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# Foreign Aid Loans and Economic Growth in Vietnam

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## Abstract

This paper examines the productivity of foreign aid in Vietnam, in two ways. First, the effect of foreign aid upon economic growth in Vietnam as a whole is studied using time series data from 1994 to 2017. Second, the effect of the yen loan, or governmental aid loan from Japan, in 34 provinces out of 63 is studied using panel data from 2001 to 2016. The effect of foreign aid is still uncertain, and the aim is to clarify it. Two points are found. First, no effect of foreign aid to Vietnam has been found using the time series data for the entire country. Second, the increase in productivity due to the yen loan has not been estimated, either. Although the impact from the foreign aid to the economic growth is not estimated, it may include Vietnamese special reasons. Since the main portion of foreign aid to Vietnam came after 1994, most infrastructure facilities are contributing relatively in a short term. This finding is likely to change in future, since infrastructure established recently with the loan will continue to contribute to economic growth in Vietnam.

**JEL classification numbers**: F35, O53
**Keywords**: Foreign Aid, Productivity, Vietnam

## 1 Introduction

The effect of foreign aid is still an open matter. Recently it has become widely believed that the effect of foreign aid is determined by the governance in recipient countries (Burnside and Dollar, 2000). In contrast, Easterly (2004, 2006, 2007) pays almost no heed to foreign aid, according to a macroeconomic perspective. In addition, recent studies suggest that foreign aid has an effect on productivity in the short term in some industries. Nowak-Lehmann et al. (2012) states that there is a relation between foreign aid and economic growth. Salaya and Thiele (2010) show that secondary and tertiary industry is affected by foreign aid. Arndt et al. (2015) analyzed the relation between economic growth and foreign aid using panel data from 89 countries between 1970 and 2007.

In the present case, Asian countries have experienced rapid economic growth. Foreign aid directed to Vietnam was granted mainly after 1994, soon after the Cambodian peace process was under way. Foreign aid received by Vietnam increased significantly during the 2000s together with the economic growth in a relatively short time (Figure 1) while the exchange rate has been appreciated (see Figure 2). Since this appreciation lowers the export and the value of the foreign aid, the effect on economic growth does not look to be necessarily stable. It is important to analyze and publicize what happened, as a guide for other developing countries. Kimura and Todo (2010) show that foreign aid leads foreign direct investments and that this relation promotes economic growth in the experience of Asian countries. In a

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previous study about Vietnam, Chung (2015) demonstrated the positive effect (in 10% sufficiency) of Official Development Assistance (ODA) upon economic growth in Vietnam.

As well as foreign aid, the productivity of the public capital stock has been considered (Aschauer, 1989). In the United States, this analysis was held to influence whether old infrastructure lowered economic growth. In Japan, it has been suggested that the productivity of the public capital stock was reduced after the 1990s (Miyagawa et al., 2013).

This paper examines the productivity of foreign aid in Vietnam by measuring the productivity of public capital, since this is one of the ways by which an economy can use foreign aid effectively to promote economic growth.

## 2 Estimation of the Effect of Foreign Aid in the country as a whole

### 2.1 Model

First, we examine the whole country impact of the foreign aid upon the economic growth in Vietnam by using the economic growth model. We assume a Cobb-Douglas production function:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where
$A_t$: total factor productivity in year t
$K_t$: capital in year t
$L_t$: labor in year t
$Y_t$: gross domestic product in year t

The total factor productivity $A_t$ depends on foreign aid and the manufacturing-to-GDP ratio, since foreign aid and industrialization makes available skills from donor countries to recipient countries, which leads to change in the resource allocation of labor and capital. In other words,

$$A_t = G(AID_t, MAMU\_GDP_t) \tag{2}$$

where
$AID_t$: accumulated foreign aid until the year t
$MAMU\_GDP_t$: manufacturing-to-GDP ratio in the year t

A linear model is adopted for the induced changes in this model. Upon taking the logarithm and the first derivative of equation (1), it follows that

$$ln\left(\frac{Y_t}{L_t}\right) = \text{const.} + \beta(MANU\_GDP_t) + \gamma ln(AID_t) + \alpha ln\left(\frac{K_t}{L_t}\right) + u_t \tag{3}$$

### 2.2 Data

We take variables $Y_t$ , $L_t$ and $K_t$ from the World Development Indicators of the World Bank. For $L_t$ we use the population aged from 15 to 64, rather than the number of employees. The variable $AID_t$ denotes DAC statistics, taken from the OECD. In this case we use the accumulated disbursement of governmental loans from 1960, since most foreign aid (including aid loan) in Vietnam is used for infrastructure to strengthen the industrial base, such as the construction of power plants, highways, and water supply and sewerage systems. All data are converted by GDP deflation and a US dollar basis is used. The data interval is from 1994 to 2017. Data description is shown in Table 1.

### 2.3 Results

#### 2.3.1 Unit Root Tests

Table 2 shows the results of unit root tests. All variables are shown as I(1) and I(2); this may generate a spurious regression problem, and it is necessary to check whether each estimation equation is cointegrated. We should therefore perform unit root tests for error terms in level series estimation.

#### 2.3.2 Results of Estimation

Table 3 shows results of the estimation in equation (3), based on the data. Results are shown both excluding and including the manufacturing-to-GDP ratio, in equations (1) and (2) respectively. Since equations may exhibit serial correlation, we add on the terms AR(1) and MA(1). According to the results shown in Table 3, the explanatory variables for foreign aid and per capita capital are sufficient, and are positive. Error terms in both equations are I(1), however, indicating that there is a spurious regression problem. $R^2$ shows the high value because of this spurious regression problem. Furthermore, it does not emerge that this equation is not significant if the first difference is taken. From these results it appears that foreign aid in Vietnam has no effect if measured for the whole country.

## 3 Estimation of the Effects of Foreign Aid (Yen Loan) in Regional Panel Data

Next, we use the Gross Provincial Products (GPP) data made public by each province in Vietnam. We also use the size of the yen loan in estimating the effect of foreign aid in regional economic growth. Yen loan is the foreign aid loan from the Government of Japan, whose main portion is used for contracting the social infrastructure. In addition, the Yen Loan is the main portion of the aid to Vietnam. Hence it is useful to see the impact of the Yen Loan.

### 3.1 Model

We assume a Cobb-Douglas production function, similar to the case for the whole country:

$$Y_{rt} = A_{rt} K_{rt}^{\alpha} L_{rt}^{1-\alpha} \quad (1)$$

where
$A_{rt}$: total factor productivity in region r in year t
$K_{rt}$: capital in region r in year t
$L_{rt}$: population in region r in year t
$Y_{rt}$: output in region r in year t

The total factor productivity $A_t$ depends on foreign aid and also on the industrial structure similarity index, since foreign aid gives skills from donor countries to recipient countries, and industrial change leads to changes in the resource allocation of labor and capital. In other words,

$$A_t = G(YEN\_LOAN_{rt}) \quad (2)$$

where
$YEN\_LOAN_{rt}$: accumulated yen loan (governmental aid loan from Japan)

A linear model is adopted for the induced changes in the above model. Upon taking the logarithm and first derivative of equation (1)', it follows that

$$\text{Ln}\left(\frac{Y_{rt}}{L_{rt}}\right) = const. + \alpha \ln\left(\frac{K_{rt}}{L_{tr}}\right) + \gamma \ln(YEN\_LOAN_{rt}) + u_t \quad (3)$$

### 3.2 Data

In this work we use gross products data for 34 provinces out of 63 in Vietnam (for these provinces, see the Appendix), which is assembled in each province and are the same as in Taguchi and Pham (2019). These statistics for each province are limited to gross products, and the investment from 2000 to 2016. It is therefore necessary to estimate the variables as follows. The variable $Y_{rt}$ is derived from the gross regional product in each province, and is converted by using the GDP deflator. In addition, the variable $K_{rt}$ is not released in the gross products per province in Vietnam, and we use the accumulated investment from 2000. Investment data in relation to the gross products per province is divided into foreign direct investment (FDI) and domestic investment. Since FDI is the nominal stock base, the one year difference is taken and converted by the GDP deflator in the World Development indicators. Domestic investment is simply converted into constant price since it is shown in the nominal flow base. $L_{rt}$ is the population in each province, as published by the General Statistics Office of Vietnam. The variable $YEN\_LOAN_{rt}$ is the aid loan from the government of Japan, based on the final evaluation of projects costing at least 200 million yen. Since some facilities, such as railroads and highways, are allocated to several regions, these data are divided into regions. In contrast, some of the yen loan is allocated for the entire country, such as the fund for loans to farmers and small sized manufacturers. These kinds of projects are not included in this paper. We use data from 2001 to 2016 in 34 provinces. In addition, if no Yen Loan was given, we deleted the relevant logarithmic term. Table 4 sets out descriptive parameters for these data.

The ratio of the yen loan share in the total foreign aid from OECD countries is around 40% during the same period. In addition, the coverage of the yen loan in this dataset is around 70% of the total yen loan to Vietnam. As a result, the coverage of this dataset in the total foreign aid from OECD countries is about 30%. Since large cities are located in the34 provinces covered, around 80% of the total GRP is involved. The total investment for these 34 provinces in some years exceeded that for the whole country as published by the World Bank. This raises a question over accuracy of the data; in this paper we use the original statistics.

## 4 Results of Estimation

In the estimation of the parameters in equation (3)', we compare the three sets of estimates: pooled OLS model, fixed effects model, and random effects model. Normally pooled OLS regression does not use time-demanded variables. Hence fixed effects model is necessary to ignore how the variables change over time. We also estimate the random effects model since there may have additional unobserved effect because of not including some provinces.

From the estimation results in Table 5, fixed effects estimator is selected by using the F test and Hausman test. In addition, estimation results of fixed effects model and random effects model are similar while that of pooled OLS is not, which shows that effects for periods is relatively larger than that for provinces. Since the coefficient of the term ln(YEN_LOAN) is positive but insignificant in the fixed effects model, we conclude that the yen loan to Vietnam has not necessarily strengthened productivity so far. In contrast, it is thought that the capital accumulation itself is contributing to the economic growth since the coefficient of the term ln(K/L) is estimated significantly positive.

## Conclusion

This paper has examined the effect on productivity of foreign aid in two ways: the effect of the foreign aid in the entire country using the time series data, and yen loan, Japanese governmental aid loan, using panel data. Two main conclusions can be drawn. First, foreign aid has had no clear effect on

economic growth in the Vietnamese economy as a whole, to date. Second, the yen loan has had no clear positive effect so far either. Overall, it is not possible to conclude that foreign aid received by Vietnam has strengthened productivity so far, partly because most of the foreign aid was received after the late 1990s, and the infrastructures constructed by the foreign aid facilitate relatively in a short term. It is possible that these conclusions will change in the near future.

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## Figures and Tables

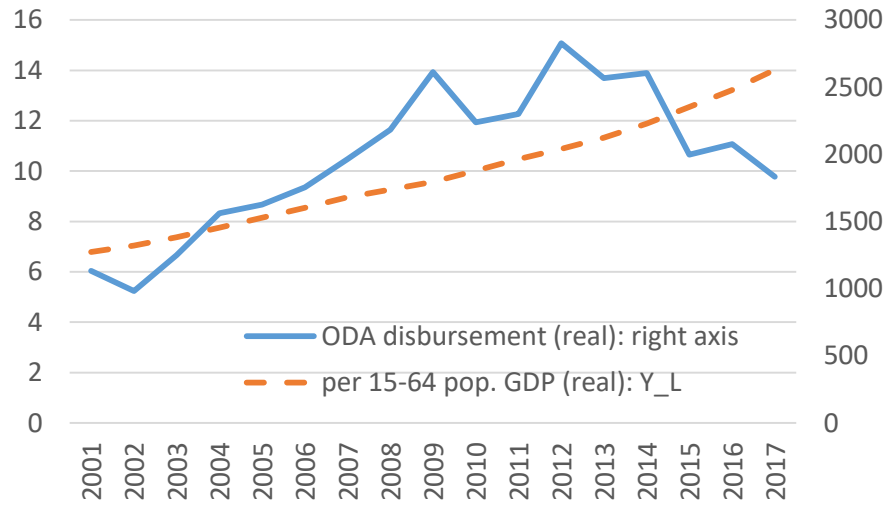



Figure 1: Foreign Aid and per capita GDP in Vietnam
Source: World Development Indicators (World Bank) and DAC statistics (OECD)

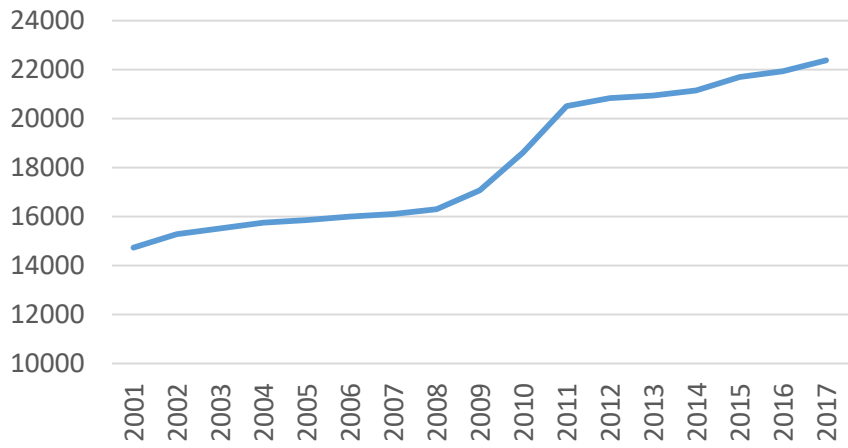
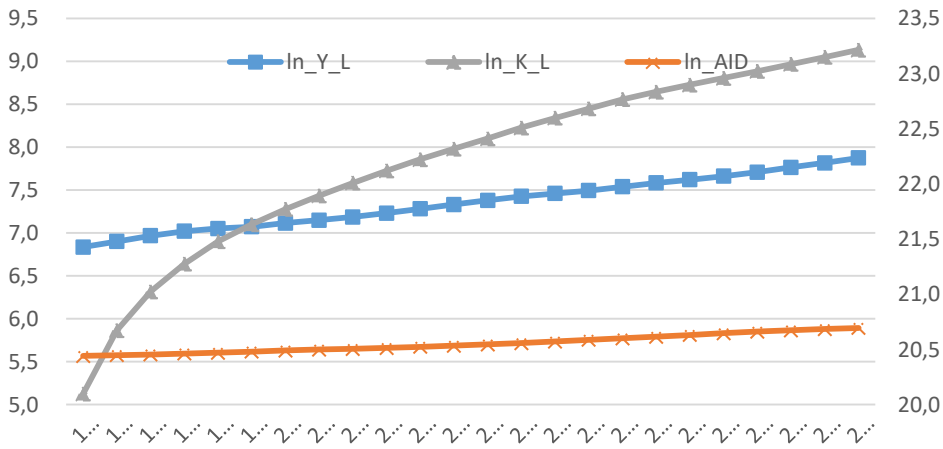



Figure 2: Exchange Rate Vietnam Ding per USD
Source: World Development Indicators (World Bank)

Table 1: Description of the Data for the Whole Country

| | ln(Y/L) per capita GDP | ln(AID) Foreing Aid Disbursement to Vietnam | ln(K/L) per capita capital | MANU/GDP manufacture/GDP |
|---|---|---|---|---|
| mean | 7,353 | 20,554 | 7,820 | 0,347 |
| std | 0,297 | 0,079 | 1,046 | 0,034 |
| max | 7,874 | 20,694 | 9,133 | 0,402 |
| min | 6,835 | 20,441 | 5,124 | 0,288 |




Source: World Development Indicators (World Bank) and DAC statistics (OECD)

Table 2: Unit Root Tests

ln(Y/L) (per capita GDP): I(2)

| | ADF | | PP | |
|---|---|---|---|---|
| | intercept | intercept&trend | intercept | intercept&trend |
| level | 0,039 | -3,094 | -0,019 | -2,486 |
| first difference | -2,592 | -2,542 | -2,604 | -2,643 |
| | -3.899*** | -4.232** | -3.842*** | -4.244** |

ln(AID) (foreign aid to Vietnam): I(2)

| | ADF | | PP | |
|---|---|---|---|---|
| | intercept | intercept&trend | intercept | intercept&trend |
| level | 0,224 | -2,251 | 3,016 | -1,837 |
| first difference | -1,706 | -1,528 | -1,678 | -1,528 |
| | -4.932*** | -5.195*** | -4.949*** | -5.384*** |

ln(K/L): I(1)

| | ADF | | PP | |
|---|---|---|---|---|
| | intercept | intercept&trend | intercept | intercept&trend |
| level | -6.978*** | -2,963 | -6.650*** | -12.684*** |
| first difference | - | -28.912*** | - | - |

Note ***: significant at 1%, **: significant at 5%, *: significant at 10%.

Source: Author's estimation

Table 3: Estimation Results across the whole country

| dependent variable: | ln(Y/L) | |
|---|---|---|
| estimation period | 1994-2017 | |
| | (1) | (2) |
| ln(AID) | 2,910 | 2,907 |
| | (0.283)*** | (0.292)*** |
| ln(K/L) | 0,070 | 0,070 |
| | (0.024)*** | (0.024)** |
| MANU/GDP | | -0,008 |
| | | (0.198) |
| const. | -53,004 | -52,949 |
| | (5.641)*** | (5.846)*** |
| AR(1) | 0,660 | 0,663 |
| | (0.211)*** | (0.215)*** |
| MA(1) | 0,599 | 0,598 |
| | (0.425) | (0.432) |
| adjusted $R^2$ | 0,999 | 0,999 |
| D.W. | 1,422 | 1,417 |
| residual | I(1) | I(1) |

Notes: 1. standard error in parentheses.

2. ***: significant at 1%, **: significant at 5%, *: significant at 10%.

3. Error term in this equation is I(1),

i.e., including spurious regression problem.

Source: Author's estimation

Table 4: Data Description for Regional Panel Data

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| ln(Y/L): per capita GPP | 544 | 7,007 | 0,725 | 0,000 | 9,503 |
| ln(YEN_LOAN): Yen Loan | 544 | 2,052 | 2,530 | 0,000 | 7,213 |
| ln(K/L): per capita capital | 544 | 8,725 | 1,571 | 0,000 | 11,068 |

Source: Author's estimation

Table 5: Estimation Results in Panel Data

| | | Pooled OLS | Fixed Effects | Random Effects |
|---|---|---|---|---|
| ln(YEN_LOAN) | | 0,057 | 0,015 | 0,026 |
| | | (0.021)** | (0.033) | (0.026) |
| ln(K/L) | | 0,272 | 0,227 | 0,231 |
| | | (0.072)*** | (0.106)** | (0.100)** |
| cons. | | 4,515 | 5,000 | 4,938 |
| | | (0.611)*** | (0.870)*** | (0.845)*** |
| $R^2$ | within | | 0,305 | 0,305 |
| | between | 0,460 | 0,583 | 0,601 |
| | overall | | 0,444 | 0,453 |
| sigma_u | | | 0,398 | 0,346 |
| sigma_e | | | 0,403 | 0,403 |
| rho | | | 0,493 | 0,435 |
| F test (Pooled vs Fixed) | | | F(33, 508) = 13.41<br>Prob > F = 0.000 | |
| Breusch and Pagan test (Pooled vs Random) | | | chibar2(01) = 655.99<br>Prob > chibar2 = 0.000 | |
| Hausman test (Fixed vs Random) | | | chibar2(2) = 8.84<br>Prob>chi2 = 0.012 | |

Notes 1. This equation is estimated by the Fixed Effects model since both F test and Hausman test are rejected.

2. Standard error in paratheses. ***: significant at 1%, **: significant at 5%, *: significant at 10%.

Source: Author's estimation.

## Appendix: Provinces in Vietnam

| region | available | not available | |
|---|---|---|---|
| Northwest | Lào Cai | Điện Biên | Sơn La |
| | | Hoà Bình | Yên Bái |
| | | Lai Châu | |
| Northeast | Bắc Giang | Bắc Kạn | Phú Thọ |
| | Thái Nguyên | Cao Bằng | Tuyên Quang |
| | Lạng Sơn | Hà Giang | |
| | Quảng Ninh | | |
| Red River Delta | Bắc Ninh | Ninh Bình | |
| | Hà Nam | Thái Bình | |
| | Hà Nội | | |
| | Hải Dương | | |
| | Hải Phòng | | |
| | Hưng Yên | | |
| | Nam Định | | |
| | Vĩnh Phúc | | |
| North Central | Thanh Hóa | Hà Tĩnh | |
| | Nghệ An | Quảng Bình | |
| | Thừa Thiên–Huế | Quảng Trị | |
| South Central Coast | Bình Định | Khánh Hòa | |
| | Bình Thuận | Ninh Thuận | |
| | Đà Nẵng | | |
| | Phú Yên | | |
| | Quảng Nam | | |
| | Quảng Ngãi | | |
| Central Highlands | Lâm Đồng | Đắc Lắc | Gia Lai |
| | | Đắk Nông | Kon Tum |
| Southeast | Bà Rịa–Vũng Tàu | Tây Ninh | |
| | Bình Dương | Bình | |

| | | | |
|---|---|---|---|
| | | Phước | |
| | Đồng Nai | | |
| | Ho Chi Minh City | | |
| Mekong River Delta | An Giang | Bến Tre | |
| | Cần Thơ | Kiên Giang | |
| | Đồng Tháp | Hậu Giang | |
| | Long An | Sóc Trăng | |
| | Tiền Giang | Bạc Liêu | |
| | Trà Vinh | Cà Mau | |
| | Vĩnh Long | | |