THE IMPACT OF GOVERNMENT EDUCATION EXPENDITURES ON ECONOMIC GROWTH: EVIDINCE FROM AZERBAIJAN

Shahriyar Mukhtarov
Khazar University,
Azerbaijan State University of Economics (UNEC), Azerbaijan
smukhtarov@khazar.org

Ilkin Mammadov
Azerbaijan State University of Economics (UNEC), Azerbaijan
ilkinmammadov@unec.edu.az

Hamid Hamidov
Azerbaijan State University of Economics (UNEC), Azerbaijan
h.hamidov@unec.edu.az

ABSTRACT

This paper investigates the impact of government education expenditures on economic growth in Azerbaijan during 1995-2017 using the Vector Error Correction Model (VECM). Since the study uses time series variables the unit root properties of employed variables are tested for non-stationarity. Stationarity of the data is tested using conventional Augmented Dickey-Fuller test. Different cointegration methods, namely, Johansen, DOLS, FMOLS and CCR are used in order to get more robust results. The results from cointegration methods are consistent with each other and confirm existence of long-run relationship among the variables. This implies that there is a long run relationship between government expenditures on education and economic growth in Azerbaijan. In order to test the quality of the model residuals of the model are tested for the serial correlation, heteroskedasticity, and normality. The model is checked for model misspecification and stability. The results of all above mentioned tests are found to be adequate. Moreover, estimation results of VECM show that government expenditures on education has positive and statistically significant impact on economic growth in the long-run. The paper concludes that a concerted effort should be made by policy makers to boost educational investment in order to accelerate economic growth.

Keywords: *Azerbaijan, cointegration, economic growth, government education expenditures, VECM*

1. INTRODUCTION

Education is an important determinant of economic growth for any country and is considered as one of the necessary conditions to achieve better outcomes on social welfare. Investing in education means to invest in human recourses that are one of the most important factors of production function that is directly linked with the countries' development level and the standard of living. It raises the labor productivity and efficiency and thus produces skilled labor force that is capable of leading the economy towards the path of sustainable economic development (Zaman, 2008). Government expenditures on education lead to human capital formation more than to physical capital and social capital, and that makes a significant contribution to economic growth (Dickens et al., 2006; Loening, 2004). Because expenditures on education contribute to human capital development, they can help achieve better education outcomes. An investment in human capital, especially in education allows each person to contribute to their society productively. It becomes an important determinant of an economy's capability to achieve a high level of growth with low unemployment, high wages and a strong social unity.

Therefore, the impact of education spending on economic growth is one of the crucial issues in the economic literature. There are several models such as Solow (1956), Lucas (1988) and Romer (1990) that highlighted the human capital, formed through spending on education, as a driving force of economic growth. The social benefits of education provide a powerful set of arguments in favor of public investment to achieve the social optimum (Harsha, 2004). Therefore, government spending on education as investment is an economic issue well debated nowadays. There are a lot of empirical research papers that estimate the relationship between public expenditure on education sector and economic growth. However, they come out with different conclusions on the relationship between public expenditure of education and economic growth. The common view is that education expenditure is the key to sustainable growth (Blankenau et al., 2007: 393). Economic theory provides important foundations for this idea. Considering the studies on the importance of human capital, Nelson and Phelps (1966) stated that a better educated workforce would adopt technological developments faster and better mimic technology. Aghion and Howitt (1998) state that human capital accumulation increases the innovative capacity of the economy, thus accelerating growth. Benhabib and Spiegel (1994) stated that education supports economic growth, helping the successful implementation of new technologies designed by others, dissemination and dissemination of the information necessary for understanding and processing new information. Mankiw, Romer and Weil (1992), Lucas (1998), emphasized that the increase in the human capital of the individual can contribute to the productivity of all the factors of production except its own efficiency and thus provide a growth-promoting process. Therefore, education makes the manpower needed by the economy more efficient. Also, it contributes to the development of creative thinking and advanced techniques with more qualified workforce, which is more suitable to the needs of the changing economy, and thus prepares important foundations for the continuation of economic growth as well as social cohesion (Wykstra, 1971). Given the above arguments, the main aim of this paper is to investigate the impact of government's education expenditures on economic growth in Azerbaijan using annual data covering the period from 1995 to 2017. The contribution of the study is as follows: (a) It studies the government education expenditure-economic growth relationship in the case of Azerbaijan, which is a rarely investigated example under education-income framework, and is a good representative for the similar economies, (b) this is the first study investigating this relationship in the case of Azerbaijan by employing time-series data, which enables to see the country-specific features of this relationship.

2. LITERATURE REVIEW

In this section, the similar studies devoted to the relationship between government education expenditures and economic growth are reviewed. There are a vast of studies in economics literature investigating the relationship between education expenditures and economic growth. Empirical studies conducted by Landau (1983), Barro (1991), Tamang (2011), Mayer (2001), Bloom et al. (2001), Wolff (2001), Bose et al. (2007), Blankenau et al. (2007), Erdoğan and Yıldırım (2009), Petrakis and Stamakis (2002), Riasat et al. (2011), Asteriou and Agiomirgianakis (2011), Li and Kong (2012), Idrees and Siddiqi (2013), Koc (2013), Selim et al. (2014), Mekdad et al. (2014), Owusu-Nantwi (2015), Otieno (2016), Mallick et al. (2016) and Sunde (2017) concluded a positive relationship between education expenditures and economic growth. Furthermore, studies by Devarajan et al. (1996), Ndiyo (2007), Nurudeen and Usman (2010), Mariana (2015) and Eggoh et al. (2015) found a negative relationship between education expenditures and economic growth. In some studies, like Nketiah-Amponsah (2009), Griliches (1997), Çetin and Ecevit (2010), Pamuk ve Bektaş (2014), relationship between these two variables was not determined. Li and Kong (2012) empirically investigated long-term relationship between education spending and economic growth for China.

Their findings are very similar to Mallick and Dash (2015), where both studies found that there is one-way causality relationship between government education expenditures and economic growth. In another research for Bangladesh, Mukit (2012) revealed that government education expenditures has significantly positive long-term effects on economic growth for the period of 1995-2009. Moreover, Idrees and Siddiqi (2013) for G-7 countries, Mallick et al. (2016) for 14 Asian countries also found similar results. In addition, in a recent study over the period of 1976-2016, Sunde (2017) found a long term relationship between education expenditure and economic growth as in Mukit's (2012) research. Otieno (2016) investigated the impact of education expenditure per worker on economic growth for Kenya over the period of 1967-2010. The results revealed that education expenditure per worker has a positively and significantly impact on economic growth in both long term and short term. As can be seen from the literature review, no study has investigated the impact of government's education expenditures on economic growth in the case of Azerbaijan. Therefore the objective of the current study is to fill in this gap by utilizing VECM approach and different cointegration tests to observe long-run cointegration. The findings will suggest policy makers to take into account the role of government's education expenditures in economic growth for macro prudential regulation and sustainable development purposes in Azerbaijan and also contribute to the empirical literature for further studies in the case of similar countries.

3. MODEL AND DATA

3.1. Data

Our study uses annual data over the period 1995-2017 for empirical analysis. All data set have been taken from World Development Indicators of World Bank (WB, 2018) and The State Statistical Committee of the Republic of Azerbaijan (The State Statistical Comitee of Azerbaijan, 2018). Government expenditures on education (EDU_EX) is measured in million constant US dollars. Economic growth (Y) is measured by real GDP (2010 US $). All the variables have been transformed into natural logarithmic form for consistent and reliable empirical results.

3.2. Methodology

We analyze relationship between energy consumption, economic growth and financial development using the different cointegration techniques and VECM method framework in this study. Our empirical analysis will cover the following stages. First, we will check non-stationarity characteristics of variables. We will use the Augmented Dickey Fuller unit root test (Dickey and Fuller, 1981, ADF) for this exercise. Since this test is widely used one, we do not describe it here. Interested readers can refer to Dickey and Fuller (1981). Second, if the orders of integration of the variables are the same, then we will apply cointegration tes(s) to see whether they are cointegrated. In order to be on the safe side, we will follow the latter option and hence, use the Johansen test (Johansen, 1995) as it is the only test can produce proper. Third, if we find only one cointegrated relationship among the variables, then alongside the Johansen method we will also use other alternative cointegration and long-run estimation methods to increase robustness of our inferences on the long-run relationship. For this exercise, we employ Dynamic Ordinary Least Squares (DOLS), Canonical Cointegrating Regression (CCR), Fully Modified Ordinary Least Squares (FMOLS) which is based on the residual-based cointegration method developed by Engle and Granger (1987). Lastly, After confirming the presence of cointegration between the variables, we will apply the Vector Error Correction Model (VECM) to investigate the long-run relationship among the variables. If between variables does exist one cointegration, the first-best solution would be using VECM model. The above mentioned methods are widely used techniques in similar studies, we do not describe them.

3.3. Empirical results and Discussion

First, we should check the stationarity properties of the used variables. As mentioned in the methodology section, for this purpose, we use the ADF unit root test. Results of unit root testing are presented in Table 1. We found that the variables are non-stationary at their levels but they are stationary at first difference, being integrated of order one, *I(1).* We thus conclude that our variables are non-stationary in levels but stationary in their first differences. In other words, they follow integrated of order one, I(1), processes. Our conclusion that the variables are I(1) allows us to proceed to the cointegration test.

Table 1: Results of ADF unit root tests

Variable	Panel A: Level		Panel B: 1st difference		Result
	k	Actual value	*k*	Actual value	
Y	0	-0.861223	0	-3.445613**	İ(1)
EDUEX	0	0.905844	1	-2.811665*	I(1)

*Notes: Maximum lag order is set to two and optimal lag order (k) is selected based on Schwarz criterion in the ADF test; *, ** and *** accordingly indicates rejection of null hypothesis at 10%, 5% and 1% significance levels; critical values are taken from the table prepared by MacKinnonun (1996). Time period: 1990-2015.*

To apply the Johansen procedure, the optimal lag number should first be chosen. A Vector Auto Regressive (VAR) model was initially specified with the endogenous variables of *Y* and *EDUEX* and a pulse dummy[1]. The details of this test were explained in table 2. A maximum of two lags was initially considered and both lag selection criteria and lag exclusion tests statistics suggested that indeed a lag of order two was optimal, which is intuitively appropriate given the small number of observations in the sample.

Table 2: Lag Interval Tests

		Information Criteria				
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9.629284	NA	0.010969	1.162928	1.262502	1.182366
1	38.40702	81.66171*	0.000135	-3.240702	-2.941982	-3.182388
2	44.52990	9.184322	0.000111*	-3.452990*	-2.955124*	-3.355801*
3	46.70444	2.826911	0.000139	-3.270444	-2.573432	-3.134380

** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Panels A through D in Table 3 report that the VAR has good properties as it is stable, its residuals have no issues with serial correlation and heteroscedasticity problem and residuals are normally distributed. The Johansen cointegration test results from the transposed version of the VAR, which is the VECM with one lag, are presented in Panels E and F of Table 3.

[1] We used a pulse dummy taking on unity in 2008 and zero otherwise, to capture the jump of *Y* in 2007 and the effect of the recent financial crisis.

Table 3: VAR residual diagnostics, stability and cointegration tests results

Panel A: Serial Correlation LM Test [a]

Lags	LM-Statistic	P-value
1	3.014	0.555
2	2.765	0.597
3	4.634	0.326
4	1.786	0.774

Panel B: Normality Test [b]

Statistic	χ^2	d.f.	P-value
Jarque-Bera	2.544	4	0.636

Panel C: Heteroscedasticity Test [c]

White	χ^2	d.f.	P-value
Statistic	32.24	24	0.120

Panel D: Stability Test [d]

Modulus	Root
0.959923	0.959923
0.636985	0.041 - 0.635i
0.636985	0.041 + 0.635i
0.545367	0.545367

Panel E: Johansen Cointegration Rank Test (Trace)

Null hiphthesis	Eigenvalue	Trace statistics	0.05 Criticial value	P-value
None *	0.575805	18.87043	15.49471	0.0149
At most 1	0.040200	0.861638	3.841466	0.3533

Panel F: Johansen Cointegration Rank Test (Maximum Eigenvalue)

Null hypothesis:	Eigenvalue	Max-Eigen Statistic	0.05 Criticial value	P-value
None *	0.575805	18.00879	14.26460	0.0122
At most 1	0.040200	0.861638	3.841466	0.3533

Notes: a The null hypothesis in the Serial Correlation LM Test is that there is no serial correlation at lag of order h of the residuals; b The Normality Test is the Urzua (1997) system normality test with the null hypothesis of the residuals are multivariate normal; c The White Heteroscedasticity Test takes the null hypothesis of no cross terms heteroscedasticity in the residuals; d VAR stability test results show that no roots of characteristic polynomial are outside the unit circle; is the Chi-square distribution; d.f. stands for degree of freedom.

Both the trace and the max-eigenvalue test statistics indicate one cointegration relationship among the variables. Therefore, we conclude that there is a cointegrating relationship among the variables. From the Johansen cointegration test results, we couldn't reject the hypothesis of one cointegration relationship. We also employed the Engle-Granger type DOLS, FMOLS and CCR methods to test whether the variables are cointegrated. The test results revealed that the variables are cointegrated (to save space we do not report the test results but they are available upon the request). Finally, we estimate FMOLS, DOLS and CCR methods as a further robustness check alongside the VECM in estimating the long-run coefficients. We bring together the estimated long-run coefficients from all the four different methods for the comparison purpose in Table 4.

Table following on the next page

Table 4: Estimation and testing results from the different cointegration methods

Method	VECM	DOLS	CCR	FMOLS
		Panel A: Long-run equations		
Regressor	Coef. (Std. Er.)	Coef. (Std. Er.)	Coef. (Std. Er.)	Coef. (Std. Er.)
EDUEX	1.142 (0.013) ***	1.151 (0.117) ***	1.128 (0.020) ***	1.132 (0.021) ***

Panel B: Residuals diagnostics tests results for VECM

$Q_{AR(2)}$	2.544 [0.863]
LM_{SC}	3.241 [0.518]
χ^2_{HETR}	16.06 [0.587]
JB_N	4.993 [0.288]

*Notes: Dependent variable is GDP; Coef. and Std. Er. denote coefficient and standard error; *, ** and *** indicate significance levels at 10%, 5% and 1%; Probabilities are in brackets; Q_(AR(2)) = Q-statistic from testing AR(2) process; 〖LM〗_SC = Lagrange multiplier statistic of serial correlation test; χ_HETR^2 = Chi-squared statistic for heteroscedasticity test; 〖JB〗_N = Jarque-Bera statistic for testing normality; In VECM, Jarque-Bera statistic was taken from the option of Orthogonalization: Residual Correlation (Doornik-Hansen).*

As it can be seen from the Table 4 the long-run coefficients from the different methods are statistically significant. Additionally, the residuals of the estimated specifications successfully pass the residuals diagnostics tests which is another indication of the robustness of the estimation results. We give priority to the VECM and discuss it little bit in detail as it outperforms all its counterparts when there is one cointegration relationship between variables, which is the case in our research here. Table 4 reports the impact of government education expenditures on economic growth in long run. We find that EDUEX has a positive and statistically significant impact at 1% level on economic growth. The results reveal that a 1% increase in government education expenditures, increases economic growth by 1.14%. Our results are consistent with the findings of Mukit's (2012) for 14 Asian countries, Idrees and Siddiqi (2013) for G-7 countries, Owusu-Nantwi (2015) for Ghana, Otieno (2016) for Kenya for Kenya and Sunde (2017) for Mauritius.

4. CONCLUSION

The study examines the relationship between government expenditures on education and economic growth. For this purpose, different cointegration techniques (Johansen, DOLS, FMOLS and CCR) and the VECM method were used to estimate the long run relationship among the variables. Our empirical evidences confirm that cointegration exists among the variables. This implies that there is a long run relationship between economic growth and government expenditures on education in Azerbaijan. Results of the estimations revealed that government education expenditures has statistically significant, positive impact on economic growth. This implies that 1% increase in EDU will increase economic growth 1.14%. The main finding and related policy implication of this study are a concerted effort should be made by policy makers to boost educational investment in order to accelerate economic growth.

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