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THE EFFECTS OF ODA IN INFRASTRUCTURE ON FDI INFLOWS
IN PROVINCES OF VIETNAM, 2002-2004

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Abstract

The study investigates the impacts of official development assistance (ODA) on the inflows of foreign direct investment (FDI) in 64 provinces of Vietnam in 2002–2004. These impacts are examined using both the two-stage least squares method and the fixed effects/random effects model. The regression results give evidence of the positive impacts of ODA in infrastructure on FDI inflows, not only by direct channel, but also by indirect channel through improving the human capital base of respective provinces. However, the short term impacts of current level of ODA disbursement are ambiguous. Robust evidence only proves the long-term impacts of ODA in infrastructure on FDI attraction. At the donor level, we found that the Japanese ODA has a positive and significant impact on the allocation of FDI of Japanese private investors in both the short-run and long-run.

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1. Introduction

For achieving a sustainable economic development target, the major issue for developing countries is to attain an adequate foreign financial source to escape from the vicious circle of low savings and low economic growth. Developing countries usually start their economic development at a low level of income per capita and, thus, low levels of domestic savings. According to Hayami Y. and Godo Y., 2006: "For such developing countries, in which the investment needs for development tend to exceed domestic saving capacities, net capital import from abroad represents a possible escape from the vicious circle of slow economic growth and low savings". Therefore, in developing countries, of which financial sectors are yet to be well developed, foreign direct investment (FDI) and official development assistance (ODA) not only represent the major source of finance, but also provide a chance for human capital accumulation and technology transfer in recipient countries.

FDI, compared to ODA, is preferable due to its characteristics of political independence. Determinants of FDI have become a major source of recent economic studies to unveil the reasons why some regions are more successful than the others in attracting FDI. So far, many empirical studies have identified various factors that can affect the inflow of FDI including the level of development, market size and policy, and infrastructure, of which infrastructure is considered the key element to improve the investment environment for promoting FDI.

Countries with high levels of infrastructure investment like Japan, Korea and later China and Vietnam, have experienced a high and sustainable economic growth. In these countries, infrastructure and its related services reduce the transaction costs, raise competitiveness, support productivity and efficiency in manufacturing and distribution, and create a sustainable domestic market while linking them to international market. For further attracting FDI, the challenge is now is to find ways to finance infrastructure. Infrastructure, due to its specificity of high capital intensity and long life cycle tends to be prone to market failures. Therefore, investment in infrastructure usually relies heavily on public finance. In developing countries with low level of domestic saving as mentioned above, ODA represents the main source of finance.

In the literature, many studies have focused on figuring out the relationship among FDI, infrastructure, ODA, and economic development. While most studies find the positive relationship between infrastructure and FDI inflow and between FDI and economic growth, the relationship between ODA in infrastructure and FDI attraction is still lacking¹. According to the World Bank (2006), this is probably due to the fact that in most developing countries, ODA in infrastructure does not contribute significantly to the total funds for infrastructure investment. In fact, ODA in developing countries, is usually not an important source of financing infrastructure investment in low- and middle-income countries of East Asia. However, it is not the case so in Vietnam.

Over the past decade, Vietnam has achieved a spectacular continuous GDP growth with an annual per capita growth rate averaging 7.3%, the eighth highest in the world, from 1992 to 2002. A critical part of this success is contributed by a high level of FDI. In fact, FDI has contributed as much as 14% of the total Gross Domestic Product (GDP) of Vietnam and 54% of its total exports (Freeman, 2002). Among various factors, the high level of infrastructure investment, which has been mainly financed by ODA, has been considered to contribute

¹ The studies include Glickman and Woodward, 1988; Hill and Munday, 1991, 1992; Wheeler and Mody, 1992; Lorre and Guisinger, 1995.

significantly in attracting FDI attraction to Vietnam. The importance of ODA in funding infrastructure has been recognized widely in the 5-year plan and 10-year socio-economic strategy by the Vietnamese government. In the Socio-economic Development Strategy of 2006–2010, the Vietnamese government has specified the target of future annual infrastructure investment summing up to 11.4% of the GDP, i.e., an increase of 2% of the GDP over the recent levels.

In order to meet the government's infrastructure goals, this financing gap will need to be filled with an increase in ODA in infrastructure. The key issue for recent discussion is to find a positive relationship between increasing ODA in infrastructure and improving the FDI inflow. However, so far, there is no empirical study about the linkage between ODA in infrastructure and FDI inflow in Vietnam. This linkage, once proved, not only can affect largely the governmental policies toward mobilizing and utilizing this important fund for development, but also can provide a strong argument for persuading donors to invest in infrastructure projects.

To provide more evidence on the debate about the importance and the role of ODA in infrastructure and FDI in Vietnam, this paper focuses on analyzing the impacts of ODA in infrastructure as one of the more important determinants of FDI inflow. This paper aims to explore the interrelationship between ODA in infrastructure and FDI inflow. More specifically, this paper can produce a new perspective on the discussion of the impacts of foreign aid on FDI promotion to persuade donors in infrastructure projects.

2. Conceptual Framework

2.1. Definition of Terms

Foreign Aid

According to the Glossary of Statistical Terms of the Organization for Economic Co-operation and Development (OECD), ODA refers to “The flow of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element of at least 25 percent (using a fixed 10 percent rate of discount). By convention, ODA flows comprise contributions of donor government agencies, at all levels, to developing countries (“bilateral ODA”) and to multilateral institutions. ODA receipts comprise disbursements by bilateral donors and multilateral institutions”.

Infrastructure

According to the definition in investorworld.com, “Infrastructure is the basic physical systems of a country's or community's population, including roads, utilities, water, sewage, etc”². These systems have been considered significant in improving the dynamic development of economies. Infrastructure in this study is limited to transport, electricity and telecommunications because these services are capital-intensive and tend to exhibit substantial economies of scale. Moreover, the features of infrastructure services including space and use specificity, long-lasting life time and lumpiness make it typical type of a public good. With the characteristics of a public good, including non-excludability and non-rivalness

² <http://www.investorwords.com/2464/infrastructure.html>

and, more importantly the phenomenon of free-riding, infrastructure services suffer from market failures, which make it difficult to allocate appropriate financial sources for infrastructure investment. “In some infrastructure sectors, there are activities in which private sector financing can help unlock resources. However, in most cases, private sector interest is likely to be limited and private sector participation is more difficult to structure” (World Bank, 2006). In these situations, official financing plays an important role in unlocking a country’s own resources to meet infrastructure challenges. Official funds, especially ODA, may play a significant role in financing large-scale infrastructure projects. This is particularly important because through ODA, the government can also encourage private sector initiation so as to maximize national and international welfare.

Foreign Direct Investment

According to the Government of Vietnam (1999): “FDI is defined as a long-term investment by a foreign direct investor in an enterprise resident in an economy other than where the foreign direct investor is based”.

2.2. The Linkage Between ODA and FDI

Infrastructure affects FDI inflow in both direct and indirect ways (Figure 1). Infrastructure in transport system provides better conditions for foreign investors to access their markets of both outputs and inputs. The establishment of other crucial facilities including electricity, water, and gas allow mass production of output. In addition, workers involved in infrastructure construction have chances to increase their income and, in turn, raise the aggregate disposal income and consumption, which eventually increases market size and potential sales of investors. Also, better access to schools and hospitals and increase in income have positive effects in human capital formulation, which in turn, supply a highly qualified labor force for the investors.

3. Review of Previous Studies

3.1. The Effects of Infrastructure on Investment and Economic Growth

According to Estache (2004), there are 102 studies that examine the impacts of infrastructure on growth, investment, and productivity. The majority finding is the positive impact of infrastructure and economic growth on investment. In the case of developing countries, many studies have confirmed the significant impact on aggregate output of the development of telecommunications and roads³. In particular, Canning and Bennathan (1999) estimated the social rates of return to electricity and paved roads, relative to the returns to general capital. They found that both types of infrastructure are highly complementary with the other physical and human capital, especially in a few countries, where there is evidence of acute shortages of electricity and paved roads. Thus, there are excess returns to infrastructure investment. While infrastructure is important, Devarajan, Swarrop and Zhou (1996), ironically, found a negative relationship between the share of infrastructure expenditures in total public expenditure and investment.

Prud’homme (2004) found that most of these studies follow the production function-based approach, which suffers from a number of drawbacks. Firstly, many infrastructure investment

³ The studies include studies of Roller and Waveman, 2001; Demetriades and Mamuneas, 2000; Canning and Bennathan, 1999; Fernald, 1999.

decisions are not based solely on the consideration of maximizing economic growth but much weight is taken on the political and social aspects. Secondly, measuring the infrastructure stock is difficult, both conceptually and empirically, because what affects investment are infrastructure services, while the available information are related to infrastructure supply. Thirdly, the efficiency with which infrastructure services is supplied depends on the regulatory framework governing service provision.

3.2. The Effects of Foreign Aid on Investment and Aggregate Growth

Doucouliagos H. and Paldam M. (2005) reported that there are 43 papers containing accumulated estimates of the impacts of aid on savings. Aid is found to have a positive impact on savings and investment and, thus, savings and investment promote aggregate economic growth. Also, Sturm (2001) found that foreign aid has made a statistically significant contribution to public investment, which in turn contributes to economic growth. However, studies such as Hansen and Tarp (2000) and Harms et al. (2004) conclude that foreign aid may depress domestic savings.

3.3. The Determinants of FDI

Edward Crenshaw (1991) found in a number of studies the positive effects of the level of development, market size and economic growth on FDI⁴. On the other hand, Bennett and Green (1972) and Schneider and Frey (1985) found the negative relationship between political instability and FDI.

Harms and Lutz (2006) and Karakaplan et al. (2005) examine directly the relation between foreign aid and FDI using data from developing countries. Harms and Lutz(2006) found two major effects of ODA on FDI flows: (1) ODA improves infrastructure system of recipient countries and, thus, enhance the marginal product of capital in the recipient countries; (2) ODA encourages rent-seeking behavior, which lead to the decrease in factor productivity in the country and may discourage FDI inflows. The effects of aid on FDI is generally insignificant but significantly positive for countries in which private agents face heavy regulatory burdens. Karakaplan et al. (2005) also found an insignificant effect of aid on FDI, but in contrast to the finding of Harms and Lutz (2006), their results suggested that good governance and developed financial markets lead to a positive effect of aid.

4. FDI and ODA in Vietnam: An Overview

Since the start of economic reforms in Vietnam in 1986 up until 2006, FDI inflow in Vietnam has increased considerably. In 2005, Vietnam attracted US\$5.8 billion from FDI. Apart from the shock to the world or regional economy such as the Asian financial crisis, the number of registered FDI projects has increased strikingly (Figure 2). We can also notice a similar trend in the level of ODA disbursement. During the period 1993-2003, donors committed US\$25.4 billion in ODA to Vietnam. ODA resources have mostly been allocated in accordance with the priority of the Government. Infrastructure has been the largest beneficiary of ODA: 22.6 per cent of the source was allocated to transport, 20.3 percent to electricity generation and transmission and another 8.3 per cent to water supply, drainage and urban infrastructure (Ministry of Planning and Investment, 2003). Interestingly, the distribution of ODA among provinces of Vietnam is not biased toward the poor areas of the country (Table 1). Regions with low poverty rate such as Red River Delta and South East received much more aid than

⁴ These studies include study of Dunning (1981), Bollen and Jones (1982), and Scheneider and Frey (1985).

other poor regions. This can be explained by the higher efficiency of development spending, mainly through encouraging FDI in relatively more developed areas in generating economic growth. Therefore, a large amount of ODA was allocated to the relatively prosperous urban centers rather than to the rural and mountainous areas, where poverty concentration is high.

Red River Delta and the South East region are ahead of the rest of the country in terms of the amount of FDI they attract. These regions also have the nation's highest number of new enterprise registrations per capita. Provinces with a high concentration of ODA including Hochiminh City, Hanoi, Dongnai, Binhduong, and Baria-Vungtau have also attracted large inflows of FDI (Figure 3). Since their local economies continue to be reinforced by large ODA inflows, we can expect to find a strong correlation between FDI inflow and ODA in infrastructure in the provinces of Vietnam.

5. Econometric Model

We use the two stage least square (2SLS) and the fixed effects/random effects (FE/RE) model in the estimation.

5.1. The 2SLS

In the first stage of 2SLS, the ODA in infrastructure is regressed on a set of exogenous variables including 2 instrumental variables that affect ODA, but do not affect the FDI. In the second stage, the predicted values of ODA enter as one of the regressors of the FDI.

There are two reasons why the 2SLS is justifiable. Firstly, infrastructure, which is mainly financed by ODA, acts as a prerequisite for the establishment of FDI projects. ODA is also considered an endogenous variable in the FDI regression and instrumental variables are needed to correct for endogeneity using two-stage estimation procedure. Secondly, the error term in the FDI regression contains unobserved province-specific effects so that the error term may be correlated with the variations in some of the regressors. For example, shocks in the Gross Domestic Product Per Capita (GDPPC) may be highly correlated with the shocks that affects FDI. The tests for endogeneity, the test for over-identification, and the test for strength of instruments are conducted to ensure the robustness of the coefficients, of which the results are all in favor of 2SLS.

In both stages, all variables are transferred into logarithm form to minimize the excessive variations in the value of ODA and FDI. Also, as some provinces are recorded to have zero values, those observations are excluded when they are transferred into logarithm form and hence reduce the number of observations for the regression analysis. In order to avoid this problem, a small value of 0.001 is added to each observation when they are being transformed into logarithm form (Pham Hoang Mai, 2005).

The first equation in the 2SLS is as follows:

$$\text{Eq. (1)} \quad \ln\text{ODA} = f(\ln\text{lagODA}, \ln\text{GDPPC}, \ln\text{PATIENTBED})$$

The endogenous variable ODA is measured by the current disbursement value of ODA in infrastructure from all donors. This represents the direct, short-tem impact of ODA on the attraction of FDI. ODA is measured in real domestic currency, deflated by the CPI using 2000 as the base year and converted into US dollar (USD) using the official exchange rate of the respective year. In this paper, ODA values include ODA in roads, telephones and other

telecommunication, and electricity, which come from the report of Development Assistance Database (DAD) project of Ministry of Planning and Investment⁵.

The level of ODA disbursement depends on the disbursement level of the previous year, which is measured by the variable lag of ODA ($\ln \text{lagODA}$) and income per capita ($\ln \text{GDPPC}$), which are both in real terms after deflated by national CPI and converted into USD.

The instrumental variable is included to correct for the endogeneity of ODA. The chosen instrumental variable is the number of patient beds per person in local hospitals (PATIENTBED), which represents the level of basic public service in that province. The data of this variable comes from Ministry of Labor and Social Affairs

The second-stage equation of the 2SLS is as follows:

$$\text{Eq. (2)} \quad \ln \text{FDI} = f(\ln \text{ODAhat}, \ln \text{lagODA}, \ln \text{INDUS}, \ln \text{SCHOOL}, \ln \text{GDPPC}, \ln \text{POP}, \ln \text{TAX}, \ln \text{ODAhat} \times \ln \text{SCHOOL}, D_{2002}, D_{2003}).$$

Since there are no strong reasons to assume any functional forms other than a linear relationship, a simple linear regression analysis is applied. The structural regression equation follows the model used by Kimura and Todo (2007).

The dependent variable is measured by the registration value of FDI in the provinces. The commitment value, rather than disbursement value, is an appropriate proxy because this study focuses on the influence of ODA in infrastructure and the improvement of FDI inflow. The data of registered FDI comes from the data of provincial committed FDI flows for the 2002-2004 period, which is collected by the Foreign Investment Agency of the Ministry of Planning and Investment.

The variable $\ln \text{ODAhat}$ represents the short-term impact of ODA in infrastructure on FDI whereas the variable $\ln \text{lagODA}$ represents the long-term impact. The indirect effect of ODA on FDI is captured by the interaction term between ODA and the secondary school enrollment ($\ln \text{ODAhat} \times \ln \text{SCHOOL}$). The variable $\ln \text{INDUS}$ represents the area of industrial and export-processing zones, where basic infrastructure for FDI projects is provided.

One motivation of foreign investors to invest in developing countries is the availability of cheap and well-educated labor force. The variable $\ln \text{SCHOOL}$ is used as a proxy for the quality of local labor force, which represents the potential productivity in each province. The income per capita of each province ($\ln \text{GDPPC}$) is used as the proxy of level of wage rate in Vietnam, which represents the cost of labor in Vietnamese provinces.

The effects of provincial market size are represented by the population of the province ($\ln \text{POP}$). Population has been considered a proxy for market size and many studies have proved statistically significant positive effects of population on FDI flows in both national and regional levels, for both developed and developing countries (Lecraw 1991; Wheeler and Mody 1992).

⁵ For this study, foreign aid data is measured in gross which is yet to subtract the repayment from the government to loan aid. The gross value is justifiable because this paper analyzes the effects of ODA at provincial level, which does not relate closely to repayment at the national level.

To examine the impacts of governmental policies on FDI inflow, we include the taxratio variable (lnTAX), which represents the favorable policies of government towards mountainous provinces. The variable is calculated by the average tax ratio, based on the ratio of turnover tax and profit tax over total turnover of FDI projects.

The year dummy for 2003 and 2004 are included to access any secular increase in FDI compared to 2002 (the base year).

5.2. The FE/RE model

The FE model is appropriate because there are unobserved factors that affect local FDI attraction, the values of which are constant across the time and can not totally be covered in the ordinary least square (OLS) model. In this case, the OLS regression may suffer from omitted variables problem which causes the coefficients to be inconsistent and biased. In order to correct for biases arising from omitted variables and possible correlation between the error term and explanatory variables, we employ the FE/RE method to correct for the correlation between the error term and the independent variable. The superiority of the FE/RE model is evaluated based on the result of Hausman test.

The FE/RE equation is presented as follows:

$$\text{Eq. (3)} \quad \ln \text{FDI} = f(\ln \text{ODA}_{\text{hat}}, \ln \text{lagODA}, \ln \text{SCHOOL}, \ln \text{GDPPC}, \ln \text{POP}, \ln \text{TAX}, \ln \text{ODA}_{\text{hat}} \times \ln \text{SCHOOL}, a_i).$$

The FE/RE effects model includes all exogenous variables in the second-stage equation of 2SLS model, except for the variable lnINDUS, the value of which is constant throughout the period of 2002-2004. All time-invariant factors are captured by a_i .

5.3. Expected sign of the coefficients

We expect that lnODA and lnlagODA to assume positive signs because the level of infrastructure is a critical determinant of FDI inflow. The coefficient of the variable $\ln \text{ODA}_{\text{hat}} \times \ln \text{SCHOOL}$ is expected to have a positive sign to prove the positive indirect effect of ODA on FDI by enhancing human capital resources. The area of industrial and export-processing zones (lnINDUS), which reflects the level of infrastructure development, is also expected to have a positive coefficient. lnSCHOOL is expected to have a positive coefficient, which implies that the higher rate of secondary school enrollment attracts more FDI. Workers who completed secondary school are likely to understand new technology more easily and be able to better participate in industrial production.

The expected sign of the coefficient of lnGDPPC is ambiguous. GDPPC represents the prevailing wage rates in the provinces so that the higher the GDPPC, the lower the FDI. On the other hand, GDPPC represents consumption demand and, thus, a higher GDPPC means a higher potential sale for the firms. The variable lnPOP, which is a proxy for the potential market size, is expected to have a positive coefficient. Provinces with larger population size are expected to attract more FDI.

Government tax incentives in mountainous and remote areas and in areas with difficult natural, economic and social conditions are expected to promote FDI inflow. The Foreign Direct Investment Law of Vietnam set two encouraging tax levels, i.e., 10% and 15%, instead of the normal 28%. The coefficient of the variable lnTAX is expected to have a negative sign,

i.e., the smaller the tax ratio the higher the FDI inflow. The dummy variable 2002 and 2003 is expected to have positive sign to indicate a secular rise in the FDI vis a vis 2002 (control).

6. Regression Results

The results of the first stage regression are summarized in Table 2. As expected, the level of ODA disbursement is positively affected by the level of disbursement in the previous year. In particular, a 1% increase in the previous-year disbursement has led to about 1% increase in the level of current disbursement, which is statistically significant at 1%. ODA in infrastructure is negatively correlated with the number of patient beds in provincial hospitals, implying that aid allocation is influenced by the level of development of public service in that province. Provinces receiving less public service will receive more attention and more aid from donors. GDPPC does not have a significant impact on the level of ODA in infrastructure. GDPPC is the proxy of the level of living in the provinces. This implies that ODA in infrastructure does not necessarily flow to poor provinces.

The results of the second stage regression are summarized in Table 3. The effect of the total stock of current ODA in infrastructure on FDI flow is positive but insignificant in the 2SLS model. This suggests that the total direct short-term effects of foreign aid on FDI are not substantial. However, after controlling for provincial fixed effects, we find in the FE model that the effect of current aid in infrastructure positively affects the FDI inflow. In particular, 1% increase in ODA in infrastructure leads to a 4% increase in FDI inflow. This is consistent with the expectation that ODA in infrastructure enhances the attraction of. In other words, infrastructure depends to a large extent on the specific characteristics of each province. These results implies that there is evidence of the direct, short-term impact of ODA in FDI inflows.

The positive coefficients of $\ln \text{lagODA}$ in infrastructure are statistically significant both in the 2SLS model and the FE model. This proves the direct, long-term impact of ODA in infrastructure on FDI inflows, which can be explained by the specific characteristics of long life-time cycle of infrastructure.

In the 2SLS model, the coefficient of the interaction term between ODA in infrastructure and secondary school enrollment ($\ln \text{ODA}_{\text{inf}} \times \ln \text{SCHOOL}$) is significant, which means that ODA, through increasing the secondary school enrollment rate, has positively contributed to the attraction of FDI. This suggests that ODA in infrastructure enhances FDI inflow through indirect channel by improving the human capital in the provinces.

In the FE model, the coefficient of the interaction term is, however, not significant, suggesting that the indirect impact of ODA in infrastructure on FDI attraction is not robust. The area of industrial zones also has a significant impact on FDI inflows with the coefficient being statistically significant in the 2SLS model. The number pupils enrolled at secondary schools has positive and significant coefficient both at the 2 SLS model and the FE model. The magnitude of the coefficients in both model are comparatively large, implying that the quality of labor force of each province has played a decisive role in attracting FDI flows.

The positive correlation of GDPPC to FDI inflows implies that FDI does not flow to provinces with low income per capita or low average wage rate. Rather, it supports the argument that GDPPC, which represents the potential market size of the province, has a positive impact on the FDI inflow, i.e., the higher the income, the larger the local market; and hence, the more attractive the province is to FDI flows. This also proves that quality, rather than the cost of labor, matters in the decision of foreign investors in FDI allocation.

The only variable which has opposite sign with the expectation (negative sign instead of positive) is population. For the 2SLS model, the coefficient is statistically significant at 1% but it is insignificant in FE model. This reveals that the impact of population on FDI inflows is ambiguous. Apart from Hanoi and Hochiminh city, where high density of population associated with higher level of income and expenditure, other big-population provinces are mainly characterized with larger geographical areas, but low levels of expenditure on consumption goods. Therefore, population does not appropriately represent the purchasing power or the potential market size of the provinces.

Tax ratio has a statistically significant, positive correlation with FDI inflows in 2SLS model but has no statistically significant impact on the FDI inflows in the FE model. This result may imply that the government tax incentives have not been effective in attracting FDI flows in mountainous or remote provinces. From 2002 to 2004, provinces such as Quang Tri province in Central Coast, Kon Tum province in Central Highlands, and Bac Kan province in Northern Uplands received no FDI projects.

Now, we examine the disbursement value of ODA in infrastructure in Japan and European Union (EU), the two major bilateral donors in Vietnam. Japan has been by far the largest donor in Vietnam since the resumption of aid to Vietnam in 1992. During the 1994-2005, Japan has committed JPY 1.4 trillion of which JPY 965 billion is in the form of soft loans with the main area of investment in infrastructure projects such as national road, trade ports, and large-scale power plants.

We apply similar techniques of 2SLS and FE/RE model to explore the determinants of FDI in the two countries. In the case of Japan, the Hausman test (Chi-squared (8) = 21.05) shows that RE is superior to FE so that we report the results of the RE model. Our results indicate that ODA from Japan has a positive and significant effect on the inflow of Japanese FDI but this does not hold true in the case of EU (Table 4). It might be because Japanese ODA is allocated mainly for infrastructure development: the proportion of ODA in infrastructure investment accounts for 85% of the total Japanese ODA (Ministry of Planning and Investment, 2006). Transportation sector and power industry account for the largest chunk of Japanese ODA, which comprise 38% and 29% of the total ODA, respectively. And, according to CONCETTI (2002), there is high tendency for Japanese investors to invest in provinces which received much ODA in infrastructure.

In the case of EU, the major factors that affect FDI are secondary school enrollment and the area of industrial zones. This implies that ODA in infrastructure attracts FDI through its indirect effect on human capital accumulation and the presence of complementary industrial zones. Overall, our results show that the major distinct feature of the Japanese ODA is its emphasis on infrastructure development, which, in turn, significantly attracts FDI to the provinces of Vietnam.

7. Conclusions and Policy Implications

Our results show evidence that ODA in infrastructure has contributed to the attraction of FDI in the provinces of Vietnam, not only by direct channel through the current ODA disbursement, but also by indirect channel through improving the human capital base of the respective provinces. The impact of ODA in infrastructure on FDI inflow is ambiguous because of specific characteristics of infrastructure such as use specificity, long gestation period, and lumpiness.

Our results also show an unequal allocation of FDI across provinces, which can be attributed to differences in the infrastructure development, quality of labor force, and size of the local market. Provinces with a higher level of infrastructure development, higher quality of labor force, and larger local market tend to attract a significantly larger amount of FDI. Japanese ODA on infrastructure has a positive and significant impact on Japanese FDI but this does not hold true in the case of EU. Japanese ODA are heavily biased toward infrastructure development.

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Table 1. Regional Distribution of Official Development Assistance, 1993-2004

<i>Regions</i>	<i>Poverty Rate in 2002</i>	<i>Per capita ODA (USD)</i>
North West	68.0	119.9
North East	38.4	117.0
Red River Delta	22.4	129.5
Hanoi ¹	5.2	440.3
Central Coast	38.9	128.4
Central Highlands	51.8	82.1
South East	10.6	157.1
Hochiminh City ²	2.0	274.0
Mekong Delta	23.4	49.6

¹ Hanoi is located in Red River delta but is cited separately because the ODA level in this province is much higher than the average level in the region.

² Hochiminh City is located in South East but is cited separately for the same reason.

Source: World Bank, Ministry of Planning and Investment (MPI), Ministry of Labor, Invalids and Social Affairs (MOLISA) and Government Statistics Office (GSO), 2003.

**Table 2. Determinant of Official Development Assistance in Infrastructure
(The First Stage in 2LS Model)**

<i>Variables</i>	<i>Name of the variables</i>	<i>Coefficients (2SLS)</i>	
		<i>Coef.</i>	<i>t-value</i>
Lag of ODA in infrastructure	lnlagODA	0.68**	13.75
Income per capita	lnGDPPC	-1.14	-0.12
Number of patient beds per person in hospitals of the province	PATIENTBED	-2.26**	1.97
Constant term	Cons	-14.52*	-1.68
Adjusted R²		0.22	
Number of observation		192	

* = statistically significant at 5% level

** = statistically significant at 1% level

Source: Author's estimates using dataset

Table 3. The Determinant of FDI Inflows-The Structural Equation in 2SL Model

<i>Variables</i>	<i>Name of the variables</i>	<i>Two-stage Least Squares</i>		<i>Fixed Effects</i>	
		Coef.	t-value	Coef.	t-value
Predicted ODA	lnODAhat	1.30	1.46	4.04*	1.79
Lag of ODA in infrastructure	lnlagODA	0.89**	1.98	1.50**	2.12
lnSchool*lnODAhat	Interation	0.14*	1.92	0.135	0.81
Area of industry zones	lnInduszone	0.32*	1.69		
Secondary school enrollment	Lnschool	5.03**	1.93	6.36**	2.33
Income per capita	lnGDPPC	2.87**	1.96	3.26*	1.78
Population	lnPopulation	-6.98**	-2.24	-6.86	-1.29
Tax ratio	lnTaxation	- 1.51***	3.00	0.87	0.02
Year Dummy for 2003	D_{year03}	2.91	0.93		
Year dummy for 2004	D_{year04}	1.29	0.19		
Constant term	Cons	-19.20	-0.54	-19.48	-0.59
Adjusted R²		0.45		0.49	
Number of observations		192		192	

* = statistically significant at 5% level

** = statistically significant at 1% level.

Source: Author's estimates

**Table 4. The Regression Results For Japanese and European Union (EU)
Official Development Assistance**

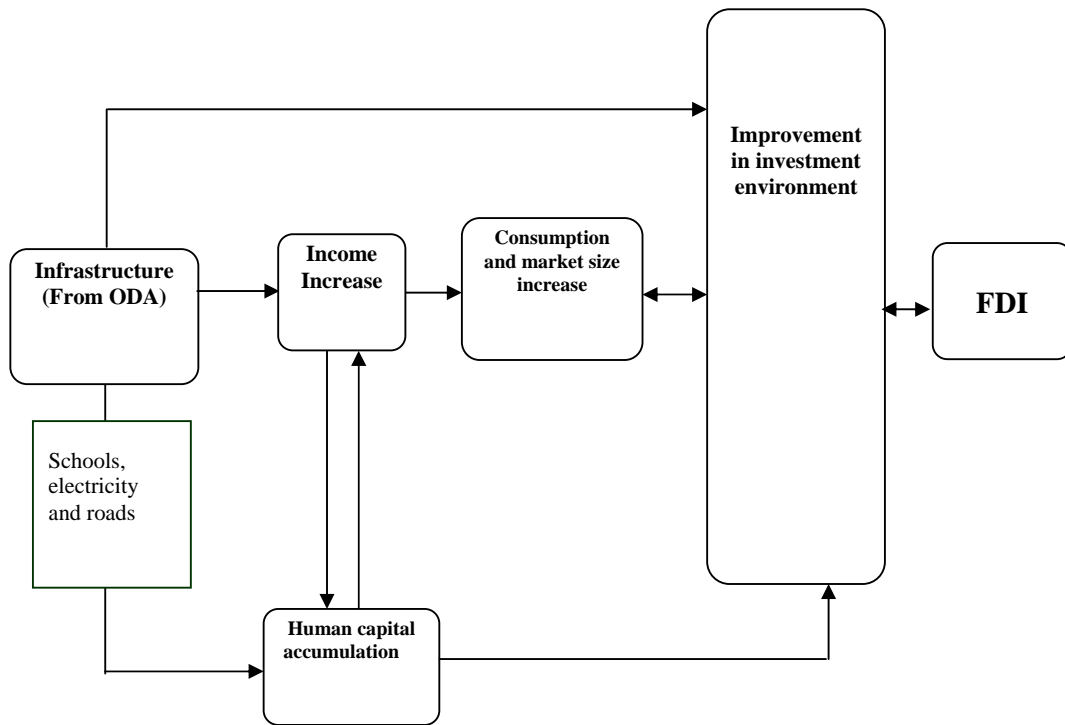
<i>Variables</i>	<i>Name of the variables</i>	<i>Japan</i>				<i>EU</i>			
		<i>2SLS</i>		<i>Random Effects</i>		<i>2SLS</i>		<i>Fixed Effects</i>	
		<i>Coef</i>	<i>t-value</i>	<i>Coef.</i>	<i>t-value</i>	<i>Coef.</i>	<i>t-value</i>	<i>Coef.</i>	<i>t-value</i>
Foreign Direct Investment inflows	lnFDI								
Predicted ODA	lnODAhat	4.03 *	0.88	3.47**	2.52	3.30**	2.78	1.64	0.24
Lag of ODA in infrastructure	lnlagODA	4.00**	3.55	4.03**	2.03	0.68	1.60	0.21	0.96
lnSchool*lnODAhat	Interation	2.35**	1.90	7.31**	2.34	0.20**	2.92	0.06**	2.92
Secondary school enrollment	lnschool	1.63	0.56	2.73**	3.67	2.47**	2.35	2.47**	3.38
Area of industry zones	lnInduszone	2.69*	1.60	2.15	1.13	5.74**	3.27	0.92**	2.22
Income per capita	lnGDPPC	3.15**	2.30	3.45**	2.31	4.50	0.18	0.39	0.16
Population	lnPopulation	5.63	0.42	3.24	0.77	-3.16	-1.28	7.20	0.91
Tax ratio	lnTaxation	-4.32	-1.04	-5.24	-0.75	-4.28	-1.48	-0.51	-0.58
Year Dummy for 2003	D_{year03}	1.55	0.76						
Year dummy for 2004	D_{year04}	0.35	0.11			8.94 3.04	-		
Constant term	Cons	1.39	0.07	1.91	0.09	-89.11 1.66	-	25.13	0.83
Adjusted R²		0.51		0.53		0.78		0.79	
Number of observation		192		192		128		128	

* = statistically significant at 5% level

** = statistically significant at 1% level.

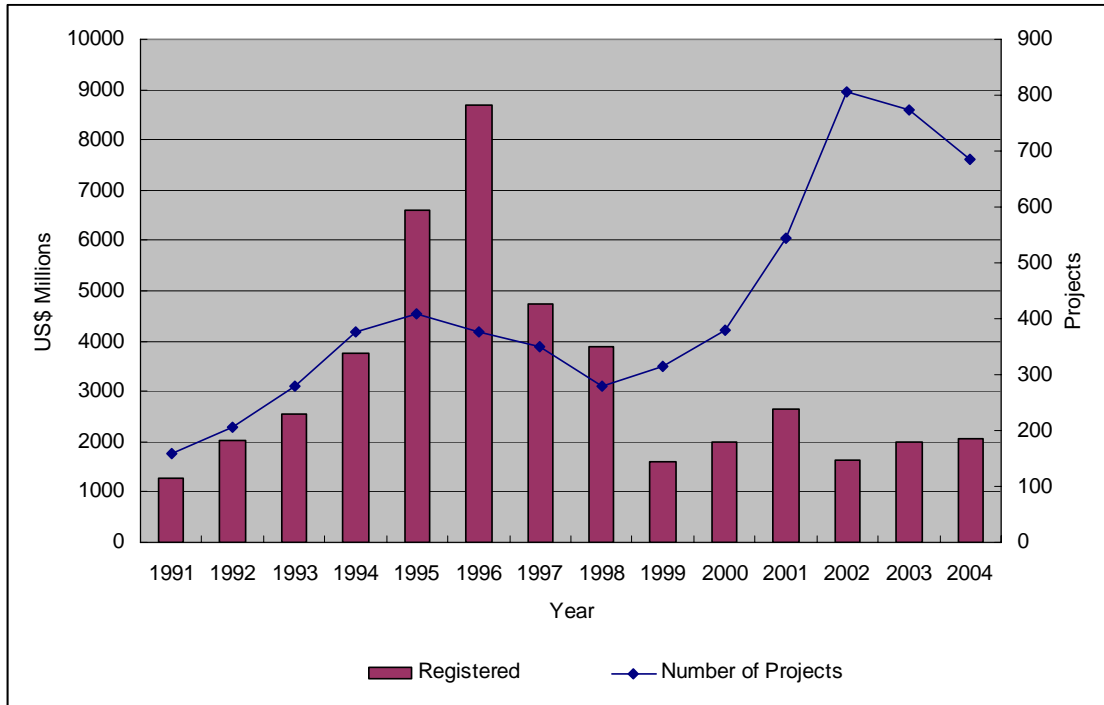
Source: Author's estimates

Figure 1. The Relationship between Infrastructure and FDI Inflows



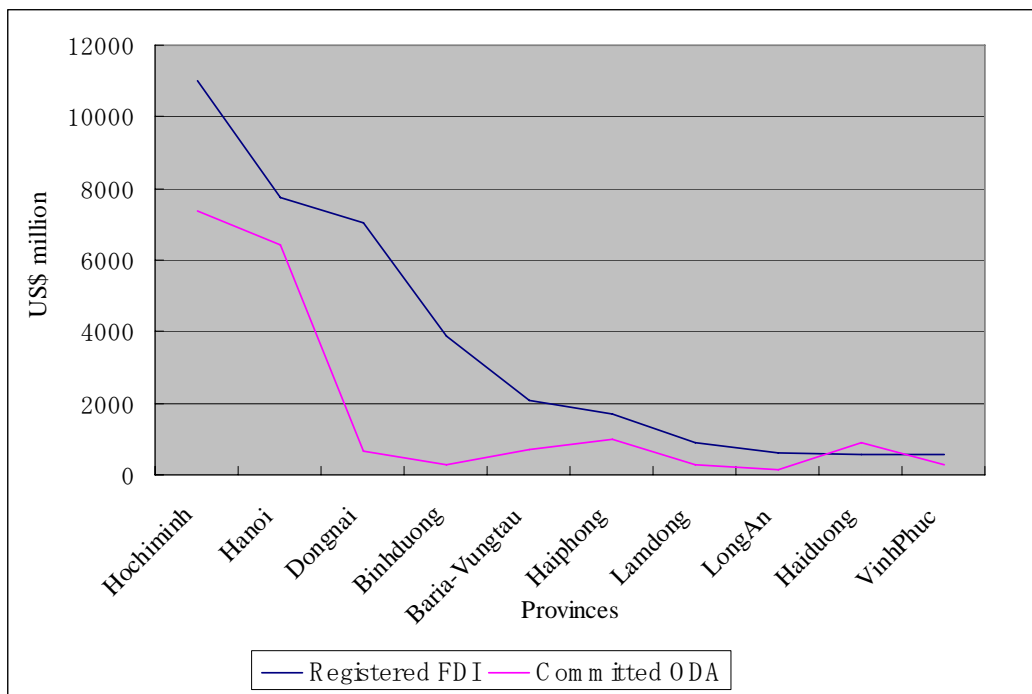
Source: Author's illustration

Figure 2. The Amount of Registered FDI in Vietnam, 1991 – 2004



Source: Ministry of Planning of Investment.

Figure 3. Registered FDI and Committed Official Development Assistance in Provinces of Vietnam, 1988-2004⁵



⁵The resumption of ODA in Vietnam started since 1988.

Source: Ministry of Planning and Investment, 2004.