

## Does Korea's Official Development Assistance (ODA) Promote Its FDI?

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### Abstract

This paper empirically investigates whether Korea's ODA promotes its FDI to recipient countries, using a dynamic panel analysis over the period from 1995 to 2012. The regression results reveal that total ODA, infrastructure aid, and technical assistance exert positive effects on Korea's total FDI stock in the recipient countries. At the sectoral level, differences between manufacturing and service sectors are noticeable, implying that the so-called vanguard effect of ODA on FDI depends both on industrial sector and on the type of ODA. The positive effects of ODA on manufacturing FDI are confirmed only in loan-type ODA. Infrastructure-related aid shows no significant effects on FDI in services, but technical assistance and humanitarian aid are positively associated with service sector FDI. Our empirical findings suggest that Korea's ODA plays a crucial role in facilitating its private investment flows in recipient countries, and thus it is important to formulate appropriate ODA policies favorable for private capital flows.

JEL Classification: F12, F14, F21, F35

Keywords: ODA, FDI, Korea, Gravity Model, Vanguard Effect

## 1. Introduction

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The FDI-promoting effect of ODA is drawing a renewed attention especially in international development policy fields. The newly established international development targets, the Sustainable Development Goals (SDGs), engage with a great deal of investments in developing countries, ranging from USD 3.3 trillion to USD 4.5 trillion per year. Given the financial challenges combined with the economic transformation objectives of the SDGs, the role of the private sector is even more important than before. In addition to domestic private investment, private investment flows from overseas will be indispensable in many developing countries, including FDI and other external sources of finance.

While substantial amount of private funds are available worldwide, they are not adequately guided to sustainable-development-oriented projects, especially in developing countries<sup>3</sup> (UNCTAD, 2014). Why wouldn't private capitals flow into developing countries? Among others, lack of proper infrastructure, physical or institutional, can explain the reason. In this regard, ODA may play a role as a 'vanguard' of private capital inflows by providing recipient countries with physical or institutional infrastructure. Nevertheless, knowledge about the relationship between ODA and FDI is still very limited. The empirical findings on the effectiveness of ODA in attracting FDI are ambiguous, in general, while it is found that ODA promotes FDI flows for Korea and Japan (Kimura and Todo, 2007; Park and Lee, 2008). Major shortcoming of the existing studies is that they examine the impacts of overall ODA on overall FDI flows, lacking the detailed, sectoral analysis of the impacts of ODA on FDI flows.

This paper intends to fill the gap by analyzing the relationship between ODA and FDI in detail. Specifically, we investigate whether Korea's bilateral ODA for specific countries induces its private investments to these countries, or crowded them out, or there is no relationship between the two capital flows. The paper contributes to the existing literature by applying a typological and sectoral approach to analyze the effects of ODA on FDI, specifically in the case of Korea. In particular, we examine the difference in effectiveness over various types of ODA (e.g., grants vs. loans and economic vs. non-economic aid) and the industrial sectors of FDI (e.g., manufacturing vs. services). In doing so, we rely on the knowledge-capital model of Markusen (2002) and then use a dynamic panel analysis over the period from 1995 to 2012 to test it.

This paper is organized as follows. In the following two sections, we review Korea's ODA and FDI trends and then round up the existing theoretical discussions on the influence of ODA to FDI. Section 4 describes the estimation model and the data for empirical analysis. Section 5 presents the regression results from the dynamic panel analysis, and Section 6 wraps up our findings and suggests some policy implications.

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<sup>3</sup>For example, only about 2 per cent of the assets of pension funds and insurers are invested in infrastructure, and FDI to LDCs stands at a meager 2 per cent of global flows (UNCTAD, 2014).

## 2. Trends of Korea's ODA and Its FDI

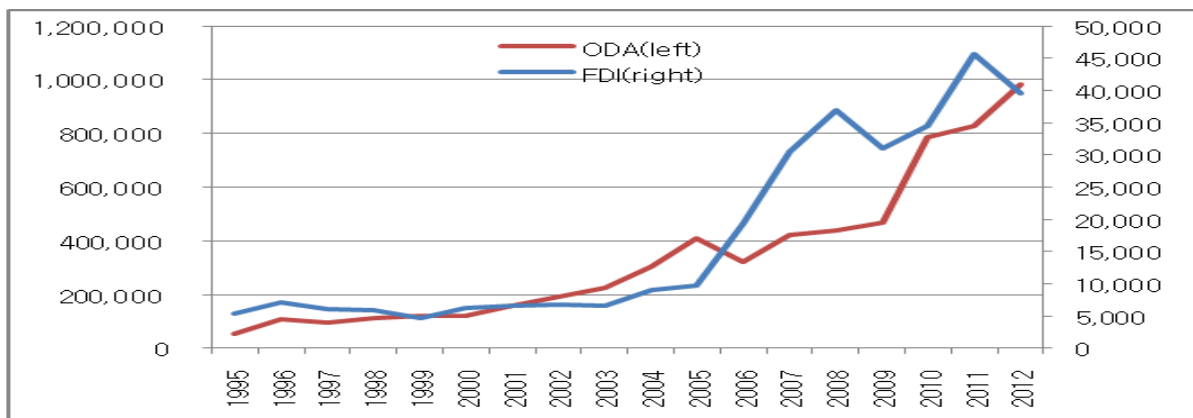
The size of Korea's ODA is still small compared to the other developed donor countries. The ODA to GNI ratio of Korea is a mere 0.14% as of 2012, which is much lower than the average 0.29% of DAC member countries. However, since 1996, it has been expanding at a rapid pace with notable increases especially for 2004-2005 and 2009-2010. Grant-type ODA accounted for only 30 % of total ODA in the early 1990s, but the Korean government has continued to increase grants vis-à-vis loans since 2003 and is recently maintaining approximately 40:60 ratio. In terms of purpose, until the early 2000s, economic development assistance such as economic and social infrastructure aid and technical assistance accounted for up to 80% of total ODA, and since then, general purpose aid such as humanitarian aid or debt relief has increased to account for about 30% of total ODA.

On the other hand, Korea's outward FDI used to be annually 5~6 billion USD for the period of 1995~2003. Having sharply increased since 2005, Korea's FDI reached to 37 billion USD in 2008. Accordingly, the total stock of Korea's FDI recorded 460 billion USD in 2011, thus increased by more than nine-fold in 20 years. The sectoral configuration of FDI also underwent a significant change during the period. In 1995, manufacturing sector accounted for a lion share of Korea's FDI, making up about 78.3% of total FDI, wholesale and retail for 10.9%, finance and real estate for 6.5%, mining for 2.3%, agriculture for 1.8%, and other general services for 0.2%, respectively. On the contrary, in 2012, the share of manufacturing sector in Korea's FDI was significantly reduced to 34.5%, while the share of the mining sector increased to 34.8% and the finance and real estate sectors rose to 24.8%.

This change strongly implies that the nature of Korea's FDI has changed and its purpose has been diversified over the period. In the 1990s, Korea's FDI was focused mainly on cheap labors, thus moving production plants into the countries where cheap labors were abundant. Due to the emergence of global value-chains, commodity boom, and the low interest rate since 2000, however, non-manufacturing FDI flows have rapidly increased, purchasing various types of foreign assets such as real estates, mining rights, and financial instruments.

The above mentioned trends of ODA and FDI are presented in <Figure 1> where the two data series for 1995~2012 are plotted on the same graph. During the period, ODA showed a sharp rise two times in 2004 and 2009, followed by increases in FDI with one-year time lag. These movements strongly imply that ODA is preceding or leading the FDI flows.

< Figure 1> Trends of Korea's ODA and FDI for 1995- 2012 (thousand USD, million USD)



Source: Korea EXIM Bank

### 3. Conceptual Framework on the Relationship between ODA and FDI

Perspectives on the relationship between ODA and FDI are still mixed. The most common idea is likely that ODA and FDI are complementary capital sources for each other (UN, 2002). Among various types, infrastructure aid is known to promote private capital inflows by enhancing the productivity of physical capital (infrastructure effects) in the recipient country. Besides the infrastructure effects, Kimura and Todo (2007) suggested 'vanguard effects' that means the discriminative positive effects of a specific donor's ODA on its FDI in the recipient country. The 'vanguard effects' work through providing business-related information, thus mitigating donor's investment risks, or implanting donor's business practices, rule and system into recipient countries. It is, however, often explained that ODA crowds out private investment by inducing rent-seeking behaviors in developing countries. Caselli and Feyrer (2007) argued that capital inflows through ODA would be offset by any form of capital outflows as the marginal productivity of capital (MPK) is reduced. On the other hand, some scholars even argue that there is no logical relationship between ODA and FDI. Kosack and Tobin (2006) claimed that ODA, which is, by nature, the general financial supports and human capital investments, has nothing to do with FDI that inherently follows the investment decision making of the private sector.

As the theoretical studies related to the impact of ODA on FDI are contradictory each other, the findings from empirical research are of special importance. Unfortunately, however, empirical results are also mixed. Karakaplan et al. (2005) showed that ODA imposes a negative impact upon FDI, but the negative effect could be mitigated by better governance or financial market development. Harms and Lutz (2006) confirmed a complementary relationship between ODA and FDI, and claim that FDI-promoting effects of ODA appear more strongly in those nations where investment environment is unfriendly. Blaise (2005) showed that Japan's ODA has positive effects on infrastructure-related FDI.

However, Kimura and Todo (2007) failed to confirm the ‘infrastructure effects’ and the negative ‘rent-seeking effects’ in general, but affirmed the positive ‘vanguard effects’ in the case of Japan.

The mixed empirical results are attributed to excessive aggregation. In this regard, Selaya and Sunesen (2012) pointed out that the composition of aid plays an important role in determining the relationship between ODA and FDI. Based on the idea, they empirically analyzed the relationship by dividing ODA into aid for production factor and aid for physical capital, and confirmed positive effects of the former and crowding-out effects for the latter. As for Korea’s case, Park and Lee (2008) affirmed that Korea’s ODA follows Japanese ODA in the relationship between ODA and FDI. They also argued that the similarity between the two countries can be attributed to their common features of aid practices. It is in line with Park (2007) who tentatively classified 21 DAC donor countries into four groups according to the features of their aid practices: humanitarianism (all the Scandinavian countries are included in this group.), ex-colony management (France, Belgium, Australia, Portugal, and the UK), economic relation (Japan, Austria, Italy, Spain, New Zealand, Canada, and Korea), and national security (the U.S.). According to the classification, Korea and Japan tend to provide the majority of their aid to poor countries with which they have strong ties in terms of trade or overseas investment.

However, we should be careful not to confuse ‘economic consideration’ for aid allocation with ‘tied condition’ in procurement process. A substantial part of Korea’s aid is implemented with untied condition<sup>4</sup>. Thus, tied aid, though it is pivotal to the role of ODA, cannot alone determine the effects of aid on trade and FDI. Kang (2014) showed that Korea’s untied aid has economic effects on trade as much as tied aid has. Non-physical investment projects such as technical assistance, even though under tied condition, often do not require any procurement that can be recognized as international trade. Korea has made serious efforts to reform the structure and process of ODA since joining the OECD DAC. One of those efforts is, since 2011, selecting and managing “priority countries” to enhance economic cooperation through strategic aid allocation (Park et al., 2013). A question may be raised that this system would directly affect both ODA and FDI decisions. To control this potential factor or bias, we selected the period of 1995~2012 in the following empirical test<sup>5</sup>.

Our paper intends to figure out whether Korea’s ODA has the vanguard effects on its FDI or not, in the spirit of Kimura and Todo (2007) and Park and Lee (2008). Unlike the existing literature, this paper considers not only aggregate FDI, but also sectoral FDI such as manufacturing and service FDI. Additional, but critical, feature is to deal with not only aggregate ODA, but also a various types of ODA: loans and grants, infrastructure aid, technical assistance, and humanitarian aid. In a related paper that examines the relationship between Korea’s ODA and its exports, Kang (2014) empirically

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<sup>4</sup> Korea’s untied aid ratio has decreased from 48.4% in 2009 to 35.7% in 2010, but rebounded to 55.1% in 2012. (CIDC, 2014)

<sup>5</sup> Since ODA needs more than one year from decision to disbursement, the selecting system of priority countries hardly affects our empirical results.

confirmed the overall positive effects of ODA on exports, and discussed the difference in terms of the size and direction of the effects over the various ODA types in different sectoral context. He also showed that infrastructure aid has vanguard effects only on capital goods exports, and technical assistance bears export-promoting effects in both various manufacturing industries and overseas construction (a service sector). Humanitarian aid showed the vanguard effects in inferior goods exports. Given the close relation between FDI and exports, we argue that different types of ODA could have different effects on FDI, and the same types of ODA could have different effects on FDI in the different sectors.

## 4. Empirical Model and Data

### 4.1 Empirical Model

To empirically test the relationship between Korea's ODA and FDI in the recipient countries, we rely on the knowledge-capital model developed by Markusen (2002) which is formed as follows:

$$f_{it} = \alpha_1 + (\alpha_2 - 1)F_{it-1} + \beta'X_{it} + \eta_i + \omega_t + v_{it}, \quad (1)$$

where  $f_{it}$  is FDI flows into country  $i$  in year  $t$ , and  $F_{it-1}$  represents the accumulated stock of FDI flows until year  $t - 1$ , which reflects the accumulation effect.  $X_{it}$  represents a vector of the other independent variables and  $\alpha_1$ ,  $\alpha_2$ , and  $\beta'$  are the parameters to be estimated.  $\omega_t$  is the time-specific effect, as a fixed, unknown constant, which is equivalent to putting time dummies in the regression.  $\eta_i$  reflects country-specific effect, and  $v_{it}$  is a stochastic error-term. Since  $f_{it}$  can be expressed by  $F_{it} - F_{it-1}$ , equation (1) can be transformed into the following dynamic panel regression form.

$$F_{it} = \alpha_1 + \alpha_2 F_{it-1} + \beta'X_{it} + u_{it}, \quad (2)$$

$$u_{it} = \eta_i + \omega_t + v_{it}, \quad i = 1, 2, \dots, N, \quad t = 1, 2, \dots, T.$$

The control variables except ODA are selected, based on generally acknowledged FDI decision factors such as agglomeration, market access, and business environments. In order to take agglomeration effect into consideration, one-period lagged FDI is employed as an explanatory variable. As a proxy for market access, we use the GDP and tariff of the recipient country as control variables. To consider market access (or openness conditions), we first should take note that the relationship between FDI and market access depends on the different forms of FDI such as classical horizontal type, vertical FDI, and export-platform FDI. According to Markusen (2002), in case of horizontal FDI, the big scale of a market, high trade costs (or barriers), or low production costs attract

more FDI. If that is the case, the regression coefficients of GDP and tariff will have positive signs. However, Neary (2007) argues that M&A FDI (non green-field FDI), even if it is a horizontal-type FDI, would increase with lower trade costs. Moreover, in case of vertical-type FDI, the complementary relationship between FDI and exports is shown, and FDI would become active as tariff is low. Thus, in the case of M&A type FDI and vertical FDI, the regression coefficient of tariff would be negative. Meanwhile, vertical FDI would be less dependent on the market size of the recipient countries. In particular, in the case of export-platform FDI (vertical, but focusing on third-country markets in a trade block rather than host-country market), regression coefficients of the host country's GDP may be meaningless. Finally, regarding business environments, existing literature claims that qualitative improvements in institutions such as the higher degree of protection of civil and property rights, the higher level of economic and political freedom, and the lower levels of corruption, would reduce uncertainty about investment return and promote private investments. We use the Economic Freedom Index of *Heritage Foundation* and *the Wall Street Journal* for economic and political stability<sup>6</sup>. We also employ the difference of GDP per capita between Korea and host countries (income-level gap) which is closely related with investment environments (Benassy-Quere et al., 2007). Income-level gap, as in the case of Park and Lee (2008), is also a variable to represent skill difference between Korea and the recipient country.<sup>7</sup>

## 4.2 Data

ODA variables that are our principal interest include various types of ODA as well as aggregate ODA. Financial types, such as grant and loan, and the objectives of ODA, including infrastructure investments, technical assistance, and humanitarian assistance, are considered. ODA (disbursement) data was extracted from the DAC database of OECD by recipients and types, and then conversion was done with flow ODA data to stock<sup>8</sup>. Bilateral FDI stock data are obtained from the Korea Imports and Exports Bank (Korea EXIM). Not only aggregate FDI but also sectoral FDI data were used, including the manufacturing industry, wholesale and retail businesses, and other general services (e.g., printing, food, etc.). Other general services FDI, the portion of which in total FDI is still marginal but meaningful in terms of service industry development, needs to be analyzed with wholesale and retail

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<sup>6</sup> Park and Lee (2008) use ICRG Corruption Index as a proxy for investment environment; however, we employ the Economic Freedom Index of Heritage Foundation, which covers freedom from corruption, property rights, business freedom, and investment freedom and so on.

<sup>7</sup> Income-level gap can be a proxy variable that reflects a wage gap between the two countries.

<sup>8</sup> ODA stock data were calculated using perpetual inventory method. 20 percent annual depreciation rate was applied to aggregate ODA, while 5 percent for loan-type ODA and 40 percent for grant-type ODA. The higher depreciation rate of grants than loans is explained by its feature as current expenditure rather capital investments. Nevertheless, we conducted robustness checks, changing depreciation rates such as 5% for grants and aggregate ODA, and confirmed that ODA regression coefficients were not significantly sensitive to changes in the depreciation rate.

FDI for comparison or for considering the complementarity. Despite its substantial amount and rapidly increasing rate, however, finance and real-estate FDI is excluded. This is because available bilateral FDI data cannot exactly tell the final destinations due to tax havens that are attracting a huge amount of FDI searching for tax benefits. Mining and agriculture FDI were not considered either in this paper since the knowledge-capital model is not applicable to these sectors. For control variables, GDP and population data were extracted from the World Development Indicator of the World Bank and overall tariff level is obtained from the UN Comtrade database. Business environments index was obtained from the Economic Freedom Index 1998 by Heritage Foundation. <Table 1> summarizes the definitions and sources of the variables used in the paper.

<Table 1> Definitions and Sources of the Variables

Variable	Definition	Sources
FDI	Korea's FDI stock in recipient countries (in thousand USD)	Korea EXIM
GDP	Hosts' GDP (in million USD)	World Bank
tariff	Hosts' average tariff for manufacturing products (%)	UNCOMTRAD
income-level gap	difference between Korea's GDP per capita and hosts' GDP per capita	World Bank
business Environments	Economic Freedom Index	Heritage
ODA total	Korea's total (net) ODA stock in recipient countries (in thousand USD)	OECD
ODA grants	Korea's grants ODA stock in recipient countries (in thousand USD)	OECD
ODA loans	Korea's loans ODA stock in recipient countries (in thousand USD)	OECD
ODA T.A.	technical cooperation ODA flows from Korea to recipient countries (in thousand USD)	OECD
ODA H.A.	humanitarian ODA flows from Korea to in recipient countries (in thousand USD)	OECD

## 5. Estimation Results

<Table 2> shows the results of regression analysis for aggregate FDI. The last five columns show the regression estimates by system-GMM model that is based on equation (2), while the first five columns present the results by random effect model for robustness check. The coefficients of the lagged FDI variable were at the range of 0.7~0.8 with statistical significance at the 1% level regardless of specifications, implying strong agglomeration effects. The market size, measured by host country GDP is positive as expected and statistically significant in all cases. The tariff is negative and significant in most cases. Thus, it is not clear whether FDI and exports are complements or substitutes. The coefficients of difference in GDP per capita are negative for all specifications and statistically significant for dynamic specification. This negative relationship implies that Korea's FDI may be skill-seeking and discouraged by big skill difference. The Economic Freedom Index capturing



the quality of business environments is positive but insignificant in all cases. This may be attributed to the aggregation of FDI that might cover up sectoral differences in the propensity to the degree of economic freedom.

Aggregate and disaggregate ODA variables, which are the main concern of this study, are all positive, and, in most cases, significant. There is not much difference between regression models in terms of coefficients' signs and statistical significance. Dynamic panel analysis showed that a 1% increase in aggregate ODA stock raises FDI stock by 0.083%, while a 1% increase in the stock of grant-type ODA leads to 0.164% increase in FDI stock. For every 1% increase in loan-type (or infrastructure) ODA stock, FDI stock rises by 0.021%. In the case of technical assistance, FDI stock will increase by 0.121%. This shows that aggregate ODA, grants, loans (infrastructure), and technical assistance have strong FDI-promoting effects, but the impact of humanitarian aid remains unclear. It is interesting that the grant-type ODA and technical assistance have a stronger impact in promoting FDI than the loan-type ODA, which is contrary to what most believe.

	RE(1)	RE (2)	RE (3)	RE (4)	RE (5)	GMM(1)	GMM(2)	GMM(3)	GMM(4)	GMM(5)
L.Dep.	0.870*** (0.024)	0.864*** (0.024)	0.874*** (0.023)	0.866*** (0.024)	0.875*** (0.023)	0.741*** (0.114)	0.741*** (0.110)	0.747*** (0.118)	0.739*** (0.113)	0.757*** (0.111)
lgdp_host	0.168*** (0.057)	0.152*** (0.057)	0.168*** (0.056)	0.145** (0.057)	0.167*** (0.057)	0.359** (0.172)	0.319** (0.158)	0.361** (0.178)	0.312** (0.158)	0.354** (0.169)
ltariff	-0.311** (0.138)	-0.343** (0.139)	-0.241* (0.139)	-0.326** (0.138)	-0.272** (0.138)	-0.296* (0.178)	-0.348** (0.171)	-0.164 (0.210)	-0.328* (0.170)	-0.250 (0.174)
lgdpg	-0.247 (0.258)	-0.405 (0.269)	-0.215 (0.252)	-0.318 (0.264)	-0.156 (0.248)	-0.335 (0.281)	-0.596** (0.287)	-0.292 (0.251)	-0.473* (0.284)	-0.128 (0.241)
lfd	0.390 (0.603)	0.368 (0.601)	0.332 (0.594)	0.254 (0.599)	0.368 (0.603)	0.836 (1.040)	0.759 (1.037)	0.772 (1.017)	0.575 (1.067)	0.755 (1.001)
latos	0.049* (0.029)					0.083* (0.046)				
lagrs		0.102*** (0.039)					0.164*** (0.059)			
lalos			0.012 (0.007)					0.021* (0.011)		
loda_tc				0.069** (0.033)					0.121** (0.053)	
loda_ha					0.046 (0.035)					0.031 (0.026)
Constant	0.659 (4.163)	2.167 (4.215)	0.855 (4.131)	2.176 (4.257)	0.086 (4.140)	-1.133 (5.519)	1.536 (5.354)	-1.103 (5.203)	1.651 (5.476)	-2.364 (5.425)
Observations	489	489	489	489	489	489	489	489	489	489
Number of pair	56	56	56	56	56	56	56	56	56	56
AR(1)						0.008	0.009	0.010	0.011	0.008
AR(2)						0.453	0.545	0.352	0.388	0.588
Sargan-P						0.000	0.000	0.000	0.000	0.000
Hansen-P						0.823	0.794	0.627	0.802	0.917

Note: RE means random effect method. Dependent variable is the log of Korea's FDI stock in the recipient countries. Ldep. means the one-period lagged dependent variable. lgdp, ltariff, lgdpg and ldist are control variables indicating recipients' GDP, tariff rate, per capita GDP difference and distance in log. latos, lagrs, lalos mean the log of the stock of total ODA, grant-type ODA, loan-type ODA, respectively. loda\_tc and loda\_ha mean the log of the flow of technical cooperation ODA and humanitarian aid, respectively. Sargan-P and Hansen-P mean the p-values of the Sargan and Hansen statistics.

§ Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

<Table 3> shows the regression results for the manufacturing sector FDI. The regression coefficients of the one-period lagged dependent variable were around 0.8 and statistically significant in all cases, which shows a strong agglomeration effects. The coefficients of GDP and tariff were positive and insignificant unlike total FDI, suggesting that manufacturing FDI may not seek the markets of host countries. The skill difference captured by the difference in GDP per capita is negative, implying Korea's FDI may be skill-seeking. Unlike aggregate level analysis, economic freedom is positive and significant for total ODA. This shows that Korea's manufacturing FDI seeks to avoid risks in business environments. These results are consistent with both vertical FDI and export-platform FDI model. These empirical findings show that Korea's manufacturing sector seeks to utilize local skilled labor, capitals, and technology through FDI as a strategy for globalization and regional diversification. Total ODA is positive and significant in system-GMM estimation, implying

various types of ODA jointly contribute to improving business environments, thus increasing FDI. The positive and significant impact was also confirmed for loan-type ODA. Grant-type ODA is positive but insignificant. Thus, we cannot find evidence for separate effects of grants on manufacturing FDI. In summary, we may conclude that strong FDI-promoting effects are affirmed in total and loan- types or infrastructure ODA for manufacturing sector FDI.

<Table 3> Regression Results: Manufacturing FDI

	RE(1)	RE (2)	RE (3)	RE (4)	RE (5)	GMM(1)	GMM(2)	GMM(3)	GMM(4)	GMM(5)
L.Dep.	0.890*** (0.020)	0.889*** (0.020)	0.890*** (0.020)	0.888*** (0.020)	0.894*** (0.020)	0.839*** (0.077)	0.836*** (0.076)	0.844*** (0.073)	0.833*** (0.077)	0.835*** (0.078)
lgdp_host	0.097* (0.050)	0.089* (0.052)	0.105** (0.050)	0.086 (0.053)	0.109** (0.050)	0.146 (0.120)	0.138 (0.112)	0.150 (0.111)	0.119 (0.108)	0.176 (0.112)
ltariff	-0.007 (0.154)	-0.017 (0.155)	0.072 (0.157)	-0.012 (0.155)	0.018 (0.154)	0.040 (0.194)	0.028 (0.196)	0.135 (0.201)	0.020 (0.194)	0.066 (0.189)
lgdpg	-0.534* (0.292)	-0.571* (0.308)	-0.492* (0.287)	-0.526* (0.301)	-0.372 (0.279)	-0.599** (0.289)	-0.644** (0.293)	-0.553** (0.267)	-0.683** (0.305)	-0.366 (0.255)
lfd	0.932 (0.635)	0.900 (0.635)	0.913 (0.635)	0.836 (0.638)	0.910 (0.636)	1.250* (0.748)	1.223 (0.751)	1.188 (0.736)	1.088 (0.739)	1.256 (0.780)
latos	0.050 (0.030)					0.064** (0.033)				
lagrs		0.060 (0.042)					0.078 (0.051)			
lalos			0.012 (0.008)					0.015* (0.009)		
loda_tc				0.046 (0.036)					0.086 (0.058)	
loda_ha					0.001 (0.043)					-0.032 (0.054)
Constant	0.853 (4.565)	1.396 (4.676)	0.754 (4.573)	1.441 (4.739)	-0.409 (4.530)	-0.644 (4.790)	-0.086 (4.646)	-0.695 (4.467)	1.109 (4.461)	-2.655 (4.864)
Observations	489	489	489	489	489	489	489	489	489	489
Number of pair	56	56	56	56	56	56	56	56	56	56
AR(1)						0.021	0.021	0.021	0.019	0.020
AR(2)						0.290	0.296	0.305	0.285	0.324
Sargan-P						0.398	0.424	0.413	0.414	0.421
Hansen-P						0.824	0.729	0.901	0.809	0.852

Note: RE means random effect method. Dependent variable is the log of FDI stock from Korea to recipient countries. Ldep. means the lagged dependent variable. lgdp, ltariff, lgdpg and ldist are control variables indicating recipients' GDP, tariff rate, GDP difference and distance in log. latos, lagrs, lalos mean the log of the stock of total ODA, grant-type ODA, loan-type ODA, respectively. loda\_tc and loda\_ha mean the log of the flow of technical cooperation ODA and humanitarian aid, respectively. Sargan-P means the p-value of the Sargan statistics.

§ Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

<Table 4> shows the regression results for the wholesale and retail sector FDI. The coefficients of the lagged FDI were estimated at 0.6~0.9 and statistically significant at the 1% level in all cases. Host country's GDP showed relatively large, positive, and significant effects as expected, indicating that market size is a major determinant of the FDI. Tariff showed positive signs in most cases of GMM

analysis, which is consistent with the feature of market-seeking FDI. However, the estimates are statistically insignificant. Skill-gap is also positive and insignificant. This implies that the sales service FDI may not be skill-seeking. A strong positive impact of economic freedom was confirmed in all cases, indicating a better business environment attracts more wholesale and retail FDI from Korea. Among various types of ODA, only technical assistance has positive and significant impacts on FDI. The other types of ODA, including total ODA, showed positive coefficients without statistical significance. Based on these results, we can conclude that technical assistance promotes sales services sector FDI, while the effects of the other types of ODA remain unclear.

< Table 4> Regression Results: Wholesale and Retail FDI

	RE(1)	RE (2)	RE (3)	RE (4)	RE (5)	GMM(1)	GMM(2)	GMM(3)	GMM(4)	GMM(5)
L.Dep.	0.901*** (0.019)	0.899*** (0.019)	0.902*** (0.019)	0.896*** (0.019)	0.901*** (0.019)	0.608*** (0.116)	0.628*** (0.119)	0.585*** (0.118)	0.625*** (0.122)	0.856*** (0.063)
lgdp_host	0.205*** (0.046)	0.192*** (0.047)	0.208*** (0.046)	0.181*** (0.047)	0.206*** (0.046)	0.682*** (0.212)	0.678*** (0.212)	0.683*** (0.206)	0.682*** (0.219)	0.279** (0.113)
ltariff	-0.027 (0.113)	-0.047 (0.113)	0.009 (0.115)	-0.052 (0.113)	-0.002 (0.112)	0.014 (0.197)	0.097 (0.211)	-0.002 (0.201)	0.068 (0.185)	0.008 (0.096)
lgdpg	0.185 (0.214)	0.078 (0.225)	0.214 (0.211)	0.058 (0.219)	0.223 (0.204)	0.288 (0.502)	0.462 (0.414)	0.205 (0.489)	0.513 (0.410)	0.164 (0.189)
lfd	0.988** (0.461)	0.960** (0.461)	0.977** (0.462)	0.861* (0.462)	0.989** (0.461)	1.864** (0.847)	1.831** (0.839)	1.726** (0.860)	1.851** (0.832)	1.042** (0.418)
latos	0.025 (0.022)					0.040 (0.042)				
lagrs		0.057* (0.030)					0.087 (0.073)			
lalos			0.005 (0.006)					0.007 (0.013)		
loda_tc				0.063** (0.026)					0.116** (0.059)	
loda_ha					0.040 (0.031)					0.034 (0.027)
Constant	-7.264** (3.380)	-6.168* (3.452)	-7.369** (3.393)	-5.354 (3.484)	-7.544** (3.340)	- (6.845)	- (7.162)	- (6.684)	- (7.020)	- (6.725)
Observations	489	489	489	489	489	489	489	489	489	489
No. of pair	56	56	56	56	56	56	56	56	56	56
AR(1)						0.007	0.008	0.007	0.009	0.007
AR(2)						0.076	0.072	0.074	0.067	0.085
Sargan-P						0.000	0.000	0.000	0.000	0.000
Hansen-P						0.972	0.976	0.977	0.988	0.988

Note: RE means random effect method. Dependent variable is the log of FDI stock from Korea to recipient countries. Ldep. means the lagged dependent variable. lgdp, ltariff, lgdpg and ldist are control variables indicating recipients' GDP, tariff rate, GDP difference and distance in log. latos, lagrs, lalos mean the log of the stock of total ODA, grant-type ODA, loan-type ODA, respectively. loda\_tc and loda\_ha mean the log of the flow of technical cooperation ODA and humanitarian aid, respectively. Sargan-P means the p-value of the Sargan statistics.

§ Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

<Table 5> shows the regression results of the other general services sector FDI except wholesale and retail. The coefficients of the FDI in the last period were 0.7~0.8 and statistically significant at the 1% level. GDP showed positive impacts on FDI while tariffs proved negative impacts. These results are not in line with the theoretical expectation, but statistically significant, illustrating that the purpose of the FDI may be market-seeking. The income gap variable showed a mixed relationship with FDI, and the economic freedom variable demonstrated a positive one. However, the estimates for these two variables are insignificant. Thus, we cannot find enough evidence to conclude that the other general services FDI is skill-seeking or seeks to avoid risks from business environments. ODA showed positive impacts on FDI in all types and specifications. Among them, grant-type ODA, including technical assistance and humanitarian aid, is statistically significant. The distinctive feature of the other general services sector FDI is that humanitarian ODA showed positive impacts.

< Table 5> Regression Results: Other Services FDI

	RE(1)	RE (2)	RE (3)	RE (4)	RE (5)	GMM(1)	GMM(2)	GMM(3)	GMM(4)	GMM(5)
L.dep.	0.877*** (0.023)	0.872*** (0.023)	0.879*** (0.023)	0.871*** (0.023)	0.879*** (0.023)	0.789*** (0.094)	0.814*** (0.075)	0.769*** (0.114)	0.791*** (0.091)	0.794*** (0.101)
lgdp_host	0.152*** (0.055)	0.138** (0.056)	0.162*** (0.055)	0.122** (0.057)	0.155*** (0.055)	0.283** (0.137)	0.214* (0.112)	0.322* (0.168)	0.215* (0.125)	0.280* (0.152)
ltariff	-0.400** (0.156)	-0.427*** (0.157)	-0.295* (0.160)	-0.427*** (0.157)	-0.335** (0.156)	-0.370** (0.169)	-0.415*** (0.156)	-0.232 (0.190)	-0.416** (0.167)	-0.295* (0.157)
lgdpg	-0.033 (0.296)	-0.144 (0.312)	0.043 (0.292)	-0.117 (0.304)	0.090 (0.284)	0.170 (0.389)	-0.065 (0.314)	0.229 (0.390)	-0.058 (0.332)	0.273 (0.397)
lfd	0.417 (0.633)	0.359 (0.633)	0.392 (0.635)	0.200 (0.637)	0.417 (0.634)	0.611 (0.527)	0.526 (0.533)	0.587 (0.531)	0.290 (0.616)	0.588 (0.534)
latos	0.072** (0.031)					0.080 (0.054)				
lagrs		0.107** (0.044)					0.145** (0.058)			
lalos			0.015* (0.008)					0.022 (0.014)		
loda_tc				0.097** (0.038)					0.143*** (0.049)	
loda_ha					0.098** (0.044)					0.117*** (0.043)
Constant	-1.636 (4.616)	-0.335 (4.716)	-1.918 (4.631)	0.470 (4.781)	-2.555 (4.574)	-5.220 (4.808)	-2.480 (4.195)	-5.765 (4.768)	-1.290 (4.471)	-5.852 (4.871)
Obs.	489	489	489	489	489	489	489	489	489	489
No. of pair	56	56	56	56	56	56	56	56	56	56
AR(1)						0.002	0.002	0.002	0.003	0.002
AR(2)						0.081	0.094	0.082	0.114	0.086
Sargan-P						0.000	0.000	0.000	0.000	0.000
Hansen-P						0.899	0.894	0.859	0.918	0.880

Note: RE means random effect method. Dependent variable is the log of FDI stock from Korea to recipient countries. Ldep. means the lagged dependent variable. lgdp, ltariff, lgdpg and ldist are control variables indicating recipients' GDP, tariff rate, GDP difference and distance in log. latos, lagrs, lalos mean the log of the stock of total ODA, grant-type ODA, loan-type ODA, respectively. loda\_tc and loda\_ha mean the log of the flow of technical cooperation ODA and humanitarian aid, respectively. Sargan and Hansen mean the p-value of the Sargan and Hansen statistics. § Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

We can summarize the above regression results as in <Table 6>. Regarding the overall relationship

between FDI and ODA, not only aggregate ODA but also disaggregated ODAs by types, such as grant, loan, and technical assistance were identified as having significant positive effects on FDI. Humanitarian aid has also a positive effect even though statistically insignificant. This is enough evidence that Korea's ODA crowds in FDI from Korea to recipient countries, through either the vanguard or infrastructure effects. In addition, the difference between manufacturing and service sectors are observed, implying that the vanguard effects depend on the industrial sector and the type of ODA. We argue that the vanguard effects clearly emerge when the features of aid match well those of FDI. The manufacturing sector is characterized by strong agglomeration effects, unclear market access effects, and strong skill-seeking and risk-averse nature. In the sector, aggregate and loan-type aids have strong positive effects on FDI while grant-type and technical assistance have no effects. The strong positive effect of aggregate aid means that various types of ODA jointly contribute to improving investment environment such as labor quality, governance, and infrastructure efficiency. The positive effect of loan-type or infrastructure aid implies that Korea's infrastructure aid would lower the investment risk of Korean investors in recipient countries. No effect of technical assistance looks puzzling. However, it implies that Korea's technical assistance has not showed a substantial impact on the quality of workers, at least in the manufacturing sector.

Service sector FDI is also influenced by limited ODA types. The FDI of wholesale and retail sector is positively influenced only by technical assistance (a kind of grant-type ODA), but the other general services showed vanguard effects in grants, including technical assistance and humanitarian aid. Service sector FDI is characterized by market-seeking. Thus, we may assume that the vanguard effects would come up in relation to trade. Kang (2014) confirmed that in Korea's case, technical assistance (or grants) has positive effects on various sub-sector exports while the positive effects of infrastructure aid (or loans) is limited to capital-goods exports. Wholesale and retails are often related to consumer goods rather than capital goods, thus we can infer that infrastructure aid cannot stimulate consumer goods exports and, in turn, fails to promote wholesale and retails FDI. However, technical assistance would stimulate wholesale and retails FDI by promoting consumer goods exports. The FDI in the other general services sectors is not clear in terms of its purpose. It may be related to various types of goods and services exports or capital investment, thus might be affected by humanitarian aid that could crowd in foreign investment with friendship between donors and recipients.

< Table 6> Summary of the Regression Results

ODA\FDI	Total FDI	Manufacturing	Wholesales and Retails	Other Services
Total ODA	Yes	Yes	No	No
Grants	Yes	No	No	Yes
Loans	Yes	Yes	No	No
Technical Assistance	Yes	No	Yes	Yes
Humanitarian Aid	No	No	No	Yes

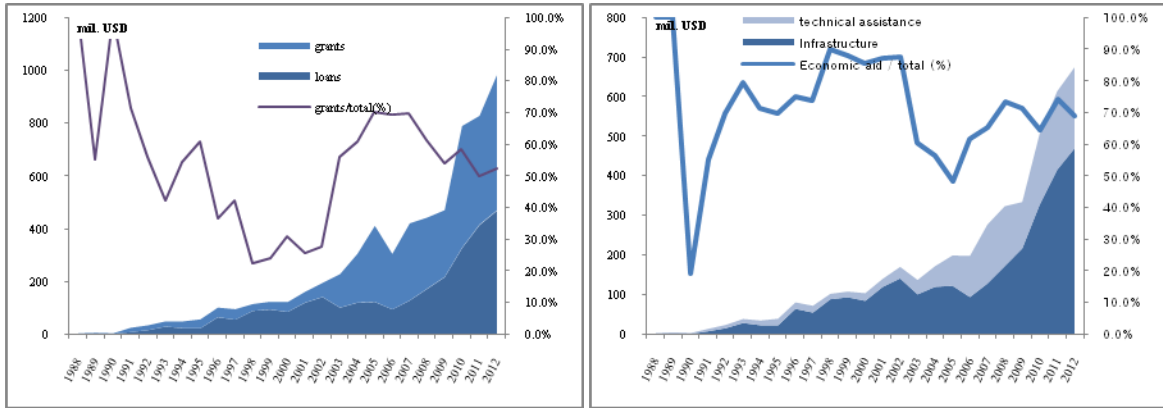
## 6. Conclusion and Policy Implications

We investigated whether Korea's foreign aids promote its FDI to recipient countries - the vanguard effects. Aggregate level analysis on Korea's ODA reveals that there exist strong vanguard effects on FDI. We also argued that FDI-promoting effect of Korea's ODA depends on the types of aids and the FDI sector. This claim is based on the reasoning that aid alleviates the uncertainty of the investment climate in recipient countries and, in turn, crowds in FDI, a kind of private capital investments, from donor countries. It is also considered that ODA facilitates FDI through trade in goods and services. The sectoral analysis showed evidence for the argument. The positive effects of ODA on manufacturing sector FDI are confirmed for loan-type ODA, suggesting that infrastructure aids promote the FDI by improving investment environment. The relationship between ODA and FDI showed different aspects for service sector FDI, which is mainly made in relation to exports. The FDI of wholesale and retail sector is influenced only by technical assistance (a kind of grant-type ODA), which promotes consumer goods exports to recipient countries. Other general service FDI, which may be related to most types of goods and services exports, is affected not only by technical assistance, but also by humanitarian aid.

Given the proliferating business activities on the global level and the importance of FDI, our findings on the relationship between ODA and FDI have substantial policy implications. From the donor's perspective, these results could justify the increasing provision of ODA despite the prolonged global economic slowdown and increasing pressures for fiscal frugality. From the recipients' perspectives, ODA would help them to reduce investment gaps through both public and private capital inflows. In order to realize this win-win situation, donors have to design an appropriate ODA policy by precisely selecting the types of ODA and the recipient countries in harmonizing with its export and FDI strategies.

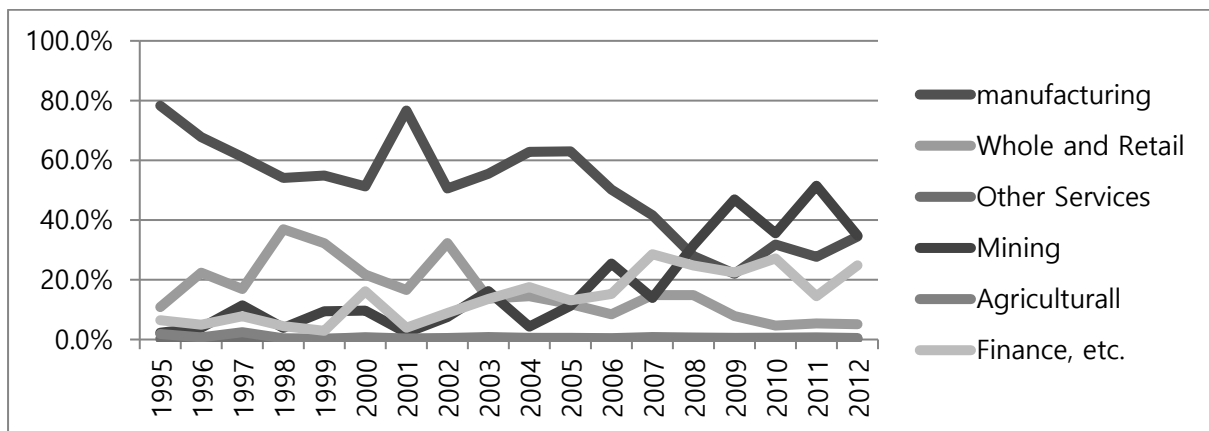
Appendix

<Figure A1> Trend of ODA composition: 1988-2012



Source: Kang (2014)

< Figure A2> Trend of FDI composition: 1995-2012



Source: Korea EXIM Bank



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