

DOES EDUCATION CAN EXPLAIN ECONOMIC GROWTH? CONTRIBUTION OF OLD AND NEW APPROACH

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ABSTRACT

Does education can explain economic growth? The aim of this study is to find out the impact of education on economic growth with two different approach that is the old approach called Augmented Solow Model (Neoclassical Growth Theory) and newer approach called New Growth Theory. Many research used this two model and found different result, in broad outline there are still two conclusion about impact education on economic growth. First, many researcher still conclude that education is one of important variable that influence economic growth, and vice versa. Apart from the fact that education still give two conclusion, New Growth Theory with TFP serves a broader view about what channel that used by education to influence economic growth that is from diffusion and innovation.

Keywords: Economic growth, education, NGT, Augmented Solow Model.

INTRODUCTION

Economic development is briefly defined as the increase in output per capita in the long run. This means that there are three key words in the economic development namely, process, output per capita, and the long run. The theory of economic growth itself can be interpreted as factors affecting the

increase in output per capita in the long run, and briefly the factors affecting economic growth can be grouped into economic and non-economic factors. In classical growth theory, capital growth has a central role in the process of output growth, in which the growth rate of output depends on level of capital growth. According to Adam Smith, stock of

capital has two effects on the level of total output, the first effect is a direct effect where the accretion of capital will directly affect output, the more input will result the more output. Then the second influence is the indirect effect of capital on output in the form of increased productivity per capita over the possibility higher degree of specialization and division of labor. Economic growth itself is undoubtedly an interesting issue in the last several decades, even up to now. Lipsey et al. (2005) stated the reason why many economists often focus on economic growth rather than changes in the economy due to the strength (power) of the growth itself. This is acceptable when the growth in GDP is easy to be measured using accumulation (Van Den Berg, 2005).

Another reason why growth is so attracted the attention of experts is due to the strongly correlated with many aspects of individuals lives or the community, issues surrounding the environment, institutional, distribution of income, etc. The above argument has become apparent increasingly if we look back at what

has happened in the growth experiences of many poor countries or other developing countries in the last decades. Easterly (2001) stated that the poor country was initially expected to grow with developed countries proved in the last two decades experience worsen conditions and are not able to keep pace with countries that has been developed. Then Todaro and Smith (2009) also states that when the trend of this phenomenon will be found in less developed countries, even the experts so far does not have a set of concepts that can explain why the process of economic growth in less developed countries not similar with other developed countries.

Nowdays, education level of labor is used as a proxy of human resources that are often used as indicators of the growth progress in a country. Relating to education, it can be said that the school is a form of investment. And the basic specifications and other implications of this investment as we know refer to what is called return in education, usually it reflects the different wages due to investment in education.

Mincer (1974) with an elegant formula has made simplification of return estimates using cross-section data to see the rate of return. The formula can estimate the rate of return through years of schooling in a cross-section regression to obtain individual wages. In general, return estimated using Mincer formulation results in the range 5-15%. Psacharopoulos (1985) states that the return on the developing countries are higher than returns on developed countries, and obtained the highest return on primary education, but the return on the university is greater than the return of high school. When we can accept this result, it would make sense for us to think that the role of education should be derived from different studies thus it will produce many variations.

In general, if education level of residents in a country is higher, then the level of economic progress that country will be higher too. In line with above research, Barro (1991) in empirical research conducted in developing countries, found there is a positive correlation between education and economic growth.

Lucas (1988) specifies the importance of human capital for economic growth with the ability education to generate technology as a source of long-term growth. Then Romer (1990) with his influenced article about the issue of economic growth also revealed the similar things where human capital has enormous power in determining economic growth, more than Neoclassical thought before. Moreover, Downes (2001) states that one important key in improving productivity is the development of the human capital, human capital is one element in the productivity equation. With the development of this field can increase the productivity of the organization. Development in human capital can be considered as a process in enhanced capabilities, expertise, knowledge, creativity and national productivity. Benhabib (1994 and 2000) with newer another approach found a significant effect of education on growth with New Growth Theory.

But it reversed expressed by other researchers such as Pritchett (2001) who found that education is

not an important variable or powerful variable in explaining economic growth. In contrast, Kumar (2006) for the same model actually found the absence impact of education on economic growth. Benhabib & Spiegel (1994) found a negative relationship between educational attainments in the workforce on economic growth. They assert that the existence of a weak relationship between these two variables to describe the error and the influence of outliers in cross-country sample. This is similar to Musila & Belassi (2004) study on Uganda case, they found that cross-section analysis is less capable in explaining the causality between education and economic growth. However, Temple (1998) states that the failure to see the connection between education and economic growth due to a sample bias by including some countries that have an exceptional case in their study. So, until now causal effect of education on economic growth can be said still debatable and still attract discussed, the importance of education has brought us into a lot of studies on economic growth.

Empirically from the many facts found by experts, just only one question remains unsolved: is education worth mentioning as the one of the 'actors' in promoting economic growth?. There are several ways in modeling the influence of education on economic growth, in this paper we will present some views on the influence of education on economic growth. This paper also presented a theoretical framework concerning the ways used by education in influencing economic growth. While it is still very difficult to trace the role of education, but experts agree that some of the methods in this paper at least bring us closer to how to measure those impacts.

THEORETICAL FRAMEWORK

Neoclassical production function

Neoclassical production function simply assumes there is the possibility of substitution between production factors K (capital) and L (labor), where the production function is usually written as:

$$Y = F(K, L) \quad (1)$$

Here it is assumed that the production function is CRTS (Constant Return to Scale) in which all inputs increase by a certain multiplication on the output will be followed by the same multiplication. So, positive constants can be written:

$$cY = F(cK, cL) \quad (2)$$

For example, if all inputs are doubled, then for the case here c is equal to 2, and output will rise double as well. Now we can take advantage of this characteristic of the CRTS (Constant Return to Scale) to assume $c = 1/L$, so that gives us:

$$Y/L = F(K/L, L/L) \quad (3)$$

$$Y/L = F(K/L, 1) \quad (4)$$

Then, the equation above can be written:

$$y = f(k) \quad (5)$$

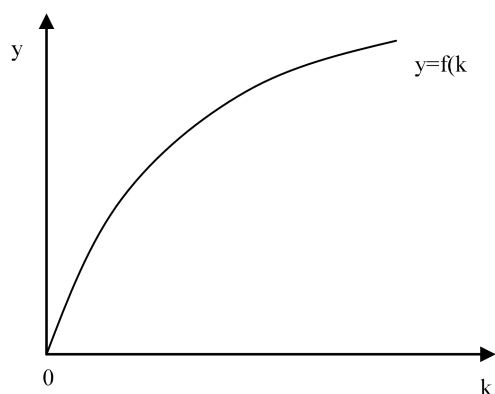


Figure 1. Neo-classical production function

Figure 1 demonstrates that if there was an increase in constant k , then the output will grow as the increase in k , but the slope will decrease because every addition of k is relative to L causing smaller and smaller increase in output. The production function $f(k)$ above represents the supply side or production capacity, but keeps in mind that the amount of capital depends on the function of investment. Many researchers assume the saving will be equivalent to investment and all investments consist of new productive capital.

So far, researchers have been specified the neo-classical production function with $Y = F(K, L)$, where F is a function of the relationship between input and output. Yet, the relationship has a limitation on the function where we only get a qualitative conclusion, as an example we can say that the increasing investment (saving) will drive an increasing in Y , but so far we do not know exactly how much. Therefore, we also can use the Cobb-Douglas production function with a more specific mechanism form

which can provide more specific quantitative solution.

Cobb-Douglas production function is often written in the form:

$$Y = AK^\alpha L^{1-\alpha} \quad (6)$$

Where A reflects the level of technology and α is a parameter that has a value between 0 and 1. As we know that the Cobb-Douglas production function reflects the Constant Return to Scale that is similar to Solow. By multiplying each factor by c then we can get new equation of the Cobb-Douglas function:

$$\begin{aligned} A(cK)^\alpha (cL)^{1-\alpha} &= Ac^\alpha K^\alpha c^{1-\alpha} L^{1-\alpha} \\ &= c^{\alpha+1-\alpha} AK^\alpha L^{1-\alpha} = cY \end{aligned} \quad (7)$$

So the constant return depending on α and $1-\alpha$. Another advantage of the Cobb-Douglas function is the characteristic which it would not be difficult for us to see the share of each input. So, it could be concluded that the share of each input K and L are α and $1-\alpha$. This of course can help us to conclude the contribution of each factor input to the Y . When there is no big problem about capital and labor, Then the question now is how contribution of

education to economic growth?, many experts argue that education is an indispensable factor in explaining the economic growth phenomenon in many cases, Is Solow model able to accommodate the impact of other factors (i.e. Education) on economic growth?

Education and Economic Growth

There are several ways to modeling how a major expansion in education can boost economic growth. The first, the view of education as human capital investment which was used by Krugman (1994) when investigating the success of Asian tiger through investments in education. Secondly, positive externalities results show that the "education as part of the community and also part of the overall profits". Externalities are defined as the impact of education level of other people on the productivity an individual. Here we must distinguish between statistical externalities in which education has a one-time effect on output (Lucas, 1988) and dynamic externalities that can make economic growth faster as a result of increased human capital,

increased innovation (Romer, 1990) or the ease of doing imitation of technology (Nelson & Phelps, 1966). Too, a higher level of education will show declining mortality rate (Lleras-Muney, 2005) and decreasing level of crime (Lochner & Moretti, 2004). If the return of public education is greater than return of private education, there will be positive externalities from education. If the average education in a country affects the average wage, and if this effect is greater than that estimated for the individual relationship, then there is a positive impact of externalities to education.

Furthermore, if the average education in a country has an effect on the growth of output, then there is a dynamic impact of positive externalities to education. Externalities are also an indicator for the policy (Aghion & Howitt, 1998). The idea of positive externalities is actually not a 'new item' where 200 years ago the classical economists argued that government should support education to create externalities

which in turn will promote the educated labor force as a function of economic growth and democracy in society. Further, in a social perspective by using cross-country data have found varying results. Fuente & Domenech (2006) took data from OECD countries and found the weakness of time series data which is the elasticity of GDP per worker and the years of schooling is almost 1. The social returns from education is about 10 percent, this result is far above the individual return in OECD countries. While Cohen & Soto (2007) have used the data of 95 countries and found the social return is about 8-9 percent, and the result is very similar to the individual returns in many countries. This is consistent with results by Ciccone & Peri (2006) with the data of American cities in which their results show that the externality value is almost zero.

The last way in modeling the role of education is referring to the view that human capital is an important input in innovation and R & D activities. This analogous that education can create the idea and will

accelerate technology. This last model is identical to the Schumpeterian assumption of product competition in imperfect markets which allow a process of "creative destruction". Countries that have advanced technology usually have an educated population, and economy with high income levels usually provide their residents with more education than in developing countries.

The importance of education and human capital has brought a lot of studies on economic growth. Robert Lucas in the late 1980s specified the importance of education as a force that can generate technology in the economy. He says further that education creates human capital that affects labor productivity and differences in the level of technology in the world. Because the importance of the human capital concept, and the role of education is that many researchers have been investigating the role of education through human capital on economic growth. The statistical differences explaining relation between education and growth are also often

found in other study such as Krueger and Lindahl (2001) who try to solve the conflict between macro and micro estimates of the role of education.

Macro study has shown a weakness in association / relationship between growth of GDP per capita and change in education with cross section data. Micro study as presented by Bils & Klenov (2000) found an inverse relationship in which economic growth results in higher levels of education, and they found the reverse effect which is greater than the relationship of education to growth. They also found that although there is a positive relationship between growth and initial level of education, no positive relationship between growths and the rate of change in education. Even some economists expressed the difficulty in measuring the effect of education because education operates through many channels. For examples, FDI (Foreign Direct Investment) plays an important role in the transfer of technology in which education operated in technology, so that education can operate indirectly

through FDI. And then, this group also stated that there are tendency of foreign investors to transfer technology through FDI by looking at whether there are workers who have higher education and able to handle the newer methods and more complex procedures. IMF study through Kim & Kim (2000) mentioned that education can stimulate economic growth in which education will increase the mobility of workers. High mobility causes easier and faster changes in the structure for international trade.

Other work by Temple (1998) which employed data from the education and economic growth together with data from Benhabib & Spiegel, then examine data from a different angle. Temple found that the failure in seeing the relationship between education and economic growth is caused by bias including a few sample countries that have a remarkable case in their study. When few exceptional cases (such as economic growth is too slow) are applied, then education has a positive and significant influence. But one thing that can be highlighted such as

presented by Islam (1995) is that human capital plays an important role in the growth process, but there are still unresolved questions on what channel exactly? It leaves the job for many researchers. Regardless of these differences, we might agree that education and human capital remain an interesting discussion of a concept in economic studies of growth and development, especially after the economy such as Hong Kong, Korea, Singapore, and Taiwan have achieved economic growth unprecedented previously through large investments in education. Therefore, it is still much debate, and this paper will estimate the effect of education on economic growth in the form of panel analysis.

Augmented Solow Model

As we have seen in above that the Neoclassical production function makes it easy for us to measure how much the role of inputs variable to economic growth. Furthermore, to add the education or human capital in the Neoclassical model (Solow model), we can add education as a separate component in the model. Suppose (H) as a new variable of

education in the Cobb-Douglas production function, so we can rewrite the Solow model into the Augmented Solow Model as follows:

$$\text{Log } Y = A + \alpha \text{Log}K + \beta \text{Log}L + \gamma \text{Log}H + \varepsilon \quad (8)$$

Where Y = Economic growth, A = Technological progress, K = Capital, H = Human capital, L = Labor, α = Share capital on economic growth, β = Share labor on economic growth, γ = Share human capital on economic growth, and ε = error term.

Here, Human capital can be defined as the knowledge required by a person, human capital includes investments in education, R & D, organization learning, training, or even self-training (Van Den Berg, 2005). The importance of education and human capital has been widely discussed in the literatures of economic growth. In terms of the relationship between education and economic growth, it may arise the question how well education works to affect economic growth - there are several versions and ways to model how much the role of education in promoting economic growth. Kumar

(2006) generally states that education or human capital is related to knowledge and skills which can be pursued through several channels to influence growth, including:

1. Human capital is the input for the production function.
2. Accumulation of human capital will generate positive externalities for the community so that later will lead to economic growth.
3. Human capital will lead to innovation and greater R & D activities so as to generate economic growth.
4. Accumulation of human capital will affect physical capital investments and will effect economic growth.

When there are increased trusts or assumption that education is the agent of social change, it brings about the importance of investment from education, Especially higher education in many developing countries. It undoubtable result in a view that the return form is higher wages and prosperity. So in general, this perception will lead us to an opinion that the education will be the

forerunner of economic growth in the long term.

New Growth Theory

Because there are some dissatisfied opinion about the Augmented Solow Model accuracy, it causes some experts (and including developing countries) to seek new alternatives to resolve this question. New Growth Theory is considered a fresher model than the 'old approach' that often fails to capture the impact of education. Education in this new model plays a double role as a diffusion and innovation agent that drives economic growth goal. Diffusion here is the ability of a country in imitation from advanced economies that do innovation. Since this activity is essentially cheaper than innovation, it makes sense for a more developed country to grow faster than a more developed country. If this is true, then it means a step closer to answering how education operates in promoting growth. The NGT growth equation can be written as follows:

$$(\Delta \text{Log } Y) = c + (g - m)H_i + mH_i [Y_{\max}/Y_i] + \alpha(\Delta \text{Log } K) + \beta(\Delta \text{Log } L) + (\Delta \text{Log } \varepsilon) \quad (9)$$

So it can be simplified with:

$$(\text{Log } Y_t - \text{Log } Y_0) = c + (g - m)H_i + mH_i [Y_{\max}/Y_i] + \alpha(\text{Log } K_T - \text{Log } K_0) + \beta(\text{Log } L_T - \text{Log } L_0) + (\text{Log } \varepsilon_T - \text{Log } \varepsilon_0) \quad (10)$$

Where $(g-m)$ is innovation ability by a country, and m is refer to difusion of technology, Y_{\max} is output of labor in leader country, while Y is output of labor in the follower country.

Equation number (9) and (10) above is an Endogenous Growth Model (NGT) that wants to generate long-term economic growth from the role of education. If we see one of the similarities of the NGT and Augmented Solow Model is that NGT actually itself does not emphasize the new sources of economic growth to derive long-term movement. The NGT only gives us an idea how education can be linked to economic growth. Lessons to be learned from NGT's theory are as follows: First, NGT is used to find out whether developing countries are converging or diverging. This is because the outcomes will depend on the irrelevant policies that will be execution by developing country and

NGT provides assistance in mapping it out. Secondly, NGT can describe the role of technological diffusion that can increase productivity in developing countries. Third, the NGT reemphasize the role of education regarding its ability to create technological diffusion, and innovation. In general, according to experts NGT provides refreshment and re-emphasis on the Neoclassical approach assumptions. Once the assumption on this NGT is negligible, the Neoclassical approach is able to better explain the impact of education on economic growth than thought by many economists previously.

With using Indonesian data, Reza (2012) found that although there are differences in the assumptions between two approaches, but both were able to explain the impact of education on growth variables very well. In Neoclassical approach, education has positive and significant impact on growth through its growth rate. While on the other hand, NGT through its productivity show to us the important role of education in derive growth through innovation

and diffusion of technology. Islam (2004) concludes that developing countries can use NGT to track the function of human capital, in particular, this theory can help us in illustrating how long-term growth is formed. Barro (2013) found growth is positively related to the starting level of average years of school attainment of adult males at the secondary and higher levels. The results also suggest an important role for the diffusion of technology in the development process. With African countries case, Gyimah-Brepong et al. (2005) with panel data over 1960-2000 period found that all levels of education, including higher education, have positive and statistically significant effect on the growth rate of per capita income in African countries. They points out the need for African countries to effectively use higher education human capital in growth policies. Perhaps a temporary conclusion that can be drawn is as said by Woessmann (2003) education is an especially crucial aspect in development because it is not only important for human capital in the

narrow sense that it augments future production possibilities, but also for human capabilities in the broader sense of ability and freedom of people to lead the kind of lives they value.

CONCLUSION

Economic growth is a issue that is endlessly discussed, the linkage of growth with other factors that cause it now increasingly complex and still becomes a big question how interaction between them. Education as a hope and the way of modern human in break away all the economic problems, but it seems have been not able to show a good direction and its impact on development and economic growth. Although the empirical results of several decades still leave many mysteries, but the blooming of some methods seemingly shifts to the expected direction. The growth model based on education has been tested for reliability, revised, and even formulated into the other forms. Finally, as Rodrik says the theory of growth is now a 'tool' that is stronger than it was before Solow put his

pencil on the paper. Science and economic problems are now full of great ideas, questions, and even debates itself.

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