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MODELLING 'PRODUCTIVITY' OF BUDGET EXPENDITURE ITEMS BEFORE-AND-AFTER THE OIL BOOM IN A RESOURCE RICH COUNTRY: EVIDENCE FROM AZERBAIJAN

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Abstract: *This research investigates the "productivity" of budget expenditure items (capital, education, health, social, administration, and other expenditures) in terms of encouraging non-oil output growth in the long-run while controlling for tax revenues and oil related factors. Authors employ ARDLBT approach to cointegration for the period of 2000Q1-2014Q4 to estimate long-run impact over non-oil GDP for each expenditure item, separately, in case of Azerbaijan. Estimation results provide statistically significant and positive contribution of all expenditure items, supported by Keynesian theory. However, productivity of all type of expenditures has significantly decreased after the oil boom. Research findings are useful for policymakers to consider while allocating budget expenditures.*

Keywords: *budget expenditure items, non-oil output growth, ARDLBT approach, Keynesian hypothesis*

JEL Classification*: E62; F41; O23; O53*

1. INTRODUCTION

Since Keynes, fiscal policy tools are widely used by economic policy makers. Such tools enable governments to have influence over the economic indicators of the countries as well as to protect their votes in the next elections. In this context, effectiveness of fiscal policy, especially public expenditures in encouraging total output is open to discussions. Many studies have been devoted to investigate the contribution of public expenditures over the economic growth theoretically (Arrow and Kurz, 2002; Barro, 1990; Devarjan *et al.*, 1996; Chen, 2006; among others) and empirically (Barro

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1991; Folster and Henrekson, 2001; Cooray, 2009, etc.). Moreover, scholars divide public expenditures into two categories: productive and non-productive (Sturm and Haan, 1995; Glomm and Ravikumar, 1997; Kneller *et al.*, 1999). For example, expenditures on building of national parks, national defence, and implementation of social programs are classified as non-productive while infrastructure expenditures, government spending on education, training and the law system are specified as productive in Carboni and Russu (2013). Paradox of plenty is another issue affecting productivity of public expenditures. As stated in Devarjan *et al.* (1996), public expenditure units which are productive could be unproductive if the resources are excessively used.

In resource rich economies, fiscal policy behaviour of the governments differs from ordinary economies. Such governments generally finances public expenditures by using easy gained resource revenues which challenge with fiscal difficulties when the resource revenues sharply decreases. On the other hand, resource dependency leads to lower economic growth performance or weak non-resource sector in those economies. In this context, efficiency of public expenditures is crucial for economies to avoid negative symptoms of resource dependency and to ensure sustainable fiscal policy. Nevertheless, achieving such efficiency is not so easy depending of political-institutional factors (Talvi and Vegh, 2005; Alesina *et al.*, 2008) and the level of corruption (Dietz *et al.*, 2007; Andersen and Aslaksen, 2008). Azerbaijan is also a resource-rich country, enjoyed its oil-boom period after 2005 until the end of 2014. Since early 2015, the country faced with serious challenges of post-oil boom period (Aliyev and Gasimov, 2016). Now, Azerbaijan government decided to follow sharp contractionary budget policy after 10 year expansionary trend. Therefore, efficiency of public expenditures is more important priority for Azerbaijan within the near future.

Unlike Hasanov and Alirzayev (2012), here we investigate the impact of public expenditures over non-oil GDP of Azerbaijan by separating that into 6 different categories (expenditures to the national economy, education, health care, social, administration, and other expenditures) which allows to compare the efficiency of each expenditure directions. In addition, our models enables to compare public expenditure efficiency before-and-after the oil boom. Note that Aliyev and Suleymanov (2015) define the years after 2005 as the oil boom period in Azerbaijan. To this end, we employ Autoregressive Distributed Lagged Bound Testing (ARDLBT) approach to cointegration to estimate the short- and long-run effects of these expenditure categories on non-oil GDP growth and employ quarterly data over the period 2000Q1-2014Q4.

The rest of the paper is organized as follows. Section II provides a review of related literature. Section III gives a brief background of our theoretical model. Section IV discusses our empirical methodology and data. Section V provides the empirical results and Section VI concludes with some policy implications and recommendations those should be taken into consideration by fiscal policy decision-makers.

2. LITERATURE REVIEW

There is a wide identification that government expenditure is vital to maintain long-term economic growth, reduce income inequality and poverty. Governments participate to allocate all their resources in developing human resources like education, create safe environment with social and health services and spend much more resources in stimulating savings and investments (Masan, 2015). Auty (2001) provide that public sector is thought as an engine of economic growth in oil exporting countries. Therefore, various functional spending expenditures have been explored in relation to economic growth, such as public infrastructure, educational, healthcare and other expenditures. Previous studies has been done for GCC countries- such as Bahrain, Oman, Qatar and United Arab Emirates (U.A.E.). For instance, Kireyev (1998) estimated the relationship between the change in government expenditure and growth in the non-oil GDP for Saudi Arabia using a pair wise Granger causality test for a sample period 1969-97. His results indicated that 1 percent increase in total government expenditure causes roughly a 0.5 percent increase in non-oil GDP. Treichel (1999) examined the same relationship for Oman from 1981 to 1997, but subdividing total real government expenditure into current and capital spending. He found that an increase of 1 percent in current government expenditure may generate about a 0.6 percent increase in non-oil GDP growth, while an increase of 1 percent in capital government expenditure may generate 0.2 percent increase in non-oil GDP growth. Also, Joharji and Starr (2010) tested the relationship between government capital and current expenditures and non-oil sector GDP in Saudi Arabia from 1969-2005 by using time-series methods. Their results showed that compare to capital expenditure, capital government expenditure has larger effects on non-oil GDP growth. This empirical finding was also supported by Espinoza and Senhadji (2011), which they found that capital government expenditure has the largest effect on non-oil sector.

Nowadays, increasing labor force in non-oil sector by expanding the role of the private sector in economy is the most important aim for policy makers in Azerbaijan. Because, the fiscal policy in Azerbaijan has demonstrated a greater weakness due to the volatility of oil price. Public sector is the principal player with a big role in the economy of Azerbaijan. To the best of our knowledge, only few studies investigate the relationship between disaggregated government expenditures and economic growth for Azerbaijan. 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 cointegration approach 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 its components is also found in Aliyev (2013) who analysed oil-exporting countries including Azerbaijan.

Limitations of empirical studies on Azerbaijan is that those 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). Moreover, none of those studies measures the budget expenditures effectiveness before-and-after the oil boom which in the context of "paradox of plenty" is expected to be significantly lower within the oil boom period. Therefore, this study is expected to fill both gap in the literature and provide vital policy implications.

3. THEORETICAL BACKGROUND

There are two schools of thought focusing on the direction of causality between government expenditures and economic growth. In the previous studies, the validity of Wagner's law and Keynesian hypothesis have been empirically tested both for developing and developed countries. But, the role of public expenditure in promoting economic growth stays arguable in developing and developed countries. Moreover, both theoretical and empirical literature have not yet achieved success in providing clear response to the question of how public expenditures affects economic growth (Devarajan *et al.*, 1996).

A conceptual framework of the Wagner's law and Keynesian hypothesis can be explained by the classical view of AD-AS model (Aggregate Demand and Aggregate Supply model). These two hypothesis are opposite in the direction of causality between public expenditure and economic growth, and both of them are short-run phenomenon (Tang, 2010). Wagner's law hypothesized public expenditure is an endogenous factor as a result of a growth of national income (Wagner, 1890). In contrast, the accepted thinking of the Keynesian approach tells that public expenditure is an exogenous factor which can impact economic growth (Keynes, 1936). Nevertheless, the net result of Keynesian hypothesis or Wagner's law is uncertain because of reallocation of the components of government expenditures. If government increases the expenditure on a particular component, then it can affect or may lower the allocation on other components. Therefore, the main question in our paper is *which components of government expenditures should be released and which preserved*. Devarajan et al. (1996) suggested that to answer this question the contribution of each component to economic growth should be analysed. The primary objective of our paper is to perform mainly Keynesian hypothesis to fiscal policy to investigate the effect of government expenditures on the non-oil GDP of oil-exporting country Azerbaijan.

4. DATA DESCRIPTION AND METHODOLOGY

The research employs quarterly data for 2000Q1-2014Q4. Definition of used variables are presented below:

Non-oil GDP (RGDPN) is the inflation adjusted amount produced in the economy excluding oil sector, measured in million manat. Data is obtained from the Central Bank of Azerbaijan (CBAR) 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) is the amount of capital expenditures from the central budget for investments, and government purchases for investment purposes, measured in millions of manat and adjusted for inflation. Yearly data is obtained from the State Statistical Committee of Azerbaijan Republic. 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 budget expenditures in total by the amount of yearly REXPEC for each quarter.

Note that above discussed methodology is applied also in calculation of all remaining budget expenditure units (education expenditures, health expenditures, social expenditures, and other expenditures) and data sources for each unit remains the same with REXPEC.

Education expenditures (REXPED) comprises of education costs from the central budget such as financing of general educational expenditures and other related institutions and events.

Health expenditures (REXPHE) consists of the expenditures from the central budget to the health sector as 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.

Social expenditures (REXPSOC) covers costs from the central budget for remuneration, pension and benefits, purchase of medicines, dressing materials, food products, etc. for social purposes.

Administration expenditures (REXPADM) include expenditures for maintenance of the judicial authority, law-enforcement and prosecution bodies.

Other expenditures (REXPOTH) encompasses other types of costs not covered above mentioned categories, especially defense and security costs.

Non-transfer budget revenues (RBRN) is total budget revenues minus direct transfers from the SOFAZ. CBAR database provide quarterly statistics of total budget revenues. From SOFAZ quarterly statements, we obtained the amount of quarterly direct transfers to the government budget and subtracted from quarterly total budget revenues for each corresponding period, and adjusted for inflation.

Oil production (OPrn) indicates Azerbaijan's quarterly oil production records measured in thousands barrels per day, in average. Monthly data is obtained from Trading Economics database (retrieved from *http://www.tradingeconomics.com/azerbaijan/crude-oil-production*) and converted to quarterly data by using the method of finding the average.

Oil price (OPrc) presents the quarterly world average price of one barrel oil. Data is taken from *index mundi* database. Originally, the data is monthly but was converted to quarterly frequency by using method of finding the average.

To estimate long-run relationship and short-run dynamics between budget expenditure units and non-oil GDP, we employ Autoregressive Distributed Lag Bounds Testing (ARDLBT) Approach to cointegration method. However, it is important to determine the order of integration of all included variables before conducting the approach. For this purpose, we use Augmented Dickey-Fuller (ADF hereafter) unit root tests to check non-stationarity in a given time series (see Dickey *et al.* 1981). On the other hand, ARDLBT is an alternative approach to the cointegration suggested by Pesaran *et al.* (2001). It is preferred to the other alternative methods due to some advantages. Thus, ARDLBT can be applied in small samples by using Ordinary Least Squares (OLS) estimation method without any endogeneity problem. Considering the fact that number of observations in this research is relatively small and order of integration difference in model variables, this approach is more suitable to employ.

5. RESULTS AND DISCUSSION

5.1. Unit root test results

Table 1 reports ADF unit root test results for the variables participate in the modelling and estimations. Results indicate that our variables are I(0) or I(1) in both cases, with intercept and with trend and intercept.

Table 1
ADF unit root test results. Source: Authors own elaboration

Variables	*Intercept*		*Trend and intercept*	
	I (0)	*I (1)*	*I (0)*	*I (1)*
LOG_RGDPN	-0.77	-5.33***	-5.33***	-14.98***
LOG_REXPEC	-1.86	-3.27**	-3.26**	-3.75**
LOG_REXPED	-1.09	-0.48	-19.19***	-19.18**
LOG_REXPHE	-1.12	-0.17	-4.72***	-16.90***
LOG_REXPSOC	-0.99	-2.33	-4.72***	-4.72***
LOG_REXPADM	-1.72	-0.98	-18.35***	-18.61***
LOG_REXPOTH	-1.34	-1.06	-3.81***	-3.95**
LOG_RBRN	-1.72	-3.04	-11.30***	11.32***
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.

As stated above, ARDLBT can be estimated with either I(0), I(1) series or series of combination of both orders of integration, we can start to estimate all unrestricted ECMs representing our model results.

5.2. The Results from the ARDLBT Approach

In this research, ARDLBT approach estimation results obtained from 6 different unrestricted ECMs including RGDPN as the dependent variable, RBEXEC, RBEXED, RBEXHE, RBEXSOC, and RBEXOTH as the independent variable of interest in the corresponding ECM in sequence. Moreover, all ECMs include RBRN, OPrc, and OPrn as independent variables in order to control the impact of tax revenues and oil-related factors affecting non-oil GDP in Azerbaijan economy. General model equation is given below where y_t is non-oil GDP (RGDPN), δ_t represent non-transfer budget revenues (RBRN), ϑ_t and κ_t denote oil prices (OPrc), and Oil Production (OPrn) respectively. τ_ψ covers variables employed to catch outliers (*D1*=1 in 2001Q2, otherwise 0; *D2*=1 in 2013Q4, otherwise 0) and control seasonal differences (SEAS1, SEAS3).

$$\Delta y_t = c_0 + \theta y_{t-1} + \theta_{yx} x_{t-1} + \mu_{yx} x_{t-1} * policy + \theta_{y\delta}\delta_{t-1} + \theta_{y\vartheta}\vartheta_{t-1} + \theta_{y\kappa}\kappa_{t-1} + \sum_{i=1}^{n}\alpha_i \Delta y_{t-i} + \sum_{i=0}^{n}\beta_i \Delta x_{t-i} + \\ + \sum_{i=0}^{n}\alpha_i \Delta x_{t-i} * policy + \sum_{i=1}^{n}\gamma_i \Delta\delta_{t-i} + \sum_{i=1}^{n}\pi_i \Delta\vartheta_{t-i} + \sum_{i=1}^{n}\phi_i \Delta\kappa_{t-i} + \sum_{\psi=1}^{n}\omega_\psi \tau_\psi + u_t \quad (1)$$

Here, key variable of interest is denoted by x_t which represent each budget expenditure unit separately in estimations. In total, five different equations are estimated with corresponding budget expenditure unit (x_t) coded as REXPEC, REXPED, REXPHE, REXPSOC, REXPADM and REXPOTH, respectively. Another variable of interest is the intersection variable x_t **policy* where *policy* is a dummy variable equals 0 until 2005Q4 and 1 after this period, used to measure changes in the contribution of corresponding budget expenditure unit to Azerbaijan's non-oil GDP before and after the oil-boom period.

Note that except dummies, all variables are included into the model as natural logarithm. Therefore, coefficients represent elasticity of non-oil GDP to the corresponding independent variable.

To define optimal lag size for ARDL, equation 1 is estimated with 0-4 lags for each value of x_t. Table 2 provides obtained statistics which enable to choose the lag size minimizing AIC and SBC value with no serial correlation problem in residuals. Because employed data is quarterly, the unrestricted ECM of optimal lag size should not suffer the problem of serial correlation at lag length of 1 or 4. If AIC and SBC suggest distinct lag size as the optimal, we prefer the result of SBC. Note that in all models optimal lag size is found to become 1. Therefore, we can proceed with unrestricted ECM with 1 lag size for models.

Table 3 reports ARDL specification results for each representative of x_t variable as well as the diagnostics test results for the estimated models. The first column includes all independent variables employed. The second-sixth columns represent estimation results which in sequence x_t is REXPEC, REXPED, REXPHE, REXPSOC, REXPADM and REXPOTH, respectively.

Table 2
Statistics for choosing optimal lag size for ARDL. Source: Authors own elaboration

i	*AIC*	*SBC*	$\chi^2_{sc}(1)$	$\chi^2_{sc}(4)$
Model 1: x_t- budget expenditures to the national economy (RBEXEC)				
0	-1.6079	-1.0245	0.132348 [0.7178]	0.146927 [0.9633]
1*	-1.8082	-1.0466	0.811968 [0.3737]	0.471150 [0.7565]
2	-1.6225	-0.7623	0.980734 [0.3294]	1.258657 [0.3087]
3	-1.8906	-0.8418	0.708336 [0.4077]	2.014373 [0.1260]
4	-1.8476	-0.6067	0.870041 [0.3621]	1.660673 [0.2053]
Model 2: x_t- budget expenditures to education (REXPED)				
0	-1.3946	-0.9017	0.021320 [0.8846]	0.588842 [0.6726]
1	**-1.8758**	**-1.0942**	**0.493080 [0.4872]**	**0.723448 [0.5824]**
2	-1.8976	-1.0015	0.189079 [0.6667]	1.660985 [0.1870]
3	-2.0828	-0.9616	0.783195 [0.3849]	2.067282 [0.1215]
4	-1.9892	-0.6753	0.713065 [0.4095]	2.178099 [0.1211]
Model 3: x_t - budget expenditures to health (REXPHE)				
0	-1.4764	-0.9483	0.234804 [0.6304]	0.339062 [0.8500]
1	**-2.0111**	**-1.2296**	**0.213779 [0.6467]**	**0.869596 [0.4928]**
2	-1.9319	-1.0358	0.543836 [0.4664]	2.712924 [0.0501]
3	-1.9942	-0.9092	1.435087 [0.2422]	2.429358 [0.0781]
4	-1.9559	-0.6785	0.810003 [0.3794]	1.838129 [0.1709]
Model 4: x_t- social expenditures (REXPSOC)				
0	-1.6842	-1.1208	0.028044 [0.8678]	0.077657 [0.9887]
1*	-1.9428	-1.1612	0.800464 [0.3771]	1.030426 [0.4067]
2	-2.0031	-1.1071	0.427804 [0.5179]	1.691466 [0.1799]
3	-2.1464	-1.0614	0.974191 [0.3331]	1.584193 [0.2137]
4	-2.0272	-0.7498	0.758794 [0.3946]	0.798217 [0.5437]
Model 5: x_t- administration expenditures (REXPADM)				
0	-1.5589	-0.9955	0.822352 [0.3697]	0.742226 [0.5690]
1*	**-2.2718**	**-1.4902**	**0.067160 [0.7970]**	**1.533702 [0.2160]**
2	-2.2101	-1.2065	0.515783 [0.4786]	1.468959 [0.2414]
3	-2.1305	-0.9008	1.074819 [0.3117]	1.694411 [0.1951]
4	-1.9734	-0.696	1.574089 [0.2248]	2.255724 [0.1085]
Model 6: x_t- other expenditures (REXPOTH)				
0	-1.4706	-0.9424	0.035886 [0.8506]	0.081504 [0.9876]
1*	**-1.9642**	**-1.1827**	**0.327559 [0.5708]**	**0.872907 [0.4909]**
2	-1.7628	-0.8667	1.388270 [0.2477]	2.688362 [0.0516]
3	-1.9853	-0.9003	1.738902 [0.1992]	2.647687 [0.0607]
4	-1.9025	-0.6251	1.853198 [0.1893]	2.176500 [0.1182]

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

Table 3
ARDL Specification and Residuals Diagnostics tests results. Source: Authors own elaboration

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
$lrgdpn_{t-1}$	-0.409048^{***}	-0.467062^{***}	-0.501114^{***}	-0.745640^{***}	-0.569087^{***}	-0.619110^{***}
$lrexpec_{t-1}$	0.174027^{**}	-	-	-	-	-
$lrexpec_{t-1} * p$	-0.047485^{***}	-	-	-	-	-
$lrexped_{t-1}$	-	0.176531	-	-	-	-
$lrexped_{t-1} * p$	-	-0.045297^{*}	-	-	-	-
$lrexphe_{t-1}$	-	-	0.378559^{***}	-	-	-
$lrexphe_{t-1} * p$	-	-	-0.056546^{***}	-	-	-
$lrexpsoc_{t-1}$	-	-	-	0.419277^{***}	-	-
$lrexpsoc_{t-1} *$	-	-	-	-0.027357	-	-
$lrexpadm_{t-1}$	-	-	-	-	0.438818	-
$lrexpadm_{t-1} *$	-	-	-	-	-0.036430^{**}	-
$lrexpoth_{t-1}$	-	-	-	-	-	0.425096^{*}
$lrexpoth_{t-1} *$	-	-	-	-	-	-0.055859^{**}
$lrbrn_{t-1}$	-0.151568^{*}	-0.130526^{*}	-0.132127^{**}	-0.112537^{*}	-0.261832^{***}	-0.111528^{*}
$loprc_{t-1}$	0.185404^{***}	0.268861^{***}	0.149408^{**}	0.262165^{***}	0.253155^{***}	0.056446
$loprn_{t-1}$	0.152318	0.294846^{**}	0.103428	0.155030	0.208974^{**}	0.167013^{*}
$\Delta lrexpec_t$	0.149815^{**}	-	-	-	-	-
$\Delta lrexped_t$	-	0.152169^{*}	-	-	-	-
$\Delta lrexphe_t$	-	-	0.225493^{***}	-	-	-
$\Delta lrexpsoc_t$	-	-	-	0.246786^{***}	-	-
$\Delta lrexpadm_t$	-	-	-	-	0.262817^{***}	-
$\Delta lrexpoth_t$	-	-	-	-	-	0.267608^{***}
$\Delta loprn_t$	-	-0.179436	-0.426780^{**}	-	-0.299902^{*}	-
$\Delta lrbrn_t$	-	-	-	-	-0.138686^{**}	-
$\Delta lrgdpn_{t-1}$	-0.212656^{***}	-	-0.273772^{***}	-	-0.258192^{***}	-0.156634^{**}
$\Delta lrexpoth_{t-1} *$	-	-	-	-	-	-0.069230
$\Delta loprn_{t-1}$	-0.746540^{***}	-0.545626^{**}	-0.686724^{***}	-0.453013^{**}	-0.764314^{***}	-0.779537^{***}
D1	-0.249121^{**}	-0.284838^{***}	-0.261709^{***}	-0.248183^{**}	-0.271960^{***}	-0.201002^{***}
D2	-0.296808^{***}	-0.272030^{***}	-0.266011^{***}	-0.233667^{**}	-0.276755^{**}	-0.278771^{**}
@SEAS(1)	-0.248235^{***}	-0.251576^{***}	-0.266444^{***}	-0.244352^{***}	-0.259067^{***}	-0.196759^{***}
@SEAS(3)	0.134853^{**}	0.058451	0.132345^{***}	0.070401^{***}	0.131458^{***}	0.150439^{***}
Intercept	1.547198	0.690704	2.172923^{***}	2.409946^{***}	1.736287^{***}	2.051121^{***}

Panel B: Statistics and Residuals Diagnostics tests results

Model (1)	σ=0.087022; $\chi^2_{SC}(4)$=0.254641 [0.9051]; $\chi^2_{ARCH}(5)$=0.652289 [0.6612]; χ^2_{HETR}= 1.366481 [0.2149]
Model (2)	σ=0.100689; $\chi^2_{SC}(4)$= 0.364945 [0.8321]; $\chi^2_{ARCH}(5)$=0.212534 [0.9555]; χ^2_{HETR}= 1.382583 [0.2061
Model (3)	σ=0.076865; $\chi^2_{SC}(4)$= 0.788645 [0.3078]; $\chi^2_{ARCH}(5)$=0.679008 [0.6415]; χ^2_{HETR}= 1.493333 [0.1548]
Model (4)	σ=0.087255; $\chi^2_{SC}(4)$=0.134760 [0.9686]; $\chi^2_{ARCH}(5)$=0.567745 [0.7242]; χ^2_{HETR}= 1.874601 [0.0742]
Model (5)	σ=0.070990; $\chi^2_{SC}(4)$=1.266773 [0.3000]; $\chi^2_{ARCH}(5)$=2.313800 [0.0699]; χ^2_{HETR}= 0.959790 [0.5110]
Model (6)	σ=0.078815; $\chi^2_{SC}(4)$=0.912777 [0.4661]; $\chi^2_{ARCH}(5)$= 1.063208 [0.3927]; χ^2_{HETR}= 1.278807 [0.2595

Notes: Dependent variable is $lrgdpn_t$; 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 and F_{FF} indicate statistics to test the null hypotheses of normal distribution and no functional mis-specification respectively; *, ** and *** denote significance level of 10%, 5%, and 1% levels, respectively; Probabilities are in brackets. Method: Least Squares; Estimation period: 2000Q1-2014Q4.

Following ARDLBT estimation methodology discussed above, next stage is testing for cointegration relationship among the variables. For this purpose, Wald test is employed and table 4 present the test results for each representative variable of x_t. Test results provide evidence in favor of existence of cointegration relationship in all models at 5% level of significance.

Table 4
F-statistic for testing an existence of cointegration in ARDLBT approach.
Source: Authors own elaboration

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: $\theta = \theta_{yx} = \theta_{y\delta} = \theta_{y\theta} = \theta_{yk} = 0$					
Model 1: x_t*- budget expenditures to the national economy (RBEXEC)*					
$F_W = 4.436805$	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
Model 2: x_t*- budget expenditures to education (REXPED)*					
$F_W = 6.431421$	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
Model 3: x_t*- budget expenditures to health (REXPHE)*					
$F_W = 7.222365$	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
Model 4: x_t*- social expenditures (REXPSOC)*					
$F_W = 11.14371$	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
Model 5: x_t*- administration expenditures (REXPADM)*					
$F_W = 9.768567$	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
Model 6: x_t*- other expenditures (REXPOTH)*					
$F_W = 7.027449$	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 $\theta_i = 0$ in the Wald 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).

$$lrgdpn_t = 3.782 + 0.425 * lrexpec_t - 0.116 * lrexpec_t * policy - 0.370 * lrbrn_t + 0.453 * loprc_t + 0.372 * loprn_t + u_{1t} \quad (2)$$

$$lrgdpn_t = 1.479 + 0.378 * lrexped_t - 0.097 * lrexped_t * policy - 0.279 * lrbrn_t + 0.575 * loprc_t + 0.631 * loprn_t + u_{2t} \quad (3)$$

$$lrgdpn_t = 4.336 + 0.755 * lrexphe_t - 0.113 * lrexphe_t * policy - 0.263 * lrbrn_t + 0.298 * loprc_t + 0.206 * loprn_t + u_{3t} \quad (4)$$

$$lrgdpn_t = 3.232 + 0.562 * lrexpsoc_t - 0.037 * lrexpsoc_t * policy - 0.151 * lrbrn_t + 0.352 * loprc_t + 0.208 * loprn_t + u_{4t} \quad (5)$$

$$lrgdpn_t = 3.051 + 0.771 * lrexpadm_t - 0.064 * lrexpadm_t * policy - 0.460 * lrbrn_t + 0.445 * loprc_t + 0.527 * loprn_t + u_{5t} \quad (6)$$

$$lrgdpn_t = 0.313 + 0.686 * lrexpoth_t - 0.106 * lrexpoth_t * policy - 0.180 * lrbrn_t + 0.091 * loprc_t + 0.270 * loprn_t + u_{6t} \quad (7)$$

5.3. Interpretations of the Empirical Results

Supporting empirical evidence for the relationship between public expenditure items and non-oil economic growth in Azerbaijan is provided. Note that basically, we are looking for long-run association existence of which is confirmed for all models above. Findings ensure sufficient information to justify the arguments promoted in this study.

Equations 2-7 represents long-run equation coefficients for the model 1. Before discussing coefficients embodies public expenditure efficiency, it is useful to overview the sign of control variable coefficients which all are essential to interpret the effects of current fiscal policy changes in the near future. Hence, the impact of non-transfer budget revenues or tax revenues over non-oil sector is very important to consider while budget policy building. Considering association between non-oil economic growth and the oil related factors, changes in the levels of oil price and oil production is also crucial to take into consideration by fiscal policymakers.

In consistent with the Keynesian economic theory, association between tax revenues and economic growth is revealed as negative. However, one should not forget that non-transfer budget revenues is not totally collected from non-oil sector, still include major contribution from the oil industry. That is why despite the impact is statistically significant in all models, elasticity of the impact is not so large, is between -0.15 and -0.37. In other words, 1% more tax revenues means giving up 0.15-0.37% growth of non-oil sector in the long-run while holding other variables constant. Findings also indicate long-run dependency of non-oil economic growth from oil related factors as expected. 1% increase in oil prices significantly encourages non-oil growth by 0.30-0.58% in average. Only model 6 is an exception where this association is neither statistically nor economically significant. Oil production also significantly pushes non-oil sector production upward, in amount of 0.21-0.63% in response to 1% increase in average daily production.

Research findings provide statistically and economically significant positive contribution of all types of public expenditures which confirms Keynesian hypothesis in case of Azerbaijan. However, results also reveals differences in the strength of the contribution across distinct expenditure units. For example, while holding other variables constant, in average, 1% increase in expenditures to the national economy (capital expenditures) is expected to foster non-oil economic growth by 0.43% while the same change in amount of expenditures on education, health, implementation of other social responsibilities as well as administration and other expenditures encourage non-oil GDP by 0.38%, 0.76%, 0.56%, 0.77%, and 0.69% respectively.

This is quite reasonable and expected in the context of both Keynesian hypothesis, and political economy of the fiscal policy framework. Initially, it is observed that Azerbaijan's non-oil economy is more elastic to the administration and health expenditures followed by other expenditures from the state budget. Comparatively lower elasticity to the change in capital expenditures creates some impression on questions about the expenditure effectiveness. However, one should take into consideration the amounts of both variables denoting public expenditure items measured in domestic currency and the dependent variable instead of log profile of variables in order to discover real efficiency issue. In the context of interpretations based on elasticity association may be misdirecting.

Meanwhile, efficiency of the use of public expenditures before-and-after the oil boom, in other words how the efficiency changed in the context of the "paradox of plenty" also differs across the expenditure items. As expected, the difference is negative and statistically significant in all models. This means the significantly decreasing effectiveness of the public expenditures across all directions after the oil boom. For capital, education, health, social, administration, and other expenditures, the long-run contribution has been 0.12%, 0.10%, 0.11%, 0.04%, 0.06%, and 0.11% less after the oil boom compared with the previous period, respectively.

6. CONCLUSION

The role of public expenditures in development of non-oil sector is one of the essential topics in Azerbaijan economy in the current phase. Before, the relationship was investigated in total bases in Hasanov (2013a) and Hasanov and Alirzayev (2012). This research filled the gap in the literature by investigating the issue in the context of different expenditure units' contribution. Research findings provided evidence of the significant positive impact of all type of public expenditures categories over non-oil sector development where efficiency of all lowered within the oil boom period. Considering productivity performance, administration and health expenditures seems to be better than remaining ones. Especially, Azerbaijan fiscal policy makers should focus on enhancing efficiency of capital expenditures which takes significant share of public expenditures with considerable less contribution to the non-oil sector.

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