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The impact of ODA in constructing road traffic infrastructure on Vietnam's economic growth

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A B S T R A C T

The study examines the impact of official development assistance (ODA) in constructing road transport infrastructure on Vietnam's economic growth. The authors select gross domestic product (GDP) to represent economic growth and test the influence of ODA in constructing road traffic infrastructure on Vietnam's GDP. Based on the references and analysis of previous studies, the authors propose an impact assessment model of ODA in constructing road transport infrastructure, Foreign direct investment (FDI), Domestic Investment (VDT) and Labor Force (Labor) to economic growth through GDP as a dependent variable. The regression results show that the ODA had a positive impact on GDP. Moreover, ODA plays an important role in constructing road transport infrastructure on Vietnam's economic growth.

1. Introduction

Supporting developing and underdeveloped countries for socio-economic development has become a global problem along with the development of the world economy. Developed countries have policies and solutions to support capital and technology for developing and underdeveloped countries, including official development assistance (ODA). Basically, ODA is toward general development goals, improving people's living standards through socio-economic development investment programs, infrastructure construction, poverty reduction, health care, population, education and training, supporting reforming the economy towards a market mechanism, etc., so it is an important resource to help countries chase the development of the world. Vietnam is considered one as of the countries which attract and uses ODA most effectively. Vietnam gets great impacts from ODA capital on economic development. From the beginning, Vietnam has reached ODA loans committed by up to 70 billion USD. This is an impressive figure which proves Vietnam's ability as well as development prospects in attracting this capital.

In the international economic integration context, Vietnam is an attractive destination for foreign investors. However, the underdeveloped infrastructure in general and the transport sector in particular in Vietnam is one of the major limitations that worries investors. This will greatly influence foreign investment capital attraction into Vietnam. Therefore, ODA is a priority over the other sources of capital because of its advantages in this situation. Recently, ODA accounts for about 70% of the total investment capital for the transport sector. Although, the transport sector has been granted more than 10 billion USD of ODA, accounted for nearly 40%, in comparison with ODA for health - society only accounted for 4.54% and 3.84% for education and training, Vietnam's transport system infrastructure, especially road traffic which is the most important type of transportation (because it is close to people, accounting for the largest proportion of freight, the most mobile, can operate across the country, the investment cost is relatively low and the freight fee is relatively cheap) has many weaknesses.

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According to the Vietnam Transport Development Strategy to 2020 vision to 2030, the total investment capital needs for developing transport infrastructure in Vietnam in the period of 2016-2020 are estimated at about 651 trillion VND for the road sector, so attracting and using investment capital including ODA in transport infrastructure is seriously concerned by the government. Investing in constructing key infrastructures such as main highways, routes with major transport demand, connecting routes, etc. is the main task priority in developing road transport infrastructure in the period (2016 - 2020). The transportation industry strives to has more than 2,000 km of highways, in which the priority is to invest in the North-South highway from Hanoi - Ho Chi Minh City. Due to limitation State budget limitation, the majority of investment capital for infrastructure development is mobilized from abroad (mainly ODA loans), domestic and foreign private investors. In the context of the limited state budget, economic difficulties, less access to ODA source when Vietnam is above the low-middle-income countries, there is a need to seriously re-evaluate managing and using ODA process in road transport in order to make long-term development plans.

2. Literature Review and Research Model

Economic growth is always the top concern of scholars, researchers and policymakers. Based on Keynesian ideology, in the 40s of the 20th century, two economists at the MIT Institute US named Harrod (1939) and Domar (1946) introduced the exogenous growth model - the Harrod - Domar growth model. This model proposes views on the relationship between economic growth and capital needs, especially the role of investment capital in economic development for a country. The Harrod - Domar model is widely used in developing countries to determine the relationship between economic growth and capital needs. This model focuses on the level of investment, labor, productivity, and output, with the goal to provide a suitable production function for the economy. At the national level or the whole economy, the production function describes the relationship between the size of a country's labor and capital stock with its gross domestic product (Gross Quantity). This relationship in the whole economy is called the production function.

Let *Y, K* and *L* be output, capital stock and labor, respectively. The production function can be expressed as follows,

$$Y = F(K, L).$$

Theoretically, ODA is an integral part of economic capital and can contribute to the economic growth of a country. However, it can have different impacts on each economy because of its dual nature. Many authors have studied and evaluated the impact of ODA on economic growth and argued many different explanations, but the results of the study are generally inconsistent.

Some previous studies about foreign aid programs have suggested that poverty reflects government failure. Boone (1996) studied aid effectiveness based on the analytical framework of aid effectiveness as well as political regimes and found that aid neither significantly increases investment nor benefits the poor through improvements in the human development index, but it increases the size of the government. In this study, Boone, (1996) also found no systematic relationship between foreign aid and economic growth, investment, or human development indicators in host countries, and conclude that foreign aid is largely ineffective.

Many authors have argued that ODA has been used wastefully, not for the right purposes, creating the “danger of corruption”. ODA is invested in projects with huge costs but a large part of money falls into the project providers’ pockets or becomes a foundation for the corrupt dictatorship that leads the country to gradually become poor and stay backward, while the bureaucrats become very rich. According to research by Lensink and Morrissey (2000), the limitations of ODA for developing countries from a microeconomic perspective are instability and uncertainty because of negative effects from external aid capital on financial and investment policies of aid recipient countries. These studies have clearly identified donors' responsibilities in ODA policy and confirmed that the impact of ODA is dangerous and negative on economic development, largely due to corruption and inefficiency in the process of implementing the ODA capital of the recipient country.

Knack (2000) researched cross-sectional data about the relationship between aid and the quality of institutions, which included the variables: corruption, legislation, and administrative procedures. The author concluded that aid undermines the quality of government, which means aid creates corruption and bureaucracy. Upadhyaya et al. (2007) examined the effectiveness of foreign aid and foreign direct investment in the Czech Republic, Estonia, Hungary, Latvia, Lithuania, and Poland. This model includes the workforce, equity, foreign aid, and foreign direct investment, and is estimated using time series data from 1993 to 2002. The results indicated that the increase in domestic capital and inflows of foreign direct investment are important factors that positively affect economic growth in these countries. Foreign aid does not seem to have any significant effect on real GDP. Mallik (2008) pointed out that after more than thirty-five years of supporting development, people in the poorest countries in Africa are still living in poverty, real per capita income has been decreasing since 1965 or has remained decrease despite receiving a large amount of foreign aid. The study examined the effectiveness of foreign aid for economic growth in the top six poor and grantee African countries: Central African Republic, Malawi, Mali, Niger, Sierra Leone, and Togo. Using cointegration test analysis, Mallik (2008) found that there was a long-term relationship between real GDP per capita, aid as a percentage of GDP, investment as a percentage of GDP. However, the effect of foreign aid on growth is negative for most of these countries. Driffield and Jones (2013) assessed the relative contributions of foreign direct investment, official development assistance, and remittances to economic growth in developing countries. Foreign capital inflows including foreign direct investment (FDI), official development assistance (ODA), and remittances (REM) have increased significantly over the past 20 years. Even so, economists have never considered the combined effect of each variable on economic growth.

The main contribution of the study is that the authors used array data regression to explain the inherent endogeneity in these relationships. The results show that both foreign direct investment and remittances have a positive impact on growth in developing countries. In contrast, the relationship between official development assistance and economic growth is ambiguous and appears to have a negative effect on economic growth.

Disagreeing with the above point of view, most researchers have pointed out that ODA has a positive impact on economic growth. According to this view, developing countries cannot generate enough savings on their own to finance key investment projects to boot growth, total savings are even too low to compensate for depreciation. Aid in this case is essential to boost growth through new investment financing, especially investments in public goods or services. Aid is used to build roads, harbors, power supply, schools, and other essential infrastructure to help promote capital accumulation. If this investment is effective, this capital accumulation will increase the growth rate.

Chenery and Strout (1966) emphasized the importance of ODA. The authors have argued that from the beginning, supporting the necessary amount of capital from developed countries is very important to boost the developing countries' growth. As a result, developing countries will have the motivation to overcome difficulties, thereby narrowing the gap between them and developed countries. Burnside and Dollar (2000) theoretically showed that the impact of foreign aid on growth proves to be ambiguous. For example, in the context of a standard neoclassical growth model, the steady-state effect will depend not only on the quantity and type of aid, but also on how the recipient country uses it. This study used a cross - empirical database about the ODA of 56 countries to examine the relationship between foreign aid, economic policy, and per capita GDP growth. Research results show that foreign aid has a positive effect, but only in the economies have well-combined among fiscal, monetary, and trade policies, and less effective in the economies don't have well-combined. The more transparent the institution, the more transparent the ODA capital has to promote economic growth. Hansen and Tarp (2001) found that foreign aid is a very important factor affecting average GDP growth. The study mainly used a 20-year time series to assess the impact of ODA on the economy in the macroeconomic aspect, not considering the performance of each project. This paper examines the relationship between foreign aid and real GDP per capita growth, shows that foreign aid increases the growth rate and this result is not conditional on the 'good' policy.

Karras (2006) used data from 71 aid recipient developing economies over the period (1960 - 1997) to study the relationship between foreign aid and per capita GDP growth. The results show that the impact of foreign aid on economic growth is positive, long-term, and statistically significant. An increase in foreign aid by $ 20 per person in the host country leads to an increase in the real per capita GDP growth rate is about 0.16%. But this impact is different in different growth economies. This study is considered a good study to evaluate the impact of ODA on economic development in the macro aspect. Adams and Atsu (2014) examined the impact of foreign aid on economic growth in Ghana between 1970 and 2011. By using Auto-Regressive Distributed Lag (ARDL), the findings show that ODA has a short-term positive but negative long-term impact on the economic growth of the recipient country ... Government investment and consumption variables are closely related to economic growth, while trade and financial policy have no significant impact on Ghana's economic growth.

Tang and Bundhoo (2017) explored the impact of foreign aid on economic growth in sub-Saharan Africa. Despite being the world's largest recipient of foreign aid, the region is the poorest with the lowest HDI and GNI per capita. This raises doubts about the effectiveness of foreign aid on the region's economic growth and development. This study examines the relationship between foreign aid as determined by ODA and the economic growth rates of the ten largest foreign aid recipient countries in sub-Saharan Africa (Ethiopia, Democratic Republic of the Congo, Tanzania, Kenya, Côte d'Ivoire, Mozambique, Nigeria, Ghana, Uganda, and Malawi) for a period of 23 years from 1990 to 2012. The author found that foreign aid does not have a significant effect on economic growth. However, variable foreign aid interacting with policy indicators was found to be statistically significant and positive, meaning that foreign aid tends to drive economic growth in the good environment policy. The effectiveness of foreign aid depends on the economic, political, and institutional conditions of the host country, which may explain why aid effectiveness is negligible in sub-Saharan Africa where the political is unstable. Therefore, governments, donor agencies, and policymakers should consider this aspect when undertaking foreign aid activities.

The authors support this view that foreign aid depends greatly on the quality of the policies of the recipient country. ODA has a positive effect on growth in countries with good political institutions. Many econometric studies assessed the impact of ODA on economic growth such as Driffiel and Jones (2013) have used array data regression to test for developing countries with independent variables: ODA (Development Assistance official), FDI (Foreign Direct Investment), REM (Remittances), POP (Population), and GDP dependent variable. Research results have shown that all three factors, ODA, FDI, and REM, have an impact on the economic growth of developing countries. Accordingly, the author has pointed out that ODA has a negative impact on GDP growth while FDI and REM have a positive impact with a significance level of 5%.

Nguyen Thi Lan Anh (2012) used array data model to analyze the impact of ODA (Official Development Assistance), VDTTN (Domestic Investment Capital) and LD15 (Labor over 15 years old) to the Northwest region's average GDP as well as to test the 1-year lag of independent variables in the STATA. The general regression results for the Northwest region show that the value of ODA (-1) has a positive impact on the average GDP of the Northwest region; ODA has an impact after 1 year on the economic development of the Northwest region, this also means that ODA has a slow effect 1 year after the beginning of ODA. Domestic investment in the Northwest region has an immediate impact on the average GDP of 3 provinces and has a

positive impact, but this effect is not clear at the significance level of only 10%. In addition, the factor of the labor force over 15 years old after 1 year is also significant in affecting the per capita income of the region but is also relatively weak.

Based on the reference and analysis of previous studies, we focus on selecting the variable representing economic growth as GDP and assessing the impact of ODA in constructing road traffic infrastructure on Vietnam's GDP. We propose an impact assessment model of ODA (Official development assistance in road traffic infrastructure), FDI (Foreign direct investment), VDT (Domestic investment) and Labor (Labor Force) to economic growth through the dependent variable of Vietnam's GDP.

The authors' research model is shown as follows:

$$GDP = \beta_0 + \beta_1 \times ODA + \beta_2 \times FDI + \beta_3 \times VDT + \beta_4 \times Labor$$

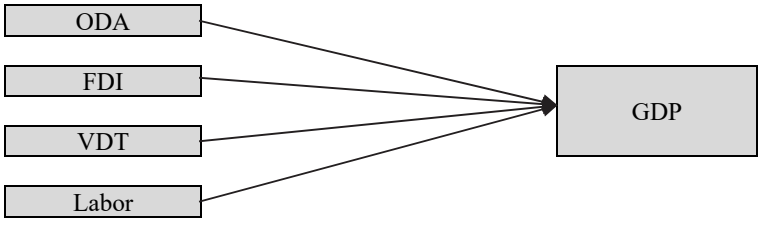

Fig.1. Research model of the impact of ODA in constructing road transport infrastructure on Vietnam's GDP

Table 1
Description of variables

Variable	Symbol	Mean
Independent	ODA	Official development assistance capital (disbursement) for constructing road transport infrastructure of Vietnam
	FDI	Implemented Foreign Direct Investment of Vietnam
	VDT	Vietnam's domestic capital
	Labor	Vietnam's labor force
Dependent	GDP	Vietnam's Gross domestic product

ODA is a source of "humanitarian" capital, so when governments receive ODA capital, it will significantly reduce the budget burden. Investing in infrastructure construction projects generally require a large amount of capital with long payback periods. When ODA capital is available to invest in improving infrastructure, convenient transportation, services serving production and business processes will also become smooth, reducing investment costs, creating an attractive investment environment to attract foreign direct investors. With the large scale of capital and preferential loan conditions, ODA has helped poor and underdeveloped countries have the opportunity to focus on socio-economic infrastructure improvement projects, which are a basic condition to promote economic growth. According to Burnside, C. and D. Dollar (2000), Hansen & Tarp (2001) Karras, G. (2006) ODA has a positive effect on economic growth, especially in countries that have good institutions. With that expectation, we have given the following hypothesis:

H_1: *Official development assistance in constructing road transport infrastructure has a positive effect on Vietnam's economic growth.*

3. Research methods

3.1. Database

Research data is collected quarterly from the first quarter of 2010 to the fourth quarter of 2018 from reliable sources, ensuring the objectivity and accuracy of the research results. Specifically, Foreign Direct Investment (FDI), Domestic Investment (VDT), Vietnam's Gross Domestic Product (GDP), and Labor Force (Labor) databases are taken from the Quarterly Socio-Economic Report from the General Statistics Office of Vietnam. ODA data for road transport infrastructure (disbursement) investments are obtained from the annual reports of the Ministry of Transport. The figures related to investment capital and GDP are taken at constant 2010 prices according to regulations of the Ministry of Planning and Investment. The database is time series with 36 observations. This ensures a suitable sample size for time series data analysis.

3.2 Processing data methods

The research data after being collected was put into R-project to perform regression analysis including the following analysis steps:

Descriptive statistics of data for research variables in order to evaluate the maximum, minimum and average values of each research variable.

Detecting stationary in time series data before running the regression model. In the case the data series is not stationary, taking the difference until the data is stationary.

Running the regression model will give statistically significant variables (p-value <0.05) and non-statistically significant variables (p-value> 0.05).

Perform the testing of the model's defects such as the autocorrelation, variance changes (p-value values are greater than 0.05, the model does not exist defects), multi-collinearity.

Repairing the model's defects to propose the best regression model. Finally, the authors give a regression function with statistically significant variables.

4. Research results

4.1 Data description

When putting data into R-project, the results of statistical data are as follows:

Table 2
General descriptive statistics data

Value	GDP (billion dong)	FDI (billion dong)	VDT (billion dong)	ODA (billion dong)	Labor (thousand people)
Mean	688.600	60.372	196.861	2.998	51.558
Maximum	1135.000	98.251	344.954	4.143	54.530
Minimum	413.000	45.153	99.100	1.784	45.413
Median	658.000	54.713	184.727	3.121	52.765

(Source: R project)

The data description results show that Vietnam's GDP increased by more than 2,75 times from the first quarter of 2010 to the fourth quarter of 2018, from 413 thousand billion VND in the first quarter of 2010 (reaching the smallest value) to 1.135 thousand billion VND in the fourth quarter of 2018 (maximum value). The average GDP for the whole period of 36 quarters was 688.600 thousand billion VND. Vietnam's largest FDI reached 98.251 thousand billion VND in the fourth quarter of 2018 and the smallest FDI reached 45.153 thousand billion VND in the first quarter of 2013, the median annual FDI value was 60.372 thousand billion VND. Similarly, Vietnam achieved the largest disbursement of ODA in constructing road transport infrastructure in the fourth quarter of 2014 with 4.143 thousand billion VND, the smallest ODA in the first quarter of 2018 was 1.784 thousand billion VND and on average, Vietnam annually realize 60.372 thousand billion VND in FDI.

Realized domestic investment capital (VDT) from the first quarter of 2010 to the fourth quarter of 2018 reached 196.861 billion VND, reaching the largest value 344.954 billion VND in the fourth quarter of 2018, the lowest is 99.100 billion VND in the first quarter of 2010. Vietnam's labor force (Labor) had the largest value 54.530 thousand people in the fourth quarter of 2018, the lowest was 45.413 thousand people in the first quarter of 2010 and achieved an average value 51.558 thousand people in the period from first quarter of 2010 to the fourth quarter of 2018.

4.2 Regression analysis to test the impact of ODA in constructing road transport infrastructure on Vietnam's GDP

(a) Stationary test

In order to ensure that the model does not occur spurious regression in time series data research, the data has to be stationary time series. The results of the stationary test show that the variables FDI (foreign direct investment) VDT (investment capital), LogGDP (taken log), Labor (number of employees) all stop at the first difference. The variable ODA stops at the second difference.

Table 3
Stationary test of variables

Variables	P-value
GDP*	0.01
FDI*	0.01
VDT*	0.06806
ODA**	0.01
Labor*	0.08245

* first difference, ** second difference

(Source: R-project)

In model regression, the dependent variable is GDP, the independent variables are ODA, FDI, VDT, and Labor. Each variable selected in each model is different, we choose different variables. The following results are:

Table 4
The optimal model selection from regression results

	p! = 0	EV	SD	Model 1	Model 2	Model 3
Intercept	100.0	1.008e-02	1.76e-02	1.393e-02	3.237e-03	6.365e-03
FDI_diff	67.1	4.508e-06	4.004e-06	6.812e-06	6.570e-06	-
VDT_diff	100.0	3.118e-06	8.536e-07	2.749e-06	2.662e-06	3.730e-06
ODA_diff	94.7	7.873e-05	3.325e-05	8.474e-05	9.006e-05	7.679e-05
Labor_diff	57.1	-2.455e-05	2.708e-05	-4.325e-05	-	-
nVar	4	3	2		Model 4	Model 5
r2	0.914	0.903	0.888	Intercept	1.667e-02	1.323e-02
BIC	-6.950e+01	-6.863e+01	-6.739e+01	FDI_diff	-	-
Post prob	0.408	0.263	0.141	VDT_diff	3.849e-06	4.760-06
nVar	3	2	nVar	ODA_diff2	7.126e-05	-4.772e-05
r2	0.899	0.877	r2			
BIC	-6.729e+01	-6.416e+01	BIC			
Post prob	0.135	0.028	Post prob			

(Source: R-project)

We found that R2 in model 1 and model 2 are high, but the explanation coefficient for the variable Labor is not as expected in model 1, so model 2 is the most optimal. According to the second model, the variable Labor is excluded from the model. The results of rerun the model are as follows:

Table 5
Regression results of the selected model include 3 independent variables FDI, ODA, VDT

	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	3.237e-03	1.629e-02	0.199	0.843833
FDI_diff	6.570e-06	3.091e-06	2.126	0.041886 *
VDT_diff	2.662e-06	6.744e-07	3.948	0.000441 ***
ODA_diff2	9.006e-05	2.798e-05	3.218	0.003088 **

Sig. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 Residual standard error: 0.09359 on 30 degrees of freedom
1 observation deleted due to missingness Multiple R-squared: 0.9027, Adjusted R-squared: 0.8929
F-statistic: 92.74 on 3 and 30 DF, p-value: 2.847e-15

(Source: R-project)

The variables ODA, FDI and VDT have p-value <0.05. Thus, the variables are statistically significant in testing the impact of factors on GDP with the statistical significance is 95%.

(b) Model's defect test

- Multi-collinearity

Through the multi-collinearity defect test results shown in Table 3.9, model has multi-collinearity, but the VIF coefficients of the independent variables are in the range (1,10), so the model is acceptable.

Table 6
VIF coefficients of independent variables

FDI_diff	VDT_diff	ODA_diff2
3.204356	5.465682	2.562057

(Source: R-project)

- Autocorrelation test

Using Breusch-Godfrey test

Hypothesis Ho: There is no autocorrelation

Table 7
Autocorrelation test result (data: hoiquy)

LM test = 5.5108, df = 1, p-value = 0.0189

(Source: R-project)

Because P-value <0.05 => Rejects Ho => There is autocorrelation. To overcome the autocorrelation defect, we rerun the model with the following results:

Table 8
Regression model after fixing defects (T test of coefficients)

	Estimate	Std. Error	t-value	Pr(>|t|)
Intercept	3.2373e-03	1.2576e-02	0.2574	0.798621
FDI_diff	6.5704e-06	3.7850e-06	1.7359	0.092839 .
VDT_diff	2.6624e-06	8.1146e-07	3.2810	0.002626 **
ODA_diff2	9.0056e-05	2.1863e-05	4.1190	0.000275 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 (Source: R-project)

$$GDP = 0.0032373 + 0.000090056 \times ODA + 0.0000065704 \times FDI + 0.0000026624 \times VDT$$

The general regression results show ODA has a positive impact on GDP or ODA in road transport infrastructure that has a positive effect on Vietnam's economic growth. When the difference (the next 2 quarters compared to the previous quarter – because of taking the second difference) of ODA increases by 1 billion Dong, the difference in GDP (next quarter compared to the previous quarter - because the first difference of GDP) increases 0.000090056%. Research results are completely consistent with the author's initial research expectations.

5. Conclusion and discussion

The research results above have shown that ODA in road transport has a positive effect on Vietnam's economic growth. To further promote the effectiveness of this capital, the author suggests some policies as follows:

In recent years, the arrangement of reciprocal capital (for site clearance, taxes, project management, etc.) for ODA projects in road traffic has not been timely and adequately met, those affected the progress of ODA projects. We propose to give priority to supplement reciprocal capital for ODA projects in road traffic. In case the project is urgently needed to be implemented but lack of reciprocal capital, we need to consider the possibility of borrowing ODA capital for site clearance and taxes. Currently, the World Bank and ADB support this solution.

To assign investment capital plans to develop state budget sources for the coming years to suit the actual needs of Vietnam's committed and on-going ODA projects. Avoiding unreasonable consequences of inadequate foreign capital allocation to affect the progress of ongoing projects, raising donors' concerns about Vietnam's policy stability.

Continue to prioritize and focus on investment in important projects according to the direction of the Party's Resolution No. 13-NQ / TW. In particular, for the goal of developing the expressway network that the Resolution has set out, it is proposed to allow the Ministry of Transport to develop a project to mobilize resources (including the concession mechanism for the operation of transport infrastructure works invested by the State) to build Vietnam's expressway system until 2020 and submit it to the Prime Minister for approval as a basis for implementation. For important transport infrastructure development projects that are subject to central budget expenditure but unable to directly recover capital: Maintain the current funding mechanism for ODA funding preferential loans for the Ministry of Transport to invest in projects.

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