

ผลกระทบของความช่วยเหลือจากต่างประเทศต่อการพัฒนาโครงสร้างพื้นฐาน
ในสาธารณรัฐประชาธิปไตยประชาชนลาว
The Impact of Foreign Aid on Infrastructure Development in Lao PDR.

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Article history:

Accepted 10 April 2025

Revised 12 June 2025

Accepted 16 June 2025

SIMILARITY INDEX = 0.00 %

บทคัดย่อ

บทความนี้วิเคราะห์ผลกระทบของความช่วยเหลือจากต่างประเทศต่อการพัฒนาโครงสร้างพื้นฐาน โดยใช้ ข้อมูลแบบแผง (Panel Data) จาก 17 แขวงในประเทศลาว ตั้งแต่ปี 2551 ถึง 2562 และใช้แบบจำลองการถดถอยแบบรวมกลุ่ม (Pooled OLS), แบบจำลองผลกระทบคงที่ (Fixed Effects) และแบบจำลองผลกระทบสุ่ม (Random Effects) ผลการทดสอบฮอสมัน (Hausman Test) แสดงให้เห็นว่า ค่าความน่าจะเป็น (p-value) น้อยกว่า 0.05 ซึ่งบ่งชี้ว่า แบบจำลองการถดถอยของข้อมูลแบบแผง (Panel Data Regression Model) ควรใช้ แบบจำลองผลกระทบคงที่ (Fixed Effects) แทน แบบจำลองผลกระทบสุ่ม (Random Effects) ในฐานะ แบบจำลองผลกระทบคงที่ (Fixed Effects) เพื่อตรวจสอบผลกระทบของความช่วยเหลือจากต่างประเทศต่อการพัฒนาโครงสร้างพื้นฐาน ผลลัพธ์แสดงให้เห็นว่าความช่วยเหลือจากต่างประเทศมีผลในเชิงบวก หรือกล่าวอีกนัยหนึ่งคือ ความช่วยเหลือจากต่างประเทศช่วยปรับปรุงโครงสร้างพื้นฐานในประเทศลาว เช่น ถนน การจ่ายกระแสไฟฟ้า โทรคมนาคม และสนามบิน แต่ผลกระทบนั้นน้อยมาก โดยสมมติว่าปัจจัยอื่น ๆ คงที่ การเพิ่มขึ้นของความช่วยเหลือจากต่างประเทศหนึ่งหน่วย จะนำไปสู่การปรับปรุงโครงสร้างพื้นฐาน 0.052 หน่วย การวิเคราะห์ความแตกต่างของผลกระทบจากการสะสมโครงสร้างพื้นฐานของผู้ให้ความช่วยเหลือที่แตกต่างกันในประเทศลาว แสดงให้เห็นว่าเฉพาะประเทศผู้ให้ความช่วยเหลือรายใหญ่เท่านั้นที่มีผลกระทบอย่างมีนัยสำคัญ

คำสำคัญ : ความช่วยเหลือจากต่างประเทศ การพัฒนาโครงสร้างพื้นฐาน การพัฒนา

Abstract

This paper analyzes the impact of foreign aid on infrastructure development. Panel data from 17 provinces in Laos from 2008 to 2019 were used and implied with the Pooled OLS, fixed effects and random effects models. The Hausman test showed that a p-value less than 0.05 indicates that the panel regression model should use a fixed-effects model instead of a random-effects model. As a fixed effects model to examine the impact of foreign aid on infrastructure development. It shows that foreign aid has a positive effect, or in other words, foreign aid helps to improve infrastructure in Laos, such as roads, electrification, telecommunications and airports, but its impact is very small. Assuming that other factors remain constant, a one unit increase in foreign aid leads to a 0.052-unit improvement in infrastructure. The heterogeneity analysis of the impact of infrastructure accumulation of different donors in Laos shows that only the large donor countries have a significant impact.

Keywords: Foreign aid, Infrastructure development, Development

1. Introduction

The Organization for Economic Co-operation and Development (OECD) defines foreign aid as official development assistance (ODA), which refers to bilateral or multilateral aid provided by governments to promote the economic development and prosperity of developing countries. The majority of foreign aid consists of grants on concessional terms and low-interest loans with the lowest possible interest rates. The beginnings of foreign aid date back to 1970, when the United Nations agreed that economically developed countries should allocate 0.7% of their gross national income to foreign aid. Later, the World Health Organization recommended allocating 14% of foreign aid to global health. In 2017, public and private donors around the world provided around 200 billion dollars' worth of foreign aid to developing countries to help them grow. Therefore, foreign aid plays an important role and significance in supplementing the savings of recipient countries and promoting the economic development of underdeveloped and developing countries (Abuzeid, 2009).

However, there has been a heated debate among scholars regarding whether foreign aid can promote growth and development in underdeveloped countries. One viewpoint holds that foreign aid has a positive impact on economic growth, health, education, infrastructure, and poverty reduction in least developed and developing countries, as argued by Muktaf (2018), Chauvet & Ehrhart (2018) and Gitaru (2016). The second viewpoint suggests that foreign aid may harm the economic growth of recipient countries, as argued by Graham (2015) and Moyo (2010). The third viewpoint holds that aid can only be effective when it is combined with appropriate policies. To understand the controversy over the effectiveness of foreign aid, it is necessary to consider the purpose of the aid, the motives of the donors, and the relationship between foreign aid and economic growth, as discussed by Burnside & Dollar (2000).

Overall, although Laos has strong economic growth momentum, many issues still need to be addressed in order to achieve the Sustainable Development Goals (SDGs) and graduate from the United Nations' list of least developed countries (LDCs). These issues include inadequate infrastructure, rural poverty, and low education levels. As a landlocked and developing country with limited domestic financial capacity, Laos relies heavily on foreign aid as an essential component of its national development. International organizations, developed countries, emerging economies, and non-governmental organizations provide various forms of assistance, including funding, technology, training, and project support. These aid programs aim to improve Laos' infrastructure, education, healthcare, agriculture, and other critical sectors, which are essential for promoting sustainable development.

An official statement indicated that high-level foreign aid has played a key role in the Laotian government's efforts to achieve strong growth in the construction sector. However, in reality, despite utilizing both domestic and external funding sources to promote economic development, many least developed countries have not achieved sustainable growth. There

remains ongoing debate about whether aid is sufficient to promote sustainable economic development in Laos. Moreover, in many countries, much of the information related to foreign aid remains confidential, making the true impact of aid on deeper aspects of economic development relatively unclear. As a result, research on the impact of foreign aid on Laos' economic development is still limited. Therefore, further investigation is needed to determine whether foreign aid can effectively promote Laos' economic development through infrastructure development and to provide case studies that contribute to existing research on aid effectiveness.

Objective of study

Analyzed the impact of Foreign Aid on Infrastructure development.

2. Literature Reviews

Aid funds for economic infrastructure aim to improve energy supply, transportation efficiency, communication, and the application of information technology in recipient countries. As a form of physical capital, economic infrastructure represents an investment in economic activities that contributes to growth by supporting accounting and legal services, reducing business costs, and improving labor productivity and transaction efficiency. Donaubauer, et al., (2016) pointed out that there is strong evidence suggesting that infrastructure aid is effective in improving the infrastructure endowments of recipient countries. Infrastructure has consistently been shown to be an important determinant in attracting foreign direct investment (FDI) to developing countries. Therefore, only well-targeted assistance can indirectly promote FDI through improvements in infrastructure. Aid from both developed and developing countries—especially China—has helped recipient countries overcome infrastructure bottlenecks in areas such as water conservancy, electricity, land and air transportation, and telecommunications (Lin & Wang, 2016). This support has had a positive impact on the economic development of recipient countries. Nguyen (2022) also indicates that ODA has a positive effect on economic infrastructure. Sahoo & Bishnoi (2016) point out that ODA improves transport infrastructure, which leads to increased income and improved living standards for the population. In contrast, Noah & David (2024) argue that ODA has a negative direct effect on overall infrastructure development. However, Vathanak (2021) shows that ODA for transportation infrastructure development has significantly contributed to GDP growth. Similarly, Donaubauer, et al., (2016) state that ODA in infrastructure significantly improves the infrastructure endowments of recipient countries, attracts foreign direct investment, and indirectly promotes it through infrastructure channels.

3. Methodology

3.1. Data Collection

As the Lao People's Democratic Republic is a developing country in the early stages of development, most available data are based on raw records, which can result in some data loss. Therefore, the sample selection is based on the data that stakeholders possess and are able to provide. By combining data from the Ministry of Planning and Investment, the Ministry of Industry and Commerce, the Ministry of Public Works and Transport, the National Statistics Bureau, and the Bank of the Lao PDR, this study selected panel data from 17 provinces in Laos, covering the period from 2008 to 2019, for analysis.

3.2. Theoretical Framework

Economic infrastructure assistance in Laos is crucial for its development, particularly in improving road transportation, warehouses, logistics, and energy supply. This aid promotes social and economic growth, attracts international investment, and reduces production costs.

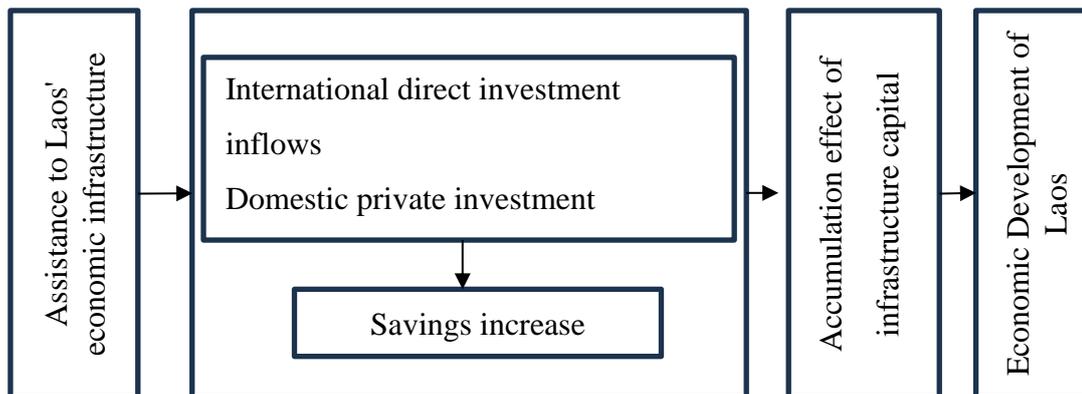


Figure 1. Infrastructure Effect in Laos

Regarding the connotation of infrastructure, Gowda & Mamatha (1997) classified it into three categories: (1) public utilities, including electricity, telecommunications, drinking water supply, sanitation and sewage treatment, solid waste collection and treatment, natural gas supply, storage and warehousing. (2) Public works, including roads, dams, canal projects, irrigation canal projects, and water tanks for irrigation and drainage. (3) Other transportation sectors, including highways, railways, ports, waterways, and airports. Asiedu (2002) suggests that good infrastructure boosts investment productivity, stimulating foreign direct investment, using the neoclassical growth theory to explain the connection between aid flows and infrastructure development. Began with the Cobb Douglas production function:

$$Y = AK^\alpha \quad (1)$$

Which Y represents total output or per capita GDP; K is the physical capital stock of each worker; A is total factor productivity, and α is a parameter between 0 and 1. The marginal productivity of capital can be obtained from equation (1) as follows:

$$MPK = \alpha AK^{\alpha-1} \quad (2)$$

I believe that the flow of aid has increased initial stock of A in the economy:

$$A = A_0 + Aid, \quad \text{where } Aid = aid * L$$

$$A = A_0 + aid * L \quad (3)$$

aid is a part of the aid for facility investment in supplementary factors. In an open economy, capital equipment funding comes from domestic savings and foreign investment, enhancing physical fitness rather than affecting it. Therefore, per capita capital accumulation is:

$$k^* = sy - (n + \delta)k + Infra \quad (4)$$

Which n is the population growth rate, δ is the depreciation rate, it's a constant. The world's actual rate of return (r) for any given time period is:

$$r = MPK - \delta = \alpha AK^{\alpha-1} - \delta \quad (5)$$

The equation that displays the steady-state level of k at any point in time can be exported:

$$r = \alpha AK^{\alpha-1} - \delta \Rightarrow k^* = \left[\frac{\alpha A}{r + \delta} \right]^{\frac{1}{1-\alpha}} \Rightarrow k^* = \left[\frac{\alpha A}{r^*} \right]^{\frac{1}{1-\alpha}} \quad (6)$$

Bring r^* , the sum of r and δ , is the sum of the Laos's actual rates of return. In addition, at the steady-state level of capital stock, the capital stock will no longer change, so $k^* = 0$. Then, It can derive the per capita foreign direct investment flow as:

$$Infra = (n + \delta)k^* - sy^* \quad (7)$$

Take partial derivatives of aid , so that:

$$\frac{\partial Infra}{\partial aid} = (n + \delta) \frac{\partial k^*}{\partial aid} - s \frac{\partial y^*}{\partial aid} \quad (8)$$

If domestic savings exceed the stable national capital stock, aid is expected to have a negative impact on infrastructure. Therefore, the final equation implies that the effect of official development assistance on infrastructure is ambiguous, as theory cannot definitively explain the direct relationship between these two variables.

Inference: Aid has improved infrastructure—including roads, water supply, electricity, and telecommunications—to support Laos' productivity and economic development.

(1). Model setting

The Pooled OLS, Fixed Effects, and Random Effects models are used to construct an econometric model examining the impact of foreign aid on infrastructure accumulation in Laos, as shown in the following equation:

$$Infra_{it} = C_0 + C_1 Aid_{it} + \sum \rho_i X_{it} + \varphi_i + \varepsilon_{it} \quad (9)$$

Infra_{it}: It identifies the infrastructure level in each province of Laos to represent infrastructure accumulation, using the number of road kilometers per unit area in each province as an indicator. The data are sourced from the Ministry of Public Works and Transport.

Aid_{it}: The core explanatory variables evaluate whether foreign aid improves the infrastructure endowment across various provinces in Laos. This study analyzes foreign aid from major donor countries and international multilateral organizations to Laos, with a focus on power and infrastructure development. While aid from major donors primarily supports this sector, multilateral aid tends to concentrate on agriculture and mining. The heterogeneity analysis distinguishes between aid from major donor countries and that from international multilateral organizations. Danga, et al., (2020) pointed out the impact of foreign aid on infrastructure construction has had a positive impact on economic growth.

X_{it}: a controlled variable, including government expenditure (GS_{it}), foreign direct investment (FDI_{it}), population (Pop_{it}), land areas (La_{it}), GDP per capita ($PerGDP_{it}$), C_0 a constant, C_1 the coefficient of estimation, ϵ_{it} the error terms.

GS_{it}: This uses the total annual budget expenditure of each province, measured in millions of US dollars, to represent the government expenditure variable, highlighting its role in improving infrastructure.

FDI_{it}: Foreign direct investment is the primary source of development funds for Laos, with each province's level determined by the total amount of foreign investment, which has a positive effect on the infrastructure development of the host country (Ng'ang'a, 2022).

Pop_{it}: Population size is closely linked to a country's economic scale, promoting domestic production, consumption, and foreign investment, and is influenced by labor supply and human capital. There is a strong positive correlation between infrastructure and urban population, with urban population driving increased infrastructure development (Weinhold & Reis, 2001).

La_{it}: Infrastructure, as the foundation of services, depends on regional growth and development, with larger provinces requiring more construction. This indicates a positive relationship between land area and the level of infrastructure (Larimer, 1994).

PerGDP_{it}: Higher GDP per capita increases infrastructure investment, particularly in democracies and autocracies, where GDP growth positively affects infrastructure growth rates; however, this effect is less noticeable in anarchic contexts (Brueckner, 2021).

(2). Hausman test

When regressing panel data, the Hausman test showed that a p-value < 0.05, indicating that the panel regression model should use a fixed effects model instead of a random effects model.

4. Results

Before conducting the benchmark regression, multicollinearity in the data should be checked using the variance inflation factor (VIF). The results show that the mean VIF is less than 5, indicating no serious collinearity problem among the variables.

Table 1. Variance Inflation Coefficient Test

Variables	VIF	1/VIF
<i>GS</i>	4.56	0.219088
<i>FDI</i>	2.64	0.378845
<i>Pop</i>	2.22	0.451446
<i>La</i>	2.06	0.486406
<i>PerGDP</i>	2.05	0.488766
<i>Aid</i>	1.57	0.638735
Mean VIF	2.51	

(1). Benchmark regression

From Table 2, the benchmark regression analysis of equations (1) to (6) shows that only models (1) to (3) exhibit a positive correlation between external aid and the level of infrastructure development at the 5% significance level. In models (2) and (3), population and foreign direct investment were added as control variables, and foreign aid still had a positive impact at the 5% significance level. However, the estimated coefficient for foreign aid was slightly smaller than those of the control variables. Assuming other factors remain constant, a one-unit increase in ODA results in a 0.052-unit improvement in infrastructure. For models (4) to (6), additional control variables such as per capita GDP, government expenditure, and land area were included. The results indicate that foreign aid is not statistically significant in these models. However, the increasing R-squared values suggest that adding control variables improved the model fit. The empirical analysis shows that, compared to internal factors like population, the impact of foreign aid on infrastructure accumulation is relatively small. This may be because some road improvements are carried out by local communities and maintained through village collection budgets.

Table 2. Impact of Foreign Aid on Infrastructure development: Benchmark Regression

Variables	Infrastructure Development					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Aid</i>	0.052** (2.22)	0.050** (2.34)	0.050** (2.34)	0.022 (1.16)	0.015 (0.79)	0.009 (1.19)
<i>Pop</i>		3.775*** (6.07)	3.764*** (5.68)	0.944 (1.38)	0.449 (0.64)	-0.328 (1.15)
<i>FDI</i>			0.001 (0.05)	-0.002 (0.13)	-0.012 (0.69)	-0.003 (0.37)
<i>GS</i>				0.299*** (7.68)	0.163** (2.51)	0.040 (1.51)
<i>PerGDP</i>					0.225** (2.60)	0.061 (1.73)
<i>La</i>						5.110*** (30.39)
_cons	7.711*** (107.88)	6.260*** (25.25)	6.261*** (25.14)	6.277*** (28.93)	5.467*** (14.47)	6.337 (40.71)
R ²	0.0259	0.1883	0.188	0.3870	0.4091	0.9036
N	203	203	203	203	203	203
ProvinceFE	Yes	Yes	Yes	Yes	Yes	Yes

Note: ***, **, * The statistical significance levels of 0.01, 0.05 and 0.1 respectively; The value in parentheses is t-statistics.

(2) Heterogeneity analysis

A. Heterogeneity analysis of infrastructure accumulation effects of different aid providers in Laos

From Table 3, the analysis examines the effects of different types of aid, dividing them into aid from major donor countries and aid from international multilateral organizations. The results show that aid from major donor countries is significantly positive at the 1% significance level, while aid from international multilateral organizations has no significant effect. The positive coefficient suggests that increased aid from major donor countries can lead to better infrastructure development in Laos. However, after adding control variables, the effect was no longer significant, and the coefficient gradually decreased.

Table 3. Heterogeneity Regression Results of Infrastructure Accumulation Effects in Laos by Different Aid Providers

Infrastructure Development						
	<i>Country_Aid</i>			<i>International_Aid</i>		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
<i>Aid</i>	0.056*** (2.98)	0.046*** (2.62)	0.005 (0.78)	0.021 (0.51)	0.012 (0.33)	0.024 (1.38)
<i>Pop</i>		3.657*** (5.52)	-0.338 (1.18)		4.390*** (5.82)	-0.361 (0.42)
<i>FDI</i>		-0.003 (0.14)	-0.003 (0.44)		-0.011 (0.47)	-0.004 (0.59)
<i>GS</i>			0.039 (1.45)			0.041 (1.45)
<i>PerGDP</i>			0.062* (1.74)			0.063 (1.17)
<i>La</i>			5.119*** (30.28)			5.132*** (6.21)
_cons	7.727*** (152.73)	6.348 *** (26.17)	6.356*** (40.42)	7.796*** (92.62)	6.179*** (21.41)	6.311*** (14.65)
R ²	0.0461	0.1948	0.9030	0.0017	0.1886	0.9028
N	202	202	202	170	170	170
ProvinceFE	Yes		Yes	Yes	Yes	Yes

Note: ***, **, * The statistical significance levels of 0.01, 0.05 and 0.1 respectively; The value in parentheses is t-statistics.

(3). Heterogeneity Analysis of the Accumulation Effect of Foreign Aid on Infrastructure in Different Parts of Laos

From Table 4, foreign aid has different effects across regions, so this analysis divides them into the northern, central, and southern regions. The results show that the estimated coefficients are significantly positive in the northern and central regions at the 1% and 5% significance levels, respectively, but not significant in the southern region. Although foreign aid has a significant positive impact on the northern region, its estimated coefficient is very small—smaller than those of control variables such as population, land area, and government expenditure. Due to the mountainous terrain, infrastructure development in the northern region can help provinces connect and facilitate economic participation for the Laotian people. In contrast, the estimated coefficient for the central region is significantly negative,

indicating that increased foreign aid inflows there do not improve infrastructure construction, especially roads.

Table 4. Heterogeneity Regression Results of the Accumulation Effect of Foreign Aid on Infrastructure in Different Parts of Laos

Variables	Infrastructure Development		
	North	Central	South
<i>Aid</i>	0.010*** (4.73)	-0.018* (2.31)	0.015 (0.82)
<i>Pop</i>	0.904* (1.84)	-0.003 (0.05)	2.762 (0.87)
<i>FDI</i>	0.000 (0.17)	-0.008** (2.80)	-0.007 (0.21)
<i>GS</i>	0.052*** (3.98)	0.134*** (12.44)	0.005 (0.08)
<i>PerGDP</i>	-0.039 (0.96)	-0.090*** (6.22)	0.104 (0.95)
<i>La</i>	5.637*** (9.95)	2.789** (4.28)	5.047** (5.39)
<i>_cons</i>	6.631*** (54.54)	7.554*** (68.33)	4.929*** (5.91)
R ²	0.9834	0.9161	0.9196
N	96	59	48
ProvinceFE	YES	YES	YES

Note: ***, **, * The statistical significance levels of 0.01, 0.05 and 0.1 respectively; The value in parentheses is t-statistics.

(4). Robustness check

From Table 5, the study examines the impact of foreign aid on infrastructure development in Laos, focusing on the percentage of households with electricity and telephones. The results show that the percentage of households with telephones is a key factor in improving infrastructure, while the percentage of households with electricity is not significant. However, the coefficient for government expenditure is slightly higher than that for foreign direct investment. The study also finds that the primary focus of foreign aid in Laos is on exporting electricity to neighboring countries, which reduces the local importance of electricity. The model suggests that government expenditure is the main driver of infrastructure improvement in Laos.

Table 5. Accumulation of Infrastructure in Different Areas of Laos by Foreign Aid

Infrastructure Development		
	<i>Access Electricity</i>	<i>Access Phone</i>
Variables	(1)	(2)
<i>Aid</i>	0.000 (0.63)	0.142* (1.70)
<i>Pop</i>	0.017 (0.81)	5.827 (1.59)
<i>FDI</i>	0.001* (2.36)	0.103 (1.11)
<i>GS</i>	0.006*** (3.07)	1.110*** (3.26)
<i>PerGDP</i>	-0.003 (1.22)	0.116 (0.25)
<i>La</i>	-0.004 (0.31)	-2.477 (1.15)
_cons	-0.005 (0.39)	-3.598* (1.80)
R^2	0.1633	0.3190
<i>N</i>	203	203
ProvinceFE	Yes	Yes

Note: ***,**,* The statistical significance levels of 0.01、 0.05 and 0.1respectively;
The value in parentheses is t-statistics.

5. Conclusion and discussion

Using a fixed effects model to study the impact of foreign aid on infrastructure development, it can be seen that foreign aid has a positive effect—that is, it helps improve Laos’ infrastructure, including roads, electrification, telecommunications, and airports—although the impact is very small. The heterogeneity analysis of the infrastructure accumulation effects from different aid providers in Laos shows that only aid from major donor countries is significant, while aid from international multilateral organizations is not. Additionally, the heterogeneity regression results for different regions of Laos indicate that the percentage of households with telephones is a key factor in improving infrastructure, whereas the percentage of households with electricity is not significant. However, the coefficient for government expenditure is slightly higher than that for foreign direct investment. The analysis results are consistent with Danga, et al., (2020), who found a positive relationship between ODA and infrastructure in both the short run and long run, and with Nguyen (2022) , who

reported that ODA has been a crucial financial resource for economic infrastructure, significantly contributing to economic conditions in recipient countries. Additionally, Sahoo & Bishnoi (2016) found that ODA promotes and supports the development of transport infrastructure. Several infrastructure projects have transformed the urban landscape and ways of living, reducing trade costs, increasing employment, and leading to improved income and living standards. However, this paper contrasts with the research of Noah & David (2024) and Kaizuka (2023), who argue that ODA has a negative direct effect on overall infrastructure development because tying aid to procurement from donor countries can inflate costs and restrict recipients' ability to source materials and services efficiently, further complicating infrastructure development. Nevertheless, when considering indirect effects mediated by governance, all external financing sources positively affect both types of infrastructure.

5.1 Suggestions for use in this research

The overall analysis suggests that ODA has had a positive impact on infrastructure development in the Lao PDR; however, when broken down by donor and region, some areas show no statistically significant effects. Therefore, the government should seek ways to maximize the use of ODA funds and ensure they are distributed evenly and fairly across all regions. Additionally, there is a need for close monitoring and auditing of expenditures to ensure alignment with plans and to prevent corruption that could undermine the effectiveness of the assistance.

The paper also found that bilateral aid had a statistically significant effect on infrastructure development, while multilateral aid did not. This may be due to their different objectives: bilateral aid often focuses on strategic or economic interests, whereas multilateral aid emphasizes poverty reduction, sustainable development, and climate change. Therefore, when seeking foreign aid, relevant parties must base their requests on the country's socio-economic development plan to ensure that the aid is targeted and effective.

5.2 Further researchers

Future research should consider using high-quality data, including aid duration, repayment period, interest rates, repayment ability, and panel data from before 2008. Since this study focuses on Laos, its findings may not apply to countries with different economic and political environments. Expanding the research to other countries and employing panel data to examine the long-term and short-term relationships between aid and economic development can help validate the conclusions. Additionally, in-depth analyses using methods such as DSGE, SUR, and spatial models could be conducted.

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