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Can ODA Enhance Economic Development? Special Research on Australian Fund for the Growth Effectiveness in Laos

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Abstract

In Laos, ODA from Australia pays over USD 40 million each year in the field of educational improvement. Australia has been assisting and promoting the economy of Laos for several decades, which establishes a good scenario of the two countries' ties (between Australia and Laos). Firstly, the author examines the relationship between the human development index and economic growth by using a bivariate correlation testing approach of two variables as provided by Pearson and Spearman, and the use of the cointegration method by Johansen test on VECM analysis, this estimation is vital for time series data. In the final finding, there was a result to denote that, education can have a significant relation to enhance economic growth in Lao PDR. Higher education reflects higher economic development by relying on the test result of Pearson with a p-value of .02 and the Spearman test with a p-value of .049, of which the p-value was less than .05. For VECM analysis, the result showed that education in both the long and short run has a negative direction in relation to economic development, in the short run the ODA from Australia showed an opposing direction to growth, but in the long run, such ODA has a positive relation to economic growth with significance. Finally, this paper detailed Laos' future policy on promoting investment in the field of technological development and innovation; a suitable law and regulation for technological investment should be effectively enacted for ODA in the field of educational improvement, eventually good educational people can build investment and national economic development of Laos.

Keywords

Assistant Funds, Australia and Laos, Long and Short Run, Vector Error Correction Model, Test of Correlation

1. Introduction

For many years, Australia has spent over US$ 40 million on the socio-economic development of Laos, in 2005, Laos received USD 19.4 million, and from 2011 to 2020 there were over USD 40 million disbursed for Laos' development by the AusAID. One more interesting information about Australian aid, it is a vital support in the field of educational development, especially education for technological improvement. Some investors are playing potential roles in the technological development in Laos. Most of those investors are Lao young people who graduated from Australia in the field of technological innovation such as IT development, mobile engineering, electrical engineering, mechanical engineering, and so forth. Regarding to Lao young generation, knowledge of technology and Australian aids are important sources to push the Laos' economy. Laos has made strong economic progress since the introduction of market-based economic reforms in the 1980s. Economic growth as well as the living standards of Lao people has been improved, but the country still faces some significant challenges in development as economic growth is shared unequally and some social development indicators remain very weak. Educational opportunities diverge significantly depending on geography, gender, and ethnicity. Australia has a strong interest in ensuring Laos continues to develop as a stable neighbor that is increasingly well-positioned to contribute to regional security and prosperity. Australian aid (AusAID) to Laos aims to build prosperity, reduce poverty, and human capital development with knowledge of technological innovation, to assist Laos in taking advantage of economic integration with the region. A growing economy and improved business environment will foster opportunities for economic partnership in the future. The Lao Government needs to encourage greater investment in many developmental sectors to broaden Laos' economic base and ensure economic opportunities are better shared. This will require further action to improve the business environment, particularly technological enterprises, provide access to finance, and employ many skilled labor forces.

This paper has the objective to examine the role of Australian aid in enhancing education in the field of technology for Lao young people. These people are now enhancing investment in the field of electronics for Laos. First, this paper entails Laos' developmental strategy for technological innovation and intervention of AusAID's support. Second, it provides how the AusAID program changes technological investment in Laos, the technological investments in Laos are established by Lao businessmen, who are young people and have a good education. The final goal is to achieve better improvement for the socio-economic development in Laos, especially education improvement in the field of technological development.

Simultaneously, this paper investigates Australian aids in relation to educational development by using bivariate tests. Besides, the paper examines ODA, Investment in technology, export of technological products, and educational development in relation to economic growth by using VECM estimation as a me-

thod. Thus, the research question of this study is doubted: Does ODA from Australia effectively improve the economic growth of Laos, and how do technological investment and education impact growth?

Due to the reason of ODA is a major factor, besides FDI and the national budget, in driving Laos' economy, building fundamental infrastructure and investment, to enhance knowledge, employment, and income; but in fact, the economic growth rate of Laos is sharply declining, unemployment issue is still existing in the economic structure of Laos, in Table 1 employment rate had been reduced from the 7th NSEDP to the 8th NSEDP, for instance, it was 4.6% in 2001-2005, but reduced to 6.23% in 2006-2010 and drastically reduced to 3.63% in 2015-2020 as well as income per capita from 78.43% in 2001-2005 and reduced to 76.51% in 2015-2020, while ODA had been increasingly disbursed from USD 232.98 million in 2001-2005 to USD 374.21 million in 2006-2010 and USD 523.84 million in 2015-2020. Finally, some details on future policies for the ODA framework to promote technological improvement and investment in the field of electronics are mentioned in this study.

1.1. National Plan and Development Strategy

The Government of Lao PDR has started formulating its National Socio-Economic Development Planning (NSEDP) since its independence in 1975, recently Laos has reached the 9th Five-Year Plan (2021-2025), it is a continuation of the 8th Five-Year Plan 2016-2020. The Plan is regarded as a measure for achieving socio-economic development, industrialization, technological development, and modernization in the year 2020 and having sustainable growth from 2030. The 9th National Socio-Economic Development Plan is the Lao PDR's guiding strategic document. It paves the way towards graduation from Least Developed Countries (LDC) status and lays a strong foundation for the achievement of the National Strategy on Socio-Economic Development 2025 and the vision 2030 as well as the Sustainable Development Goals. Laos' national economy is built up of several important sectors broadly categorized as, for instance, agriculture of crops and food, electrical industry, mining industry, manufacture of technological goods, supply of services, tourism, and so on. All generate wealth in

Table 1. The trend of ODA disbursement and macro-economic indicators.

NSEDP phases	ODA disbursement in average (US$ million)	Employment rate in average (percentage)	Income per capita on average (percentage)
2001-2005 (5th NSEDP)	232.98	4.6	78.43
2006-2010 (6th NSEDP)	374.21	6.23	77.90
2011-2015 (7th NSEDP)	430.29	6.17	77.25
2016-2020 (8th NSEDP)	523.84	3.63	76.51

Source: OECD and World Bank. Data from 2001-2020.

some form for Laos' economy. A National Socio-Economic Development Plan (NSDEP) will aim at the country's perspectives and priorities in association with all developmental sectors. This planning relates to the scope and timetable of national strategic planning and projects undertaken for completing goals and targets planned every five years. For many decades, the NSEDP frameworks enabled realistic and achievable decisions to be taken by the Lao government. The government provides an available and suitable action plan to implement its whole structure of the economy and helps institutions including international organizations, developed countries, counterpart countries, and private sectors to look for a stable and sympathetic benefit to societal life and a civilized economy. Laos' national plan provides the evidence to make positive decisions, and the national plan also meets the need of the international development perspectives from many countries and overseas institutions, donors, and organizations to make loans or to provide funds, and to establish technical assistance with a clear understanding of the benefits and wholehearted commitments to the economy of Laos. Many projects have meaningful purposes for Laos under the NSEDP, as Laos is still a least developed country, the need for overseas assistance is still quite important to driving development in Laos. Furthermore, the national plan also enables these different organizations to avoid wasteful overlap and competition among donors through their coordinating programs. Finally, the Lao government sees fundamentally that things must be done to secure its country's improvement and prosperity which determine the course of events long into the future.

1.2. Technology and Economic Development

Many countries have relied on their economic development in different ways depending on their developmental strategies and their natural resources endowment or called abundant resources have been used as their counties' real inputs for economic development; some of several LDC countries drive their economies based on agriculture, some developed countries depend on mind innovation in association to the technological development, and there are many developing countries have driven their economies based on industries, manufactures, services, tourism and so on. Science and technology have been centered on the progress and development of all nations in the world. It has contributed immensely to all sectors of the economy. Science and technology are intimately connected with development because; they have a historical record of bringing advances that have led to more productive lives and they are key ingredients to the solution for the most serious poverty alleviation and economic development. There are many ways in which science and technology impact poverty alleviation across various sectors of the economy (Anaeto et al., 2016). Science and technology are tragically important to economic opportunity and growth. For many years policymakers have suspected a closed link between economic growth and productive investment in science and technology, in three principal ways

(Watson et al., 2003); First, since the Industrial Revolution, rich (developed) countries have had the potential science and technology capacity and have grown the fastest. From 1870 to now, some scientifically and technologically advanced countries have increased wealth and their rates of growth; second returns to rural and development showed consistently positive growth in countries where science and technology are properly established; in such cases, there is always a correlation between innovation and growth (Anaeto, 2016). Most technological enterprises, led by IT and mechanical engineering companies in Laos, will drive the economy as an engine of growth. Even though Laos is just a small market economy, technology development is required. In terms of development, technology will significantly affect the overall growth of the economy and the distribution of wealth in Laos.

1.3. Australian Aid and Laos

Australia has a long-standing developmental cooperation in the Lao PDR. Australian aid currently focuses on basic education, trade and investment, community, and rural development. In 2021-22, the Australian government provided $20.6 million as Official Development Assistance (AID Program Report Performance Summary, 2020-2021) to Laos, which aims to help the Lao government lift its people out of poverty and have a stronger economy. This objective is consistent with the themes of the Australian Foreign Policy White Paper for global efforts to reduce poverty, alleviate suffering, and promote sustainable development; especially, AusAID builds people in Laos through education. Recent monitoring found that 98% of Australian Award Scholarship (AAS) alumni in Laos provided credible and relevant examples of contribution to Lao development, and most of those contributions supported Australian priorities. The Laos-Australia Development Learning Facility (LADLF) continued to provide a range of technical and analytical services to the Australian development program in Laos; in 2018-19, LADLF supported several strategic activities including GEDSI Strategy; Public Diplomacy Strategy; and engagement in the Australian standard processes. The design of the Early Childhood Benefits Program and a study on education and skills demand in the private sector is increasing substantially in Laos. The facility continued to support the Ministry of Planning and Investment in capacity building on the use of an ODA Monitoring Information System with higher technical knowledge; and the National Institute for Economic Research in conducting a technological development and climate change adaptation study. Australia is an active participant in Laos' annual donor-government coordination process. There is the Roundtable Mechanism (RTM) of the 10 sector working groups that form the RTM held annually, Australia is currently a co-chair of Education, Trade and Private Sector, and Illicit Drugs. Australia also co-chairs the water sub-sector working group. During the 2018 RTM process, Australia advocated for an inclusive coordination process that better includes non-traditional donors, the private sector, and civil society; a process that is better

linked to Lao planning and budget discussions; and embedding cross-cutting issues including gender. Australia's development cooperation program in the Lao PDR is guided by an Aid Investment Plan (2015-20), agreed by both governments in late 2015. Australian bilateral assistance focuses on three key sectors: basic education; human resource development; trade and private sector development. Lao PDR receives support from several Australian government agencies, including over AUD 5 million from the Australian Centre for International Agricultural Research (ACIAR) to support agricultural research partnerships between Australia and Lao PDR. Australia also provides around AUD 5 million to Lao PDR through Australia's Regional ASEAN and Mekong Program, which includes support to assist Lao PDR in sustainably managing its significant water resources. "Australia's development cooperation program closely aligns with Lao Government priorities, and helps improve education outcomes, build human resource capacity and foster economic reforms", "Australia's aid investments in Lao PDR are some of the best performing in the region. Australia is committed to working with the Lao Government to achieve the objectives of the Aid Investment Plan and ensure they deliver tangible results for the people of this country" Tertiary education is the flagship of Australia's development cooperation partnership with the Lao PDR. The Government of Lao PDR has placed priority on building its human resource capacity to address existing skills gaps to sustain social development and economic growth and support new enterprises.

2. Literature Review

2.1. Human Capacity Building

Capacity building is a continuous process of development that could be accomplished through the participation of the citizens in their development. 'The government needs to help citizens to gain skills and training or education that has high labor market demand for the sustainable future' (National Assembly of Laos, 2013). Enhancing the labor market information system for investments is essential to avoid the mismatch of skills that educators entrust to their graduates and the technical skills that the economy requires (Dibie & Dibie, 2014). According to (Samuelson & Marks, 2015), the potential danger of not achieving economic growth leads to high unemployment and inflation rates. W. H. Phillips believes that there is a consistent inverse relationship: when unemployment was high, wages increased slowly; when unemployment was low, wages rose rapidly (Mankiw, 2012). According to Berman et al. (2016), deficiencies in capacity building can be reduced through self-study. In a competitive market, a lack of exceptional or unusual knowledge, skills, and abilities may be a weakness because basic qualifications are assumed (Carroll & Buchholtz, 2008). Despite these facts, the public and private sectors have not created sufficient job opportunities nor have changed the structural weakness of the economy so far. This implies that there is a need to pursue growth policies and strategies that are labor-intensive (Samuelson & Marks, 2015). One of a lesson from Japan, human

resources are precisely the greatest resource that Japan boasts to the world. One of the biggest factors contributing to the grim outlook of the Japanese economy and society and the economic slowdown is the insufficient exploitation of the potential of human resource capabilities amid the declining birthrate and aging population. As a result, the capabilities of women and the elderly have not been fully harnessed, and the education of children and youth has not kept up with global trends or changes in times. However, this means, if the current system is boldly transformed, that these human resources can be significantly utilized to realize economic growth, that the decline in the birthrate and the aging structure can be halted, and that Japan's potential growth rate can be increased. In Laos, to maximize the efficiency of human resource development, an aid budget through a program should focus on three objectives: basic education; human resource development in tertiary education; and a stronger policy regime for investment in the economy. Investments in rural development in Laos still expect to achieve some significant outcomes with respective viewpoints of financial inclusion, livelihood enhancement, education, and growth.

2.2. Technological Enterprises

In principle, innovation operates with distinguishing invention. For example, (Malerba & Orsenigo, 1997) define an invention as a new idea, a new scientific discovery, or a technological newness (which has not been implemented and diffused), while innovation refers to a tradable application of an invention, as a result of invention integration into economic and social practice. Innovation is regarded, therefore, as being a result of a process that starts with an idea's genesis and continues with its materialization. In the same Schumpeterian context, the (OECD, 2005) defines innovation to be an activity that produces new or significantly improved goods (products or services), processes, marketing methods, or business organizations. In this framework, according to the Frascati Manual (OECD, 2002), technological innovations comprise new or significantly modified technological products and processes, where technological novelty emerges, unlike improvements, from their performance characteristics. Urban and suburban dwellers could also take part by patronizing local businesses, conserving energy, recycling their garbage, and forming economic cooperatives for buying food and other products. Schumpeter called technologies that met his criteria "intermediate technologies" and in 1966 founded the Intermediate Technology Development Group (ITDG) in London to put his ideas into practice. Since such solutions must be tailored to the society in which they are applied, they are now often called "appropriate technologies." In my turn, differentiated "technological product" from "technological production" by defining the first innovation type in terms of how to create or improve products, and the last concerns how to produce them. Enterprises and businesses constitute the foundation for the Lao economy; however, enterprises have been identified differently by various individuals and organizations such that an enterprise that is considered small and

medium in one place is seen differently in another. Even within a country, the definition of enterprises and business changes over time. (Solow, 1956) found small firms have higher innovation rates in high-technology, capital-intensive industries. Kumar, Rajan, and Zingales (2001) showed that countries with better institutions as measured by the judicial system tend to have larger firms and larger technology. For a sample, Solow (1956) studied European industries and showed that a larger average firm size is associated with faster innovation rates and governance. Furthermore, Agbonifor (1998) noted that enterprise with new technology is a crucial factor in economic development, it is a means by which productive activities are indigenously owned and controlled, and it is a means by which productive resources and talents that might not otherwise be put into productive uses.

3. Methodology

3.1. Data Collection

The research was conducted to explain the trend movement of economic growth and AusAID as well as economic growth and educational development index; besides that, this paper also checks whether there is an answer to assume the significant relation between education and economic development, and ODA in relation to growth, the result of bivariate test of correlation between two variables provided by Pearson and Spearman are very necessary to examine the relation of education to economic growth; furthermore, there is a potential component on testing correlation by utilizing econometric approach via vector error correction model (VECM) estimation and the use of cointegration method for time series data, the data was collected from 2000-2021 by accessing to data providers such as World Bank, National Statistics Bureau of Ministry of Planning and Investment in Laos, and Ministry of Industry and Commerce in Laos. Most of the collected data were time series and secondary. In the analysis of VECM and correlation test, the dataset was applied in the regression from 2005 to 2021.

3.2. Method of Analysis

Pearson and Spearman: The first hypothesis is null hypothesis H_0 which denotes that there is no relation between education and economic growth and the alternative hypothesis H_1 which implies that there is a relation between education and economic growth; both hypotheses rely on the significant level at .05, and there is Pearson and Spearman test of correlation between two variables formulas as given below.

Pearson bivariate test

$$r = \frac{\sum (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum (X_i - \bar{X})^2 \sum (Y_i - \bar{Y})^2}} \tag{1}$$

r is the correlation coefficient, X_i is the value of variable X, $\bar{X}$ is the mean

of X, Y_i is value of variable Y, $\bar{Y}$ is the mean value of Y.

Spearman test of correlation

$$p = 1 - \frac{6\sum d_i^2}{n\left(n^2 - 1\right)} \tag{2}$$

p refers to the Spearman rank correlation coefficient, d_i is the different value between the two variables, and n refers to the number of years in the analysis.

Vector error correction model

In the diagnosis of the relationship between ODA funds and economic development; a model such as the VECM model and cointegration method is essential. Moreover, the study relies on time series data with non-stationary as implied by the Johansen Cointegration test, certainly, the VECM model has been applied avoidably in this analysis to understand short and long-run relations between economic development via GDP and ODA. The model is given in the following.

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta Y_{t-i} + \sum_{i=i}^{n} \delta_i \Delta X_{t-i} + \varphi ecm_{t-i} + \mu_t \tag{3}$$

where ΔY_t is the GDP, the ΔY_{t-i} is the lagged of GDP, ΔY_{t-i} is the lagged of ODA, and other considerable variables in macroeconomic based on the literature of (Aghoutane & Karim, 2017); ecm_{t-i} is the lagged of residual from cointegration between ODA, and GDP. The model derived from:

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t \tag{4}$$

and,

$$\varepsilon_t = ecm_{t-i} = Y_{t-i} - \beta_0 - \beta_1 X_{t-i} \tag{5}$$

To address the issue of growth, it is a meaning of GDP growth rate. The following specifications are examined with a VECM model.

$$\Delta GDP\ growth_t = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta GDP\ growth_{t-i} + \sum_{i=1}^{n} \theta_i \Delta ODAA_{t-i}$$
$$+ \sum_{t=i}^{n} \delta_i \Delta IID_{t-i} + \sum_{t=i}^{n} \omega_i \Delta Ed_{t-i} + \varphi ecm_{t-i} + \mu_t \tag{6}$$

where, "t" represents the year, t-i refers to the lag value of each explanatory and controlled variables.

ODAA: The official development assistance from Australia

IID: Value of investment in the industry sector

*Ed*: Education improvement rate (includes higher education)

μ_t: Disturbance term.

Another point of the study, besides ODA, the study also focuses on the effect of technological investment and education improvement in relation to growth.

4. Results

4.1. Trends of Australian Aid and Laos' Economic Growth

Since 2000, Laos has achieved tremendous growth and slightly fallen during the COVID 19 as the data showed in **Figure 1**, one of the reasons impacts to this

GDP Growth (%)   ODA Funds (US$)
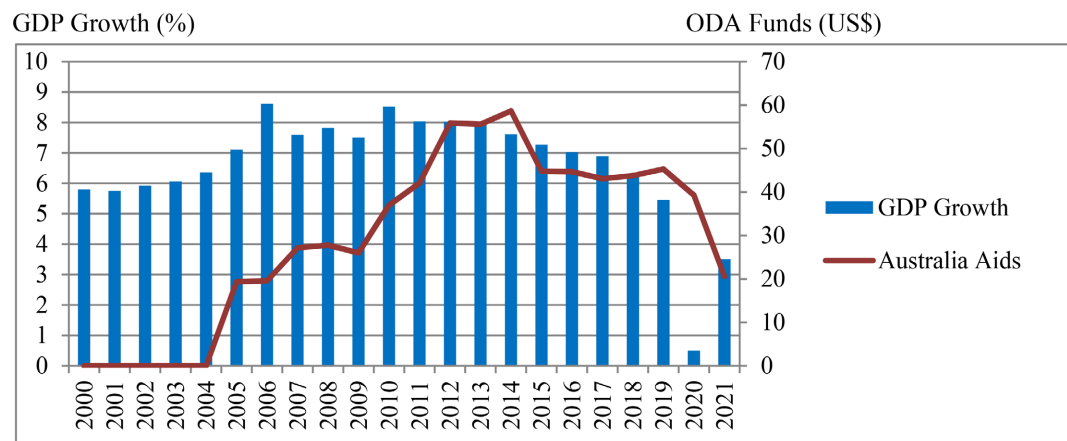
Source: World Development Indicators (World Bank, 2020), UNDP.

Figure 1. Australian aid and Lao economic development (OECD, 2000-2020).

reducing trend for a while is due to decreasing activities such as investment from private investments, FDIs, ODA donors, and government's activities, these are sources of broad money to build economic activities in Laos. On the other hand, the ODA assistance is still available in a huge volume for Laos from donor countries, for instance, Australia; by which the donor evaluates its performance to strengthen the opportunity to offer ODA for least developed countries including Laos. The definition of economic growth is an increase in economic activity that results in increased production and a more prosperous society (Rustiono, 2008). Furthermore, economic growth is a benchmark for the achievement of a country's economic development. The ODA policy and program of target donors are effective for Laos to enhance the effectiveness of education, humanity, and investment. The goal and guidelines of Australian ODA are highly valued, while those other countries are also playing significant roles at the same level as Australia has done in Laos. Thus, AusAID aims to improve the strategic pathway of its country which can be effectively linked to Laos regulations, human development, and the economy of Laos. Figure 1, shows very significant information that Laos had high GDP growth from at least 5% - 8.5% per year during 2000-2013, but fell drastically from 8% - 5% during 2014-2019 and 0.5% in the pandemic period 2020-2021. As ODA supports education and new investors who are Lao citizens, those people are involved in the economy and build benefits for their nation, but after late 2019, due to the COVID-19 situation, most economic activities have been declining and caused the growth to a level lower than 1% in 2020 but sharply recovered to 3.5% in 2021. Comparing AusAID and the percentage growth of GDP shows a vast movement of ODA from Australia that works as a small incentive to push up socio and economic development in Laos; from the year 2014, the number of ODA funds from Australia has been sharply reduced due to some programs for education has been canceled such as Bachelor degree; before 2014, there were many of Lao students went to join bachelor degree in Australia, in afterward the new agreement between Laos and

Australia as regraded with canceling bachelor course out of the AusAID program, thus the value of ODA fund from Australia have been reduced since 2015. Another scenario of the relationship between ODA from Australia and the Growth of Laos was explained in results section.

4.2. Technological Investment

Recently, investment in the technological sector including IT supply, mobile engineering, and electronic and electric engineering has been important to Laos' economy. Outstandingly, most technological investments are established by the Lao young generation who completed their education overseas, which are integrated potentially into the economic growth of Laos. It pointed out that ODA funds for human development are essential for the achievement of Laos in this recent time due to low educational improvements compared to other nearby countries such as Cambodia, Thailand, and Vietnam, and Laos has a limited national budget, thus to rely on ODA is still necessary, especially ODA in the field of education, good educational people can promote high growth of Laos (Vorachit, 2003). One of the statistical analyses for clothing and engineering industries in Sri Lanka, this study was investigated by (Deraniyagala, 1995) showed that the skills and education levels of workers and entrepreneurs were positively related to the rate of technical change of the firm. Education alone, of course, cannot transform a low-growth economy into a high-growth economy, by the reason of some capital such as FDI, ODA, and national budget also play very important roles in a country's economy. As illustrated in **Figure 2**, 'the amount of ODA funds from Australia moved upward in the same direction to technological investment participated by Lao entrepreneurs in the field of IT supply, electronic production, and spare parts production for vehicle, these were included
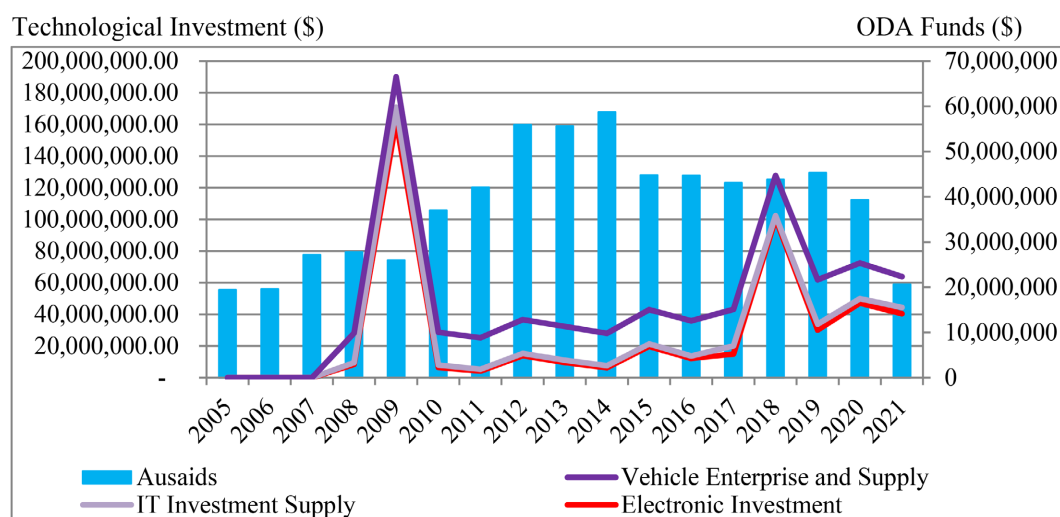
Source: National enterprise database, Ministry of Industry and Commerce in Laos (2022) PDR. Australian government, department of foreign affairs and trade.

Figure 2. Technological investments by young Lao investors and AusAID inflow.

in the total output of the Lao economy (NSEDP, 2015-2020). In Figure 2, the investment in electronics, IT, and spare parts for vehicles has been moving upward from 2010 to 2021, Only 2009 was a peak time for technological investment in Laos was caused by higher demand for technological equipment consumption from Lao households as well as new start-up business from China led to high consuming for technological products, as the same time there are many Lao households sold their lands and properties to those Chinese investors, which caused the increase in technological consumption and investment for electronics, IT and vehicles, the value of an investment in 2009 was KIP 190,118,903.75 million and once again, in 2018 was also a peak time of investment, the amount of investment was KIP 127,723,987.49 million due to high demand on technological equipment.

4.3. AusAID and Educational Development

Due to the increasing human development rate, it seems today the rate of education and enrollment of Lao students overseas has been increasing, and the participation of the Lao young generation to develop their country are potential key success similar to other developing countries in Southeast Asia, South Asia, African region, and other regions across the globe. The United Nations has determined the level of human development on a scale of 0.0 - 100.0 in the following categories: 1) High: HDI of more than 80.0, 2) Upper Medium: HDI between 66.0 - 79.9, 3) Lower Intermediate: HDI between 50.0 - 65.9, 4) Low: HDI less than 50.0 (Retnasari & Cahyono, 2015). Education may also affect per capita income growth via its impact on the denominator like population growth; for example, a study of 14 African countries in the mid-1980s showed a negative correlation between female schooling and fertility in almost all countries, with primary education having negative impact in about half the countries and no significant effects in the other half, while secondary education invariably reduced fertility (Birdsall, Ross, & Sabot, 1995); (Behrman & Wolfe, 1987) and (Thomas, Strauss, & Henriques, 1991). The indicator of HDI in Laos has been increasing in trends in today's development, and this circumstance will continuously exist in the future to come, based on good cooperation between Laos and Australia, and among other developed countries such as Japan, EU countries, the biggest economy like USA and China; when comparing education attendance rate of Lao people to the assistance from overseas, it sounds good enough for the phenomenon on socio-economic development by the involvement of ODA.

Figure 3, ODA from the AusAID program plays a role in enhancing educational development. The trend of AusAID in 2005 has been increasing substantially, which reflects the increase in the number of students who enrolled in tertiary education. The highest amount of funds spent for Laos was from 2012 to 2014, the fund disbursed was $US 55.9 million in 2012, $US 55.6 million in 2013, and $US 58.7 million in 2014. Even though the COVID-19 situation has re-

mained, support from Australia is still running for Laos, and enrolment for education is still open for all Lao young people.

However, Laos still has a weaker economy compared to most ASEAN countries, but when we look at the development of human resources in Laos such as improvement in higher education, it denotes that Laos has shifted the status from a low educational country to a good educational country quite fast and well done for its young generation, in consequences, gap of gender between male and female on accessibility to education has been substantially narrowed down.

Figure 4 shows a scatter plot that explains the relationship between the variable called education index and growth, which education has a positive relation to
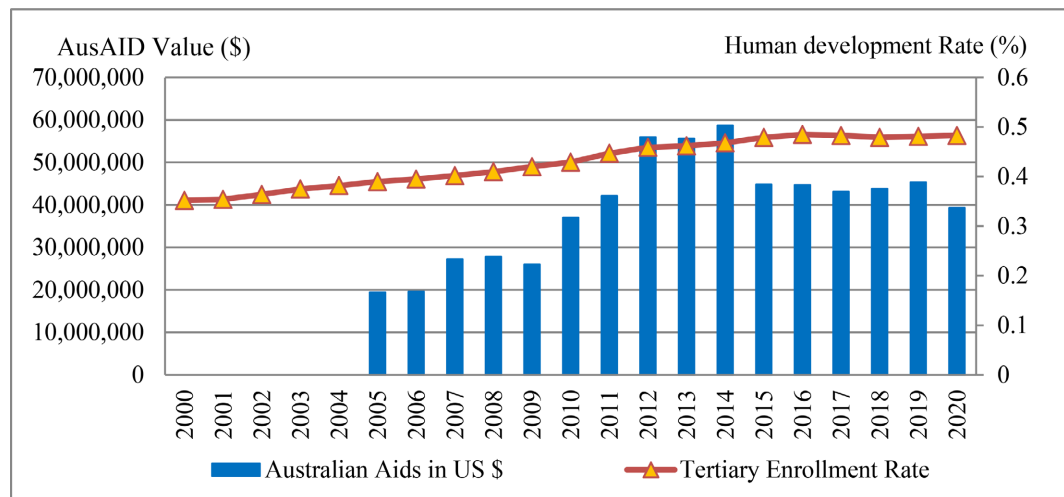

Figure 3. AusAID and Human Development Index in Laos by World Development Indicators, UNDP.
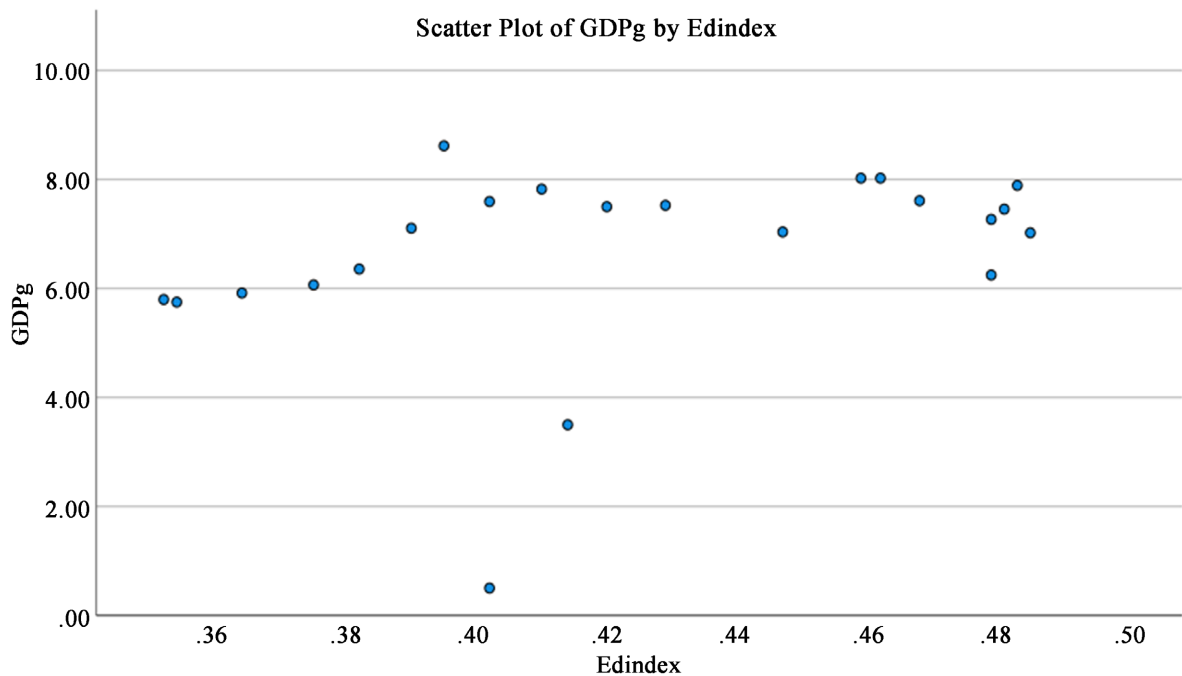

Figure 4. Distribution of two variables: GDP growth and educational index.

economic growth by relying on the data collected from 2000-2021, otherwise, growth was seemingly impacted by education. To understand the relation of these two variables in a clearer view, the test of bivariate correlation formulated by Pearson and Spearman are necessary as explained in the earlier section of this study, the results are shown in Table 2 and Table 3 respectively.

4.4. Bivariate Correlation Test between Two Variables

Figure 4 shows a scatter plot that explains the relationship between the variable called education index and growth, which education has a positive relation to economic growth by relying on the data collected from 2000-2021, otherwise, growth was seemingly impacted by education. To understand the relation of these two variables in a clearer view, the test of bivariate correlation formulated by Pearson and Spearman are necessary as explained in the earlier section of this study, the results are shown in Table 2 and Table 3 respectively.

Table 2 shows the relationship between the educational index and GDP growth by using the Pearson test of bivariate correlation, the p-value of .02 is lesser than the significant level of .05; it means there is a relationship between

Table 2. Pearson test of correlation between two variables.

Correlations		GDPg	Edindex
GDPg	Pearson Correlation	1	.516*
	Sig. (2-tailed)		.020
	N	20	20
Edindex	Pearson Correlation	.516*	1
	Sig. (2-tailed)	.020	
	N	20	20

*Correlation is significant at the .05 level (2-tailed).

Table 3. Nonparametric correlation of Spearman's bivariate.

Correlations			GDPg	Edindex
Spearman's rho	GDPg	Correlation Coefficient	1.000	.446*
		Sig. (2-tailed)		.049
		N	20	20
	Edindex	Correlation Coefficient	.446*	1.000
		Sig. (2-tailed)	.049	
		N	20	20

*Correlation is significant at the .05 level (2-tailed).

education and the economic development of Laos; the data used from the year 2000-2019 (19 years before COVID 19 situation occurred).

The result of the Spearman bivariate test in Table 3 also demonstrates a similar to the relationship by the Pearson test, with the p-value of the Spearman test (0.049) less than the significant level at 0.05, which means there is a relationship between education impacts on economic growth. Thus, by using two of these correlation tests (Pearson and Spearman), it can be assumed that the null hypothesis H_0: there is no relation between education and economic growth, is rejected.

4.5. Analysis of Growth, ODA, Education, and Investment

The result in Table 4 found that two variables such as ODA and investment have a positive impact on growth in the long run, but not on education; overall, ODA from Australia and technological investment in the electronics sector can lead to economic development for Laos. Simultaneously, in the long run, analysis of the VECM showed a significant test result of p-value less than .05, which means ODA from Australia and technological investment can impact growth, but education has opposite direction impacts on economic development.

According to the results in Table 5, the model is set to be good enough for the analysis of ODA, investment, and education impact on growth, regarding the result of no autocorrelation at lag 1 with p-value .71354 is greater than 5% significant level, the model is assumed to be fit for time series with nonstationary. Therefore, in the long run explained in Table 4, the explanatory variable "ODA" and controlled variables "IID" have significant impacts on the long-term growth, which the p-values of their coefficients in VECM are less than 5% critical value.

Table 4. Multiple regression analysis by VECM for the long-run effect.

	Coefficient	Std.err.	Z	$p > |Z|$	[95% conf. interval]	
D_GDPgrowth						
_ce1						
L1.	−.1380073	.0509545	−2.71	.007	−.2378764	−.0381383
GDPgrowth						
LD.	−.3213748	.204633	−1.57	.116	−.722448	.0796984
ODAA						
LD.	.0067173	.0146025	.46	.646	−.0219031	.0353376
IID						
LD.	.0007451	.0003059	2.44	.015	.0001456	.0013446
Ed						
LD.	−.0002287	.0001908	−1.20	.231	−.0006027	.0001453
_cons	.1665829	.2752901	.61	.545	−.3729757	.7061415

Table 5. Analysis by VECM for the short-run effect.

Cointegrating equations			
Equation	Parms	Chi²	$p >$ chi²
_ce1	3	7.902.119	.000

Identification: beta is exactly identified
Johansen normalization restriction imposed

beta	Coefficient	Std.err.	Z	$p > |Z|$	[95% conf. interval]	
_ce1						
GDPgrowth	1	.	.	.	.	.
ODAA	−.0036787	.0317141	−0.12	.908	−0.658372	.0584798
IID	.0068246	.0011151	6.12	.000	.004639	.0090102
Ed	−.003062	.0004909	−6.24	.000	−.0040242	−.0020998
_cons	−7.292783	.	.	.	.	.

Veclmar
Lagrange-multiplier test

Lag	chi²	df	Prob > chi²
1	62.609	9	.71354
2	118.464	9	.22211

H_0: no autocorrelation at Lag order.

While the VECM in the short run, the *p*-value of IID is significant and the coefficient showed that the growth is positive, on the other hand, the coefficient of ODA is negative without significance of *p*-value, and one another controlled variable like the education 'Ed' has negative relationship to growth, in both long and short run, but it is significant.

This section examines the VECM availability by using unit root test, lag selection, and Johansen cointegration as the result shown in Table 4, there is an acceptance for the utilization of VECM in this study; Table 5 showed that ODA in the short run has no significant relationship to growth and the relationship is negative, thus it can be summarized that Australian ODA is not effective to promote growth in Laos in the short run, but in the long run effect there is a positive relationship between ODA and growth, it means there is the effective promotion of Australian ODA on the growth of Laos; other variables such as IID is effective to promote growth in both long and short run, on the other hand, Ed is not effective to promote growth in both long and short run due to the result of the negative relationship in the VECM estimation.

5. Summary and Remarks

5.1. Conclusion

This paper investigated ODA impacts on economic development by using a case

study and data from the technological sector. Surprisingly, using the test of Pearson bivariate test presented interesting information that education has a positive relationship with economic growth which means education can enhance economic development. Another interesting result by Pearson and Spearman bivariate test through observing the coefficients and p-values of "edindex" showed that p-values are less than .05, and coefficients of "edindex" have a positive relationship to economic growth, this implied that higher education leads to higher growth of economic development in Laos. Furthermore, in the interpretation and analysis of VECM on the impact of ODA on growth, technological investment impacts on growth as well as education impacts on growth, there are two factors that can lead to growth in the long run such as ODA and technological investment, but in the short run, ODA did not have any sign to increase growth, however, the technological investment had a positive relation to growth in both long and short run. It is certain to mention that in the current days of development, there are many investments which have been starting and growing up, namely the technological or electronic companies, because young Lao generation has highly professional knowledge of technologies and electronics from overseas, then returns to their home country to build investments and expand growth of Laos. Another interpretation of tertiary education impacts on growth via VECM analysis; the result showed in both the long and short run, the impact of education had a negative relationship to growth. Certainly, to sum up the effectiveness of ODA's impacts on growth, this can happen only in the long run effect, but in the short run, the impact of ODA on growth is still doubtful. This implies that ODA from Australia does support growth significantly in the long run effect, and ODA from the AusAID program is an important determinant of growth in the recent trend of Laos' socio-economic development.

5.2. Recommendation

This paper suggests the governor strengthen and update ODA frameworks, laws, and regulations in association with the implementation of ODA, thus these would help the effectiveness of ODA impacts on growth. In the case of policy-making, Laos still relies on foreign assistance, due to the weakness of the Laos' economy and national budget, and FDI inflow is still low in terms of investment; however, to update regulations in association with FDI is also necessary so that FDI will enable to increase economic growth. Certainly, in Laos, ODA is a vital incentive for growth. There are some policy recommendations for a new further study: firstly, what kind of good management for ODA should the Lao government formulate and implement? Secondly, what developmental programs in association with ODA support should the Lao government and ODA donors concentrate or focus on? It means the Lao government should have separate fundamental programs for each donor such as AusAID from Australia should focus on developing industrial products, JICA should focus on developing agricultural activities, WB and ADB should focus on the development of information sys-

tems; and other donors should focus on strengthening community, trade and commerce, and economic system. If all these fundamental programs are well organized, then these will lead to the effectiveness of ODA the Laos' economy; thirdly, how to build up a new startup company with emerging regulations and promotive laws? So that many number of investments will increase and lead to the economic growth of Laos in the future.

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Supplementary Data

The dataset is also attached to this paper.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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