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Does the Budget Expenditure Composition Matter for Long-Run Economic Growth in a Resource Rich Country? Evidence from Azerbaijan

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Abstract *This study investigates the role of budget expenditure composition over Azerbaijan's non-oil economic growth in the long-run by classifying public spending as capital, social and other expenditures. Authors' employ ARDLBT approach to co-integration for the period of 2000Q1-2014Q4 to estimate long-run contribution of each spending category before-and-after the oil boom while controlling for oil-related factors. Empirical results endorse the validity of long-run association among variables. Results concluded insignificant negative impact of capital expenditures, and significant negative impact of other expenditures. However, social spending has statistically and economically strong positive impact over the non-oil output growth. Therefore, research findings confirm that public expenditure composition significantly matters for long-run non-oil economic growth, and social expenditures have the greater positive impact in a resource-rich economy, Azerbaijan. Research results are highly useful for the government officials to consider while planning the expenditures in order to minimize negative response of non-oil sector to the fiscal contraction.*

Key words Fiscal policy, public expenditure composition, non-oil economic growth, Azerbaijan
JEL Codes: E62

1. Introduction

Since Keynes, the impact of public expenditures over economic growth has been subject to a lot of theoretical (Arrow and Kurz, 2002; Barro, 1990; Lee, 1992; Devarjan *et al.,* 1996; Chen, 2006; Economides *et al*., 2011; among others) and empirical studies (Landau, 1986; Barro 1991; Foster and Henrekson, 2001; Cooray, 2009 etc.). Nevertheless, there is not commonly adopted view on the direction of this relationship. In this respect, scholars separate public expenditures as productive and non-productive (Sturm and Haan, 1995; Glomm and Ravikumar, 1997; Kneller *et al*., 1999). According to Carboni and Russu (2013), infrastructure expenditures and expenditures on education, training and the law system are productive while use of budget resources for national defense, building of national parks, and implementation of social programs are non-productive. In case of excess use of resources, seemingly productive expenditures could also be less effective or unproductive (Devarjan *et al*., 1996). Analyzing economic growth effects of public expenditure allocation is important to formulate the economic policy for long-run period (Colombier, 2011).

Certainly, contribution of public expenditures to economic growth of countries differs due to differences in allocation and efficient use of budget revenues. In this sense, classification of public expenditures as productive and non-productive seems to be case sensitive which makes rational allocation of resources across different expenditure units more crucial.

In resource rich countries, composition of budget expenditures is also important to develop non-resource sector of the economy and avoid negative symptoms of resource based economic performance, well known as resource curse in the literature. Such economies are faced with the issue of if the natural resources are blessing or curse, investigated in many studies (Newberry, 1986; Gelb, 1988; Lane and Tornell, 1996; Sachs and Warner, 1997; Hasanov, 2013a among others). The main problem related to the budget expenditure efficiency arises in such economies when governments use the revenues somehow to reduce discontent of the people. Kolstad and Soreide (2009) underlines corruption issue mainly in the form of rent-seeking and patronage as the main reason behind bad economic performance in resource rich countries.

Many studies also emphasize the role of political-institutional factors (Talvi and Vegh, 2005; Alesina, Campante and Tabellini, 2008) and corruption (Andersen and Aslaksen, 2008; Dietz, Neumayer, and Soysa, 2007) behind fiscal policy behavior in such economies.

As a resource rich country, Azerbaijan thanks to its rich oil and gas reserves, had been living oil boom period of its history since 2005 until the end of 2014 (Aliyev and Gasimov, 2016). In parallel to increasing revenues from oil industry, the amount of budget expenditures also flew upward sharply within this period. However, the country is challenged with lowering oil prices since the end of 2014 and resource dependence has also affected fiscal policy behavior of the government. And elimination of “unnecessary” expenditures is priority for Azerbaijan while building new budget expenditure allocation strategy for the near future.

Therefore, investigation of public expenditure productivity and efficiency of expenditure allocation is necessary for Azerbaijan. Here, we hypothesis that *public expenditure composition significantly matters for long-run non-oil economic growth (1),* and *social expenditures has the greater positive impact in resource-rich economies (2)*.

2. Theoretical justification

Direction of causality between public expenditures and economic growth has been subject to the studies under the validity of Wagner's law, and Keynesian hypothesis, and empirically tested both for developing and developed countries. The conceptual framework of both Wagner's law and Keynesian hypothesis could be explained by the classical view of Aggregate Demand and Aggregate Supply (AD-AS) model. However, each promotes different direction of causality. Thus, in Wagner's law it is hypothesized that public expenditure is an endogenous factor depended on the growth of national income (Wagner, 1890) while Keynesian approach considers public expenditure as an exogenous factor explaining economic growth (Keynes, 1936). According to Aliyev and Gasimov (2016), expansionary fiscal policy trend was mostly due to resource revenues and financed by direct transfers from the State Oil Fund of Azerbaijan Republic (SOFAZ), not because of non-oil national income growth. Here we take only non-oil GDP as the smaller part of national income in resource rich countries like Azerbaijan, and therefore only Keynesian hypothesis is tested.

Within AD-AS framework, as the government expenditures increases, it might shift the AD curve to the right. In other words, expansionary fiscal policy should result in better economic performance or higher economic growth and vice versa. When resource rich economies are analyzed, increasing public expenditures creates additional demand for non-resource national products under ceteris paribus condition. For Azerbaijan, this spending effect is empirically revealed in Hasanov (2013b). However, if public expenditures create demand mainly for imported products then generate less contribution to the national economy. Meanwhile, if increasing size of public sector expenditures pulls resources from the private sector (especially well-skilled human capital), non-resource private sector will be negatively affected. In this context, *public expenditure category with lower demand generation for imported products, and less resource movement impact will have greater impact*.

About the second hypothesis why social expenditures is expected to have greater impact, note that such spending is done mainly as payment of wages, pensions and other type of social responsibilities of the government, achieved directly by the citizens, turned back to the economy as the demand for consumption purposes. Moreover, this category expenditures is expected no to have substantial resource movement effect as much as remaining two categories. Simultaneously, corruption is another main factor to consider for expenditure productivity in resource rich countries, defined as "misuse of public or entrusted authority for personal gain" in Kolstad and Soreide (2009), is expected to lower efficiency much more in capital and other expenditures than the social expenditures. Because, social expenditure receivers could be considered as utility maximizers.

3. Literature review

Existing literature on the relationship between public expenditure and economic growth relationship has been studied broadly. In case of resource rich economies, resource revenues injected into the economy by using fiscal channels, especially in developing countries may lead to arise of Dutch Desease symptoms (Krugman, 1987; Auty, 2001), weak institutional development (Sala-i-Martin and Subramanian, 2003; Gylfason, 2004), and etc. Previous researches do not investigate only the impact of total budget expenditures, estimate effects of different budget expenditure categories over economic growth as well.

For example, Devarjan *et al.* (1996) employ OLS to estimate the data covering 43 developing countries for the period of 1970-1990. Their findings show that economic growth effect of current expenditures is positive and statistically significant while impact of capital expenditures is found to be negative. Gupta *et al.* (2005) have studied public expenditure composition factor in a sample covering 39 low-income countries for the period of 1990-2000, estimated by using Generalized Method of Moments (GMM). Their findings reveal that countries with concentration of public spending on wages demonstrate lower economic growth performance while capital and nonwage purchases dominated allocation of expenditures positively affects the growth. In case of Swiss, Colombier (2011) analysis the impact of budget expenditure composition over economic growth for 1960-2005 by employing an Autoregressive Distributed Lag (ARDL) model with an error-correction representation. Author's conclusion also confirms that expenditure composition matters for economic growth. Thus, public expenditures on transport infrastructure, education and administration stimulate output expansion which is crucial to consider in the context of tightening budget constraints (Colombier, 2011).

Ali *et al*. (2013) employ ARDL model to investigate the impact of public expenditure sub-categories in Pakistan for 1972-2009 by classifying that as development and current expenditures. Their finding reveals that development expenditure influences economic growth in Pakistan positively while current expenditure does not lead to higher growth performance.

Within endogenous growth framework, Gosh and Grogeriou (2008) use GMM techniques for panel data consisted by 15 developing countries for the period of 1972-1999 conclude with existence of statistically significant impact of both current (positive) and capital expenditures (negative) over the growth rate.

Because this research takes Azerbaijan's fiscal policy issues into consideration, previous studies on Azerbaijan should be reviewed. Employing Autoregressive

Distributed Lags Bounds Testing (ADLBT) approach, Hasanov and Alirzayev (2012) have investigated the impact of total budget expenditures over non-oil economic growth for 2001Q1-2012Q4 period and found out existence of significant positive relationship. Hasanov (2013a) also investigated this relationship by using single equation-based, ADLBT approach and system-based co-integration approach by Johansen (1988) and Johansen and Juselius (1990) for the period 1998Q4-2012Q3 ended with similar finding. While examining Dutch disease symptoms in Azerbaijan economy, Hasanov (2013b) discovered a “spending effect” in the economy created by budget expenditures. Existence of positive contribution of total public expenditures and/or its components is also found in Aliyev (2013) who analyzed oil-exporting countries including Azerbaijan, in Aliyev and Nadirov (2016a) who employed ARDLBT approach to cointegration for the period of 2000Q1-2015Q2.

Before, Abbasov (2013) has calculated optimal allocation of budget expenditures in Azerbaijan which maximizes GDP per capita growth. In this research, author employs OLS method to estimate the objective function, and Lagranje multiplier method to calculate optimum points for allocation across capital expenditures, expenditures for wage and pensions, and other expenditures for 2001:Q1-2008:Q4, and 2001:Q1-2012:Q3 period. Abbasov (2013) concludes with the optimal allocation proportion for *capital*, *wage and pensions*, and *other expenditures* respectively 26%, 25%, and 49% for 2001:Q1-2008:Q4, 22%, 18%, and 60% for 2001:Q1-2012:Q3 period.

Many empirical studies on Azerbaijan investigate the relationship in total basis or the impact of total budget expenditures rather than dividing them into different categories (Hasanov and Alirzayev, 2012; Hasanov, 2013a, 2013b; Aliyev and Nadirov, 2016a). Main limitation in Abbasov (2013) who applies this categorization is not controlling for oil related factors (oil prices, and oil production) supposed to be correlated with economic growth indicators which are included in our estimations. Moreover, Abbasov (2013) takes GDP per capita as the dependent variable covering production in both oil and non-oil sector of the economy. However, budget expenditures should not have direct impact over oil sector GDP, and development of non-oil sector is/must be priority for a resource rich country while allocating budget expenditures which is given as the dependent variable in this study. One more contribution presented by this research is covering wider period in analysis including latest statistics.

4. Methodology of research

4.1. Data

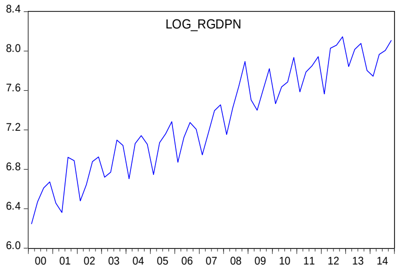
Used data for empirical estimations is quarterly for the period of 2000Q1-2014Q4. Non-oil GDP and all budget expenditure items are inflation adjusted by using CPI method with 2000Q4 as the base period. Definition of employed variables is presented below:

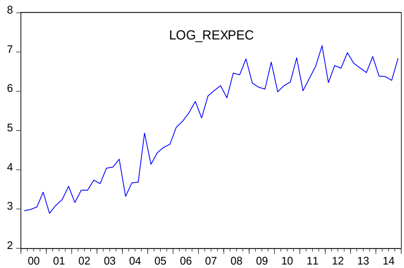
Real Non-oil GDP (RGDPN) is the amount produced output in the economy excluding oil sector contribution, measured in million manat. Data is obtained from the Central Bank of Azerbaijan (CBAR) database, provided in statistical bulletins of CBAR which could be reached online at http://www.cbar.az/pages/publications-researches/statistic-bulletin/.

Budget expenditures to the national economy (REXPEC) are the amount of capital expenditures from the state budget, measured in millions of manat. Yearly data is obtained from the State Statistical Committee of Azerbaijan Republic, and quarterly date of total budget expenditures is taken from the CBAR database. Then we found percentage shares of quarterly expenditures in total for all quarters, and simply calculate quarterly amounts for REXPEC by multiplying the shares of quarterly total budget expenditures by the amount of yearly REXPEC for each quarter.

It is noteworthy to express that quarterly data for remaining two other budget expenditure allocation items (expenditures for social-cultural activities, and other expenditures) employed in this research is also calculated by using the same methodology discussed above, and data source is the same.

Budget expenditures for social-cultural activities (REXPSOC) is the amount of budget expenditures spend for corresponding purposes, covering expenditures for education, health, social protection and security, and other type of expenditures used for social and cultural activities, measured in millions of manat. Note that education expenditures covers education costs from the central budget such as financing of general educational expenditures and other related institutions and events. Health expenditures comprises costs related to maintenance of hospitals, outpatient clinics and ambulatories, and other related services as well as costs related to applied research in the field of public services. Expenditures for social protection and security consisted of the amount of costs from the central budget for remuneration, pension and benefits, purchase of medicines, dressing materials, food products etc. for social purposes.





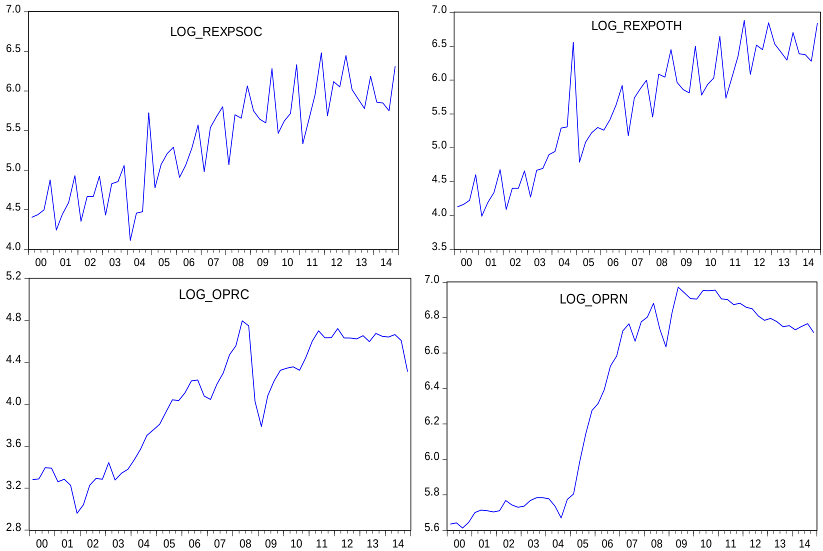


Figure 1. Time profile of the logs of variables

Other budget expenditures (REXPOTH) includes the amount of expenditures for science, maintenance of the judicial authority, law-enforcement and prosecution bodies as well as covers other types of costs not included within above mentioned categories, especially defense and security costs, measured in millions of manat.

Oil production (OPrn) presents quarterly oil production records in Azerbaijan, measured in thousands barrels per day, in average. Monthly data is taken from Trading Economics database (retrieved from http://www.tradingeconomics.com/azerbaijan/crude-oil-production) and converted to quarterly data by employing the method of finding the average in Excel 2010.

Oil price (OPrc) indicates the quarterly world average price of one barrel oil. Data is obtained from *IndexMundi* database. Originally data is monthly but was converted to quarterly frequency by using the method of finding the average in Excel 2010.

Figure 1 presents profile of log of all variables – RGDPN, REXPEC, REXPSOC, REXPOTH, OPrc, OPrn respectively. We observe high level of seasonality in non-oil GDP and budget expenditures. Oil price demonstrate falling trend towards the end of 2014. Moreover, oil production trend is also downward since 2010.

4.2. Data analysis

Before discussing empirical methodology and findings, it is noteworthy to overview the data statistics in short. This enables to see also the value range of each variable and its share in total which will prevent misunderstandings while interpreting elasticity coefficients below. Table 1 tabulates basic descriptive statistics of the variables for the whole period as well as before-and-after the oil boom.

Table 1. Descriptive statistics of the variables (million AZN)

Whole period: 2000Q1-2014Q4						
Variable	Obs. No.	Mean	Maximum	Minimum	Std.Dev.	Sum
RGDPN	60	1697.215	3445.780	515.0000	840.1434	101832.9
REXPEC	60	375.4160	1288.890	17.96000	339.5447	22524.96
REXPSOC	60	252.6270	652.5800	69.53000	150.2544	15157.62
REXPOTH	60	339.0777	974.3800	54.18000	253.5557	20344.66
OPrc	60	65.26633	121.1000	19.30000	31.80699	-
OPrn	60	664.400	1066.000	274.0000	296.3564	39684.00
Before the oil boom: 2000Q1-2005Q4						
RGDPN	24	939.0617	1455.540	515.0000	253.3167	22537.48
REXPEC	24	47.49958	138.4890	17.97400	31.35865	1139.990
REXPSOC	24	120.9258	305.7330	61.08400	53.28565	2902.219
REXPOTH	24	135.8451	703.7750	54.04200	130.0381	3260.283
OPrc	24	32.73958	56.96000	19.30000	10.53077	-
OPrn	24	325.7917	532.0000	274.0000	59.58332	7819.000
After the oil boom: 2006Q1-2014Q4						
RGDPN	36	2202.651	3445.780	964.3100	700.5475	79295.44
REXPEC	36	591.9618	1288.124	160.8560	266.2861	21310.62
REXPSOC	36	338.8964	652.6960	135.4160	131.6815	12200.27
REXPOTH	36	498.6383	974.0270	177.7640	213.4525	17950.98
OPrc	36	86.95083	121.1000	44.20000	20.57681	-
OPrn	36	890.1389	1066.000	553.0000	121.1755	32045.00

Source: Authors' own completion

Statistics show that the amount of inflation adjusted output production in non-oil sector has been significantly higher after the oil boom compared with the previous period. Thus, mean value of quarterly output production within oil boom is twice of before the boom. However, oil related factors and the amount of total budget expenditures should be carefully considered in this context. Both oil production and oil price has demonstrated substantially increase. Average price of 1 barrel crude oil has been 2.65 times higher within 2006-2014 in compared with the period 2000-

2005 while average daily oil production also increased more than 2.7 times within the compared periods. On the other hand, of 58 billion AZN total expenditures, only less than 12.6% was spent before the oil boom (2000-2005) while remaining 87.4% after the boom. This is observed in amount of average quarterly budget expenditures across all three directions – capital, social, and other which is 12.5 times, 2.8 times, and 3.7 times more than those in before the oil boom, respectively. All there un-proportional changes signals potential unproductive allocation of budget expenditures in Azerbaijan.

Table 2. Descriptive statistics of the allocation of budget expenditures (as share of total)

Whole period: 2000Q1-2014Q4					
Variable	Obs. No.	Mean	Maximum	Minimum	Std.Dev.
REXPEC	60	0.311515	0.460231	0.117004	0.125985
REXPSOC	60	0.327665	0.500802	0.213220	0.109070
REXPOTH	60	0.360790	0.398322	0.320546	0.024149
Before the oil boom: 2000Q1-2005Q4					
REXPEC	24	0.152838	0.207736	0.117792	0.037116
REXPSOC	24	0.454850	0.500802	0.393927	0.039733
REXPOTH	24	0.380319	0.398322	0.369689	0.009730
After the oil boom: 2006Q1-2014Q4					
REXPEC	36	0.409304	0.460231	0.328981	0.035794
REXPSOC	36	0.242925	0.276957	0.213220	0.023197
REXPOTH	36	0.347771	0.394062	0.320546	0.022022

Source: Authors' own completion

In this context, table 2 provides very useful representation of budget expenditure allocation statistics while taking the whole period into consideration as well as the periods before-and-after the oil boom, separately.

Before the oil boom, social expenditures dominate in the central budget followed by the other expenditures. With small budget, government did not spend much on economy. This is understandable as the priority of government might be implementation of social projects and maintaining security and defense of the country.

However, proportional allocation significantly changes after when the oil boom observed. With the huge easy gained revenues from oil sector, Azerbaijan's budget size increased sharply (Aliyev and Gasimov, 2016). However, expenditure proportion significantly changed in favor of capital expenditures. Within the oil boom period, in average, 41% of total budget is used for investment purposes which are

2.7 times greater than the previous period as share of total. Here also other expenditures follow the dominant category with nearly 35%. Interesting point is sharp fall in the share of social expenditures by approximately 9%, decreased to 24%. When the whole period is considered, allocation of expenditures across the categories seems to be almost proportional, dominated with other expenditures.

4.3. Unit Root Test

To examine the order of integration of the given variables before conducting a co-integration analysis, the Augmented Dickey-Fuller (Dickey and Fuller, 1981) unit root test was employed. Note that ADF tests the null hypothesis that a given time series is non-stationary.
For a given time series variable denoted as y, ADF statistics value is the *t*-ratio on b_1 from the equation below:

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

Here, Δ is the first difference operator; b_0 is a constant term; k represents number of lags; *trend* is linear time trend; white noise residuals and the lag order are ε_t and i, respectively. The test is broadly discussed in Dickey and Fuller (1981), Stock and Watson (1993), Dolado *et al.* (1990), Enders (2010) with both advantages and disadvantages.

4.4.Autoregressive Distributed Lag Bounds Testing (ARDLBT) Approach

Autoregressive Distributed Lag Bounds Testing approach to co-integration (ARDLBT hereafter) is suggested as an alternative approach to the co-integration in Pesaran *et al*. (2001). In comparison with the similar approaches, ARDLBT has several advantages such as applicability in small samples, and easy application by employing OLS. Moreover, there is not any endogeneity problem while employing ARDLBT approach. One more advantage of this approach is possibility of simultaneously estimating long-run and short-run coefficients which is applicable with both I(1) and I(0) series or combination of them (Pesaran *et al.* 2001, Sulaiman *et al.*, 2010). Due to working with small sample size, ARDLBT approach to cointegration is more compatible to employ in this research.
Methodologically, ARDLBT approach is built over following several stages in sequence given in Pesaran *et al.* (2001). First stage is construction of an unrestricted ECM based on the equation below.

$$\Delta y_t = c_0 + \theta y_{t-1} + \theta_{yxx} x_{t-1} + \sum_{i=1}^{n} \varpi_i \Delta y_{t-1} + \sum_{i=0}^{n} \psi_i \Delta x_{t-1} + u_t \qquad (2)$$

Where *y* is the dependent and *x* is the explanatory variable. *u* denotes white noise errors. c_0 is the drift coefficient while θ_i represents long-run coefficients and ϖ_i and φ_i symbolize short-run coefficients.
However, we should correctly define optimal lag length of the first differenced right-hand side variables while employing ARDLBT approach because of sensitiveness of finding co-integrating relationship to correct lag order selection (Pesaran *et al*., 2001: 23). If there is not serial autocorrelation in residuals, minimum Akaike and Schwarz information criteria values provides optimal lag length in the model (Pesaran *et al*., 2001). Schwarz information criterion is preferred to the former one for small sample size (Pesaran *et al*., 1999).
The second stage is testing co-integrating relationship by using Wald-test (or the F-Test) on the θ_i coefficients from the constructed ECM. Here, we test null hypothesis of “no co-integration” defined as: H_0: $\theta_1 = \theta_2 = \theta_3 = 0$ against the alternative hypothesis of H_1: $\theta_1 \neq \theta_2 \neq \theta_3 \neq 0$.
Note that in the ARDLBT co-integration test F-statistics have non-standard distribution. Therefore, conventional critical values of F- distribution are not valid. To avoid this problem, critical values of F-distribution calculated by Pesaran and Pesaran should be employed (see: Pesaran and Pesaran, 1997 or Pesaran *et al*., 2001).
In the ARDLBT co-integration test we can reject the null hypothesis if the value of F-statistic obtained from the sample is greater than the upper bound of the critical value at a given significance level. In an opposite situation where computed F-statistic value from the sample is lower than the low bound of the critical value corresponding to a given significance level. Test result is inconclusive if the computed F-statistic value is within up-and-low bound of the critical value at a certain level of significance.
Following the second stage test results which support existence of co-integration relationship among the variables, at the third stage we can estimate/calculate the long-run coefficients by using Bewley transformation (Bewley 1979) or manually setting $c_0 + \theta y_{t-1} + \theta_{yxx} x_{t-1}$ to zero on the basis of the equation (2) and solving this equation for *y* as below:

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

At the last stage, stability of the co-integration relationship is tested. For this purpose, we calculate long-run residuals on the basis of equation (3) and employ that in the equation (2) by removing level variables and related coefficients:

$$\Delta y_t = c_0 + \sum_{i=1}^{n} \varpi_i \Delta y_{t-i} + \sum_{i=0}^{n} \phi_i \Delta x_{t-i} + \gamma ecm_{t-1} + u_t \qquad (4)$$

Where,

$$ecm_t = y_t - \frac{c_0}{-\theta} - \frac{\theta_{yxx}}{\theta} x_t$$

Based on the equation above, the co-integration relationship is considered to be stabile if *γ* gets the value between -1 and zero, and statistically significant. Note that stability condition implies temporariness of the short run deviations from the long-run equilibrium path which correct towards the latter one within the next periods.

4.5. Small Sample Bias Correction in ARDLBT Approach

Existing literature includes different 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.

5. Empirical results

5.1. Unit root test results

Before applying ARDLBT approach, defining order of integration of variables is important because many economic time-series variables demonstrate non-stationarity without or with trend around the mean. Table 3 reports ADF unit root test results with only intercept and with trend and intercept provides the information about order of integration of the variables.

Table 3. ADF unit root test results

Variables	**Intercept**		**Trend and intercept**	
	I (0)	**I (1)**	**I (0)**	**I (1)**
LOG_RGDPN	-0.92	-5.33***	-2.41	-14.98***
LOG_REXPEC	-1.56	0.08	-9.19***	-9.48***
LOG_REXPSOC	-0.83	-14.31***	-2.09	-14.20***
LOG_REXPOTH	-1.07	-10.24***	-6.91***	-10.19**
LOG_OPrc	-1.23	-1.74	-6.45***	6.44***
LOG_OPrn	-1.34	-0.21	-5.58***	-5.71***

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

While modelling the elasticity relationships, all variables are included to the model as natural log. That is why existence of unit root problem is tested over natural logs of the variables. Unit root test results indicates none is I(0) without trend, but REXPEC, REXPOTH, OPrc, and OPrn are trend stationary, or I(0) while trend is included to test equation. However, natural logarithm of RGDPN and REXPSOC are I(1) in both cases. As ARDLBT is applicable with also combination of variables with I(0) and I(1), we can proceed with further estimations.

5.2. The Results from the ARDLBT Approach

Results from the application of ARDLBT approach to co-integration are based on the equation (2) with some modifications. Here, we estimate the relationships of interest with-and-without considering the issue of oil boom period. In this context, equation (5) and (6) are estimated separately by using E-Views 9 econometric software.

Equation (5) estimates the effects of expenditure composition elements without measuring the difference in the magnitude of effects for each item after the oil boom while equation (6) measures also this impact strength distinction. In both equations, y_t is the dependent variable or non-oil GDP. $X_{1...5}$ represent dynamic regressors – REXPEC, REXPSOC, REXPOTH, OPrc, and OPrn respectively all in natural logarithm, also codded as k Є [1;5] θ_S, ω_i, φ_i and σ_i in the equation (5), and β_S, ,γ_i, δ_i and μ_i in the equation (6) stand for coefficients while u_t represents residuals and t denotes the time.

$$\Delta y_t = c_0 + \theta y_{t-1} + \theta_1 x_{1,t-1} + \theta_2 x_{2,t-1} + \theta_3 x_{3,t-1} + \theta_4 x_{4,t-1} + \theta_5 x_{5,t-1} + \sum_{i=1}^{n} \varpi_i \Delta y_{t-1} + \sum_{i=0}^{n} \psi_{ki} \Delta x_{k,t-1} + \sum_{i=0}^{n} \sigma_i \Psi_i + u_t \quad (5)$$

$$\Delta y_t = c_0 + \beta y_{t-1} + \beta_1 x_{1,t-1} + \beta_2 x_{2,t-1} + \beta_3 x_{3,t-1} + \beta_4 x_{4,t-1} + \beta_5 x_{5,t-1} + \sum_{i=1}^{n} \gamma_i \Delta y_{t-1} + \sum_{i=0}^{n} \delta_{ki} \Delta x_{k,t-1} + \sum_{i=0}^{n} \mu_i \chi_i + \vartheta_t \quad (6)$$

Ψ_i and x_i cover the list of fixed regressors, respectively. In equation (5) fixed regressors include seasonal dummies (season I, and IV) and outliers (2001Q2, and 2013Q4). However, fixed regsessors in equation (6) covers also intersection variables (log (rexpec)*policy,log(rexpsoc)*policy, and log(rexpoth)*policy)in addition to those in equation (5). Here, *policy* is a dummy variable represents budget expenditure effectiveness change before-and-after the oil boom, equals 1 after the launch of oil boom (2006Q1) and 0 otherwise.

Optimal lag size for the models is automatically selected by using E-Views 9 econometric software while using ARDL method for the estimation according to Akaike Information Criteria. Numbers of evaluated models for the lag selection is 12500 for both equations. Sequence of dynamic regressors in the models is as following: RGDPN, REXPEC, REXPSOC, REXPOTH, OPrc, OPrn. Considering this sequence, optimal lag size for equation (5) and (6) is determined as [4, 3, 4, 4, 4, 4], and [4, 4, 4, 3, 4, 4] which makes AIC value minimum. It is noteworthy to re-emphasize that all dynamic regressors are included to the models as natural logarithm which will enables to calculate elasticity of Azerbaijan's non-oil GDP to each regressor.

After defining the optimal lag size, we estimate each model. To conserve the space, results are not reported here and will be provided if requested.

Next stage in testing for the existence of co-integration or long-run relationship is testing joint significance of long-run coefficients of the dynamic regressors (θ_S in equation (5), and β_S in equation (6), respectively). ARDL Bounds test statistics provide supporting evidence for existence of co-integration in both equations at 1% level of significance. Therefore, we can proceed with finding long-run equations for both equations (5) and (6).

Table 4. F-statistic for testing an existence of co-integration

The sample F-statistic	Significance level	Pesaran *et al.* (2001) critical values		Narayan (2005) critical values	
		Low bound	Upper bound	Low bound	Upper bound
Null hypothesis: There is no long-run relationship					
Equation (5)					
F_W = 11.23243	1%	3.88	3.99	3.293	4.615

The sample F-statistic	Significance level	Pesaran *et al.* (2001) critical values		Narayan (2005) critical values	
		Low bound	Upper bound	Low bound	Upper bound
	5%	2.27	3.28	2.456	3.598
	10%	1.99	2.94	2.114	3.153
Equation (6)					
F_W **= 12.17289**	1%	3.88	3.99	3.293	4.615
	5%	2.27	3.28	2.456	3.598
	10%	1.99	2.94	2.114	3.153

Notes: F_W is the F-value of testing the null hypothesis that θ_i=0 and β_i=0 ARDL Bounds test. Critical values are taken from the combination of 6 lagged level regressors, restricted intercept and no trend (See: Pesaran *et al*., 2001, pp. 300) and 60 observations (Narayan, 2005, pp. 1987).

After confirming existence of co-integration relationship, we calculate long-run coefficients for the model regressors. Table 5 tabulates long-run coefficients with p-values in co-integration equation for both models. Note that stability condition is maintained as the value of *Y* is negative and statistically significant for both models. Almost within one quarter, short-run deviations correct towards long-run equilibrium path.

Table 5. ARDL long-run estimation results

Panel B: The estimated final ARDL Specification

	Equation (5)		Equation (6)	
	Coefficient	*p-value*	*Coefficient*	*p-value*
$lrexpec_{t-1}$	-0.041547	0.7298	0.268595	0.1723
$lrexpsoc_{t-1}$	3.010298	0.0006	1.698081	0.0182
$lrexpoth_{t-1}$	-1.894511	0.0158	-1.317337	0.0917
$loprc_{t-1}$	0.848989	0.0120	0.668301	0.0068
$loprn_{t-1}$	-0.110580	0.4052	0.547177	0.0093
$lrexpec_t * policy$	-	-	-0.634196	0.0176
$lrexpsoc_t * policy$	-	-	-0.834400	0.1256
$lrexpoth_t * policy$	-	-	1.301061	0.0625
$D1$	-0.506745	0.0037	-0.312088	0.0061
$D2$	-0.375882	0.0176	-0.389046	0.0027
$Seas\,(1)$	-0.207366	0.1030	-0.063886	0.4723
$Seas\,(4)$	0.218865	0.0568	0.171267	0.0305
$Intercept$	-0.771283	0.6242	-1.523690	0.2732

Panel B: Statistics and Residuals Diagnostics tests results	
Equation (5)	σ=0.061869; $\chi^2_{SC}(4)$=2.238387 [0.1032]; $\chi^2_{ARCH}(4)$= 1.642754 [0.1793]; χ^2_{HETR}= 0.659200 [0.8638]; JB_N= 0.012261 [0.9938]; F_{FF}= 1.158628 [0.2934]
Equation (6)	σ=0.054831; $\chi^2_{SC}(4)$= 1.728666 [0.1929]; $\chi^2_{ARCH}(4)$=0.633899 [0.6408]; χ^2_{HETR}= 0.617058 8969; JB_N = 1.439938 [0.4867]; F_{FF}= 0.158768 [0.6947]

Notes: Dependent variable is $lrgdpn_t$; σ is standard error of regression; x^2_{SC}, x^2_{ARCH} and x^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 and F_{FF} indicate statistics to test the null hypotheses of normal distribution and no functional miss-specification respectively; Probabilities are in brackets. Method; ARDL; Estimation period: 2000Q1-2014Q4.

6. Interpretation of the results

Both previous studies and this research finding support the view that the relationship between public expenditure and economic growth is not always in the same direction, and changes across different expenditure units. For resource rich countries, patterns of this relationship is expected to be much more complex as those countries witnesses “paradox of plenty” for a period in their economic development history. However, the policy outcome may be unsuccessful or ineffective depend on the model for use and management of revenues. Injection of revenues from the resource sector to the national economy through fiscal expansion requires well-planned efficient allocation of public expenditures, supported by this research finding.

According to the table 4, long-run relationship exists in both equations. Equation (5) estimates the contribution of public expenditures without taking oil boom effect on the expenditure efficiency into consideration while equation (6) covers this biasedness. The coefficient representing elasticity of non-oil output growth to capital expenditures is unexpectedly neither statistically nor economically significant, negative in both models. Contribution of capital expenditures to non-oil sector has been 0.63% lower in comparison with the previous period. It is noteworthy to remember that capital expenditures, in other words, infrastructure spending was considered as “productive” in Carboni and Russu (2013), our finding supports the argument of “seemingly productive expenditures could also be less effective or unproductive” in Devarjan *et al.* (1996). Note that, in equation (5), the coefficient is very small (0.04) and negative while in equation (6), it is positive and comparatively fairly strong for the years before the oil boom. Therefore, inefficient use of capital expenditures is a reality in the context of long-run non-oil sector development, especially within the oil boom period.

The impact of other expenditures which is consisted of mainly defense and administration spending is also noteworthy to consider. Long-run contribution is found to be negative and statistically significant in both models. Nevertheless, its efficiency to promote non-oil sector output production had been significantly higher after the oil boom observed. Still, research reveals negative correlation in the long-run. This is quite reasonable as national defense expenditures are within “unproductive” spending category (Carboni and Russu, 2013). Probably, this negative impact has been “weakened” due to including administration expenditures into this category. Thus, Aliyev and Nadirov (2016b) reveal administration expenditures as the most “productive”.

The role of social spending from the state budget in encouraging development of Azerbaijan’s non-oil sector seems to be significantly greater than the other categories. Results provide statistically and economically significant and positive contribution of social spending to the non-oil sector. More precisely, 1% increase in amount of social spending leads to 3% greater non-oil GDP growth while holding other factors fixed in equation (5). Although this elasticity is substantially lower in equation (6), it is still statistically and economically significant, and larger than the elasticity coefficients in previous empirical studies on Azerbaijan (Hasanov and Alirzayev, 2012; Hasanov, 2013a; Aliyev and Nadirov, 2016a, 2016b). In consistent with paradox of plenty assumption in consistent, and the statement in Devarjan *et al.* (1996), “productivity” of social expenditures has also significantly decreased within the oil boom. 0.83% lower efficiency is crucial amount should be taken into consideration by Azerbaijan fiscal policy-makers.

7. Discussions

Since the end of 2014, oil boom period is ended and new post-oil boom period is launched in Azerbaijan (Aliyev and Gasimov, 2016). In light of decreasing oil prices and fiscal challenges in front of the government, fiscal contraction and efficiency messages are frequently observed at the official level. In the closing speech at the meeting of the Cabinet of Ministers dedicated to the results of socioeconomic development in 2014 and objectives for 2015, the prezident of Azerbaijan, Ilham Aliyev emphasized that “we can’t allow waste”, “we should improve management principles in every state agency and state-owned company”, and “we will not give our consent to projects that are not a priority”. In addition, while performing closing speech at the conference dedicated to results of second year implementation of the State Program on socio-economic development in 2014-2018, the prezident’s statement “we need to organize our entire financial and economic system using the experience of developed countries" shows the re-consideration of public expenditure efficiency issue.

In this context, our empirical findings supports both hypotheses put forward in this investigation, and confirms that Azerbaijan government should carefully re-consider the composition of public expenditures. Capital expenditures are unproductive for development of non-oil sector. And the efficiency of both capital and social spending are decreased substantially in oil-boom period, which is mainly depending on political-institutional factors and/or corruption. The quality of management and oversight of public expenditures is also disputable and open to further investigations. Through decreasing the misuse of resources and enhancing oversight of the implementation of projects financed by the state budget, government may avoid potential contactionary fiscal policy threat to the non-oil sector. While contracting the budget, policy-makers should be careful and decrease capital and other expenditures, not the social category as such spending contributes a lot to the non-oil sector production.

8. Conclusions and Policy Implications

The research investigates the role of budget expenditure factor in development of non-oil output growth in Azerbaijan economy. Employing quarterly data for the period of 2000Q1-2014Q4 and ARDLBT approach to co-integration, we analyze long-run contribution strength of different public expenditure categories - namely capital, social, and other expenditures to the non-oil economic growth. Results demonstrate existence of co-integration relationship among the variables.

Estimation results endorsed our both hypotheses that expenditure composition is a crucial factor to consider while planning non-oil sector development as the priority for Azerbaijan, especially in time of fiscal contraction. Results concluded insignificant negative impact of capital expenditures, and significant negative impact of other expenditures while spending from the state budget for social purposes encourage non-oil producers the most.

Due to fiscal contraction which is observed and seems to continue in the near future, performance in the non-oil sector will be negatively affected. Existing empirical studies endorses this expectation (Hasanov, 2013a; Aliyev and Nadirov, 2016a, 2016b). Our research provides considerable useful empirical evidence for the officials to consider in order minimizing negative response of non-oil sector to the fiscal contraction.

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