The Role of the Fiscal Policy in the Development of the Non-Resource

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THE ROLE OF THE FISCAL POLICY IN THE DEVELOPMENT OF THE NON-RESOURCE SECTOR

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Abstract The research investigates the impact of the fiscal policy on the non-oil sector of Azerbaijani economy in the framework of cointegration and error correction modeling over the quarterly period 2000-2009. For increasing robustness of the obtained results, we employed two different cointegration methods: the residual-based Engle-Granger approach and the system-based Johansen approach. The empirical results from these approaches are quite close to each other and indicate that the government expenditures have significant positive influence on the non-oil GDP both in the long- and short-run. Therefore, the fiscal policy can play a supportive role in developing the non-oil sector. We further showed that ability of the fiscal policy to support the non-oil sector development, among others, is heavily determined by the degree of dependence on the oil revenues. Therefore, one of the urgent remedies for the Azerbaijani policy makers is to loosen gradually the dependence of the government budget on the oil revenues and oil prices. Instead, non-oil taxes can be considered as an alternative source of the government revenues. We also recommend that the policy makers should also pay particular attention to the investment issues as it has a positive effect on the non-oil sector development. Finally, we reemphasize the importance of future detailed research on improving the efficiency of the fiscal policy in the non-oil sector.

*Keywords:*Azerbaijan economy; fiscal policy; non-oil GDP; the Engle-Granger approach; the Johansen approach; cointegration; error-correction modeling.

JelClassification: H50, C51, E22

1 Introduction

A development of non-natural resource sector is one of the key issues of the economy in the most of the natural resource-rich countries and it is considered as one of the important pre-conditions for obtaining balanced long-run economic growth especially in the post-oil-boom period. Thus, the development of this sector could meet domestic demand for good and services and promote export, which, in turn lead to increase in the volume of the country's foreign exchange reserves and, hence, stimulate the country's further economic development. Therefore, the countries with are abundant with natural resources should pay special attention to the development of non-natural resource sector (Sorsa, 1999).

According to thestatistics and conducted studies, the development of the non-oil sector is more urgent in Azerbaijan in comparing other oil-and gas-exporting countries of the former Soviet Union (Paczynski and Tochitskaya, 2008). It would suffice to note that for the period of 2000-2009, the non-oil sector's share of GDP had declined from 64.8% in 2000 to 45.4% in 2009, although it is a pleasing fact that the upward tendency started to emerge again in this share since 2007 (Statistic bulletin of CBAR, 2009, December).

Therefore, the development of the non-oil sector, particularly its export-oriented sectors are considered main priority of the socio-economic development of the Azerbaijan Republic. The Azerbaijani government has lunched several large-scale projects and established agencies to support this development. Any government in market-based economy by implementing of monetary and fiscal regulations can adjust economy within the boundaries of its authority and using the resources, which are at its disposal. Both fiscal and monetary policies have important tasks to implement effectively and in coordination for ensuring the development of an economy including its non-oil sector in the resource-rich economies. Studies show that a fiscal policy plays a leading role in the resource-rich economies and a monetary policy usually dealing with to remove “side effects” of the fiscal policy (Sturm and Gonzalez, 2009; Wakeman-Linn and Selm, 2002).

Thus, the non-oil sector development with effective implementation of fiscal policy measures emerges as an important issue in the Azerbaijan economy. The government’s fiscal policy undertakes exclusive opportunities in the conditions of growing inflow of the oil export revenues. The Azerbaijani fiscal authorities implement infrastructure projects and other promotional activities to support a development of non-oil sector, especially export-oriented and import substitution areas.

Thus, the objective of this study is to investigate the impact of the fiscal policy on the non-oil sector and to suggest policy recommendations in the case of Azerbaijan. For this purposes we employed cointegration and error correction framework to investigate long-run relationship and short-run dynamics as well as speed of correction from the short-run fluctuation towards long-run equilibrium in the impact of the fiscal policy on the non-oil GDP. In order to robust our empirical findings we employ two cointegration methods: the system-based and the residual-based.

The results from these cointegration approaches are very close to each other and show that, government expenditure and gross fixed capital formation have a significant impact on the non-oil GDP both in the long- and in short-run.

Policy recommendations derived from this research may be useful in development of the non-oil sector by applying the fiscal policy measures. Moreover, this study is a contribution to the literature pool devoting to non-resource sector development issues in resource-rich economies. Furthermore, this study would induce future research in this area by posing detailed research questions, which are important to investigate.

The rest of the paper is organized as follows. Section 2 is a review of relevant literature, while Section 3 describes variables and their calculations used in the empirical analysis. Econometric methods of the study are provided in Section 4 and Section 5 report results of econometric estimations. Section 6 interprets empirical results, while the next section concludes with main findings and policy suggestions.

2 Literature review

There is vast literature devoting the impact of fiscal policy on economic development. However, in this section, we will focus on the studies which investigate the mentioned research question in resource-rich economies.

Wijnbergen (2008) showed how oil fund revenues should be distributed in the non-oil sector of Azerbaijan economy and generated projections for 2007-2008 in the VAR model framework. The results showed that direct transformation of oil revenues to highly volatile fiscal spending might lead to negative consequences. In other study investigated Venezuelan economy by Baldini (2005) shows that during 1991–2003 years volatility of fiscal spending contributed substantially to the volatility of non-oil GDP. The author using a number of statistical approaches analyzed trends and cycles of economic output and fiscal consequences. The business cycle features a strong dominance of short-term cyclical components. Each cycle has an average duration of about two or three years. It was also found that the cyclical volatility of non-oil GDP is more than two times as large as the volatility of oil GDP.

Revenue source of these expenditures creates another risk and vulnerabilities to budget sustainability. As such, Zermeno (2008) find that although Azerbaijan's non-oil tax revenues increased significantly as a share of non-oil GDP in the last five years, but still remain below the potential. The non-oil tax revenue shortfall is mainly due to tax exemptions. However, by strengthening tax and customs administration this problem can be overcome. In the short term, expanding the tax base and better tax and customs administration will yield more revenues. In the medium term, more reforms, such as reducing rates for direct taxes could be considered. Reductions in key non-oil taxes represent a major fiscal risk in oil exporting countries (Budina et al. , 2010).

There is a general agreement on that even bad fiscal expenditures have positive effect on non-oil sector as well as on whole economy in the oil exporting (developing) countries. However, Fasono and Wang (2001) by employing multivariate cointegration and error-correcion modeling framework ended up with contradicted result. They found that despite the important role of the government, the empirical results did not strongly support that increases in fiscal expenditures tend to decelerate or accelerate real non-oil GDP growth in the Gulf Coorperation Council member countries over the period of 1980-1999. This raises some effectiveness and transparency concerns on implementation of fiscal policy in these countries, as well as in Azerbaijan.

In other study, Villafuerte and Pablo (2009), findings even strengths dubious effect of fiscal expenditures. As such, the authors found that during 2003–2008, an increase in primary spending deteriorated non-oil balance in oil producing countries (OPCs).

Pieschacon (2009) studied how oil price shocks affect macroeconomic activity in oil exporting small open economies using a DSGE model where aggregate production is divided into tradable and nontradable sectors. He assessed the relevance of fiscal policy as a propagation mechanism by analyzing data for Mexico and Norway, two oil-rich countries with different fiscal policy frameworks. He concluded that fiscal policy is a key transmission channel, as it largely determines the degree of exposure of the domestic economy to oil price shocks. Empirically, the impulse responses of output, real exchange rate and private consumption to an oil price shock differ greatly between the two countries.

Hence, empirical literature clears up public expenditures and growth dichotomy in oil exporting (developing) countries, asserting that non-oil primary balance (or non-oil GDP growth) distorted by high volatility of public expenditures. The most possible explanation for dubious empirical results in the literature can be twofold.

The first is that, public expenditures crowds-out private investment on non-oil sector and worsens long-run growth. But, small share of (domestic) private investment in oil exporting (developing) countries make this assertion unlikely to be true. The second possible explanation is that, possibly non-transparent and inefficient use of public investment was the main reason for this distortion. However, we expect that this could be the most possible explanation only conditional on the quality of institutions in oil-exporting (developing) countries. Nevertheless, we are not going to discuss in more detail these explanations because it is out of scope of our study.

3 Variables

We investigate the impact of fiscal policy on the non-oil GDP growth over the quarterly period of 2000-2009. In our study, fiscal policy behavior of government is captured by budget expenditures. In order to avoid a "omitted variable" problem and make results more consistent and unbiased, while reflecting the current situation in detail, we include gross fixed capital formation in analysis as a control variable. Growth theories show that investment is one the main determinants of economic growth.

Real values of all three variables should be used in the estimations. Note that deflator or price indices for the non-oil GDP, budget expenditures and gross fixed capital formation neither calculated by statistical agencies, nor publicly available. In such circumstances, other relevant price indices are used as a solution to the problem of calculating real values. In doing so, it is important to decide which alternative price indices are relevant to be used in calculating real values of our variables. A number of ways such as the visual inspection of the graphs of nominal and real time-series of a variable, economic judgment can be used for this purpose. In this regard, the real values of the non-oil GDP can be calculated based on the nominal values using a number of methods proposed. One such method was proposed by Zavkiev (2005). The method calculates the real values using real growth rate and nominal value of a variable. Another method is to convert nominal values to real ones by using Consumer Prices Index (CPI) and or Producer Prices Index (PPI). Some studies on Azerbaijan conducted by the international organizations, such as the International Monetary Fund and World Bank prefer using CPI. An example of a calculation based on PPI would be Dufrenot and Sand-Zantman (2004) in the case of Kazakhstan.

In this research, we decided to use all the three mentioned methods for calculating real values of the non-oil GDP time series. Figure 1 below illustrates the time path of non-oil GDP in nominal and real terms calculated by these methods.

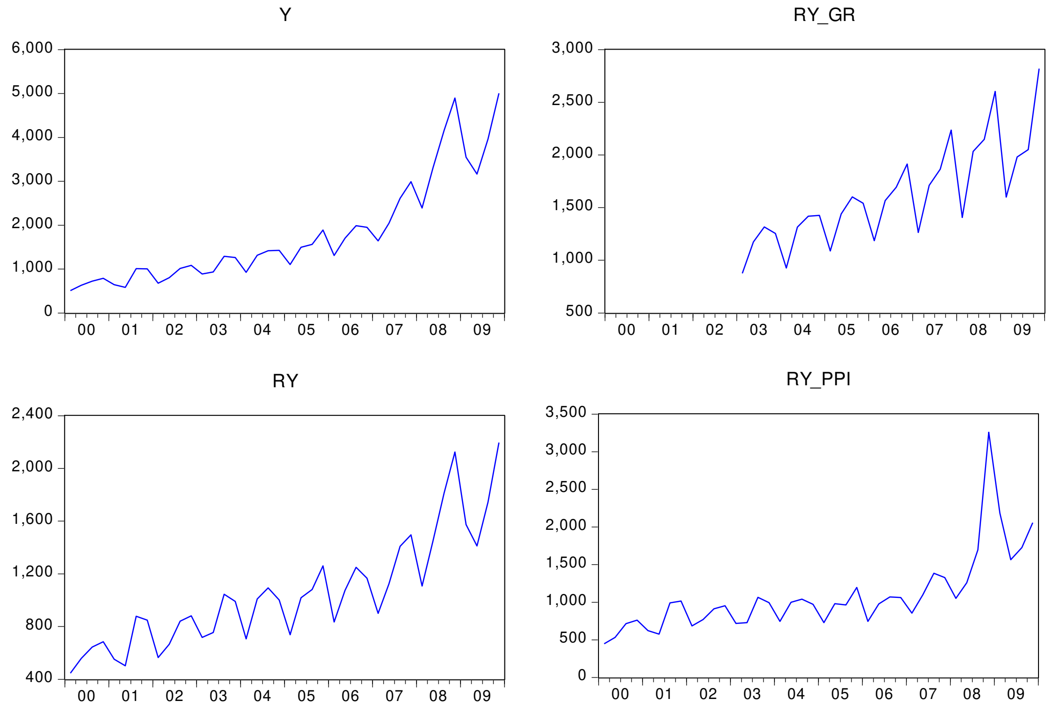

Fig. 1: Nominal and real non-oil GDPs

As the top right graph shows, real values of the non-oil GDP calculated based on growth rates starts from 2003 because of quarterly growth rates of the non-oil GDP are available only from that period. As evident from the graph, real non-oil GDP (RY) calculated using CPI is more reasonable than real non-oil GDP (RY_PPI) calculated based on PPI for capturing the time profile of the nominal non-oil GDP (Y), especially in the last two years of the period. Therefore, we decided to use the CPI-deflated real non-oil GDP in empirical estimations.

We then calculated real values of budget expenditure and gross fixed capital formations based on the above-given three methods then did comparisons. It turned out that it would be suggestive to use PPI-deflated real values of budget expenditures (RBE) and gross fixed capital formation (RGFCF).

Note that the time series of non-oil GDP, budget expenditure and gross fixed capital formation possess seasonality. Therefore, we seasonally adjusted the nominal values of these variables before calculating real values[1].

Quarterly time series of nominal values and real growth rates of the non-oil GDP were obtained from the statistical bulletins of the Central Bank of the Azerbaijan Republic. Nominal time series values of the gross fixed capital formation, Budget expenditures, as well as CPI and PPI were collected from the statistical bulletins of the State Statistics Committee of the Azerbaijan Republic[2].

Figure 2 plots the time path of seasonally adjusted real time series of the variables over the quarterly period of 2000-2009.

[1]We used Census X12 module in Eviews for seasonal adjustment. Note that there is a debate in seasonal adjustment of variables. Some scholars prefer using seasonal dummies while others are in favor of the seasonal adjustment. Seasonal adjustment would not be suggestive if future values of variables are forecasted. Since we are not going to conduct the forecast exersice, the seasonal adjustment can be applied.

[2] Note that 1995 is a base year for CPI and PPI.

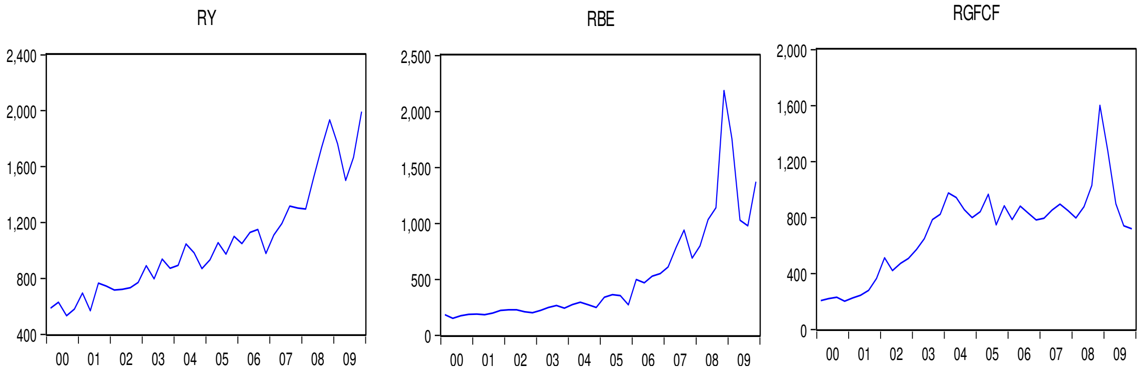

Fig. 2 Non-oil GDP, Budget expenditures and Gross fixed capital formation in real terms.

As evident from the figure, there is a drastic boost in 2008 followed by a sharp decline in 2009 in all three variables. As mentioned in Hasanov and Mehdiyev (2011), in the end of 2008, a boom emerged in the Azerbaijan economy caused by an increased extraction in oil sector and jump in the world oil price. This boom is reflected almost in all macroeconomic indicators, including total and non-oil GDP, CPI, budget revenues and expenditures, gross fixed capital formation. As such, the growth rate of the non-oil sector value added in 2008 was the highest during the entire period of 2003-2009 (The Central Bank of the Republic of Azerbaijan, Statistical Bulletin, December 2009, pp. 5-8).The significant declines in the non-oil GDP in the second quarter of 2009 mostly related to global financial-economic crisis.

4 Econometric methodology

In this research, the impact of fiscal policy on the non-oil sector was estimated within co-integration and error correction modeling framework. The biggest advantage of this method, among others, it is possible to get information about the long-term relationship between variables, the short-term dynamics, as well as speed of such adjustment from the short-term fluctuations to the long-term equilibrium (Gujarati and Porter, 2009, p. 762-765; Enders, 2004, pp. 328-334). Such information is of immense importance both for understanding and analysis of the relations among specific sectors, and a development of effective economic policy measures aimed at particular sectors.

In order to increase robustness of the obtained results, we employ the system-based cointegration approach of Johansen (1995) and the residual-based cointegration approach of Engle and Granger (1987).

4.1 Unit Root Test

Both of these approaches can be applied if variables have the same order of integration. Thus, the first step is to check stochastic features of the variables, in other words, to check their integration orders, for which a Unit Root Test is used. There are various methods to conduct a Unit Root Test, the most widely used are Augmented Dickey-Fuller (Dickey and Fuller, 1981) and Philips-Perron (Philips and Perron, 1988) tests. For any variable x to be Unit Root tested, the ADF Test equation is as following:

$$\Delta x = \alpha + \varphi T + \theta x_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta x_{t-i} + u_t \tag{1}$$

Here, Δ stands for first difference operator; α - is a constant, φ, θ, γ are coefficients; t and T– indicate time and linear trend respectively; p is the number of lags; u_t - is error term, which is a white noise.

The only difference of PP test from the ADF is that it uses non-parametric statistical methods, rather than first order lag difference of the variable (Δx_{t-i}) in order to solve the serial correlation problem of residuals (Gujarati and Porter; p. 758).

The null hypothesis of unit root is $\theta = 0$ in the both tests.

Once it is concluded that all variables have the same order of integration, we perform Johansen and Engle-Granger approaches to test an existence of cointegration among the variables. Since we use three variables in our estimations, the Engle-Granger approach should be treated with care a bit. The point is that, if the number of variables is more than two, and then there may be 3-1 number of cointegration relations among variables which the Engle-Granger apporoach is unable to account for and assumes only one cointegrating relation (Enders, 2004, p.347). Therefore, it would be better to assess the cointegration relation among the variables using Johansen approach first. If the result of the Johansen Cointegratuon Test reveals that a) there is only one cointegrating relation among the variables, b) weak exogeneity test conducted over the constructed VECM reveals weak exogeneity of variables other than *ry* (Enders, 2004, p.368), and c) there is no serial correlation in residuals of cointegration equation normalized by *ry* variable, then it would be more appropriate to check an existence of cointegration among the variables by Engle-Granger approach (De Brouwerand Ericsson, 1995).

4.2 The Johansen cointegration approach

After revealing that variables have the same order of integration, the next step in Vector Autoregression (VAR) based cointegration test using the methodology developed in (Johansen, 1991, 1995; Johansen and Juselius, 1990; Juselius, 2006) is to build unrestricted VAR model of non-stationary time series of variables:

$$y_t = \sum_{i=1}^{p} \Psi_i y_{t-i} + Ax_t + \varepsilon_t \qquad (2)$$

Here, y_t is a (*k x 1*) vector of the non-stationary *I(1)k* variables, x_t is a (*k x 1*) vector of deterministic variables, Ψ is a (*n x n*) coefficient matrix, A is a (*n x* 1) vector of coefficients, ε_t denotes a (*n x 1*) vector of innovations.

As Johansen (1988) discusses, one of the important issues in obtaining an adequate long-run relationship is to specify correctly an optimal lag order for VAR model. Note that estimated VAR should have optimal lag length which is chosen based on Lag Order Selection Criteria such as Akaike, Schwartz, Hannan-Quinne and should not have any problems withstability as well as serial correlation, non-normality and heteroscedasticity of the residuals (see: Lütkepohl, 1991, Section 4.3; Johansen 1995, p.22; Doornik, 1995). Note that since the number of observation is not long enough, we employ small sample correction version of the residuals normality test (see: Doornik and Hansen, 2008).

Note that the null hypothesis in the cointegration test is that there is no long-run relationship among modeled variables. Equation (2) may be re-written as in below:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + B x_t + \varepsilon_t \quad (3)$$

Equation (3) isJohansen (1988); Johansen and Juselius (1990) full information maximum likelihood of a Vector Error Correction (VEC) Model. Here,

$$\Pi = \sum_{i=1}^{p} A_i - I, \qquad \Gamma_i = -\sum_{j=i+1}^{p} A_j \quad (4)$$

If the coefficient matrix Π has reduced rank *0 < r <k*, then there exist *k x r* matrices of loading coefficients α , and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the VEC model.

Using the Johansen's approach for testing cointegration, covers estimation of the Π matrix from unrestricted VAR and then testing the restriction implied by the reduced rank of Π. The rank of Π determines the number of cointegrating vectors and in its turn is determined by the number of non-zero characteristic roots. The Max and Trace tests statistics are used to test for non-zero characteristic roots.

4.3 The Engle-Granger cointegration approach

Engle-Granger approach consists of the following stages (Enders, pp. 339-343): The first step is to determine the order of integration of the variables. If the result of a Unit Root Test reveals that variables are integrated at the same order, then we can proceed to the second stage of Engle-Granger approach, which is testing for an existence of cointegrating relationships among the variables. The first step in the second stage is estimation of the level relationship among the variables:

$$q_t = \phi_0 + \phi_1 z_t + v_t \quad (5)$$

Where, q - is depended variable; ϕ_0, ϕ_1 - are coefficients; z - represents a matrix of explanatory variables; v_t - denotes residuals.

Note that, since (3) uses non-stationary time series of the variables, standard t or F statistic cannot be used for making an inference (Stock andWatson 2007,pp. 557-560). An existence of the long-run relationship can be tested by checking stationarity of residuals from (5), i.e., v_t. For this purpose, usually the ADF test is used. Again note that since the time series of v_t is not observable, in other words, they are linear combination of non-stationary time series, a critical values specifically calculated by Engle and Granger for checking the presence of cointegration have to be used in stationarity testing. These ctirical values can be found in Engel and Granger (1987) or MacKinnon

(1991). So, standard critical values of the ADF test cannot be used (Gujarati and Porter, 2009, p. 763).

If the time series of v_t is stationary, then it can be concluded that cointegration exists among the variables and it is possible to proceed to the last stage of the approach which is estimation of error correction model:

$$\Delta q_t = \alpha_0 + \alpha_q \varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_{1i} \Delta q_{t-i} + \sum_{i=0}^{p} \alpha_{2i} \Delta z_{t-i} + \omega_{qt} \tag{6}$$

where, α_0 - is an constant term; α_q - is an error correction cofficient, i.e. speed of adjustment; α_{1i}, α_{2i} denotes short-term coefficients, ω_{qt} is a residual of error correction model and they have zero mean and constant variance.

If α_q statistically significant with negative sign, then it can be concluded that there is a stable cointegrating relationship between variables, that is, short-run fluctuation between variables adjusts to the long-run equilibrium relationship.

Note that, one of the important issues in accurately estimating an error correction model is correctly specifying optimal lag order of the differenced the right-hand side variables. Maximum lags size can be determined by several methods, as well as based on the frequency of the time series. For example, if the investigation period is quarterly and the number of observation is small, then four (p=4) can be considered as a maximum lag size (Perron, 1989). Optimal lag length can be specified by the number of methods, such as Akaike, Schwarz and Hannon-Quinn information criteria, the statistical significance of the longest lag.

5 Estimation results

Estimations cover the period of I quarter of 2000 through IV quarter of 2009[3]. To make econometric estimations results more reader frinedly, we present them in threeparts: Unit Root Test, Johansen and Engle-Granger approaches results.

5.1 Unit Root Test

As stated in sub-section 4.1,we use the ADF and PPP tests to check an existence of unit root. Table 1 reports the tests results.

Table 1 Unit Root Test Results

Variables	Test method	Level				First difference			
		Inter-cept	Trend	Actual value	Lag length	Inter-cept	Trend	Actual value	Lag length
ry	ADF	Yes	Yes	-2.039	6	Yes	No	-7.013***	1
	PP	Yes	Yes	-4.517***		Yes	No	-17.621***	
rbe	ADF	Yes	Yes	-3.160	0	Yes	No	-6.260***	1
	PP	Yes	Yes	-3.057		Yes	No	-10.760***	
rgfcf	ADF	Yes	No	-2.148	0	No	No	-5.321***	0

[3]The estimations are performed in E-views 7.0 econometric package.

PP	Yes	No	-2.311	No	No	-5.295***

Notes:
*, ** and *** indicate rejection of the null hypothesis of Unit Root at the 10%, 5% and 1% significance levels respectively;
Lag length in the ADF test is automatically selected by Schwarz information criterion, while Bandwidth in the PP test is automatically seleced by Newet-West method.

Note that lower case notation of variables in the table and hereafter is referred to the natural logarithm expression of theirs. The ADF and PP test results indicate that all variables, *ry, rbe*, and *rgfcf*, are non-stationary at their level and stationary at their first difference, expect the latter test to show trend stationarity of *ry*. In order to clarify the contrast results yielded by the ADF and PP tests on *ry*, we tested time series of the variable using two other unit root tests, namely, Kwiatkowski-Phillips-Schmidt-Shin (1992) and Ng-Perron (2001). Considering the results from both the tests, it can be concluded that data generating process of *ry* has a unit root rather than deterministic trend. Moreover, the graph of *RY* in Figure 2 is also depicts non-stationarity, rather than stationarity or trend stationarity. Thus, as a research decision, we concluded that *ry* is non-stationary, but its first difference is stationary. It is worthwhile to note that the results of Unit Root Tests conducted in other studies on the real non-oil GDP also concluded that this variable is non-stationary at the log level, but stationary at it's the first difference, i.e. growth rate form (For example, see Hasanov, 2010; Hasanov and Hasanli, 2011).

Thus, we conclude that all the variables in the table have the same order of integration, which is one, i.e. I(1).

5.2 Estimations results from the Johansen approach

Since all the variables are integrated in the same order, in other words they are I(1), we can proceed to the next stage – checking the cointegrating relationship among variables by using the Johansen method. For this purpose, we specified a Vector Auto Regression (VAR) model containing three endogenous variables of *ry, rbe, rgfcf* and exogenous variables of the constant and dummy variables, namely, *D_08Q4* and *D_09Q2* which are equal to unity in the fourth quarter of 2008 and second quarter of 2009 respectively and zero otherwise. We estimated VAR in the maximum lag order of four, considering that number of observation is small. Based on information criteria, the non-serially correlated residuals with homoscedastic variance and normal distribution as well as stability of the VAR we tried to choose an optimal lag order. The four (Akaike, Hannan-Quinn, Final Prediction Error and Likelihood Ratio) out of the five lag selection information criteria suggest lag size of four, while Schwarz prefers one lag. In sake for robustness, we estimated VAR in both the lag orders and then tested their stability as well as serial autocorrelation, non-normality and heteroskedasdicity of their residuals. We found that only VAR with four lags isstabileand its residuals are not serially correlated.

As a next step, we checked the presence of cointegration among the variables in The Vector Error Correction Model (VECM hereafter). According to the methodology, VECM with three lags is estimated as the VAR was with four lags. Both the Trace and Max-Eigen tests indicate that there is only one cointegrating relationship among the variables[4].

Table 2 reports the cointegration vector normalized for *ry*, speed of adjustment as well as some test results from the VECMwith three lags.

[4]The cointegration test specification was Intercept (no trend) in Cointegration Equation and VAR, Note that this specification is more appropriate for the majority of economic processes. All of the cointegration test results can be obtained from the authors upon requiest.

Table 2 Cointegration Analysis

Variables	Cointegration Equations Specification: Intercept (no trend) in CE and VAR
ry	1.00000
rbe	0.401524
[t-statistics:]	[13.4873]
rgfcf	0.227134
[t-statistics:]	[6.90064]
C	3.024764
ECM coefficient (α_{ry})	-0.624017
[t-statistics:]	[-2.52479]
Panel A: Residuals Tests[a]	
LM Test	No Serial Correlation
Jarque-Bera	2.207291
(Prob.)	(0.8997)
White Heteroskedasticity (χ^2)	129.7302
(Prob.)	(0.5396)
Panel B: Multivariate Test for Statistical Significance of the Variable[b]	
$b_{ry} = 0$	
χ^2 (Prob.)	6.327694 (0.011887)
$b_{rbe} = 0$	
χ^2 (Prob.)	7.754852 (0.005357)
$b_{rgfcf} = 0$	
χ^2 (Prob.)	8.210516 (0.004165)
Panel C: Multivariate Test for Stationarity[c]	
$b_{ry} = 1, b_{rbe} = 0, b_{rgfcf} = 0$	
χ^2 (Prob.)	8.631385 (0.013357)
$b_{ry} = 0, b_{rbe} = 1, b_{rgfcf} = 0$	
χ^2 (Prob.)	8.216521 (0.016436)
$b_{ry} = 0, b_{rbe} = 0, b_{rgfcf} = 1$	
χ^2 (Prob.)	9.478318 (0.008746)
Panel D: Weak ExogeneityTests[d]	
$\alpha_{ry} = 0$	
χ^2 (Prob.)	4.579515(0.032356)
$\alpha_{rbe} = 0$	
χ^2 (Prob.)	0.016753 (0.897014)
$\alpha_{rgfcf} = 0$	
χ^2 (Prob.)	2.316305 (0.128024)

Notes:
a - The Null hypotheses for LM and Hetersoskedasticity tests are no serial correlation and heteroskedasticity in the respiduals respectively. The Null for Jarque-Bera test is the residuals are normality distribted.
b - The Null hypothesis is that variables are not statistically significant.
c - The Null hypothesis assumes stationarity of the variables tested.
d - The Null hypothesis indicates weak exogeneity of the variables tested.

As evident from Table 2, the value of error correction coefficient (-0.62) is as expected: falls the interval of (-1;0) and it is statistically significant. Moreover, according to Panel ARDL of the table, the residuals of VECM are not subject to any problems of autocorrelation, nonnormal distribution and heteroscedasticity. Hence, it can be concluded that there is stable cointegration among the value added of non-oil sector, budget expenditures and fixed capital investments all in real terms.

χ^2 values (or their probabilities) from the Multivariate test for statistical significance, reported in Panel B of the table, indicate that all three variables in the cointegration space are statistically significant.

Panel C reports results of Multivariate test for stationarity. Note that unlike the univariate unit root tests such as the ADF and PP, this test takes the null hypothesis of stationarity. The results indicate that the variables are not stationary in their log level. In particular, multivariate test for stationarity suggests a non-stationarity of *ry*. Thus, it is desirable that the test results here are consistent with those from the ADF and PP in sub-section 5.2.

The weak exogeneity test results in Panel Dshow that *rbe* and *rgfcf* are weakly exogenous. This is desirable, because it shows that contemporaneous correlation among the three cointegrating equations' errors do not affect coefficients of equation for *ry*. Since, *rbe* and *rgfcf* are weakly exogenous to the cointegration system, we can proceed to estimate a single equation error correction model for *ry*, instead of vector of error correction equationsas suggested by De Brower and Ericsson (1995).

5.3 Estimation Results from the Engle-Granger approach

The results of the Johansen cointegration test, which indicates only one cointegrating relationship among the variables and the weak exogeneity test concluding weak exogeneity of *rbe* and *rgfcf* make us confident in using the Engle-Granger approach[5]. Therefore, this section tests an existence of cointegration and estimate single equation error correction model for *ry* in the framework of the Engle-Granger approach.

After ensuring that all variables are integrated in the order of one, wecan test an existing of cointegration among the variables. In the first stage of the approach, we estimate (5) in the case of *ry*, *rbe* and *rgfcf* and get the following results[6]:

$$ry = 3.59 + 0.35 * rbe + 0.19 * rgfcf + e \quad (7)$$

In the second stage, we checked stationarity of residuals calculated from (7) by means of the ADF test. Table 3 below tabulates the test results.

Table 3 The ADF Test Results for Cointegration

Null Hypothesis: *ECM_EG* has a unit root; Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		***-5.241278***	0.0000
Test critical values:	1% level	-4.68218	
	5% level	-3.96587	

[5] Note that some studies discuss that employing the Engle-Granger approach in the case of more than two variables is not suggestive, since the approach is unable to check an existence of more than one cointegrating relationship. Additionally, they criticize that the Engle-Granger approach preassumes weak exogeneity without testing it, which may not be the true in reality.

[6] Note that we estimate equation (5) also by using Fully Modified Ordinary Least Squares and Dynamic Ordinary Least Squares and test an existence of long-run relationship. The results from these two methods and cointegration tests are very close to those from Ordinary Leat Suqares case. They can be obtained from the authors.

10% level	-3.61366

Note: The relevant critical values of MacKinnon (1991) are calculated based on the combination of 39 observations, 3 explanatory varibles, presence of constant and no trend.

As shown in Table 3, the sample ADF test value (-5.241278) is greater than the critical value (-4.68218) at all the significance levels. Hence, we can conclude that the calculated residuals from equation (7) are stationary. In other words, there is long-run (cointegrating) relationship among the *ry*, *rbe* and *rgfcf*. Since we found cointegration among the variables, the coefficients of equation (7) are not spurious and have economic meaning and can be used in economic interpretations.

As stated in the sub-section 4.3, if there is cointegrating relationship among the variables, then we can estimate an error correction model. Again, as discussed in the sub-section, in order to have a well-specified error correction model, maximum and optimal lag order of the model should be set correctly. In this regard, since our research period covered a quarterly frequency and due to the small number of observations, we first estimated equation (6) with four lags as a maximum lag order by following De Brouwer and Ericsson (1995). Then by employing "From specific to general" approach (Enders, 2004, pp. 366-373; De Brouwer and Ericsson, 1995) we attempt to get a more parsimonious specification. The obtained parsimonious and final specification and some test results are reported in Table 4.

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Table 4 Results of Error correction model estimation

Panel A: Error correction model

Dependent Variable: $\Delta\, ry$; Method: Least Squares;

Independent Variable:	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000853	0.017524	-0.048660	0.9615
ECM_EG(-1)	-0.593727	0.188928	-3.142614	0.0038
$\Delta\, rbe$(-4))	0.279209	0.085674	3.258959	0.0029
$\Delta\, rgfcf$(-4))	0.186477	0.109928	1.696358	0.1005
D_09Q2	-0.297311	0.091701	-3.242174	0.0030
D_08Q4	0.263323	0.097297	2.706377	0.0113
R-squared	0.509307	Mean dependent var	0.030047	
Adjusted R-squared	0.424704	S.D. dependent var	0.115920	
S.E. of regression	0.087924	Akaike info criterion	-1.869893	
Sum squared resid	0.224186	Schwarz criterion	-1.603262	
Log likelihood	38.72313	Hannan-Quinn criter.	-1.777852	
F-statistic	6.020011	Durbin-Watson stat	2.122528	
Prob(F-statistic)	0.000615			

Panel B: Results of Residuals Diagnostics and Misspecification Tests

Residuals Diagnostics Tests

Q-statistics Test

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.084	-0.084	0.2705	0.603
**| . |	**| . |	2	-0.266	-0.275	3.0500	0.218
. | . |	.*| . |	3	-0.033	-0.092	3.0938	0.377
.*| . |	**| . |	4	-0.108	-0.215	3.5771	0.466
.*| . |	.*| . |	5	-0.069	-0.169	3.7801	0.581
. | . |	.*| . |	6	-0.017	-0.182	3.7927	0.705
.*| . |	**| . |	7	-0.108	-0.297	4.3337	0.741
. |*. |	. | . |	8	0.170	-0.041	5.7143	0.679
. |** |	. |*. |	9	0.231	0.088	8.3798	0.496
.*| . |	.*| . |	10	-0.102	-0.067	8.9229	0.539
. |*. |	. |*. |	11	0.078	0.170	9.2517	0.599
. | . |	. |*. |	12	-0.000	0.089	9.2517	0.681
.*| . |	. | . |	13	-0.188	-0.011	11.327	0.583

. | . |	. | . |	14	-0.030	0.031	11.383	0.656
.*| . |	.*| . |	15	-0.091	-0.108	11.922	0.685
. | . |	.*| . |	16	-0.031	-0.087	11.988	0.745

Normality Test: Jarque-Bera 0.229570 (0. 891558)

	LM Test:	ARCH Test:	White Heteroskedasticity Test:
F-statistic (Probability)	1.438748 (0.2548)	0.631170 (0.4328)	0.748539 (0.6839)
Obs*R-squared (Probability)	3.370844 (0.1854)	0.657646 (0.4174)	9.226741 (0.6010)

Note: *Herein the brackets respectively given probablity of statistics.*

Misspecification Test

Ramsey RESET Test	
t-statistic (Probability)	1.603802 (0.1200)
F-statistic (Probability)	2.572181 (0.1200)

Since the size and sign of the coefficient on error correction term with one lag, ECM_EG(-1),is statistically significant and negative, we can conclude that there is stable cointegrating relationship among the non-oil GDP, budget expenditures and gross fixed capital formation all in the real terms. According to the Panel B of the table, the results of Residuals Diagnostics and Misspecification Tests show that the final specification is free of residuals' serial correlation, non-normality, ARCH effect, heteroskedasticity as well as misspecification.

6 Comparison of the results and Interpretations

Table 5 compares the long-run elasticities and speed of adjustment coefficients obtained from the Johansen and the Engle-Granger cointegration approaches.

Table 5 Comparison of coefficients derived from different approaches

Dependent variable: ***ry***	**The Johansen approach**	**The Engle-Granger approach**
Explanatory variables:		
c	3.02	3.59
rbe	0.40	0.35
rgfcf	0.23	0.19
ECM coefficient	-0.62	-0.59

It is desirable that both of the approaches yield very similar results. This would infer robustness of the empirical analysis and adequate representation of the reality.

According to the Table 5, ceteris paribus a one percent increase (decrease) in the real budget expenditures leads to 0.35-0.40 percent increase (decrease) in the real non-oil GDP in the long run. Such finding is consistent with economic theory as an increase in budget expenditures can result increase in aggregate demand, which in turn can stimulate the production of goods and services. The Azerbaijani government should take into account this long-run positive relationship in its fiscal policy measures. In order to further improve effectiveness of the fiscal policy measures, it would be useful to investigate the following research questions in future: a) which component of budget expenditures, i.e. operational or capital can create more value-added in the non-oil sector? b) What are the impacts of budget expenditures or its components on the non-tradable and tradable branches of the non-oil sector?

Table 5 also shows that, all other things held constant, a one percent increase (decrease) in the real gross fixed capital formation cause an increase (decrease) in the non-oil GDP by 0.19-0.23 percent in the long run. Indeed, growth theories postulate that investment is one of the main determinants of economic growth.

Coefficients of speed of adjustment indicate that any shocks to system are temporary and the system will be converged to its equilibrium level. More precisely, 60 percent of short-run disequilibrium of the previous quarter, t-1, is corrected to the long-run equilibrium level in the current quarter, *t*. It means that fluctuation in the non-oil sector production caused by any shocks in the budget expenditures and gross fixed capital formation will be completely vanished out within about five months.

The error correction model reported in Panel A of Table 4 indicates that, ceteris paribus, a one percentage point change in the growth rate of the real budget expenditures and the real gross fixed capital formation cause to change of the non-oil GDP growth rate by 0.19 and 0.28 percentage points respectively. These findings are in line with Keynes's "effective demand" theory (Keynes, 1936) which states that an increase in budget expenditures in short-run will lead to an increase in aggregate demand and thus, an aggregate supply.

The findings, among others, also imply that the resources in the Azerbaijani economy are not fully employed in the investigated period. Thus, there is still a room for the Azerbaijani policy makers to increase the non-oil sector production through by increasing the government expenditures and investments. The detailed analysis is important in particular considering that "the resource curse" or Dutch Disease concept may potentially matter for the Azerbaijani economy.

7 Concluding remarks and policy recommendations

In this study, we investigate the long- and short-run impacts of the fiscal policy on the non-oil sector of Azerbaijan in the framework of cointegration and error correction modeling.

The empirical results from the different types of cointegration approaches, namely system-based the Johansen approach and the residual-based the Engle-Granger approach are quite close to each other and indicate the budget expenditures have significant positive effect on the non-oil GDP both in the long- and short-run. In other words, the fiscal policy can play a supportive role in developing the non-oil sector of the Azerbaijani economy. In this point, we should not ignore that the ability of the fiscal policy to support the non-oil sector development, among others, is heavily determined by the degree of dependence on the oil revenues. That is why any shocks in the international oil price transmit to budget revenues and thereby expenditures. We observe an example of this context in 2009, a decline in the international oil price caused the considerable decline in the government expenditures as well as in the non-oil GDP. Therefore, one of the urgent remedies for the Azerbaijani policy makers is to gradually loosen the dependence of the government budget on the oil revenues and the oil prices. As an alternative source of government revenues, non-oil taxes can be considered. It is important to note here that, in order to increase non-oil tax revenues, the fiscal authorities should not increase tax rates, as it would be harmful for the development of this sector due to distortion effect. The increase should be obtained the enhancing tax system, legislation, reducing evasion and cutting useless tax exemptions, as well as increasing transparency and efficiency of public expenditures. All of these measures would create productive environment and thereby induce growth in the non-oil sector.

Another policy recommendation derived from this study is that the Azerbaijani policy makers should also pay a particular attention to the investment issues. From this point of view, it would be useful to intensify the measures on creating a more favorable investment climate in order to attract much more domestic and foreign investment in the non-oil sector.

One of the main conclusions of this study is that it reemphasizes the importance of future research on the non-oil sector effects of the fiscal policy. In this regard, analyzing the operational and capital expenditures of the government budget on the tradable and non-tradable branches of the non-oil sector are important.

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