, strategies, technology levels, and its consequences on the host country.   Moreover, the motives of outward FDI can be different, depending on whether the destination country is a developed or developing country. That is, outward FDI to a developing country has the motive of using the low-cost labor of the country and using it as an export platform (vertical FDI).   By contrast, outward FDI to a developed country is likely to be intended to produce and sell in the local market (horizontal FDI).   Efficiency-seeking vertical FDI to developing countries is expected to have a greater substitution effect in that some domestic workers of the MNE's home country are replaced by foreign workers.   By contrast, market-seeking FDI to developed countries is expected to have a greater scale effect and result in increased domestic employment of the home country.

As noted previously, we also divide our sample into the goods (primary and manufacturing) sector, services sector, and unclassified sector in order to investigate how the association between greenfield FDI and domestic employment differs between the goods and services sectors; the "Unclassified" group includes the industries with characteristics of both goods and services sectors.

Summary statistics of the dependent and independent variables across the different subgroups are reported in table 5.

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[12] See appendix tables 2 and 3 for the country classification.

Table 5   Summary Statistics

A. All firms

Variable	Obs	Mean	S.D.	Min	Max
Log_Employment	12,621	5.66	1.26	0.69	11.53
Log_FDI (in)	12,621	14.69	1.89	10.49	17.35
Log_FDI (in, developed)	12,621	14.56	1.91	10.49	17.32
Log_FDI (in, developing)	3,013	11.51	1.68	8.78	14.02
Log_FDI (out)	12,621	15.54	1.85	10.21	17.97
Log_FDI (out, developed)	11,534	12.62	2.60	4.74	15.43
Log_FDI (out, developing)	12,392	14.83	1.91	7.44	17.37
HHI	12,621	0.14	0.10	0.03	0.87
Log_Asset (industry)	12,621	31.75	1.43	27.83	34.92
Log_Asset	12,621	25.92	1.63	21.43	33.25
Log(K/L)	12,621	20.26	0.96	16.69	26.39
Log_Productivity	12,621	26.90	0.88	21.94	31.07

B. Firms in goods sector

Variable	Obs	Mean	S.D.	Min	Max
Log_Employment	5,747	5.48	1.15	1.39	11.53
Log_FDI (in)	5,747	15.77	1.71	11.02	17.35
Log_FDI (in, developed)	5,747	15.68	1.80	10.51	17.32
Log_FDI (in, developing)	562	13.13	0.00	13.13	13.13
Log_FDI (out)	5,747	16.65	1.22	10.41	17.97
Log_FDI (out, developed)	5,516	13.83	1.77	10.41	15.43
Log_FDI (out, developing)	5,652	15.67	1.64	7.44	17.09
HHI	5,747	0.19	0.09	0.04	0.32
Log_Asset (industry)	5,747	32.20	1.18	27.83	33.38
Log_Asset	5,747	25.63	1.34	22.29	32.76
Log(K/L)	5,747	20.15	0.70	17.73	23.58
Log_Productivity	5,747	26.92	0.80	21.94	29.52

C. Firms in services sector

Variable	Obs	Mean	S.D.	Min	Max
Log_Employment	2,470	6.00	1.47	2.30	10.54
Log_FDI (in)	2,470	14.60	0.94	11.96	16.67
Log_FDI (in, developed)	2,470	14.25	1.03	11.36	15.93

Log_FDI (*in, developing*)	1,757	11.59	1.24	9.39	13.06
Log_FDI (*out*)	2,470	14.84	1.52	10.21	16.59
Log_FDI (*out, developed*)	2,185	12.65	0.93	10.75	14.04
Log_FDI (*out, developing*)	2,470	14.18	1.74	9.28	16.10
HHI	2,470	0.14	0.11	0.06	0.87
Log_Asset (*industry*)	2,470	31.97	1.83	28.29	34.92
Log_Asset	2,470	26.94	2.11	22.56	33.25
Log(*K/L*)	2,470	20.94	1.41	16.69	26.39
Log_Productivity	2,470	27.25	0.96	24.32	31.07
D. Firms in unclassified sector					
Variable	Obs	Mean	S.D.	Min	Max
Log_Employment	4,404	5.70	1.21	0.69	11.10
Log_FDI (*in*)	4,404	13.33	1.59	10.49	16.14
Log_FDI (*in, developed*)	4,404	13.27	1.50	10.49	15.84
Log_FDI (*in, developing*)	694	9.99	1.98	8.78	14.02
Log_FDI (*out*)	4,404	14.49	1.89	11.63	17.88
Log_FDI (*out, developed*)	3,833	10.85	3.19	4.74	15.26
Log_FDI (*out, developing*)	4,270	14.09	1.87	9.38	17.37
HHI	4,404	0.07	0.06	0.03	0.33
Log_Asset (*industry*)	4,404	31.03	1.16	29.47	33.11
Log_Asset	4,404	25.73	1.41	21.43	32.30
Log(*K/L*)	4,404	20.03	0.75	17.68	25.01
Log_Productivity	4,404	26.67	0.85	23.19	30.20

4. RESULTS

4.1. Benchmark Results

Table 6 reports our benchmark results for the effects of inward and outward greenfield FDI on domestic employment in the same industry.　Inward FDI and outward FDI are entered in columns (1) and (2) respectively, while they are entered simultaneously in column (3).　On examining columns (1) and (3),

**Table 6 Effects of Inward and Outward Greenfield FDI
on Employment-Benchmark Results**

	(1)	(2)	(3)	(4)
ln FDI_{jt-1} (*In*)	0.023*** (0.007)		0.023*** (0.007)	
ln FDI_{jt-1} (*Out*)		0.001 (0.007)	-0.001 (0.007)	
ln FDI_{jt-1} (*In, developed*)				0.266** (0.131)
ln FDI_{jt-1} (*In, developing*)				−0.010 (0.008)
ln FDI_{jt-1} (*out, developed*)				0.013 (0.008)
ln FDI_{jt-1} (*out, developing*)				−0.055* (0.032)
HHI_{jt-1}	−0.113 (0.131)	−0.200* (0.114)	−0.111 (0.131)	0.448 (0.345)
ln $Asset_{jt-1}$ (*Ind*)	−0.004 (0.023)	−0.01 (0.023)	−0.004 (0.023)	0.062 (0.070)
ln $Asset_{ijt-1}$	0.706*** (0.021)	0.704*** (0.021)	0.706*** (0.021)	0.679*** (0.048)
ln $(K/L)_{ijt-1}$	−0.625*** (0.039)	−0.614*** (0.038)	−0.625*** (0.039)	−0.564*** (0.066)
ln $(Productivity)_{ijt-1}$	0.077*** (0.026)	0.066** (0.027)	0.077*** (0.026)	0.026 (0.030)
Constant	−2.145** (0.875)	−1.507* (0.880)	−2.155** (0.882)	−5.682** (2.524)
N	12,170	12,517	12,170	2,550
R-sq	0.465	0.460	0.465	0.444
F	118.370	122.915	112.493	32.231

Notes: 1) Estimates are obtained with Ordinary Least Squares (OLS) estimator.   2) Firm-fixed effects and year-fixed effects are included but not shown for brevity.   3) Robust standard errors are shown in parenthesis.   4) ***, **, and * indicate the significance levels of 1, 5, and 10%, respectively.

we find that inward greenfield FDI has a significant positive spillover effect on employment by domestic firms.   Specifically, a 100% increase in greenfield FDI in an industry increases employment by local firms in the same industry by 2.3%.   In columns (2) and (3), we find no significant impact of outward FDI, implying that outward greenfield FDI of Korean firms is neither detrimental nor beneficial for Korea's local employment on aggregate.   This finding further suggests that neither the substitution effect nor the scale effect

dominates on aggregate.   Moreover, this finding is consistent with the results of Debaere *et al*. (2010), Kang and Whang (2018), and Chun *et al*. (2018).

As discussed in the previous section, the employment effects of inward and outward FDI can be different, depending on the FDI partner countries. Column (4) reports the regression results when we divide the source and destination countries into groups of developed and developing countries, respectively.   We find that inward greenfield FDI from developed countries exerts a highly significant positive spillover effect on employment by local firms.   This finding may suggest that when source countries are developed countries, the job creation effect of inward FDI in upstream and downstream local firms within the same industries is greater than its crowding-out effect on competing local firms within the same industries.   By contrast, we do not find such a positive spillover effect in the case of inward greenfield FDI from developing countries.

We also find that the coefficient of outward greenfield FDI to developing countries is negative at the 10% significance level, while we do not find such a statistically significant negative result for outward FDI to developed countries.   Thus, efficiency-seeking vertical FDI to developing countries has a greater substitution effect in that some domestic workers of the MNE's home country are replaced by foreign workers.   This finding is consistent with the finding of Debaere *et al*. (2010) that while transferring production to more advanced countries does not affect employment growth in Korea, moving to less advanced countries can cause a reduction in domestic jobs.

Among the control variables, all of the firm-specific variables, *Asset*, K/L ratio, and productivity show statistically significant effects on employment. An increase in a firm's assets and productivity increases the firm's employment, while an increase in a firm's K/L ratio decreases the firm's employment. Specifically, a 10% increase in a firm's assets increases its employment by 7.1%.   Note that an increase in a firm's assets is roughly equivalent to the firm's annual investment.

It should also be noted that neither market concentration nor industry size is found to be significant in most equations.   This is largely due to the fact that

**Table 7   Effects of Inward and Outward Greenfield FDI
on Employment-by Sector**

	All industries	Goods	Services	Unclassified
	(1)	(2)	(3)	(4)
ln FDI_{jt-1} (*In*)	0.023***	0.031***	−0.013	0.023**
	(0.007)	(0.009)	(0.025)	(0.011)
ln FDI_{jt-1} (*Out*)	−0.001	−0.001	0.029	−0.009
	(0.007)	(0.011)	(0.019)	(0.014)
HHI_{jt-1}	−0.111	−0.081	0.411	1.203*
	(0.131)	(0.130)	(0.338)	(0.697)
ln $Asset_{jt-1}$ (*Ind*)	−0.004	−0.061*	−0.057	0.139**
	(0.023)	(0.037)	(0.048)	(0.060)
ln $Asset_{ijt-1}$	0.706***	0.741***	0.650***	0.702***
	(0.021)	(0.019)	(0.063)	(0.034)
ln $(K/L)_{ijt-1}$	−0.625***	−0.687***	−0.486***	−0.660***
	(0.039)	(0.030)	(0.108)	(0.058)
ln $(Productivity)_{ijt-1}$	0.077***	0.073***	−0.010	0.168**
	(0.026)	(0.021)	(0.042)	(0.066)
Constant	−2.155**	−0.042	0.535	−8.000***
	(0.882)	(1.279)	(1.970)	(2.361)
N	12,170	5,506	2,423	4,241
R-sq	0.465	0.531	0.446	0.429
F	112.493	129.637	20.996	68.000

Notes: 1) Estimates are obtained with Ordinary Least Squares (OLS) estimator.   2) Firm-fixed effects and year-fixed effects are included but not shown for brevity.   3) Robust standard errors are shown in parenthesis.   4) ***, **, and * indicate the significance levels of 1, 5, and 10%, respectively.   5) "Unclassified" group includes the industries with characteristics of both the goods and service sectors.

these variables remain very consistent over time, and hence, within-variations over time are not large enough to show a noticeable an influence.

Table 7 reports the estimated results for the impact of inward and outward FDI on employment across the different sectors.   Reported in columns (2), (3), and (4) are the results for the goods (primary & manufacturing), services, and unclassified sectors, respectively.   We also report the results for all

industries in column (1); these have already been shown in column (3) of table 6.

We do not find any significant effect for outward FDI across the different sectors, while we find a significant positive effect of inward FDI in the goods and unclassified sectors.   The positive spillover effect of inward FDI on employment by local firms is particularly strong in the goods sector (column 2), and inward FDI in the unclassified sector (column 4) also carries a statistically significant positive coefficient, although its size is smaller than that in the goods sector.   This is due to the fact that the unclassified sector comprises industries that include characteristics of both the goods and services sectors.   It should be noted that there is no such a positive effect of FDI inflows on local employment in the services sector (column 3).   As shown in table 2, companies in the goods sector tend to be smaller than those in the services sector.   Therefore, our results may suggest that the spillover effects are larger for small firms that are operating either in the upstream or in downstream supply chains.   In the following sub-section, we will further investigate such a possibility.

Overall, we find that greenfield FDI inflows to Korea's goods sector, particularly those from developed countries, have strong spillover effects on local firms in the same industry.   This may suggest that, rather than crowding out competing firms in the same industries, foreign firms bring new business opportunities for both upstream and downstream domestic firms in the same industry.[13]

4.2. Firm-specific Factors and Effects of Inward FDI on Local Employment

As discussed in Section 4.1., the spillover effects may be larger for smaller local firms that are operating either in upstream or in downstream supply

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[13] It should also be noted that in addition to the spillover effects on employment in the same industry, foreign investment may also create more jobs in other industries that supply goods and services to foreign firms.   This possibility is not assessed in the present analysis.

Table 8   Firm-specific Factors and Spillover Effects of Inward Greenfield FDI on Employment

	All industries	Goods	Services	Unclassified
	(1)	(2)	(3)	(4)
$\ln FDI_{jt-1}$ (*In*)	0.125**	0.008	-0.012	0.350***
	(0.055)	(0.074)	(0.144)	(0.123)
$\ln FDI_{jt-1}$ (*Out*)	0.003	−0.001	0.029	0
	(0.007)	(0.011)	(0.019)	(0.013)
HHI_{jt-1}	−0.092	−0.086	0.41	0.232
	(0.133)	(0.131)	(0.335)	(0.773)
$\ln Asset_{jt-1}$ (*Ind*)	−0.019	−0.059	−0.057	0.084
	(0.024)	(0.038)	(0.050)	(0.057)
$\ln Asset_{ijt-1}$	0.764***	0.726***	0.651***	0.863***
	(0.038)	(0.049)	(0.104)	(0.060)
$\ln (K/L)_{ijt-1}$	−0.625***	−0.686***	−0.486***	−0.662***
	(0.039)	(0.030)	(0.108)	(0.058)
$\ln (Productivity)_{ijt-1}$	0.079***	0.072***	−0.01	0.172***
	(0.026)	(0.021)	(0.042)	(0.066)
$\ln Asset \times \ln FDI$ (*In*)	−0.004*	0.001	0	−0.013***
	(0.002)	(0.003)	(0.006)	(0.005)
Constant	−3.249***	0.279	0.522	−10.649***
	(1.142)	(1.549)	(2.721)	(2.891)
N	12,170	5,506	2,423	4,241
R-sq	0.466	0.531	0.446	0.431
F	108.636	123.035	20.977	65.837

Notes: 1) Estimates are obtained with Ordinary Least Squares (OLS) estimator.   2) Firm-fixed effects and year-fixed effects are included but not shown for brevity.   3) Robust standard errors are shown in parenthesis.   4) ***, **, and * indicate the significance levels of 1, 5, and 10%, respectively.   5) "Unclassified" group includes the industries with characteristics of both the goods and service sectors.

chains.   By contrast, one may worry that foreign firms are more likely to crowd out smaller, more labor-intensive and less productive local firms.

In order to assess such possibilities, we add an interaction variable of inward FDI with the individual firms' assets.   For the sake of comparison, we also

add interaction variables of inward FDI with other firm-specific variables, capital-labor ratio and productivity, separately.   Table 8 reports the regression results.   As outward FDI does not show a significant effect on employment, we include the interaction variables only for inward FDI.

Among the three firm-specific interaction variables, that relating to firms' assets (ln *Asset* × ln *FDI_in*) carries a significant negative sign.   This finding reinforces our previous finding, discussed in section 4.1. that the FDI effect on employment is shown to be greater particularly in small firms.

4.3. Lag, Contemporary, and Lead Effects

The indirect effects of inward and outward FDI on employment by local firms may take a longer time than just one year.   On the other hand, foreign MNEs may increase their investment in Korea's fast-growing industries or those with high growth potential.   Likewise, Korea's MNEs may increase or decrease their overseas investment when the domestic market is not in good condition or does not have strong growth potential.

In order to investigate such possibilities, table 9 reports the results when we replace the one-year lags of inward and outward FDI with their two-year lags (column 1), contemporary variables (column 3), or one-year leads (column 4). All of the other explanatory variables remain as one-year lags.   For the sake of comparison, the results with one-year lags of inward and outward FDI, as reported in column (1) of table 6, are also shown in column (2).   As can be seen in the table, inward greenfield FDI exerts a significantly positive effect on employment, not only with a one-year lag but also with a two-year lag and contemporaneously.   However, the one-year lead variable of inward greenfield FDI does not enter with a statistically significant coefficient.   Thus, we find evidence that our benchmark results are not due to the reverse causality bias.

On the other hand, outward greenfield FDI does not show any statistically significant coefficient across all specifications with different lags and leads.

Table 9   Lag, Contemporary, and Lead Effects of Inward and Outward Greenfield FDI on Employment

	(1)	(2)	(3)	(4)
$\ln FDI_{jt-2}$ (*In*)	0.025*** (0.007)			
$\ln FDI_{jt-1}$ (*In*)		0.023*** (0.007)		
$\ln FDI_{jt}$ (*In*)			0.026*** (0.008)	
$\ln FDI_{jt+1}$ (*In*)				0.004 (0.010)
$\ln FDI_{jt-2}$ (*out*)	−0.009 (0.008)			
$\ln FDI_{jt-1}$ (*out*)		−0.001 (0.007)		
$\ln FDI_{jt}$ (*out*)			0.004 (0.008)	
$\ln FDI_{jt+1}$ (*out*)				0.011 (0.008)
HHI_{jt-1}	0.066 (0.114)	−0.111 (0.131)	−0.092 (0.120)	−0.142 (0.113)
$\ln Asset_{jt-1}$ (*Ind*)	−0.006 (0.026)	−0.004 (0.023)	−0.002 (0.023)	0.001 (0.024)
$\ln Asset_{ijt-1}$	0.698*** (0.019)	0.706*** (0.021)	0.708*** (0.021)	0.686*** (0.022)
$\ln (K/L)_{ijt-1}$	−0.636*** (0.028)	−0.625*** (0.039)	−0.627*** (0.039)	−0.585*** (0.037)
$\ln (Productivity)_{ijt-1}$	0.094*** (0.027)	0.077*** (0.026)	0.077*** (0.026)	0.046** (0.019)
Constant	−2.155** (0.882)	−0.042 (1.279)	0.535 (1.970)	−8.000*** (2.361)
N	12,170	5,506	2,423	4,241
R-sq	0.465	0.531	0.446	0.429
F	112.493	129.637	20.996	68.000

Notes: 1) Estimates are obtained with Ordinary Least Squares (OLS) estimator.   2) Firm-fixed effects and year-fixed effects are included but not shown for brevity.   3) Robust standard errors are shown in parenthesis.   4) ***, **, and * indicate the significance levels of 1, 5, and 10%, respectively.

5. SUMMARY AND DISCUSSION

Many studies have found that inward foreign direct investment (FDI) can have a positive effect in spurring economic growth and job creation in host countries.   In particular, greenfield FDI (i.e., establishment of new firms), as opposed to mergers and acquisitions (M&A) of existing firms, is seen as a job creator in the host countries.   On the other hand, outward FDI is often seen as resulting in job substitution of home-country workers with host-country workers.

This paper has investigated the effect of inward and outward greenfield FDI on employment by Korean domestic firms.   Our empirical results have revealed that inward greenfield FDI incurs domestic firms to increase their employment in the same industry.   This positive effect is observed only in in the goods (i.e., primary and manufacturing) sector and in the unclassified sector.   But in the services sector, we have not found such a positive effect. This positive effect is also observed to be stronger when the source countries of greenfield FDI are developed countries.   We have also found that the positive effect of inward greenfield FDI on local employment is greater among small-size firms.

By contrast, we have found that the overall effect of outward greenfield FDI on domestic employment is neither positive nor negative, consistent with the findings of Debaere *et al*. (2010), Kang and Whang (2018), and Chun *et al*. (2018).   However, we have found a weak negative effect of outward greenfield FDI on employment in the sample with developing countries as destination countries.   That is, Korea's outward FDI to developing countries may have resulted in a reduction in Korea's domestic employment.   This finding is consistent with Debaere *et al*. (2010) that the hollowing out effect in domestic jobs is more significant in cases that the outward FDI is targeting developing countries with low labor costs.   Nonetheless, we should note that domestic firms' overseas investment is not necessarily harmful for the domestic economy because of other positive effects such as foreign revenue

generation, productivity increase, etc.

We acknowledge that among the two entry modes of FDI, we consider only the greenfield FDI. However, the cross-border M&A type of inward and outward FDI may have different effects on domestic employment as compared to the greenfield FDI. Therefore, as a next step, we plan to compare the effect of greenfield FDI vs. M&A FDI on employment in Korea.

Lastly, we acknowledge that there should also be various other effects of FDI on domestic economy such as productivities, sales, wages, and exports and imports, among others (Bajo-Rubio and Diaz-Mora, 2015; Lee and Hur, 2019). Therefore, we plan to examine the effects of greenfield FDI on these variables, utilizing the Korean firm-level data.

APPENDIX

Table A1   Industry Classification and Matching between Korean and fDi Markets Dataset

A. Goods (Primary and manufacturing) sector			
fDi Code	fDi Industries	KCI Code	KCI Industries
24	Metals	20600	Metal mining
		32400	Metal product
		32500	Metal Processed Product
25	Minerals	20700	Minerals mining
		32300	Minerals Product
39	Wood Products	31600	Wood Product (excluding furniture)
		33200	Furnitures
11	Chemicals	32000	Chemicals
31	Rubber	32200	Rubber & Plastics
29	Plastics		
16	Electronic Components	32600	Electronic component, communications, sound, and motion picture device
		32800	Electrical equipment
32	Semiconductors		
23	Medical Devices	32700	Medical, precision, and optical product
B. Services sector			
fDi Code	fDi Industries	KCI Code	KCI Industries
30	Real Estate	64100	Building Construction
		64200	Construction business
		126800	Real Estate Services
37	Transportation	84900	Ground & pipeline transportation
		85000	water transportation
		85100	air transportation
38	Warehousing & Storage	85200	Warehousing & shipping service
36	Hotels & Tourism	95500	Accommodations
13	Communications	106000	Broadcasting
		106100	Communications

33	Software & IT Services	106200	Computer Programming & System Service
		106300	Information service
17	Financial Services	116500	Banking
		116600	Insurance
		116700	Investment Banking
		116900	Savings (Financial Services)
		117000	All Finance (Financial Services)
		117100	Credit Finance (Financial Services)
		117200	Other (Financial Services)
22	Leisure & Entertainment	189100	Sports & Entertainment
C. Unclassified (mixture of goods and services)			
fDi Code	fDi Industries	KCI Code	KCI Industries
18	Food & Tobacco	10300	Fishing
		31000	Food product
		31200	Tobacco
		95600	Food & beverage stores
5	Beverages	31100	Beverages
35	Textiles	31300	Textiles
		31400	Clothing & clothing accessories product
		31500	Leather product
27	Paper, Printing & Packaging	31700	Pulp, paper, & paper product
		105800	Printing
12	Coal, Oil and Natural Gas	31900	Coal & oil refined product
		43500	gas and electric power
28	Pharmaceuticals	32100	Pharmaceuticals
3	Automotive Components	33000	Automotive and trailer
4	Automotive OEM	74500	Automotive & components sales
26	Non-Automotive Transport OEM	33100	All other transportation

Table A2   List of Source Countries for Inward Greenfield FDI

List of the developed countries	List of the developing countries
Australia	Brazil
Austria	Chile
Belgium	Cyprus
Canada	Hungary
Czech Republic	Iceland
Denmark	India
Finland	Israel
France	Kuwait
Germany	Malaysia
Greece	Malta
Hong Kong	Mexico
Ireland	Nepal
Italy	New Caledonia
Japan	Oman
Luxembourg	Philippines
Netherlands	PRC
New Zealand	Qatar
Norway	Russian Federation
Singapore	Saudi Arabia
Spain	Taipei, China
Sweden	UAE
Switzerland	Ukraine
UK	Viet Nam
United States	

Table A3   **List of Target Countries for Outward Greenfield FDI**

List of the developed countries	List of the developing countries		
Australia	Algeria	Israel	Romania
Austria	Argentina	Jordan	Russian Federation
Belgium	Armenia	Kazakhstan	Rwanda
Canada	Azerbaijan	Kenya	Saudi Arabia
Czech Republic	Bahrain	Kuwait	Senegal
Denmark	Bangladesh	Kyrgyz Republic	Serbia
Finland	Belarus	Lao PDR	Slovak Republic
France	Bolivia	Latvia	Slovenia
Germany	Botswana	Lebanon	South Africa
Greece	Brazil	Libya	Sri Lanka
Hong Kong	Bulgaria	Lithuania	Sudan
Ireland	Cambodia	Macedonia FYR	Syria
Italy	Cameroon	Malaysia	Taipei, China
Japan	Cayman Islands	Mali	Tajikistan
Luxembourg	Chile	Mexico	Tanzania
Netherlands	Colombia	Moldova	Thailand
New Zealand	Congo (DRC)	Mongolia	Trinidad & Tobago
Norway	Costa Rica	Morocco	Tunisia
Portugal	Cote d'Ivoire (Ivory Coast)	Mozambique	Turkey
Singapore	Croatia	Myanmar (Burma)	Turkmenistan
Spain	Dominican Republic	Nepal	UAE
Sweden	Ecuador	Nicaragua	Ukraine
Switzerland	Egypt	Nigeria	Uzbekistan
UK	Ethiopia	North Korea	Venezuela
United States	Fiji	Oman	Viet Nam
	Georgia	Pakistan	Zimbabwe
	Ghana	Panama	
	Guatemala	Papua New Guinea	
	Haiti	Paraguay	
	Hungary	Peru	
	India	Philippines	
	Indonesia	Poland	
	Iran	PRC	
	Iraq	Qatar	

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