ASERC Journal of Socio-Economic Studies

Journal homepage: www.ajses.az Volume1, Number 1, (2018) Pages 60-72

MODELLING THE RETURN TO PUBLIC EXPENDITURES ON EDUCATION: THE CASE OF AZERBAIJAN

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ABSTRACT

Building strong educational infrastructure and increasing the human capital potential is one of the major goals in public policy decision making process. This issue is much more crucial for resource-rich economies to reach sustainable development in the long-run. In this context, public expenditure on education is the most important source. This paper investigates long-run impact of public expenditures on education over non-oil GDP in Azerbaijan for 2000Q1-2017Q3 by employing ARDLBT approach to cointegration. Empirical results displays existence of long-run association. The impact of public expenditures on education over non-oil GDP is positive, economically and statistically significant in the long-run. To achieve diversified economy with strong non-oil sector, Azerbaijan should continue to invest to human capital development and public expenditures on education should be at the focus while allocating budget resources.

Keywords: Public expenditure; education; non-oil GDP; human capital development; Azerbaijan

Introduction

Governments around the world should formulate and implement policy for public spending. This policy can have major influences on economic growth, income distribution, and human capital development; therefore they tend to be at the center of economic and political arguments. Patterns of education expenditure affect economic growth in several ways. First, education increases the human capital in the labor force, which increases labor productivity and thus transitional growth toward a higher equilibrium level of output. Second, education may increase the innovative aptitude of the economy, and additional knowledge on new technologies, products, and processes promotes growth. Third, education may facilitate the diffusion and transmission of knowledge needed to understand and process new information and to successfully apply new technologies devised by others, which again promotes economic growth.

The main purpose of the research is to focus on efficient economic relations between economy and education in the world developing countries, in an assessment of Azerbaijan. Education is one of the most important determinants of economic growth. It plays a major role in the economic growth of world countries, both developed and developing. Countries of the world cannot reach sustainable economic development without considerable investment in education; therefore they spend some part of public expenditure on education. Higher education is the major degree of education that after acquiring this, countries could get economic growth. Human capital is created initially by providing individuals with schooling and this competence is driving their employability and growth, relatively. Improving educational infrastructure and enhancing the quality of education are the keys to develop non-oil sector and maintaining sustainable economic growth for Azerbaijan. Returns to investment in education based on human capital theory have been valued since the late 1950s. Human capital theory claims that people invest in education to accumulate human capital, enhance personal productivity, and in return receive higher life-cycle earning profiles. The economic return to education not only influences the individual's educational superior but also effects the labor superiority of the whole society, a significant aspect for the total performance of the economy (Chuang and Lai, 2010).

Barrow and Rouse examined whether the rate of return to education varied by race and ethnicity (Barrow and Rouse, 2005) while Zeher (2007) observed the roles of education and gender with regard to the income gap. Mathur and Mamgain (2002) find the effect of both practical and common education on gross domestic product to be positive with that of the previous being more influential. More selective rates of return estimate review focusing on the causality debate between schooling and earnings (Card, 2001). The present studies focuses on the personal return, which is the increase in personal income caused by continuing through educational levels. The projected educational returns are all private rates of return to education (Fan and Zhang, 2015). The rate of return to education influences individual educational choices and student properties accessible at colleges and universities. It is obvious that people will spend more money on education if it improves their personal earnings (Zhong, 2011).

According to the human capital theory (Becker, 1964; Mincer, 1974; Schultz, 1961), individual productivity can be increased by education, and thus lead to more effective activities. In this sense, education might be able to help entrepreneurs learn and accumulate new knowledge and make good decisions, and thus it contributes to business success (Davidsson and Honig, 2003). Human capital and entrepreneurship are both regarded as important growth engines for developing countries. However, little attention has been given to the relationship between education and entrepreneurship in developing countries (Hu, 2015).

The competitiveness of the national economies depends more and more on their capacity to produce and use knowledge. Knowledge, education, information and innovation are the main indicators of the economic growth at the globalization process. Knowledge economies use information and intelligence to unlock opportunity and power prosperity. Academic institutions, investors and business R&D are important foundations for all knowledge economies, but so too are the people developing and applying the innovations commercially (Cavusoglu, 2016). It's a future where ideas are the new linen; software development, the new ship building and brainpower our new muscle (Trzcielinski, 2015).

Educational policy inducements should typically focused on better quality, namely academic self-esteem and school motivation, school environment, community involvement, healthy lifestyle habits, preservation and drop-out rates, specialized technical training, and non-gender discrimination (Gajardo, 2017).

Legislative conventions on educational method encourage capacity by the determination of the decision makers in our society. Educational policy and its key execution approaches lead to effective and adequate consequences about education and encouraging gifted children (Cuc, 2015). This policy must hence assimilate economic knowledge and education of labor in order to build a path capable of giving young people to the world of work in the shortest time potential. It is also important to present scholastic and qualified orientation schemes in addition to work settlement platforms in every level of education (Refrigeri and Aleandri, 2013).

1. Azerbaijan's educational infrastructure and policy review

Providing sustainable development, increasing competitiveness in the international arena, creating innovative and entrepreneurial economic systems are linked to the development of more human capital in the 21st century. The uniqueness of this field is its long-term commitment to passive investment and, in many cases, hampers the individual funding of education. Especially in poorly developed countries, the social welfare of the population is a major factor preventing parents from allocating funds for educational purposes. For this reason, in most countries, primary and secondary levels of education, and sometimes even higher, are funded by the state.

Clearly, the economic transition and war with Armenia had damage to all sectors of economy, in particular to the education sector. With the breakup of the Soviet Union, Azerbaijan was re-established as an independent country in October 1991. At the time of independence, it faced a unique combination of political, military, economic, and social problems, all of which competed (along with the education sector) for public resources. One of the most prominent issues that new government faced is Human Development Index (HDI). While during the Soviet Union era, government intervention protected the majority from extreme poverty, independence was first accompanied by economic, political, and social discord, which resulted in the breakdown of many structures in society and a worsening of social indicators (UNDP, 1998). Table 1 displays human development index trends in Azerbaijan over past 25 years.

Azerbaijan's HDI value and rank Azerbaijan's HDI value for 2015 is 0.759— which put the country in the high human development category - positioning it at 78 out of 188 countries and territories. Between 1995 and 2015, Azerbaijan's HDI value increased from 0.609 to 0.759, an increase of 24.6 %. Table 2.1 reviews Azerbaijan's progress in each of the HDI indicators. Between 1990 and 2015, Azerbaijan's life expectancy at birth increased by 6.0 years, mean years of schooling

increased by 1 year and expected years of schooling increased by 2.0 years. Azerbaijan's GNI per capita increased by about 87.8 % between 1990 and 2015.

Table 1. Azerbaijan's HDI trends over 1990-2015

	Life expectancy at birth	Expectedyears of schooling	Mean years of schooling	GNI per capita (2011 PPP$)	HDI value
1990	64.9	10.7	-	8,741	-
1995	64.6	10.0	10.2	3,394	0.609
2000	66.9	10.4	10.6	4,492	0.642
2005	69.0	10.7	11.7	7,118	0.682
2010	70.5	11.7	11.0	15,123	0.741
2011	70.6	11.8	11.1	14,593	0.742
2012	70.7	11.9	11.2	14,670	0.745
2013	70.7	12.2	11.2	15,860	0.752
2014	70.8	12.7	11.2	16,433	0.758
2015	70.9	12.7	11.2	16,413	0.759

Source: Human Development Report, UNDP, 2016

In accordance with National Strategy for the Development of Education in the Republic of Azerbaijan, the main areas of activity of higher education and science are to participate in the process of formation of state policy on higher education, to coordinate and control the implementation of these concepts by higher education institutions and their scientific structures within the scope of their authority. The main task in the field of higher education is to create the necessary conditions required to meet the requirements of state and society for highly qualified specialists, to implement a unified state policy in the training process of personnel with higher education in higher education institutions of the Republic, regardless of their subordination and ownership form, and to provide control over the compliance of education with the legislation and state standards. Table 2 shows the statistics about indicators of higher education in Azerbaijan over the last 5 years from 2012 till 2017.

Table 2. Dynamics of Azerbaijan's education indicators

Indicators	2012	2013	2014	2015	2016	2017
Number of common general educational institutions	4508	4505	4475	4462	4452	4438
The number of pupils in general education institutions *(thousand persons)*	1285	1289	1322	1353	1462	1520
The number of teachers in general education institutions *(thousand persons)*	163.4	162.96	160.7	158.1	156.8	155.8
Number of higher educational institutions	52	52	53	54	51	51
Number of students in higher education institutions *(thousand persons)*	145.6	151.3	151.3	161.2	163.8	167.7
Number of enterprises implementing PhD programs	177	180	196	189	190	205
Number of trainees in the Doctoral Program	2012	2496	2875	2876	2723	2723

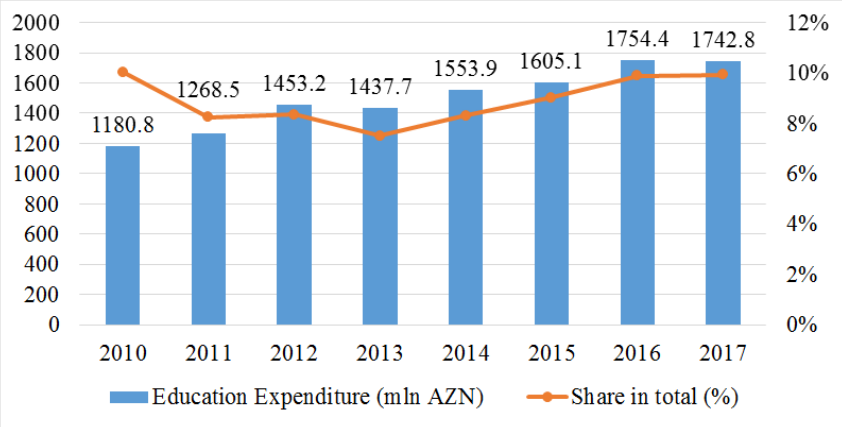
Source: The State Statistical Committee of the Republic of Azerbaijan

Higher education institutions are the main contributors that to breed human capital. Thus, developing countries attempt to increase numbers of schools, colleges, higher education institutions. It has therefore become a very important part of every government policy that countries used.

It is a well-established fact that education is a good with positive externality. A person's education does not only benefit him or her, but also benefits other people who live or work in that person's community. (In economic literature it is known as "spillover" effect) Since education is one

of the major determinants of a person's future earnings, providing free access to education for children from poor or underprivileged families can significantly contribute to the reduction of poverty and inequality in wealth distribution in future. As in the case of any other good with positive externality, major implication of having spillover benefits is that without government interventions education market is likely to "fail" by producing less than is socially optimal. In other words, the education level of society is likely to be higher with government interventions than without them. This is one of the major arguments that justify public financing of education. The figure 1 clearly denotes amount of money which is funded by state budget which increase in Azerbaijan, due to importance of acceptance in the state level.

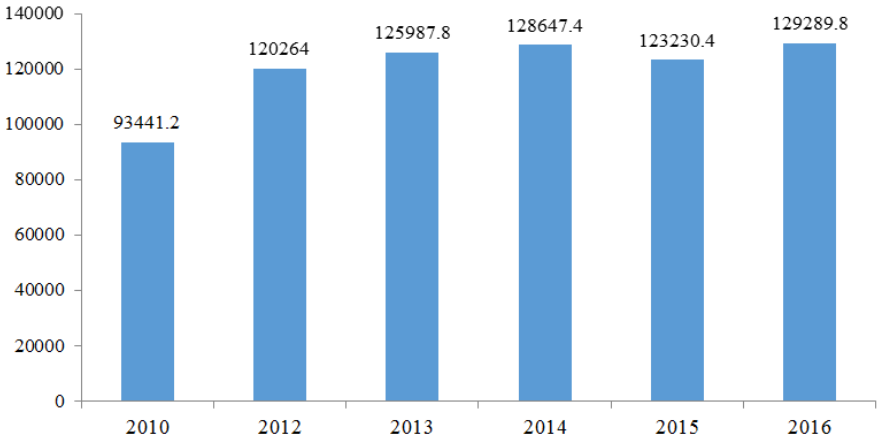
Figure 1: Dynamics of education expenditures from the state budget



Source: Authors' own completion

From 2010 until 2017 amount of education expenditures raise almost 550 million AZN. As it is seen from figure this inclination is not extremely massive, but it is noticeable. Beginning from 2010 to 2013 expenditure's total share in percentage decreases, however between 2013 and 2017 this ratio increase almost 2 percent.

Figure 2. Total expenditure on R&D in Azerbaijan (thousand AZN)



Source: The State Statistical Committee of the Republic of Azerbaijan

Education has been considered as an instrument by the countries in order to arrive to their economic targets. It can influence economic growth in various ways: it is transformed in increased labor productivity by collecting knowledge and skills, by facilitating R&D, the technological progress and innovation. To raise fund is required for the development of science, technology

and innovation in Azerbaijan. R&D covers basic research, applied research, and experimental development.

The figure 2 provides information about R&D expenses in Azerbaijan ranging from 2000 to 2016. Data which is provided from the State Statistical Committee of the Republic of Azerbaijan reveals that total expenditure on R&D increase in the given 6 years. In 2016, this figure is in its highest value. It is crystal clear that government also takes research expenditures into consideration and invest in R&D.

As it is seen from table 3, research on technical areas is higher comparison with other fields of science. From 2001 until 2016, amount of public expenditure increase noticeable. Technical and natural fields are the fields of science that public expenditure is higher than other areas. However, agricultural, social, and medical fields are the ones there are not adequate number of research on them. Thus, this statistical data should be shown in the educational policy in order to raise fund for these fields. Social, medical and agricultural fields should be financed by the government and companies.

Table 3. Volume of R&D expenditures by fields of science (thousand, AZN)

Fields	2000	2005	2010	2014	2015	2016
General	13320.8	26468.1	87816.1	118 465.9	118 643.3	120 782.3
Natural	2 164.3	6 901.3	23406.2	28 094.0	26 917.3	30 696.6
Technical	7 131.3	11 402.4	38030.7	57 498.6	56 706.7	52 476.7
Medical	603.0	1561.5	3 635.9	7 881.0	10 020.8	8 949.3
Agricultural	912.5	1 738.6	7 601.2	6 804.6	6 808.4	7 611.6
Social	1 533.6	2 126.5	8 020.8	8 133.5	6 783.0	9 097.2
Humanities	976.12	2 737.8	7 121.3	10 054.2	11 407.1	11 950.9

Source: The State Statistical Committee of the Republic of Azerbaijan

The following strategies are some of the education strategies for Azerbaijan from 2005 till 2020. *Development program on the provision of inclusive schools of the Republic of Azerbaijan with teaching staff for 2005-2009*: The main goal of the program is to successfully solve the problem connected with the lack of teaching staff at inclusive schools of Azerbaijan within the next five years. Moreover, the prospective activity includes some other problems as well. In fact, today the existence of unqualified teaching staffs at schools and their involvement to the special training courses to improve their skill, as well as increase the quality indicators are being taken into account. What is more, one of the goals is the preparation of small specialists to ensure the citizens with workplaces in the future.

The formation of a modern education system: In 2012-2020, the share of the funding for education in GDP will increase from year to year and reach the appropriate indicator in developed countries. Stimulating mechanisms will be created to increase the quality of education, and the financing of grants that promote per capita funding and innovative activity will be expanded. Management will continue to be improved in education and a management model that ensures the involvement of all interested sides will be prioritized. This will be carried out through reforms to increase the independence of all kinds of education institutions, to manage education centers in a state-public form through the broad involvement of the public (parents, pupils, students, local community, etc.), to apply other modern management technologies, etc.)

2. Data and Methodology

Brief description of the model variables are presented below:

Real non-oil GDP (RGDPN) is increase adjusted sum of the value added, measured in million manat which was produced in the economy without the oil sector. Quarterly statistics is announced by the Central Bank of Azerbaijan (CBAR) and State Statistical Committee of Azerbaijan. We use the data from the statistical statements of CBAR which could be reached online at http://www.cbar.az/pages/publicationsresearches/statistic-bulletin/.

Education expenditures (EduExp) contains spending funded by government from the central budget, adjusted for human capital development, and measured in millions of manat. Three-monthly data is obtained from CBAR record.

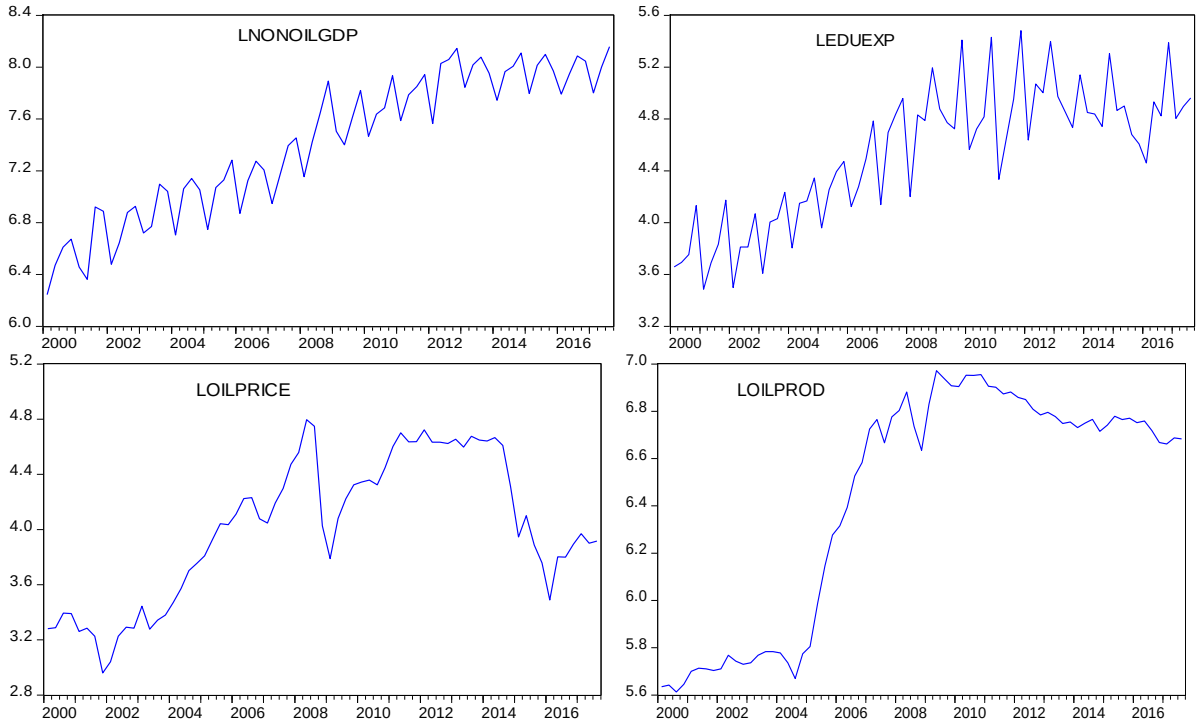
Table 4. Descriptive statistics of the variables

Variable	Obs.	Mean	Maximum	Maximum	Std. Dev.	Sum
EduExp	71	105.4995	240.1600	32.65000	51065156	7490.463
RGDPN	71	1892.584	3489.422	514.9495	907.6874	134373.5
OPrc	71	62.58765	121.1000	19.30000	29.98771	-
OPrn	71	690.7821	1066.000	274.0000	279.3999	49045.53

Source: Authors' own completion

Oil production (OPrn) is the statistics of Azerbaijan's quarterly oil production, thousands barrels per day in average. The data is obtained from Trading Economics database in monthly basis (retrieved from http://www.tradingeconomics.com/azerbaijan/crude-oil-production) and transformed to quarterly data.

Figure 3. Time profile of the logs of variable



Source: Author's own completion

Oil price (OPrc) is the quarterly world average price of one barrel oil taken from index mundi database. Originally, the data is monthly which was changed to quarterly frequency by using simple average method. For inflation modification, Consumer Price Index (CPI) method is used.

Based on employed quarterly real data, time profile of the logs of variables is provided in figure 3.

Here, Autoregressive Distributed Lag Bounds Testing (ARDLBT) Approach is engaged to co-integration technique to guess long run relationship and short run dynamics between fiscal policy indicators and non-oil GDP. Before directing the approach, the order of integration of all included variables should be determined by using Augmented Dickey-Fuller (ADF hereafter) unit root tests which tests non-stationarity in a given time series (see Dickey et al. 1981). Thus it is better to overview ADF unit root tests shortly before discussing the practice of ARDLBT approach to co-integration.

For a time series variables which is expressed as y, the regression below provides ADF statistics value as the *t*-ratio on *b1.*

$$\Delta y_t = b_0 + \psi trend + b_1 y_{t-1} + \sum_{i=1}^{k} \alpha_i \, \Delta y_{t-i} + \varepsilon_t \quad (1)$$

Here, b_0 is a constant term, and Δ is first difference operator. Number of lags is denoted by k, trend shows linear time trend while i is the lag order. As the last one, ε_t is white noise residuals.

Autoregressive Distributed Lag Bounds Testing (ARDLBT) Approach

This method is given in Pesaran et al. (2001) as an alternative approach to the co-integration. In comparison with alternatives, ARDLBT method is preferred due to some advantages such as applicability in small samples easily by using Ordinary Least Squares (OLS) without any endogeneity problem with both I(1) and I(0) series or combination of them, and concurrently estimating long-run and short-run coefficients (Pesaran et al. 2001, 2006, Sulaiman et al. 2010). Because of relatively small number of observations, and when ADF unit test results are considered, this approach is more friendly to employ for this research as well. Subsequent phases constitute the application of ARDLBT approach (Pesaran et al. 2001).

Construction of an Unrestricted ECM.

$$\Delta y_{t=c_0+} \theta y_{t-1} + \theta_{yxx} x_{t-1} + \sum_{i=1}^{n} \omega_i \, \Delta y_{t-i} + \sum_{i=0}^{n} \varphi_i \, \Delta x_{t-1} + u_t \quad (2)$$

Here, y is the dependent, and x is the independent variable while u represents white sound errors. c_0 denotes the drift coefficient where θ_i represents long-run coefficients, and ω_i and $\varphi_i$are short-run coefficients.

Testing existence of co-integrating relationship by using Wald-test (or the F-Test) on θ_i the coefficients.

After constructing an Unrestricted ECM, we should test for the null hypothesis of "there is no integration" which is defined as H_0: $\theta_1 = \theta_2 = \ldots = \theta_n = 0$ while the alternative hypothesis is the opposite expression.

Note that we can reject the null hypothesis if the value of computed F-statistic from the sample is higher than the highest level of the critical value under a given significance level. If the value is below than the lowest level of the serious level consistent to a level of importance, we can fail to reject the null hypothesis. The test results will be indecisive if computed F-statistic value from the sample is between lowest-and-highest bands of the critical value.

However, F-statistics in the ARDLBT co-integration test have non-standard distribution unlike usual F-statistics. Therefore, researchers should employ the critical values of F-distribution calculated by Pesaran and Pesaran [see: Pesaran et al. 1997 or Pesaran et al., 2001], not the conservative critical values of F- distribution.

If there is co-integrating relationship among the variables, we can estimate/calculate the long-run coefficients.

Note that these coefficients can be calculated from the equation (2) by implementing Bewley (1979) transformation which means manually setting $c_0 + \theta y_{t-1} + \theta_{yxx} x_{t-1}$ to zero and finding y as

$$y = -\frac{c_0}{\theta} - \frac{\theta_{yxx}}{\theta} x + u \quad (3)$$

Current literature includes dissimilar views related to the validity of critical values of F-distribution in the cases of small and large size samples. Despite of calculation of the upper and lower critical values of F-distribution by Pesaran and Pesaran (1997) by employing sample sizes of 500 and 1000 even 20 000 and 40 000 replications respectively, these values are challenged to be applicable for small sample sizes in Narayan (2005). Narayan (2004, 2005) argues that critical values by Pesaran and Pesaran (1997) are not for small sample sizes. In order to justify his argument, Narayan has compared his own critical values on 31 observations with the critical values in Pesaran et al. (2001), with four regressors and at the 5% level of significance. The results supported Narayan's argument. That is why critical values in Narayan (2005) will be also employed in our ARDLBT co-integration test in order to avoid the issues due to relatively small sample size.

3. Empirical results

Unit root test results

Table 5 reports ADF unit root tests results with-and-without trend. Test results disclose that variables are always I (1) with or without including the trend. Because ARDLBT method can be estimated by using combination of I(0) and I(1) variables, we can proceed the analysis to the next estimation stage.

Table 5. ADF unit test results

Variables	Intercept		Trend and intercept	
	I(0)	I(1)	I(0)	I(1)
RGDPN	-1.71	- 5.86 ***	-0.73	-6.14***
EduExp	-1.23	- 16.44 ***	-1.50	16.43***
OPrc	-1.66	- 6.81 ***	-1.22	- 6.87***
OPrn	-1.59	- 6.21 ***	-0.25	- 6.34***

*Note: *, ** and *** indicate importance level of 10%, 5%, and 1% levels, correspondingly. Lag length is defined automatically based on Schwarz material criteria (SIC) of 10 maximum lags. P-values are one-sided MacKinnon (1996) values.*

In this research, we have four independent variables. Note that we coded non-oil GDP, budget expenditures, non-transfer revenues, oil prices, and oil production as RGDPN, RBE, RBRN, OPrc, and OPrn, respectively. Therefore, equation (2) is modified below in this case:

$$\Delta y_t = c_0 + \theta y_{t-1} + \theta_{yx} x_{t-1} + \theta_{y\delta} \delta_{t-1} + \theta_{y\vartheta} \vartheta_{t-1} + \theta_{yk} k_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta y_{t-i} + \sum_{i=1}^{n} \beta_i \Delta x_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta \delta_{t-i} + \sum_{i=1}^{n} \pi_i \Delta \delta_{t-i} + \sum_{i=1}^{n} \varphi_i \Delta k_{t-i} + u_t \quad (4)$$

Where, y_t- Non-oil GDP (RGDPN), x_t- Budget Expenditures (EduExp), ϑ_t- Oil Prices (OPrc), and k_t Oil Production (OPrn). Additionally seasonal dummies (@SEAS(1), and @SEAS(4)) are included to the model to control for seasonality effects.

Note: k is a lag order while AIC and SBC are Akaike and Schwarz information criteria respectively. χ^2_{SC} (1) and χ^2_{SC} (4) are LM statistics for testing no serial correlation against lag orders 1 and 4 respectively. Probabilities are in brackets.

At first stage, we should determine optimal lag length which will result minimum value for the lag selection information criteria with non-correlated residuals. For this purpose, equation (4) is estimated with different lag lengths ranging from zero to four.

Table 6 provides the results of optimal lag search process. From the table 6, it may be easily seen that only lag order of one can be preferred. Thus, remaining models suffer the problem of serial correlation of residuals at lag orders one or four, or in both cases. Because our data is quarterly, it is important not to have serial correlation problem at lag orders one and four.

Table 6. Statistics for choosing optimal lag size for ARDL.

i	AIC	SBC	$\chi^2_{SC}(1)$	$\chi^2_{SC}(4)$
0	-1.586075	-1.264861	16.968 [0.0001]	5.065 [0.0015]
1	-1.688518	-1.235221	7.202 [0.0096]	2.622 [0.0454]
2	-1711024	-1.123507	10.957 [0.0018]	3.249 [0.0198]
3	-1.680485	-0.956557	5.683 [0.0215]	3.631 [0.0127]
4	**-1.626612**	**-0.764021**	**0.857 [0.3602]**	**2.024 [0.1117]**

Source: Authors own elaboration.

Therefore, lag order of 4 is optimal to estimate the equation (4). Table 7 provide estimation results and diagnostics test statistics for final ECM in which insignificant short-run coefficients are removed.

In the estimation results, coefficient of the lagged long-run dependent variable is negative, less than 1 and statistically significant which means that stability condition is maintained in the model. Approximately, 31% of short-run deviations from long-run equilibria is adjusted within one quarter. Meanwhile, residual diagnostics test results displays no existence of serial correlation, heteroscedasticity or functional misspesification problem. According to Jarque-Bera test value, residuals are normally distributed.

Therefore, we can test existence of long-run relationship or cointegration among the variables by employing Wald test. Test statistics and critical values is given in the table 8. Calculated F-Statistic value is 7.751.

Table 7: ARDL Specification and Residuals Diagnostics tests results

Panel A: *The estimated final ARDL Specification*			
	Coefficient	**Standard Error**	**p-values**
$\ln(RGDPN)_{t-1}$	-0.314577	0.05937	0.0000
$ln(Edu\_exp)_{t-1}$	0.275874	0.087060	0.0026
$\ln(oprn)_{t-1}$	0.001424	0.065431	0.9827
$\ln(oprc)_{t-1}$	0.007937	0.038674	0.8382
$\Delta\ln(oprn))_t$	-0.281032	0.190575	0.1465
$\Delta\ln(oprc))_t$	-0.162134	0.076292	0.0384
@SEAS(1)	-0.280801	0.064683	0.0001
@SEAS(2)	-0.096191	0.065580	0.1486
Intercept	1.206072	0.238317	0.0000
Panel B: *Statistics and Residuals Diagnostics tests results*			

σ=0.084252; $\chi^2_{SC}(4)$=0.653623 [0.5246]; $\chi^2_{ARCH}(4)$=0.565157 [0.6889]; χ^2_{HETR} = 0.816948 [0.6476]; JB_N = 3.259641 [0.1959]

Notes: Dependent variable is $\Delta\ln(RGDPN)_t$; σ is standard error of regression; χ^2_{SC}, χ^2_{ARCH} and χ^2_{HETR} denote chi-squared statistics to test the null hypotheses of no serial correlation, no autoregressive conditioned heteroscedasticity, and no heteroscedasticity in the residuals; JB_N indicate Jarque-Bera statistics to test the null hypotheses of normal distribution and no functional mis-specification respectively; Probabilities in brackets; Method: Least Squares; Estimation period: 2000Q1-2017Q3

Table 8: F-statistic for testing an existence of cointegration in ARDLBT approach

The sample F-statistic	Signi-ficance level	Pesaran et al. (2001) critical values		Narayan (2005) critical values	
		Low bound	Upper bound	Low bound	Upper bound
Null hypothesis: No cointegration					
	1%	3.65	4.66	3.451	4.764
***Fw* = 7.751318**	5%	2.79	3.67	2.589	3.683
	10%	2.37	3.20	2.204	3.210

Notes: *Fw* is the F-value of testing the null hypothesis that $\theta_i = 0$ in the Wald Test.Critical values are taken from the combination of 4 lagged level regressors, restricted intercept and no trend (See: Pesaran et al., 2001, pp. 300) and 60 observations (Narayan, 2005, pp. 1987).

Calculated F-Statistics value is substantially greater than upper bound of both Pesaran et al. (2001) and Narayan (2005) critical values. Hence, test results provide strong scientific justification for existence of cointegration in the model. Therefore, we can apply Bewley (1979) transformation to obtain long-run equation.

Equation (5) presents long-run coefficients normalized for *lrgdpn* in the model.

$$\ln(RGDPN)_t = 3.828 + 0.876 * \ln(\exp\_educ)_t + 0.003 * \ln(oprc)_t + 0.025 * \ln(oprn)_t - \\ -0.892 * @seas(1) - 0.305 * @seas(4) \quad (5)$$

According to equation (5), educational expenditures from the state budget affects non-oil GDP growth in Azerbaijan significantly and positively. More precisely, 1% increase in the volume of expenditure for education raises real non-oil GDP by approximately 0.88%, while holding other variables fixed, in average. The impact is statistically significant at 1% level of significance (see table 7). This level of relationship is economically and statistically strong which is also supported in previous findings. Before, Dehning, Aliyev and Nadirov (2016) and Aliyev and Mikayilov (2016) have investigated this relationship as part of their research and revealed very strong positive impact. It is surprising that empirical results no significant long-run effect of oil price and oil production over Azerbaijan's non-oil GDP. Significant long-run impact of public expenditures over non-oil GDP in Azerbaijan is also confirmed in Aliyev (2013), Aliyev and Nadirov (2016), Hasanov et al. (2016), Hasanov and Alirzayev (2016), Gurbanov et al. (2017), and Hasanov et al. (2018) among others. Because, this is not our major focus, we will not go to deeper analyses of this issue. It can be subject to other empirical studies. Most probably, it is due to pass-through effect over public expenditures. Note that, Aliyev, Dehning and Nadirov (2016) has also revealed insignificant effect oil-related factors over non-oil GDP.

Conclusion and Discussion

In modern economics, better human capital is the most important factor to achieve sustainable development. To build Knowledge Based Economy is the priority for the officials. In this context, having better education infrastructure is considered as the base for development of knowledge based economy. That is why education policy or more specifically, public expenditure on education is very crucial to maintain long-term and sustainable satisfactory economic performance.

A lot of theoretical and empirical studies are devoted to the investigation of the return to education. One aspect of this is the elasticity of national income to public expenditure on education. For a resource rich country such as Azerbaijan fiscal channels are the major body of transmission mechanism for development of non-resource sector on the bases of easy gained resource reve-

nues. Azerbaijan has a chance to use resource revenues for investing to education which has been promoted by top of the government for more than one decade. After 2005, excessive expansionary fiscal policy is implemented (Aliyev and Gasimov, 2018) which has been a challenging issue to keep public expenditure increase as before. Therefore, the impact of public expenditure on education over non-oil sector performance is highly important to be investigated in order to provide scientific evidence about its importance.

This article is devoted to investigation of the association between public expenditure on education and non-oil GDP in Azerbaijan for 2000Q1-2017Q3 by employing ARDLBT approach to cointegration while controlling for the impact of oil related factors – oil price and oil production. Empirical results present that there is cointegration among variables and long-run impact of public expenditures on education over non-oil GDP of Azerbaijan is economically and statistically significant. 1% increase in amount of education expenditures from the state budget raises the volume of output in non-oil sector by approximately 0.88% while holding other factors fixed, in average. The margin of elasticity coefficient displays the strength of the relationship of multiplication effect of education expenditures in Azerbaijan.

Therefore, the importance of investing to education is vital and its role in stimulating non-oil sector is empirically proven once more. To maintain macroeconomic stability, Azerbaijan government should increase effectiveness of attempts towards diversification of economy and decreasing dependency from oil sector. In this context, investing to education should be considered as the priority which allows to develop human capital quality and therefore stimulate non-oil sector. This also the key issue towards building a knowledge based economy.

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