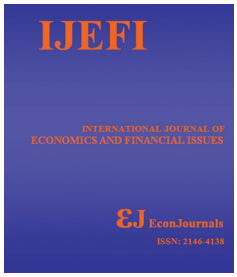

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Effect of Solow Variable to the Economic Growth in Southeast Asia

Ady Soejoto[1], Hendry Cahyono[2]*, Ni'matush Solikhah[3]

[1]Faculty of Economic, Universitas Negeri Surabaya, Indonesia, [2]Faculty of Economic, Universitas Negeri Surabaya, Indonesia, [3]Faculty of Economic, Universitas Negeri Surabaya, Indonesia. *Email: Hendrycahyono@unesa.ac.id

ABSTRACT

Economic growth in Southeast Asia is very dynamic and interesting. This paper aims to analyze the defining factor of that condition. This paper uses regression analysis to determine the impact of labor, investment, human resources, natural resources, and technology toward economic growth (Solow variable). The result indicates that Solow variable affect differently to each country. In Indonesia and Brunei, investment, human resources, and labor have significant effect toward economic growth. In Thailand and Philippines, investment, natural resources, and labor affect economic growth significantly. In Malaysia investment, technology, and human resources have significant effect toward economic growth. In Vietnam, technology, natural resources, human resources, and labor affect economic growth significantly. Meanwhile, In Cambodia technology, natural resources, and labor have significant impact toward economic growth.

Keywords: Investment, Human Resources, Natural Resources, Technology, Labor, Economic Growth
JEL Classifications: O0, O4

1. INTRODUCTION

The welfare of each country is different of course. Many factors could cause these differences. Factors macro-economic conditions which vary from state economy could be one cause. Macro economic indicators of a country can grow or not depends on the total amount of productivity generated by that state or by said economic growth of a country depends heavily on productivity generated by production factors.

When explaining about economic growth in one country alone is easy, as already concluded above with the words of "productivity." However, when explaining the growth on an international scale will become more complicated. Each country must have its own economic characteristics.

The condition occurs difference in economic growth rates also in countries in Southeast Asia. The rate of economic growth in South East Asia relative differ between countries. Based on growth data ever made Heston, Summers, Aten, Penn (in Mankiw, 2013) that in the period 1960-2004 in the Southeast Asia countries that have the fastest economic growth rate is Singapore with a growth rate of up to 2004 reached the figure of about 5%, followed by Malaysia, Thailand, and Indonesia with a growth of more than 3%, and the Philippines with the economic growth rate of 2% more.

However, the economic growth rate is always changing every year can be seen for example in 2008 the rate of economic growth in countries of Southeast Asia is no longer changed as the rate of growth in the period 1960-2004. Based on data from the World Bank's 2016 release of the Southeast Asia Southeast Asia countries with the highest economic growth of Laos with figures 7.82% and 6.69% respectively followed by Cambodia, Indonesia 6.01%, 5.66% Vietnam, Malaysia 4.83%, Philippines 4.15%, Singapore 1.78%, 1.72% and Thailand. Data growth in 2008 above proves that economic growth is not static and is very volatile.

Referring to the theory of Solow model of growth based on the determinants of growth is capital, number of employees, the availability of human resources, natural resources and the final determinant is the technology. Capital accumulation and technological development in the era of globalization is that is irreversible by any State. The outflow of capital in the financial markets is facilitated by more open regulations. Rapid technological developments with internet access more equitable in almost all the area is no exception in Southeast Asia.

The growth of Southeast Asian region is very dynamic is certainly very interesting to analyze. Because it can only State in the region of Southeast Asia variables can have the same or different as a determinant of growth. Of course, to prove this is required in depth research. Then the purpose of this study was to determine the effect of variable Solow economic growth in Southeast Asian countries.

2. LITERATURE REVIEW

2.1. Economic Growth (Solow Model)

Solow neoclassical growth model (Mankiw et al., 2014) is an extension of the theory of Cobb Douglass, explaining that the output or gross domestic product (GDP) depends on the technology, number of employees, amount of physical capital, the amount of human capital, as well as the amount of natural resources. So it can be written by the following equation.

$$Y = A\,f\,(L,K,H,N)$$

Where is $f(\,)$ the function that shows how the inputs are combined to produce output. A is a variable that indicates the availability of production technology. If technology increases, a growing, so that economic activity generates more output than input combinations of shape variation. L is the amount of labor. K is the amount of physical capital. H is the amount of human capital, and N is the number of natural resources.

The first factor that determines the output of a country is labor. Economists argue that population growth will affect life in society. The most impact is the change in the total labor force. Large population, will have a large labor force in producing goods and services. In addition, economists believe that growth is the engine of the world's population in technological progress and economic prosperity. Where if more people it will be more scientists, inventors or engineers who can play a role in technological progress and economic prosperity.

The second factor is the physical capital. Physical capital is the completeness of the equipment and structures used to produce goods and services. Investment is one form of physical capital in the production function. Both domestic and foreign investment holds the contribution in accelerating the economic growth of a country.

Human capital is the third factor in the neoclassical growth model Solow. Namely human capital acquired knowledge and skills of workers through education, training, and experience. Human capital is formed began childhood, school, university, and vocational training centers for adults who have included workforce. Quality human capital will enhance the ability of a country to produce goods and services.

The deciding factor is the fourth natural resources. Natural resources are inputs in the production activities provided by nature, such as land, rivers and mineral content in the earth. Many countries have good natural resources, bringing the country towards economic growth are good also, as it happens in the middle east countries rich in petroleum. However, the natural resources are not a factor that is required for the economy. As the state of Singapore does not have a wealth of natural resources, but the country is able to bring his country into a developed country in the world.

The fifth factor that determines the output of a country is the mastery of science and technology. Technological knowledge is an understanding of the best ways to produce goods and services. When there is a technological development, it will need less labor. So most of the workforce will be able to produce other goods and services, the result will be increased productivity.

2.2. Review Studies

2.1.1. Impact of labor quality on labor productivity and economic growth (Jajri and Ismail, 2010)

The study reveals that the capital stock and capital-labor ratio played a major role in contributing to the Malaysian economic growth and labor productivity respectively. The effective labor did play a positive role in determining economic growth but its contribution is less than the physical labor. This paper suggests that the education system must be geared towards producing workforce that can efficiently be used in the labor market.

2.1.2. The renewable energy and economic growth nexus in black sea and Balkan countries (Kocak and Sarkgunesi, 2017)

The study has concluded that there is a long term balance relationship between renewable energy consumption and economic growth and renewable energy consumption has a positive impact on economic growth. Heterogeneous panel causality analysis results support growth hypothesis in Bulgaria, Greece, Macedonia, Russia and Ukraine; feedback hypothesis in Albania, Georgia and Romania; neutrality hypothesis in Turkey and according to the panel data set including all nine countries the results support feedback hypothesis. With the findings, it was concluded that there is a significant impact of renewable energy. The study has concluded that there is a long term balance relationship between renewable energy consumption and economic growth and renewable energy consumption has a positive impact on economic growth. Heterogeneous panel causality analysis results support growth hypothesis in Bulgaria, Greece, Macedonia, Russia and Ukraine; feedback hypothesis in Albania, Georgia and Romania; neutrality hypothesis in Turkey and according to the panel data set including all nine countries the results support feedback hypothesis. With the findings, it was concluded that there is a significant impact of renewable energy.

2.1.3. Domestic private investment and economic growth in Nigeria: Issues and further consideration (Kalu et al., 2015)

This study re-considers the empirical investigation of the link between domestic private investment and economic growth in Nigeria, using the Cob-Douglas model framework. The model is estimated using error correction modeling approach and annual data covering 1970 to 2012 was used. The study shows the significance of investment on real GDP (RGDP). The result of tests reveals equilibrium relationship between RGDP and its determinants in the long and short-run. An important finding of the study is that, like most other studies, foreign direct investment (FDI) should at best complement domestic private investment.

We therefore, conclude that macroeconomic policies and overall macroeconomic stability is quite essential for the promotion of domestic private investment.

3. RESEARCH METHOD

Type of this research is descriptive quantitative research. Descriptive quantitative research for describe or provide a quantitative overview of the economic growth, total employment, investment, human resources, natural resources, and technology in the State of South East Asia. Data obtained from the World Bank in 2006 to 2012. Data used include: Economic growth using data from GDP growth (annual %), total employment using data from a total of 15+ employment to population ratio (%), using data from the investment FDI, human capital using data from the tertiary gross enrollment ratio both sexes (%), natural resources use the data agriculture value added (% of GDP), and technology using data from the energy use (kg of oil equivalent per capita). The model equations used are: Type of this research is descriptive quantitative research. Descriptive quantitative research for describe or provide a quantitative overview of the economic growth, total employment, investment, human resources, natural resources, and technology in State southeast Asian region. Data obtained from the World Bank in 2006-2012. Data used include: Economic growth using data from GDP growth (annual%), total employment using data from a total of 15+ employment to population ratio (%), using data from the investment FDI, human capital using data from the tertiary Gross enrollment ratio both sexes (%), natural resources use the data agriculture value added (% of GDP), and technology using data from the energy use (kg of oil equivalent per capita). The model equations used are:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

Description: X_1 = Total labor, X_2 = Investment, X_3 = The quality of human resources, X_4 = Natural resources, X_5 = Technology, and Y = Growth.

This research there are two variables are related to one another. These variables are: The independent variable (X). In this study, which is the independent variable is investment, human resources, natural resources, total labor and technology in Indonesia, Singapore, Malaysia, Thailand, Vietnam, Laos, Cambodia, Philippines (Dependent variables/Y). In this study which is the dependent variable of economic growth in Indonesia, Singapore, Malaysia, Thailand, Vietnam, Laos, Cambodia, Philippines.

To avoid misperception or misinterpretation in understanding the variables of the study, the researchers explain the definition of the variables above:

a. Number of workers (X_1), total labor force working in the State of Indonesia, Malaysia, Thailand, Vietnam, Brunei, Cambodia, the Philippines.
b. Investments (X_2), proxy by a large amount of FDI in the State of Indonesia, Malaysia, Thailand, Vietnam, Brunei, Cambodia, the Philippines.
c. The quality of human resources (X_3), proxy by the number of people who took high school education in the country of Indonesia, Malaysia, Thailand, Vietnam, Brunei, Cambodia, the Philippines.
d. Natural resources (X_4), proxy by the agricultural sector contribution to GDP in the country of Indonesia, Malaysia, Thailand, Vietnam, Brunei, Cambodia, the Philippines.
e. Technology (X_5), proxy by the amount of electrical energy consumption/kWh in the country of Indonesia, Malaysia, Thailand, Vietnam, Brunei, Cambodia, the Philippines.
f. Economic Growth (Y), GDP growth in the number of countries Indonesia, Malaysia, Thailand, Vietnam, Brunei, Cambodia, the Philippines.

Results of regression analysis calculation above will be tested using the test classic assumptions and hypothesis testing.

4. RESULTS AND DISCUSSION

Based on data from the World Bank's 2016 several countries in Southeast Asia has a relatively high economic growth. Countries with the highest growth figures Laos with 7.82% and 6.69% and then sequentially followed by Cambodia, Indonesia 6.01%, 5.66% Vietnam, Malaysia 4.83%, Philippines 4.15%, Singapore 1.78%, and 1.72% Thailand. Total employment, investment, human resources, natural resources, and technology contributing to influencing the amount of economic growth in these countries.

Cambodia occupies a position of economic growth of 6.69%. This represents a decline of economic growth when viewed from the range of 2006 to 2012. Judging from the pictures 1.1 economic growth of 10.8% in 2006; 10.2% in 2007; 6.7% in 2008. However, in 2009 due to the global economic crisis economic growth is only 0.1% and re-grow dramatically by 6.0% in 2010, returned in 2011 and 2012 rose by 7.1% and 7, 3%. Factors that affect the economic growth seen from Solow growth model for Cambodia is total employment, investment, human capital, natural resources, and technology from year to year has increased. Total employment of 2006 by 80.6% from the total population, in 2012 rose by 82.3%, the average for 2006-2012 was 81.9% of the working population.

Indicators Solow economic growth is investment, where FDI in Cambodia from year to year increases sharply, the beginning of 2006 amounted to 4.8 hundreds of millions of US $ and the end of 2012 amounted to 14.4 million US $. Furthermore, human capital in Cambodia views of tertiary gross enrollment ratio also increased, from 2006 only amounted to 5.66% of the total population of heading 15.90% in 2011. Natural resources seen from the data agriculture value added (% of GDP) also increased, averaging over 7 years in Cambodia natural resources amounting to 34.62% of GDP. Technology in Cambodia for 7 years also increased, it can be seen from the indicator energy use. Where from 2006 energy hundreds of 2.5 kg of oil equivalent per capita and in 2012 to 3.7 hundreds kg of oil equivalent per capita. This indicates a fairly advanced technologies that support the production process in Cambodia.

To test the hypothesis, carried out using test statistic equipment that the t-test. T-test was used the team to see the significance of the influence of independent variables on the dependent variable.

According to Gujarati (2007. p. 105), the determination of the value of α or level of significance in hypothesis testing was done arbitrarily (arbiter). In this test performed with a confidence level of 80% or the degree of error of 30% (α = 30%). The smaller the α means the smaller the probability of rejecting the hypothesis is correct and the larger α means greater probability of rejecting the hypothesis is correct (Widarjono, 2007. p. 59). Testing for partial significance (test t) is if the P value is calculated is smaller than the critical value of P, means the null hypothesis can be rejected. But if the P value calculated is greater than the critical P value, meaning the null hypothesis cannot be rejected (Gujarati, 2007. p. 163). With the critical P value is 30%.

From the results of hypothesis testing that has been done is found a few differences Solow model variables that affect significantly to economic growth in some southeast Asian countries were the object of research. The results are summarized in the Table 1.

From the above matrix can be known that Solow variable determinant of growth in Southeast Asian countries is very varied. Starting from the results that the investment does not significantly influence economic growth in Vietnam and Cambodia. The data used is the investment of FDI from 2001 to 2013. No significant investment on economic growth is a phenomenon that is interesting to discuss. Because theoretically investment is one trigger of growth. same as proposed by Kalu and Onyinye (2015), that proves that the FDI significantly affects the RGDP. If in the case of Cambodia and Vietnam FDI does not affect the growth can be caused by several things.

First, a quantitative increase in FDI in Vietnam and Cambodia is still relatively small when compared with other countries in southeast Asia especially when compared with Singapore, Thailand, Indonesia and Malaysia. So that the contribution of FDI to GDP is very small. Second, that the FDI that there are not too many targeting the dominant sector in the GDP of Cambodia and Vietnam. The economic structure of Vietnam and Cambodia are not much different from other countries in the Southeast Asia region the agricultural sector. It could be that there are more prioritized FDI in the service sector are not directly related to the sector more labor absorbing mass agricultural sector. Third, FDI is not accompanied by the ease of access to banking credit to the real sector. So according to Permatasari et al. (2013) economic actors in the real sector is quite difficult to get access to capital. Though the capital is one of the factors of production that menuentukan productivity.

For technological variables that significantly influence economic growth in the country is Malaysia, Vietnam, and Cambodia. In this study the technology proxy variables by the number of electric energy use by the public. The results of that variable technology could have a significant effect on the growth in the State of Malaysia, Vietnam, Cambodia together with the results of research conducted by Kocak and Şarkgüneşi (2016) in the area of the Black Sea and Balkan countries that in the long term renewable energy will have a positive impact on economic growth, fore technology that uses renewable energy is going to be an alternative solution will be energy scarcity world.

While in countries such as Indonesia, Thailand, Brunei, and the Philippines variable technology has no significant effect on economic growth. This may be because the production process several economic sectors such as agriculture still not using modern equipment requires electrical energy. Or in other words the use of the technology is still not maximized in economic activity is not maximized its contribution also for economic growth.

Solow neoclassical growth model (Mankiw et al., 2014) is an extension of the theory of Cobb Douglass, explaining that the output or GDP depends on the technology, number of employees, amount of physical capital, the amount of human capital, as well as the amount of natural resources. So it can be written by the following equation.

$$Y = A\,f\,(L,K,H,N)$$

Where is the function that shows how the inputs are combined to produce output. *A* is a variable that indicates the availability of production technology. If technology increases, a growing, so that economic activity generates more output than input combinations of shape variation. *L* is the amount of labor. *K* is the amount of physical capital. *H* is human capital, and *N* is the number of natural resources. All of these variables could be doubled if there is an element of the technology. Loo and Soete (1999) said that the technology could produce more products, product differentiation, increase consumer welfare even though the impact on the economy is limited. As discussed (Cahyono et al., 2017) differences in infrastructure and resource conditions of physical and non-physical Akhinya will form potential differences of each region.

The next variable is the use of natural resources that hopes will boost the economic growth of a country. From the results of this study showed that the variables of natural resources does not affect the economic growth in the State Indonesia and

Table 1: Comparison matrix variable significance of the interstate in Southeast Asia (based on t-test hypotheses)

Country	Solow variable				
	Investment	Technology	Natural resources	Human resources	Total employment
Indonesia	Significant (0.17)	Not significant (0.47)	Not significant (0.42)	Significant (0.15)	Significant (0.28)
Malaysia	Significant (0.007)	Significant (0.26)	Significant (0.01)	Not significant (0.65)	Not significant (0.88)
Thailand	Significant (0.08)	Not significant (0.35)	Significant (0.15)	Not significant (0.32)	Significant (0.15)
Vietnam	Not significant (0.46)	Significant (0.10)	Significant (0.04)	Significant (0.006)	Significant (0.21)
Brunei	Significant (0.08)	Not significant (0.61)	Not significant (0.96)	Significant (0,18)	Significant (0,23)
Philippine	Significant (0.12)	Not significant (0.80)	Significant (0.01)	Not significant (0.71)	Significant (0.10)
Cambodia	Not significant (0.58)	Significant (0.22)	Significant (0.10)	Not significant (0.30)	Significant (0.93)

Source: Proceed Researcher, 2016

Brunei. However, for the State of Malaysia, Thailand, Vietnam, Philippines and Cambodia, variable natural resources significant effect on economic growth. Behbudi et al. (2010) says that the poor use of natural resources will lead to a negative impact on economic growth and human development. However, research conducted (Gerelmaa and Kotani, 2016) showed that used of natural resources in the range of 1990-2010 had a positive effect on economic growth.

The next variable is the use of natural resources that hopes will boost the economic growth of a country. From the results of this study showed that the variables of natural resources does not affect the economic growth in the State Indonesia and Brunei. However, for the State of Malaysia, Thailand, Vietnam, Philippines and Cambodia, variable natural resources significant effect on economic growth. Behbudi et al. (2010) say that the poor use of natural resources will lead to a negative impact on economic growth and human development. However, research conducted (Gerelmaa and Kotani, 2016) showed that the use of natural resources in the range of 1990-2010 had a positive effect on economic growth.

The next variable studied is the quality of human resources or human capital. From the results of this study show that countries like Indonesia, Vietnam, and Brunei, the quality of human resources have a significant effect on economic growth. The results of this research together with research conducted (Isola and Alani, 2012) which shows that the education and health is a component in human development is crucial for economic growth in Nigeria. In addition, Eigbiremolen and Anaduaka (2014) also conducted a study that the results indicate where in 2010 the construction of a positive impact on economic growth. Man is a thing that cannot be forgotten in sustainable development, and also can improve economic growth.

In the development of a strengthening of the human development is not limited to education and health, but also on economic empowerment. In this case the community is expected to drive the wheels of the economy on their own families. Because one of the missions of economic policy is to reduce unemployment. To reduce unemployment not lean job creation by government but also the role of the private sector to reduce unemployment. The results of the study Castaño et al. (2016) showed that the euro zone government pays close attention to entrepreneurship as an important factor that can print the field of economic growth and new jobs.

The variable amount of labor in this study showed that only in the State of Malaysia, the number of workers do not have a significant effect on economic growth. In the study Jajri and Ismail (2010), shows that the ratio of the capital stock and labor force plays a major role is important in the productivity that will contribute to economic growth.

Whereas in the State of Indonesia, Thailand, Vietnam, Brunei, the Philippines and Cambodia, showed that the number of workers significant effect on economic growth. Significant or not the amount of labor to economic growth could be due to the major economic sectors are the driving force of economic growth. No sector is labor intensive and capital intensive sectors. Besides the age structure of the workforce could also be a significant determinant of the amount of labor to economic growth. According to Wongboonsin and Phiromswad (2016) the demographic structure has a different effect on the economic growth in developed countries and developing countries. In countries that have developed an increasing number of workers over the medium have a positive impact on economic growth, investment and educational channels. But also the increasing elderly also have a negative impact on economic growth. According to Cahyono et al. (2016), relating to regional economic development, the provincial government policies will affect the economy of smaller areas like districts/cities.

5. CONCLUSION

From the research conducted there some of the conclusions are: In Indonesia Solow model variables significant effect on economic growth is investment, technology, natural resources and labor. Thailand Solow model variables significant effect on economic growth is investment, natural resources, and labor. Malaysia Solow model variables significant effect on economic growth is investment, technology, natural resources. Vietnam Solow model variables significant effect on economic growth is technology, natural resources, human resources, and labor. Brunei Solow model variables significant effect on economic growth is investment, natural resources, human resources, and labor. Philippines Solow model variables significant effect on economic growth is investment, natural resources, and labor. Cambodia Solow model variables significant effect on economic growth is technology, natural resources, and the amount of labor.

The suggestions put forward based on the results of research are: For in Southeast Asian countries that the variable quality of human resources is not expected to make significant improvements and governance system in the fields of education, health, and economic empowerment. Variables technology in the in Southeast Asian region still need to be increased role through the expansion of electrification, additions and electricity resources in each country.

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