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THE IMPACT OF HIGHER AND SECONDARY EDUCATION ON ECONOMIC GROWTH IN AZERBAIJAN[2]

Altay Ismayilov[a], Ahliman Kasumov[a], Emel Ahmadova[b]

[a]Knowledge economy UNEC research center
Azerbaijan State University of Economics
Baku, Azerbaijan.
[b]International Magistrate and Doctorate Center
Azerbaijan State University of Economics
Baku, Azerbaijan.

ABSTRACT

This article examines the impact of education on GDP growth (non-oil sector), a key indicator of Azerbaijan's economic development. The study used non-oil GDP per capita as a dependent variable, capital stock, total government expenditure, oil fund revenues, number of graduates of specialized secondary educational institutions, number of graduates of higher educational institutions, and human development index as independent variables. Quarterly data covering 2003-2019 were used to construct the model. 9 models were built using Vector Error Correction Models. According to the models' results, education has significant positive effects on economic growth in models 1, 4, 7 in the short term, significant positive effects in models 1, 2, 8, and significant adverse impact in models 6 and 9 in the long run. The best result among these models was obtained in model 1 (independent variables are capital stock, oil fund revenues, and the number of graduates of specialized secondary educational institutions). Because almost all indicators in the first model for both short-term and long-term are significant.

Keywords: Education; Economic growth; Azerbaijan economy; Vector Error Correction Model

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INTRODUCTION

Education is one of the most important components of the knowledge economy of the modern era. Thus, education contributes to economic development by developing the higher levels of skills needed to transition to a knowledge-based economy. Also, education has a high economic value because it leads to human capital formation and increases competitiveness in the global economy. Education enriches people's creativity and productivity, encourages initiative and technological development, reduces poverty, and increases employment. Lucas (1988), Mankiw (1992), Barro and Lee (1996), Hanushek and Woessmann (2007, 2008), and others note that the development of education will lead to economic growth. This makes it necessary to examine the relationship between education and economic growth.

The study's main purpose is to econometrically assess the impact of key education indicators on economic growth based on statistical indicators collected in Azerbaijan. The study found limitations, such as insufficient statistics to evaluate education quality and the lack of some statistics for certain periods. This article seeks to answer whether education positively affects economic growth in the country and whether education indicators have the most significant impact.

The research examines theories of economic growth. Most of the studies are by Solow, Mankiew et al. studied based on theories. Research on education and economic development has shown that this effect is both positive and negative. Researchers explain the negative impact of the low quality of education in these countries, low investment, and inefficiency (Eggoh et al., 2015). The studied models used enrollments, attainments, school years, PISA, and other indicators on education.

In this study, we constructed Vector Error Correction models based on the Solow-based Cobb-Douglas production function using the number of graduates in the specialized secondary, a number of higher educational institutions, and humans development index indicators on education. Each of the education indicators was used separately in the 9 models on quarterly statistics for 2003-2019. Real non-oil GDP was taken as the dependent variable in the model. As Azerbaijan is an oil country and the share of oil in GDP growth is high, the non-oil sector has been taken to see the impact of education more clearly. We used the oil fund revenues indicator in model 1-3, the total government expenditure indicator in model 7-9, and both indicators in model 4-6. It should be noted that the model takes into account both short-term and long-term.

1. LITERATURE REVIEW

Neoclassical theories play an important role in the study of economic growth. In his study of economic growth, well-known neoclassical scientist Robert Solow found that technical progress and capital are the main determinants of GDP growth per capita. This result was obtained by performing calculations based on the Cobb-Douglas production function. As is well known, the Cobb-Douglas production function is a function that depends on technical progress, capital, and labor. However, comparing the economic growth of countries with this function does not reflect the reality. Therefore, to compare the figures, Solow calculated the GDP per capita by dividing both sides by the number of employees (Solow, 1957). However, in later years there were criticisms of this theory. It was claimed that there was no connection between economic growth and the level of savings. Subsequent research has shown that an increase in the collection rate leads to higher economic growth (Romer, 1986; Lucas, 1988; Romer, 1994; Mankiw, 1995; Barro and Sala-i-Martin, 1995).

Physical and human capital play a more important role in capital, one of the key elements of the function. Capital investment in human resources is linked to his education, health, and experience, which makes him more productive. This, in turn, leads to the emergence of new values and, consequently, the growth of economic development (Lucas, 1988; Mankiw et al., 1992; Barro and Lee, 1993, 2013; Gu & Lev, 2001; Daum, 2003; Burja, C. & Burja, V., 2013; Odit et al., 2010). From this perspective, the role of education in the economy in economic development is undeniable (Hanushek and Woessmann, 2007, 2008).

Due to the broad scope of education, research on the impact of education on economic growth is multifaceted. A group of researchers used indicators of education levels (primary, secondary, higher, etc.).

Wang and Liu studied the impact of different education levels on economic growth in 55 countries using the Solow-based Cobb-Douglas production function. The study found that the effect of education, especially higher education, and life expectancy on human capital on GDP per capita growth is positive.

Using the panel methodology, Eggoh et al. (2015) found that the relationship between investment in education and health care and economic growth was negative. It was shown that the reason for this is the presence of inefficiency and underinvestment in African countries. Azam et al. (2019), who researched 33 developing countries using the same method. They found a positive correlation between these indicators. Another study of 48 developing countries examined the relationship between human capital, employment, and economic growth. Life expectancy and education expenditure on human capital is taken. The study, which covered the period 1996-2018, found a significant positive effect among the indicators (Khan & Chaudhry, 2019).

Based on statistics covering 45 years in Tunisia, Frini & Muller (2012) provided an econometric analysis of the impact of three education indicators (primary, secondary, and higher education) on GDP per capita. The model was examined both short-term and long-term through multivariate cointegration analysis. The short-term outcomes were close to the long-term outcomes, and education positively affected GDP growth.

In his study, Abdullah (2013) empirically assessed each of the indicators on Malaysia's human capital (primary school enrollment, secondary school enrollment, and tertiary school enrollment) on economic growth. Malaysian Educational Statistics used data from WDI and Barro and Lee (2010) for comparison. The results from each database were similar, and the relationship between human capital and economic growth was negative.

Delalibera and Ferreira (2018), who argue that early education had a significant impact on economic growth, used figures from 1961-2008. The article also notes that investing in early education is more important, although it will pay off in the long run.

In “Education and economic growth in Pakistan: A cointegration and causality analysis," M. Afzal et al. (2011) analyzed the relationship between education and economic growth in 1970-2009 using Autoregressive Distributed Lag (ARDL) Model of Cointegration and the Augmented Analyzed by Granger Causality Approach given by Toda and Yamamoto (1995). The study concluded that higher education has a more significant positive impact on economic growth among other educational indicators. Seetanah and Teeroovengadum (2019) also found that higher education's positive effect on economic growth using Panel Vector Autoregression in their research. The study covered 18 African countries from 1980 to 2015. A study of South Asian countries using an econometric panel co-integration investigation also shows that higher education has a long-term economic growth effect. As a suggestion, the author said the government should focus on human capital spending, especially higher education (Hussaini, 2020).

A study of the relationship between education and economic growth in Nigeria over 2000-2018 shows that although there is a long term co-integration between education and economic growth, the Granger causality test reveals the gross enrolment ratio of higher education does not affect GDP growth (Omodero & Nwangwa, 2020). Another study in Nigeria showed that total government education (primary, secondary, tertiary) expenditure positively affected economic growth from 1980 to 2018. To obtain this result, Lawanson & Umar (2020) used the Error Correction Model and Unit Root, co-integration, and Granger Causality tests. Using the same methods, Boutayeba and Ramli (2019) investigate the relationship between education and economic growth in Algeria for 1990-2016. As a result, they find a long-term relationship between the indicators, although there is no causality (Boutayeba & Ramli, 2019).

Over 2010-2017, the study "The Composition of Human Capital and Economic Growth: Evidence from Aceh and West Papua Provinces, Indonesia" shows that in two regions of Indonesia, although tertiary education in human capital has an insignificant effect on economic growth, primary and secondary education have more impact. Therefore, the authors suggest that the government should pay attention to the levels of education and teachers' training (Hasyyati & Sahara, 2020).

Burja and Burja (2013), in their article economic growth and key indicators of education (persons with lower secondary education attainment, individual's level of computer skills, individual's level of internet skills, life-long learning, early leavers from education, the employment rate of persons with tertiary education (level 5 and 6), the total investment on GDP ratio, the growth rate of real labor productivity per hour worked and training) and built a regression model on the example of Romania and the EU. The model covered the years 1997-2011. The impact of key education indicators on GDP per capita was 53% and 57%, respectively, in the EU and Romania.

A study of 284 European countries from 2000 to 2017 reveals that the increase in the number of universities positively affects economic growth (Agasisti & Bertoletti, 2020). An analysis of the correlation between indicators in a study of 25 EU countries shows that public expenditure on tertiary education affects economic growth after 6 years. In the study, tertiary education was used as a synonym for higher education according to The International Standard Classification of Education (ISCED) adopted by the EU (Firsova and Tsypin, 2018).

Hanushek and Woessmann (2007, 2008), who consider the impact of education quality on economic growth more important than quantity, have researched in 50 countries. In a 2016 study, Hanushek said that adding higher schooling years to economic growth is small without cognitive skills (Hanushek, 2016).

In their study, Gamlath and Lahiri (2018) examined the effects of public and private spending on education on economic growth. According to them, the state should provide tax incentives to stimulate private education, indirectly reducing parental expenditure. However, the high cost of private education reduces interest in this field in developing countries. Given the greater access to education in the public sector for these countries, it is important to invest in this sector and improve education quality. The positive impact of education spending on economic growth has been identified in studies in countries such as Turkey (1970-2012), France (1970-2012), Tunisia, and Morocco (1980-2015) (Mercan and Sezer, 2014; Ifa and Guetat, 2018; Ozatac et al., 2018). The study for Sri Lanka also found a long-term positive link between education expenditure and economic growth. The study, which covered 1974-2018, used indicators from Gross Domestic Product, Gross Capital Formation, Labor Force, and Public Expenditure on Education. Therefore, the article recommends that the government increase spending on university education (Rathnasiri & Jayawardena, 2019). The link between government expenditure on education and economic growth has also been studied in India. The study built a vector error correction model on indicators covering 38 years since 1980, including the Johansen co-integration test. The results show that there is causality among the indicators and that education significantly impacts economic growth (Upveja and Shastri Swati, 2019).

Mammadov and Gümüş (2020) studied the relationship between net government education expenditures per student, the number of students enrolled in secondary education, per capita GDP indicators by DOLS and FMOLS methods in 1998-2015 on 30 countries participating in the PISA 2015 exam. As a result, a negative correlation was found between education finance and secondary education, and a positive correlation between "education finance and economic growth" and "secondary education and economic growth". It was also found that before the 2008 crisis, education finance had a negative impact on secondary education and economic growth.

Cvetanoska and Trepeski (2020) studied the causal link between higher education and economic growth in North Macedonia from 1990 to 2018. The results of the Granger causality study, developed by Toda and Yamamoto (1995), found that higher education led to economic growth. The authors recommend developing new policies to improve the quality of knowledge and skills and increase investment in education, taking into account the problems created by Covid-19 in education.

2. METHODOLOGY

In the research, we used the Cobb-Douglas production function based on the Solow model:

$$Y = AK^{\alpha}H^{\beta}$$

Where Y is the production volume; A-constant, K, H-physical capital and human capital, respectively; α, β are the parameters of the model and α + β = 1

If we logarithm both sides of the equation, we can bring the nonlinear function to a linear function:

$$lnY = lnA + \alpha \cdot lnK + \beta \cdot lnH + \varepsilon$$

According to the studied model, as dependent variable - seasonally adjusted real non-oil GDP (2005= 100), as explanatory variables - seasonally adjusted capital stock, total government expenditure, oil fund revenues, number of graduates of specialized secondary educational institutions, number of graduates of higher educational institutions, human development index indicators were used on a quarterly basis. Quarterly indicators of education were calculated using the Eviews program, and the formula calculated quarterly calculations of the Capital Stock indicator $K_{t+1} = (1-\eta)K_t + I_{t+1}$ (Rudolf & Zurlinden, 2010). Here, t is time, I is a quarterly investment (gross fixed capital formation), and η is depreciation rate. The model is included in different combinations to avoid multicollinearity between the indicators. As in the Solow model, each indicator is divided into the labor force and considered short-term and long-term.

$$Y/L = AK^{\alpha}H^{\beta}/L$$

$$y = ak^{\alpha}h^{\beta}$$

$$\ln y = lna + \alpha \cdot lnk + \beta \cdot lnh$$

We have also differentiated the model because we have considered it for the short term. Different econometric models were built based on the data obtained on the example of Azerbaijan, and among them were the Vector Error Correction models that gave the best results.

In detail, we can describe our model in terms of short-term and long-term, respectively:

$$\mathrm{dln}y = constant + \alpha \cdot dlnk + \beta \cdot dlnh + erc(-1)$$

$$\ln y = constant + \alpha \cdot lnk + \beta \cdot lnh$$

In this model, we assume that education has a significant positive impact on economic growth.

3. THE SOURCE OF THE DATA

In the model were used quarterly statistics for 2003-2019 in Azerbaijan. We used real non-oil GDP indicator from the Central Bank of the Republic of Azerbaijan's (2020), capital stock, number of graduates of specialized secondary and higher educational institutions, human development index from World Bank's (2020), UNESCO Institute for Statistics' (2020), oil fund revenues indicator from the State Oil Fund of the Republic of Azerbaijan's (2020), total government expenditure indicator from the Ministry of Finance of the Republic of Azerbaijan's (2020) official websites.

4. DISCUSSION

The results of the Vector Error Correction models are shown in Table 1. According to Table 1, 9 models for short-term and long-term are built in different combinations. DLOG(RNGDP_SA) for the short term and LOG(RNGDP_SA) for the long term are taken as the dependent variable. Besides, ERC(-1) is also involved to the Vector Error Correction Model in the short-run.

In model 1 we used DLOG (SECONDARY), DLOG (OF), DLOG (C_STOCK_SA) for short-term, and LOG (SECONDARY), LOG (OF), and LOG (C_STOCK_SA) for long-term as explanatory variables. As can be seen from Model 1, explanatory variables other than capital stock are statistically significant,

and the impact of education on economic growth is positive. Thus, a one percent increase in education in the short term has a positive impact on the economic growth of 0.14 percent, and in the long term of 0.15 percent.

In model 2 we used HDI for education. In this model, all indicators are significant, except for short-term oil fund revenues, but all indicators positively impact the long run.

In Model 3, we used DLOG(HIGHER) for short-term and LOG(HIGHER) for long-term on education. In this model, in the short run, oil fund revenues, in the long run, oil fund revenues and capital stock indicators are significant.

In Model 4, 5, 6, we used each indicator of education separately, including DLOG (OF), DLOG (GOV_EXP), DLOG (C_STOCK_SA) for short-term, and LOG (OF), LOG (GOV_EXP), LOG (C_STOCK_SA) for long-term. Models 7, 8, 9 are calculated by subtracting oil fund revenues from these indicators. The impact of education on economic growth in models 4 and 7 is positively significant in the short term, and in the long run, it was positive but insignificant. In models 5 and 8, this effect is insignificant, although positive in both periods. In models 6 and 9 there is a negative insignificant in the short term and a significant effect in the long term.

As can be seen, the ERC (-1) coefficient is negative and statistically significant in each short-run model. This also meets the requirements of the Vector Error Correction Model.

Table.1. Vector Error Correction Model results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
DLOG(SECONDARY)	0.14*	-----	-----	0.15*	-----	-----	0.15*	-----	-----
DLOG(HDI)	-----	0.50	-----	-----	0.37	-----	-----	0.32	-----
DLOG(HIGHER)	-----	-----	0.01	-----	-----	-0.04	-----	-----	-0.05
DLOG(OF)	0.08*	0.08*	0.09*	0.06**	0.07**	0.06**	-----	-----	-----
DLOG(GOV_EXP)	-----	-----	-----	0.06	0.04	0.05	0.08	0.06	0.07
DLOG(C_STOCK_SA)	0.15	0.15	0.11	0.29	0.20	0.24	0.58***	0.43	0.45
C	0.01**	0.01	0.01***	0.01	0.01	0.01	0.01	0.01	0.01
ERC(-1)	-0.12**	-0.17**	-0.12**	-0.17**	-0.18**	-0.19**	-0.20*	-0.19**	-0.22*
R^2	0.23	0.16	0.16	0.25	0.16	0.19	0.19	0.09	0.12
DW	1.89	1.96	1.99	1.88	1.97	1.94	1.84	1.89	1.89
LOG(SECONDARY)	0.15**	-----	-----	0.06	-----	-----	0.04	-----	-----
LOG(HDI)	-----	3.76*	-----	-----	2.44	-----	-----	2.72*	-----
LOG(HIGHER)	-----	-----	0.01	-----	-----	-0.27**	-----	-----	-0.31*
LOG(OF)	0.12*	0.04**	0.13*	0.04**	0.02	0.02	-----	-----	-----
LOG(GOV_EXP)	-----	-----	-----	0.22*	0.12**	0.27*	0.29*	0.14*	0.31*
LOG(C_STOCK_SA)	0.52*	0.35*	0.46*	0.39*	0.33*	0.42*	0.41*	0.35*	0.45*
C	-1.94*	-0.15	-1.76	-1.15*	-0.34	1.77	-1.03*	-0.23	2.21**
R^2	0.97	0.98	0.96	0.98	0.98	0.98	0.98	0.98	0.98
DW	0.20	0.57	0.20	0.31	0.48	0.43	0.33	0.51	0.46

* Significant at the 1% level, **Significant at the 5% level, ***Significant at the 10% level, dependent variables are respectively DLOG(RNGDP_SA) and LOG(RNGDP_SA)

As can be seen from Table 1, the number of graduates of specialized secondary educational institutions positively impacts economic growth for both periods. However, in the short term, this effect is significant in all models, but in the long run, it is insignificant in models 4 and 7. The positive and significant impact of this indicator on economic growth is that more and more of these people quickly find a job that is not related to education and creates new value.

Although the human development index has an insignificant effect on economic growth in the short run, in the long run, it has a significant impact of + 3.76 percent in model 2 and + 2.72 percent in model 8. Note that the life expectancy index, education index, and income index are used in the calculation of the human development index. There the reason for this is that people will benefit more from the economy by being more educated and experienced in the long run.

Another exciting result of the model is that the number of graduates of higher educational institutions has an insignificant effect on economic growth in all models in the short term and a signi-

ficant adverse effect in models 6 and 9 in the long run. The insufficient level of higher education can explain the reasons for such influences in the country and the difficulty of graduates finding jobs in their field.

5. CONCLUSION

Theoretically, many researchers have studied the impact of education on economic growth and noted its importance in achieving economic development. In Azerbaijan's case, Dehning, Aliyev and Nadirov (2016) found a significant long-run positive impact of education expenditures from the state budget over the non-oil sector.

This issue was also investigated in this article on the example of Azerbaijan. According to the Vector Error Correction model results, education has positive effects on economic growth in model 1, 4, 7 in the short term, significant positive effects in models 1, 2, 8, and significant negative effects in models 6 and 9 in the long run. As can be seen from the comparison of the models, the best results are in model 1, and in this model, our hypothesis proves itself. According to Model 1, a one-percent increase in the number of graduates of specialized secondary education institutions increases the economic growth of 0.14 percent in the short term and of 0.15 percent in the long run.

The results of the model show that there are problems with higher education in Azerbaijan. To solve this problem, there is a need to strengthen university-state-industrial relations in the Azerbaijani economy and train specialists who meet the market's requirements. Another solution is to attract educated people who have studied abroad to higher education institutions and create competition by offering high salaries to staff.

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