Primary submission: 01.08.2017 | Final acceptance: 05.02.2018

The role of social and physical infrastructure spending in tradable and non-tradable growth

Fakhri J. Hasanov[1,2,3], Jeyhun I. Mikayilov[1,4,5], Sabuhi Yusifov[6], Khatai Aliyev[7,8,9], Samra Talishinskaya[10,11]

ABSTRACT

This study investigates the impact of social and physical infrastructure spending on the non-oil tradable and non-tradable sectors while controlling for non-oil capital stock and employment in the Azerbaijani economy for the period 1995-2014. The analysis employs the Engle-Granger and Phillips-Ouliaris cointegration tests using FMOLS estimation results to test for the existence of long-run relationships. The tests results indicate the existence of long-run relationships among the variables. The estimation results reveal positive impacts of both social and physical infrastructure spending on non-oil tradable and non-tradable outputs. However, the impacts on the non-tradable sector are considerably larger than those on the non-oil tradable sector. Developing the non-resource tradable sector, and thereby reducing possibility of the "Resource Curse" and especially the Dutch Disease, is one of the strategic aims of natural resource-rich countries. In this regard, the findings of this research may be useful for Azerbaijani policymakers in taking measures that aim at fostering the development of the non-oil tradable sector, thereby avoiding possible negative outcomes of resource dependency.

KEY WORDS: Social expenditures; infrastructure expenditures; non-oil tradable sector; non-tradable sector; Dutch Disease, Azerbaijan

JEL Classification: H5; O1; O2

[1] King Abdullah Petroleum Studies and Research Center, Saudi Arabia;
[2] George Washington University, Economics Department, USA;
[3] Azerbaijan National Academy of Sciences, Institute of Control Systems, Azerbaijan;
[4] Institute for Scientific Research on Economic Reforms, Azerbaijan;
[5] Azerbaijan State University of Economics, Department of Statistics and Econometrics, Azerbaijan;
[6] Azerbaijan Technology University, Department of Public Administration, Azerbaijan;
[7] Azerbaijan State University of Economics, UNEC Empirical Research Center, Azerbaijan;
[8] Baku Engineering University, Department of World Economy, Azerbaijan; [9] ASERC, Baku, Azerbaijan;
[10] OJSC The International Bank of Azerbaijan, Azerbaijan; [11] ADA University, School of Economics, Azerbaijan

1. Introduction

The direction of the relationship between government expenditures and economic growth has been a subject of debate among scholars and has led to a substantial number of empirical studies (Barro 1991; Cooray, 2009; Fölster & Henrekson 2001; Landau 1986). This empirical research concentrates primarily on developing countries' public expenditure and especially capital spending, which is considered an effective measure for decreasing poverty, promoting the domestic economy and consequently boosting economic growth, which contributes

Correspondence concerning this article should be addressed to: **Khatai Aliyev**, Azerbaijan State University of Economics, UNEC Empirical Research Center, Istiglaliyyat street 6, Baku, AZ1000, Azerbaijan. E-mail: khatai.aliyev@unec.edu.az

to the socio-economic well-being of nations (Bose, Haque & Osborn, 2007; Fan & Rao, 2003). Infrastructure spending, one of the main components of capital expenditure, is generally considered a driver of economic growth (see Sahin, Can, & Demirbas, 2014; Sojoodi, Mohseni Zonuzi, & Mehin Aslani Nia, 2012), although some studies, such as Josaphat and Morrissey (2000) and Romer (1990), find a negative relationship between the two. Hence, the existing literature has regarded infrastructure spending as a pivotal component of economic growth, and a lack of infrastructure is thought to hinder economic development (Aschauer, 1989a; 1989b; 1989c). Gemmell, Kneller and Sanz (2016) suggest the reallocation of public spending towards expenditures to stimulate long-run output levels based on an examination of a sample of OECD countries.

The above-mentioned positive effects of government spending, especially capital expenditures, on economic growth is ambiguous for natural resource-rich developing countries because the functioning of their economies, particularly the fiscal mechanisms, is quite different (Budina, Pang, & Van Wijnbergen, 2007; IMF, 2007; Kalyuzhnova & Kaser, 2006; Krause & Lücke, 2005; Sturm, Gurtner, & Gonzalez, 2009; Wakeman-Linn, Mathieu, & Van Selm, 2003). The fiscal channel is the main way that resource-rich developing counties, which often experience fiscal expansions, inject resource revenues into the economy (Paczynski & Tochitskaya, 2008; Sturm et al., 2009; Wakeman-Linn et al., 2003). The expansion of government expenditures may harm economic growth in the long run due to the Dutch Disease (Auty, 2001; Corden & Neary, 1982; Krugman, 1987; Matsuyama, 1992), weak institutional development (Gylfason, 2004; Leamer, Maul, Rodriguez, & Schott, 1999; Sala-i-Martin & Subramanian, 2003; Stijns, 2005) and rent seeking (Auty, 1997; Bulte, Damania, & Deacon, 2003; Sachs & Warner, 1999). The main conclusion of the above-mentioned studies is that, to guard the economy against these threats, non-resource (especially non-resource tradable) sectors need to be developed.

The infrastructure in Azerbaijan has experienced considerable improvement, owing to high yields from oil revenues over the last two decades (Hasanov, 2013b). Alongside rapid improvements in social and physical infrastructure, the government has launched a number of programs such as its Regional Development Programs covering the 2004-2008 and 2009-2014 periods to promote development in the non-oil sector. This inspired a number of studies to investigate the impact of government expenditure on economic growth in Azerbaijan (Aliyev, Dehning, & Nadirov, 2016; Aliyev & Mikayilov, 2016; Aliyev & Nadirov, 2016; Dehning, Aliyev, & Nadirov, 2016; Hasanov & Alirzayev, 2016; Koeda & Kramarenko, 2008). However, these mentioned studies do not examine the impact of different categories of government expenditures on the tradable and non-tradable sectors of the economy. Investigating this topic is important because there has been a rapid increase in government expenditure, and it is vital to analyze whether this expenditure has positively or negatively influenced the non-oil tradable and non-tradable sectors of the economy. Thus, our aim in this research is to examine the role of the infrastructure and social spending in the development of the non-oil tradable and non-tradable sectors of the Azerbaijani economy.

This study employs cointegration tests, estimates long-run elasticities and finds positive impacts of both social and physical infrastructure spending on the non-oil tradable and non-tradable sectors. The findings of the study may be useful for decision-makers in taking effective measures to support the development of the non-oil tradable sector.

To the best of our knowledge, no prior study has investigated the impact of social and physical infrastructure spending on the non-oil tradable and non-tradable sectors in Azerbaijan. Attempting to fill this gap is the main contribution of this study. Another contribution of this study is that it constructs a dataset covering the non-oil tradable and non-tradable outputs and the respective employment and capital stocks as well as government infrastructure and social spending over the period 1995-2014 for Azerbaijan and makes it publicly available, which should encourage future related studies.

The remainder of this paper is organized as follows. Section 2 briefly reviews the existing literature, while Section 3 describes the data employed. The modeling framework and methods are discussed in Section 4. Section 5 presents outputs from the empirical analysis, and Section 6 discusses them. Finally, Section 7 summarizes the main concluding remarks and policy recommendations of the study.

2. Literature Review

A tremendous number of empirical studies have investigated the effects of aggregated and disaggregated public expenditures on economic growth. The results varied from study to study, as different countries, data, and period were considered. The existing literature can be classified into three groups with respect to the conclusions obtained. First group finds positive effect of public spending on economic growth. Some examples of this strand of research are Olukayode (2009) for Nigeria, Sojoodi et al. (2012) for Sahoo, Dash and Nataraj (2010) for China, Alexiou (2009) and Sahin et al. (2014) for European countries, and Aschauer (1989a, b, c) for the US. The second group supports the idea that public expenditure has a negative impact on economic growth (see Taban, 2010 for Turkey and Ighodaro and Okiakhi, 2010 for Nigeria). Finally, the third group of studies obtains mixed results: some components of disaggregated government spending have positive effects, while others either do not have any effect or are negatively associated with economic growth. Alshahrani and Alsadiq (2014) for Saudi Arabia, Saad and Kalakech (2009) for Lebanon, Belgrave and Craigwell (1995) for Barbados and Bose et al. (2007) for 30 developing countries are included in this strand of the literature. The World Development Report provides a summary of similar literature, where in some cases infrastructure spending stimulates economic growth, while in other cases, it plays no apparent role (The World Bank, 1994). Recently, in the case of Vietnam, Quy (2017) reports that public investments, especially in social and economic services, positively and significantly affect the economic development of localities within the country. Chan, Ramly and Karim (2017) stress the importance of the efficiency of government spending to the promotion of economic growth. Lupu and Asandului (2017) also reveal the existence of cointegration between public expenditure and economic growth for each of 8 Eastern European countries.

Consistent with the objective of this paper, in our detailed review below, we will focus on the studies devoted to Azerbaijan.

Koeda and Kramarenko (2008) evaluate a fiscal scenario with the assumption of a rapid scaling-up of expenditures followed by their rapid scaling-down and consider Azerbaijan's "temporary oil production boom" and the relevant experience of Saudi Arabia and Nigeria in a long-term neoclassical growth model. Their findings support the existence of a positive impact of public expenditures on non-oil economic growth. Additionally, they find that non-oil growth will be slowed following a decrease in capital expenditures.

Hasanov (2013a) studies the role of total budget expenditures in the development of Azerbaijan's non-oil sector for the period 1998Q4-2012Q3 using different econometric methods, i.e., the single equation-based Autoregressive Distributed Lags Bounds Testing (ADLBT) approach by Pesaran et al. (2001) and system-based cointegration approach by Johansen (1988) and Johansen and Juselius (1990). He estimates the long-run elasticity of budget expenditures to non-oil GDP to be 0.55. Similar findings are obtained by Hasanov and Alirzayev (2016) and Aliyev et al. (2016) for 2001Q1-2012Q4 and 2000Q1-2015Q2, respectively.

Aliyev et al. (2016) follow Hasanov (2013a) and Hasanov and Alirzayev (2016) while controlling for oil-related factors, such as oil price and production, and national tax revenues. They employ several alternative techniques, such as Ordinary Least Squares (OLS), ARDLBT, Fully Modified OLS (FMOLS), Dynamic OLS (DOLS), and Canonical Cointegration Regression (CCR), to test for the existence of a cointegration relationship for the period 2000Q1-2015Q2. Their findings also reveal a statistically significant and positive long-run impact of budget expenditures on the non-oil sector. They find that the elasticity ranges from 0.73 to 0.87, depending on the method employed.

In Dehning et al. (2016), the authors categorize budget expenditures as capital (or physical infrastructure), education, health, social, administration, and other expenditures for the period 2000Q1-2014Q4 while controlling for the effect of the oil boom. They reveal a positive correlation between all types of expenditure items and non-oil GDP. The long-run elasticities of non-oil economic performance with respect to capital, education, health, social, administration, and other expenditures are found to be 0.43, 0.38, 0.76, 0.56, 0.77, and 0.69, respectively. Moreover, the authors show that fiscal effectiveness decreased significantly during the oil boom period. According to Dehning et al. (2016), the long-run contribution of the above-mentioned expenditure categories was 0.12%, 0.10%, 0.11%, 0.04%, 0.06%, and 0.11% less after the oil boom compared to the previous period, respectively.

Our contribution to the existing empirical literature is that this is the first study that investigates the impact of both social and physical infrastructure spending on the disaggregated non-oil sector, namely the non-oil tradable and non-tradable sectors, in the long run for Azerbaijan, an oil-rich country. Theoretical foundation for this analysis is the Production Function framework by Cobb and Douglas (1928) augmented with government expenditure (Alexiou, 2009; Barro, 1990; Grossman, 1988; Hasanov, Mammadov, & Al-Musehel, 2018; Lucas 1988; Ram, 1986).

3. Data

This section describes the dataset that we constructed for the period 1995-2014. As mentioned in the Introduction, one of the contributions of our study is that we construct/calculate the indicators described below and make them publicly available, which should encourage future research in this area.

The construction of the non-oil tradable and non-tradable data is based on the International Monetary Fund (IMF) methodology followed in Oomes and Kalcheva (2007) and Hasanov (2013b), while the non-oil capital stock is constructed using the Perpetual Inventory Method framework (Collins, Bosworth, & Rodrik 1996; Michael & Jan-Erik, 2014; Nehru & Dhareshwar, 1993).

Non-Oil Tradable Value Added (RGDP_NOT). This is the value added in the non-oil tradable sector in millions of real 2010 manats. This is sum of the value added in agriculture, forestry, fishery, and manufacturing, measured in millions of manats and deflated by the Consumer Price Index (CPI) of food and non-food goods with a base year of 2010.

Non-Tradable Value Added (RGDP_NT). This is the value added in the non-tradable sector measured in millions of real 2010 million manats. It is calculated as follows: GDP excluding value added in the oil sector and value added in the non-oil tradable sector (agriculture, forestry, fishery, and manufacturing), measured in millions of manats, and deflated by CPI of non-food goods and services, with a base year of 2010. Thus, RGDP_NT contains value added in the Construction, Service, Transportation and Communication sectors.

State Budget Expenditures to the National Economy (RBE_E) is calculated as the amount of expenditures from the central budget used for investments and government purchasing purposes, measured in millions of manats. We deflate the resulting series by CPI, with a base year of 2010, to obtain the real values.

Social Expenditures of the State Budget (RBE_S) is calculated as sum of expenditures from the central budget for remuneration, pensions and benefits, purchases of medicines, dressing materials, food products, etc. for social purposes, measured in millions of manats. To obtain the real values, the resulting series is deflated by CPI, with a base year of 2010.

Non-Oil Capital Stock (RCS_NO). This series is constructed using non-oil gross fixed capital formation as the investment and setting the initial capital-output ratio to be 1.5 and 5% of the depreciation rate under the framework of the Perpetual Inventory method. Then, the obtained values are deflated by CPI, with a base year of 2010, to obtain the real values.

Non-Oil Tradable Employment (E_NOT) is constructed as the sum of employment in the agriculture, forestry, fishery, and manufacturing sectors, measured in thousands.

Non-Tradable Employment (E_NT). This series is computed as the non-oil sector employment excluding employment in agriculture, forestry, fishery, and manufacturing, measured in thousands.

All the data needed to construct the above-mentioned variables were collected from the official webpage of State Statistical Committee of the Azerbaijan Republic (http://www.azstat.org).

Table A1 in the Appendix describes the formulas and data needed for the calculations, as well as their retrievable web source in detail, while Table A2 reports the constructed data for the period 1995-2014.

Figure 1 below illustrates the time profiles of the natural logarithmic expressions of the constructed indicators over the period 1995-20014.

As demonstrated in Figure 1, the non-oil tradable value added in Azerbaijan has experienced two downward shifts: one in 2004, which is sudden, and another that gradually evolved during the period 2007-2010 and was of greater magnitude. In contrast, the non-tradable value added exhibited an upward shift during the period 2006-2008. The shifts in these variables were most likely caused by the “oil boom” during the period 2006-2008 and then the recent global financial crisis (Aliyev 2014; Aliyev & Suleymanov, 2015).

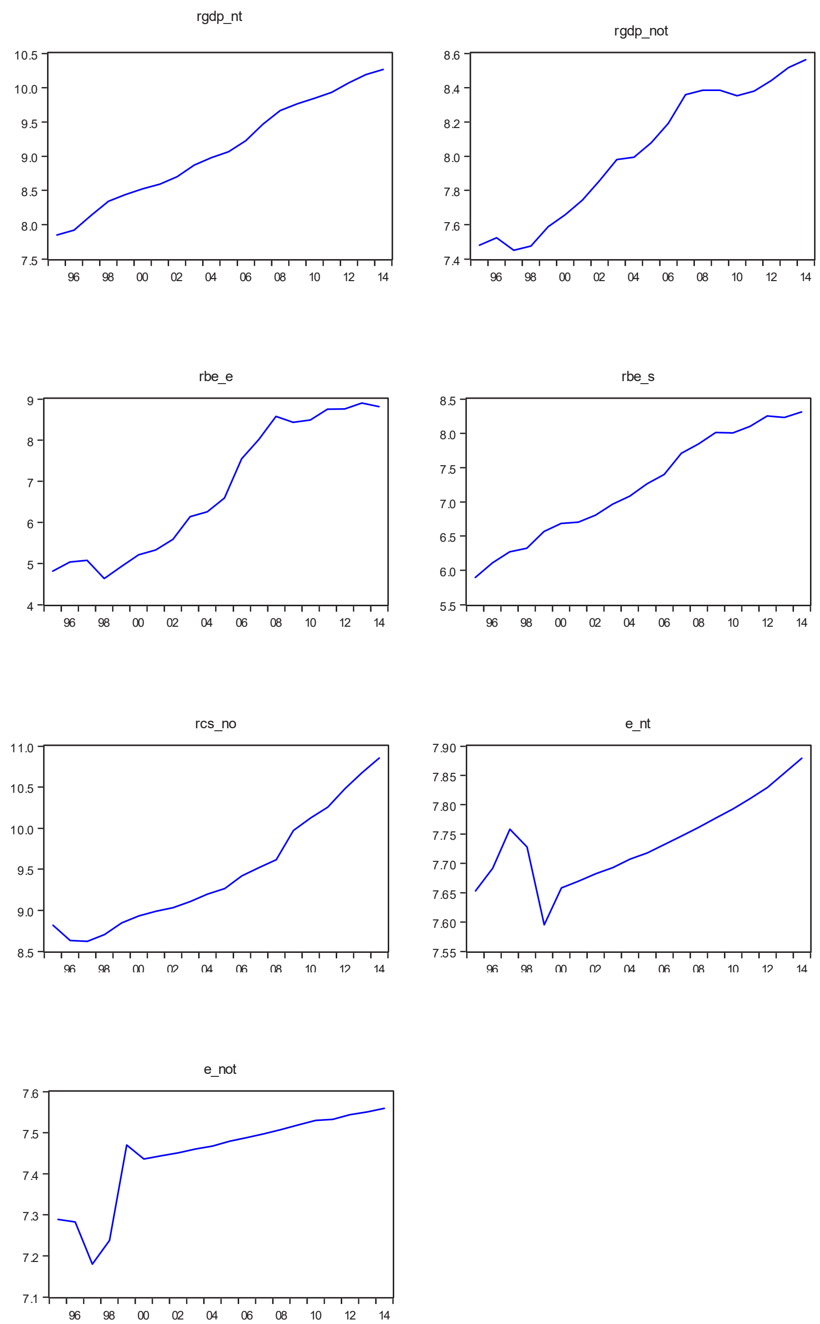

Figure 1. Time profile of the logs of variables

Figure 1 also illustrates capital expenditures from the state budget over time. At the beginning of the oil boom period, there is a sharp increase in government expenditures, especially in the infrastructure spending, during the years 2006-2008. Due to the recent global financial crisis, the oil price declined, and as a result, oil revenues and physical infrastructure spending declined considerably in 2009 but began to recover in subsequent years. It can be seen in Figure 1 that social expenditures exhibit a relatively stable but small upward slope compared to the capital expenditures. Note that the former dominated the state budget until 2006, while the latter have since increasingly exceeded the former.

Figure 1 shows time profile of the non-oil capital stock during the period investigated. As is the case for any macroeconomic indicator, the non-oil capital stock was also considerably influenced by the oil boom in the country. However, unlike other macro-indicators, the variable was impacted by the boom with lag, which is consistent with the nature of the capital stock.

One can observe from Figure 1 that employment in the non-tradable sector is higher than that in the non-oil tradable sector.

4. Methodology

This section discusses the methodology employed in the present study.

4.1 Unit Root Test

In empirical studies, it is important to examine the order of integration of given variables to rule out spurious results. The Augmented Dickey Fuller (ADF hereafter, Dickey and Fuller, 1981) Unit Root (UR) Test is widely employed for this purpose.

For a given time-series variable denoted by y, the *t*-statistic on b_1 provides the ADF statistic from the equation below:

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

Here, b_0 is a constant term; Δ indicates the first-difference operator; k represents the maximum number of lags; t is the linear time trend; and white noise residuals and the lag order are defined as ε_t and *i*, respectively.

If the t-statistic in the estimated ADF equation is smaller in absolute terms than the critical ADF values at different significance levels, then the null hypothesis of a UR cannot be rejected, and hence it is concluded that y_t is a non-stationary variable, i.e. it contains a unit root. Otherwise, if the t-statistic in the estimated ADF equation is greater in absolute terms than the critical ADF values at different significance levels, the null hypothesis of a UR can be rejected, meaning that the variable is not non-stationary.

Also note that

$$b_1 + 1 = p \qquad (2)$$

where p is the coefficient on y_{t-1} in the level UR equation given below:

$$y_t = b_0 + \psi t + p y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \varepsilon_t \qquad (3)$$

According to the UR concept, if $b_1 = 0$, i.e., $p = 1$, then y_t has a UR. Otherwise, if $b_1 = -1$, i.e., $p = 0$, y_t does not have a UR.

In empirical applications, it is difficult to find b_1 being exactly zero or negative unity. Therefore, if it is close to zero, then it can be assumed that there is a UR in a given series. Otherwise, if it is close to negative unity, then one can argue that there is no UR in the series.

Due to space limitations, we do not discuss detailed aspects of the UR tests here, but they can be found in Dickey and Fuller, 1981; Stock and Watson, 1993; Dolado, Jenkinson and Sosvilla-Rivero 1990; Brouwer and Ericsson, 1998; and Enders, 2010.

Note that in some cases (for instance, when number of observations is small or the given variables have a structural break) standard UR tests, such as the ADF, yield mixed results. For the sake of robustness, it is preferable to employ other UR tests and those with structural breaks as well as inspect time profiles of given variables carefully to conclude comprehensively about the integration order of them in such circumstances.

4.2 Fully Modified Ordinary Least Squares (FMOLS) method

If series are cointegrated, the static OLS estimation of the cointegrating vector is consistent, converging at a faster rate (Hamilton 1994). One important weakness of static OLS (SOLS) is that its estimates have an asymptotic distribution that is *generally* non-Gaussian, exhibit asymptotic bias and asymmetry, and are a function of non-scalar nuisance parameters. If we make inference in a cointegration context employing OLS, conventional testing procedures are not valid and require further modifications.

Phillips and Hansen (1990) propose the so-called Fully Modified OLS (FMOLS) estimator, which employs a semi-parametric correction to reduce the problems caused by the long-run correlation between the cointegrating equation and innovations in the stochastic regressors. This estimator is asymptotically unbiased and has fully efficient mixture normal asymptotics, which allows for the use of conventional testing and inferencing procedures such as the standard Wald test using asymptotic Chi-squared statistical inference.

The FMOLS method modifies variables and estimates directly to eliminate the existing nuisance parameters. The idea behind the FMOLS procedure is transforming the data and estimators. The FMOLS estimator uses preliminary estimates of the symmetric and one-sided long-run covariance matrices of the residuals.

Let $\hat{\Omega}$ and $\hat{\Lambda}$ be the long-run covariance matrices (and appropriate submatrices) computed using the residuals from the cointegration and level equations $\hat{u}_t = (\hat{u}_{1t}, \hat{u}_{2t}')'$. Then, we may define the modified data

$$\hat{y}_t^+ = y_t - \hat{\omega}_{12}\hat{\Omega}_{22}^{-1}\hat{u}_2 \tag{4}$$

and an estimated bias correction term

$$\hat{\lambda}_{12}^+ = \hat{\lambda}_{12} - \hat{\omega}_{12}\hat{\Omega}_{22}^{-1}\hat{\Lambda}_{22} \tag{5}$$

The FMOLS estimator is given by

$$\hat{\theta} = \begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = (\sum_{t=2}^{T} Z_t Z_t')^{-1}(\sum_{t=2}^{T} Z_t y_t^+ - T\begin{bmatrix} \hat{\lambda}_{12}^{+}{}' \\ 0 \end{bmatrix}) \tag{6}$$

where $Z_t = \left(X_t', D_t'\right)'$ is a vector of independent variables.

Note that this method has the advantages of eliminating sample bias in addition to correcting for endogeneity and serial correlation effects (Narayan and Narayan, 2004).

5. Empirical estimations

Note that the natural logarithm forms of the variables are used in the empirical analysis over the period 1995-2014.

5.1 Unit root test results

We applied the ADF test to examine the integration properties of the variables. Note that since we have a small number of observations, as a robustness check, we investigate the ADF sample values along with the b_1 coefficient in equation (1). The purpose is to determine whether different ways of testing for a UR will lead to the same conclusion.

We conduct our UR investigation for both the intercept and trend as well as the intercept only in the ADF test equation. We test for trend in both the level and the first difference of the variables. Our explanation for including the trend in both cases is that, as explained in Hasanov Bulut and Suleymanov (2016), inter alia, if we do not have the trend in our test equation, but it is a part of the data generating process, this will result in misleading results, and the power of the test will decline towards zero. Recall that the power of the test is its ability to reject a false null hypothesis of a unit root (Enders, 2010, p. 234). Then, we test whether the trend is statistically significant in the test equation. If it is not, we exclude it because a redundant trend will consume one more degree of freedom, and a redundantly estimated coefficient of it will reduce the power of the test. In this case, a researcher will most likely be unable to reject a false null hypothesis, meaning that there is no unit root in the true data generating process (Enders, 2010, p.237-238; Campbell and Perron, 1991). It is noteworthy that the probability of accepting the false null is high when one tests for the first difference of a given variable, as the trend is usually not statistically significant in difference equations.

Table 1 reports the ADF test results.

The table documents that when we test the levels of the variables, the ADF sample statistics (t-statistics) are smaller in absolute terms than the ADF critical values at any (1%, 5% and 10%) significance level, regardless of whether only the intercept or the intercept and trend are included in the test equation. Therefore, it can be concluded that the levels of the variables contain a unit root. In other words, they are non-stationary.

Table 1. The ADF unit root test results

Variables	Intercept and Trend				Intercept			
	Level	b_1	First difference	b_1	Level	b_1	First difference	b_1
rgdp_not	-2.421	-0.410	-2.748	-0.669	-0.534	-0.021	-2.841*	-0.670
rgdp_nt	-2.882	-0.356	-3.492*	-0.865	0.903	0.021	-3.758**	-0.831
rbe_e	-1.524	-0.246	-2.930	-0.765	-0.347	-0.015	-3.053**	-0.766
rbe_s	-1.391	-0.304	-4.224**	-1.074	-1.422	-0.035	-4.148***	-1.013
rcs_no	-2.168	-0.197	-4.739***	-1.002	2.951	0.097	-3.836**	-0.648
e_not	-2.688	-0.726	-6.108***	-1.620	-1.437	-0.182	-5.331***	-1.552
e_nt	-2.078	-0.463	-4.996***	-2.575	-0.668	-0.098	-4.295***	-1.061

Note: *, ** and *** denote rejection of the null hypothesis at the 10%, 5%, and 1% significance levels, respectively. Maximum lag length is set to two, and optimal lag length is automatically selected by Schwarz information criterion (SIC).

In testing the first difference of the variables, the sample ADF values are greater in absolute terms than the ADF critical values at various (1%, 5% and 10%) significance levels when only the intercept is included in the test equation. Hence, one can reject the null hypothesis and conclude that the first differences of the variables are stationary. When both the intercept and trend are included in the test equation, the results are the same for all the variables as in the previous case, except for $\Delta rgdp\_not$ and Δrbe_e. Further analysis shows that the trend is highly statistically insignificant in the ADF test equations of these two variables. This is as expected in the sense that the trend is usually not significant in the difference equations, as discussed above. Thus, one would prefer to specify the test equation without the trend, from which we conclude that $\Delta rgdp\_not$ and Δrbe_e are stationary. Moreover, we apply the KPSS UR test to these two variables. The reason for choosing the KPSS as a robustness check among other alternative tests is that it takes the null hypothesis of stationarity, unlike other UR tests including the ADF. The test results clearly show that $rgdp\_not$ and rbe_e are non-stationary while $\Delta rgdp\_not$ and Δrbe_e are stationary. Additionally, we visually inspect the graphical illustrations of $\Delta rgdp\_not$ and Δrbe_e, and they exhibit mean-reverting processes, which are indicative of stationarity. The ADF test equations with the trend where it appears highly insignificant, the test results for the ADF test without the trend and the KPSS as well as graphical illustrations of the first difference of the variables are not reported here but can be obtained from the authors upon request.

Now, let us check the stationarity of the variables using the b_1 or p coefficient reported in Table 1. When the intercept and trend are included in the test equations, the sample values of the b_1 coefficient are approximately zero (meaning that the sample values of p are close to unity) when we test the levels of the variables, except for e_not. The corresponding values for b_1 and p are close to negative unity and zero, respectively, when the first differences of the variables are tested. The inference from the sample values of the coefficients is that the variables are non-stationary in their levels but stationary in their first differences. For e_not, graphical illustration of it in Figure 1 above clearly shows that the variable is non-stationary in levels. When only the intercept is included in the test equations, the sample values of the b_1 coefficient are approximately zero in the level testing and approximately negative unity in the test of first differences of the variables. These results quite straightforwardly lead to the conclusion that the variables are non-stationary in their levels and stationary in their first differences.

As a final exercise in this sub-section, we perform unit root tests with a structural break for the non-oil tradable value added, as suggested by an anonymous referee. This exercise also serves as a robustness check. The time profile of non-oil tradable value added in Figure 1 suggests two main shifts in its level during the period 1995-2014, as discussed in the Data section above. One is in 2004, which was sudden. The second occurred in 2007 and took place gradually, ending in 2010. To this end, we perform the unit root test with structural breaks by following Zivot and Andrews (1992), Vogelsang and Perron (1998), Kim and Perron (2009) and Perron (2006). We do not discuss the setup of the test procedure, such as selecting the break type, the maximum and optimal lags, or specifying the test equation due to space limitations, but a description can be obtained from the authors upon request. The test runs yield the calculated ADF statistics of −3.13 and −3.00 for the 2004 break and 2010 break, respectively. The critical values from the Perron (1989) test are −3.46, −3.76, and −4.32 and -2.43, -3.46 and 3.99 at the 10%, 5%, and 1% significance levels, respectively. Evidently, for the non-oil tradable value added, the null hypothesis of a UR cannot be rejected in favor of the alternative hypothesis of trend stationary with a break. Thus, the results from the unit root test with breakpoints support those from the standard ADF test.

To summarize the UR test exercises, we can decidedly conclude that all the variables are non-stationary in their levels and stationary in their first differences. In other words, they follow I(1) processes.

5.2 The Results from the FMOLS estimations

In this sub-section, first, using FMOLS, we estimate the impacts of social and physical infrastructure spending on tradable and non-tradable outputs while controlling for non-oil capital stock and employment. Our level equations have the following forms:

$$rgdp\_not_t = \beta_0 + \beta_1 * rbe\_e + \beta_2 * rbe\_s_t + \\ + \beta_3 * rcs\_not_t + \beta_4 * e\_not_t + u_t \quad (7)$$

$$rgdp\_nt_t = \theta_0 + \theta_1 * rbe\_e_t + \theta_2 * rbe\_s_t + \\ + \theta_3 * rcs\_not_t + \theta_4 * e\_nt_t + \vartheta_t \quad (8)$$

where all the variables are defined as above; u and ϑ denote residuals; and β_i and θ_i are coefficients to be econometrically estimated.

Then, we check for existence of long-run relationships among the variables using the Engle-Granger and Phillips-Ouliaris cointegration approaches. Note that initially we attempted to employ the Autoregressive Distributed Lag Bounds testing approach because it usually outperforms other alternative cointegration methods (Pesaran et al., 2001 inter alia). However, our sample size, 19 observations, did not allow us to properly perform the method. For the same reason, we also were unable to properly apply the Johansen cointegration approach or a Dynamic OLS estimator.

Table 2 presents the FMOLS estimation results for both equations.

Note that the residuals of both estimated specifications are normally distributed and free of autocorrelation. Due to space limitations, the test results are not reported here but can be obtained from the authors upon request.

We conduct the Engle-Granger and Phillips-Ouliaris cointegration tests using the residuals from the estimated equations (7) and (8). Table 3 tabulates the results.

In both tests, the sample values of the tau statistics from the ADF tests on the estimated results of equation (7) are smaller than the critical tau statistics from MacKinnon (1996). Therefore, one can conclude that the null hypothesis of no cointegration cannot be rejected. This failure to reject the null is probably due to small sample size, as the MacKinnon (1996) critical values may not provide accurate inference when there are fewer than 25 observations. In fact, the sample value of the b_1 coefficient from the ADF tests above is -0.92. In other words, p is 0.08, meaning that there is no unit root process in the residuals, and thus they are stationary. Stationarity of the residuals implies the rejection of the null hypothesis and accepting that there is a cointegrated relationship among the variables in equation (7).

Regarding equation (8), the Engle-Granger and Phillips-Ouliaris cointegration test results and the estimated value of the b_1 coefficient suggest cointegration among the variables.

Thus, as a research decision, we conclude that there is a long-run relationship among the variables in both equations.

Note that estimates from equations (7) and (8) yield the theoretically expected signs and magnitudes, especially for the capital stock and employment because

Table 2. FMOLS estimation results

Regressors	Equation (7)	Equation (8)
rbe_e_t	0.100***	0.143***
rbe_s_t	0.078	0.453***
rcs_no_t	0.169***	0.320***
e_not_t	0.555***	-
e_nt_t	-	0.491
Intercept	1.024	-2.062
D_1	0.099**	-
D_2	-0.140**	-
D_3	0.087**	-

Notes: Dependent variables are *rgdp_not* and *rgdp_nt* in equations (7) and (8), respectively. D_1 and D_2 are the shift dummies taking values of unity in 2004-2014 and 2010-2014, respectively, and zero otherwise. D_3 is the pulse dummy variable that takes a value of unity in 2003 and zero otherwise; *, **, and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 3. Cointegration test results

	Engle-Granger		Phillips-Ouliaris		b_1
	tau-statistic	z-statistic	tau-statistic	z-statistic	
Equation (7)	-3.858	-17.487	-3.946	-16.534	-0.920
Equation (8)	-5.396**	-23.590***	-5.845**	-20.646*	-1.214

Notes: Null hypothesis: variables are not cointegrated; *, **, and *** denote rejection of the null hypothesis at the 10%, 5% and 1% significance levels respectively; Both tests use MacKinnon (1996) critical values.

both of them have positive signs, and the latter is larger in magnitude than the former. Moreover, the estimated specifications are statistically well behaved.

6. Interpretation of the Empirical Results

This section discusses the empirical results. We first discuss the unit root and cointegration tests results for the considered variables and then interpret the long-run coefficients.

The results from the UR tests and visual analyses of the graphs suggest that all the considered variables exhibit I(1) processes; in other words, they are integrated processes of order one. This finding implies that the variables have stochastic trends and that any shock to the variables will have a permanent effect. Hence, it is difficult to predict the future values of these variables in their level forms.

Since all the variables have stochastic trends, there is a possibility that they move together in the long run. Based on the cointegration tests and estimation results, reported in the Tables 2-3, we conclude that there is a cointegrating relation between the non-oil tradable and non-tradable value added and the explanatory variables: government social and infrastructure spending, capital and labor.

Since we conclude that there is a long-run relationship among the variables, the estimated coefficients in regression equations (7) and (8) can be regarded as long-run elasticities.

The main focus of our study is to analyze the effects of government infrastructure and social expenditures on the non-oil tradable and non-tradable sectors. In this regard, both components have statistically significant impacts on the non-tradable sector, whereas the latter component does not exert a significant influence on the non-oil tradable sector. Ceteris paribus, a 1% increase in infrastructure spending leads to 0.10% and 0.14% increases in the non-oil tradable and non-tradable sectors, respectively. A positive impact of infrastructure spending on these sectors of the economy is theoretically expected in the sense that infrastructure spending is usually considered a government investment and one of the main drivers of economic growth. Moreover, infrastructure spending results in a better-developed infrastructure system, which facilitates the production of goods and services and, thus, attracts more domestic and foreign enterprises/investors. The positive effect of the government's infrastructure spending on the non-tradable sector is higher than that on the non-oil tradable sector. Moreover, as reported in Table 2, social spending by the government has a statistically significant impact only on the non-tradable sector and not on the non-oil tradable sector.

According to the above-mentioned findings and discussion, the non-tradable sector benefits more from government spending than the non-oil tradable sector does. Therefore, the former sector develops more than the latter sector.

We can consider some explanations for this observation. One might associate this phenomenon with the fact that government spending in the economy consists primarily of infrastructure projects taking place in the non-tradable sector. For example, constructing new buildings, roads, highways, bridges, pavement and other related activities are the part of the value-added creation in the non-tradable sector. Therefore, it is unsurprising to observe the development of the non-tradable sector when the government increases capital expenditures. Another explanation is related to the so-called "transition effect" concept. The concept holds that the service sector, which is the main part of the non-tradable sector, expands more than the non-tradable sector, i.e., manufacturing and agriculture, when closed economies, such as the former Soviet Union republics including Azerbaijan, open up to the rest of the world, engaging in international trade and facing competition. Explanations of this concept in the case of resource-rich economies can be found in Oomes and Kalcheva (2007) and Clemens (2007), inter alia. Hasanov (2013a), among others, discusses empirical aspects of this concept in the Azerbaijani economy. The second explanation is that as economies develop over time, the service sector becomes more dominant, as postulated in the theory of progression. This theory states that in the early stages of countries' economic development, agriculture and mining become dominant, and then manufacturing and finally the service sector occupies the dominant position (Asian Development Bank [ADB], 2007; Bosworth & Maertens, 2010; Francois & Hoekman, 2010; Ghani, 2010). The third explanation is related to the Dutch Disease. According to this concept, the non-tradable sector expands and the non-resource tradable sector, i.e., agriculture and manufacturing, deteriorates over time due to the boom in the resource sector (Corden, 1984, Corden & Neary, 1982). One of the drivers of this process is increased government spending, financed by resource revenues. It causes excess demand for goods and services, and since the tradable sector is subject to international competition, the excess demand results in price increases and then wage increases in the non-tradable sector. This motivates capital and labor resources to move from the tradable sector to the non-tradable sector. Oomes and Kalcheva (2007) discuss this explanation for the case of the Russian economy, while Hasanov (2013b) describes and empirically measures it for the Azerbaijani economy. Additionally, Koeda and Kramarenko (2008), Hasanov (2013a), Hasanov and Alirzayev (2016), Aliyev et al. (2016), Dehning et al. (2016) and Aliyev and Nadirov (2016) also find s positive role of aggregated and disaggregated government spending in economic growth of Azerbaijan.

In addition to the relationships of interest above, we also find that the impacts of the non-oil capital stock and employment differ across the non-oil tradable and non-tradable sectors. The non-oil capital stock has a statistically significant positive impact on both sectors. However, this effect is approximately doubled in the non-tradable sector compared with that in the non-oil tradable sector. Numerically, a 1%

increase in the non-oil capital stock is associated with a 0.32% and 0.17% increase in the non-tradable and non-oil tradable value added, respectively, in the long run. These findings are consistent with theory, which articulates that capital is one of the determinants of economic growth. The findings show that the non-oil capital stock leads to more development in the non-tradable sector than in the non-oil tradable sector. One possible explanation for this observation relates to modern components of the non-oil capital stock. Modern components of the non-oil capital stock in Azerbaijan are mainly newly constructed buildings, bridges and paved roads, as well as other infrastructure and transportation elements, rather than equipment, tools and machines, which are basically used for producing goods. The non-oil tradable sector, mainly manufacturing and agriculture, needs a modern/advanced capital stock to develop, while this is not the key condition for development in the non-tradable sector. The point is that production in the tradable sector is subject to the law of one price in international trade competition, implying that if the sector is not competitive, it will lose its share in domestic and foreign markets. To be competitive, the sector needs to use modern technologies, equipment, machines and other factors. Unlike the tradable sector, the non-tradable sector is not subject to such competition, and the development of the sector depends on other factors, such as the income level and government spending, rather than a modern capital stock. For example, to develop aspects of the service sector, such as tourism and hoteling, a well-established infrastructure is sufficient. However, development in agriculture demands the application of modern capital items, among other things, to be competitive in international markets.

Moreover, we find that in terms of magnitude, the effects of the non-oil tradable and non-tradable employment on the sectors are nearly identical, being approximately 0.5. The labor elasticities of the sectors are greater than their capital elasticities. This finding is in line with production function theory, which predicts that the ideal proportion between capital and labor is 0.25:0.75 (Cobb & Douglas, 1928; Douglas, 1976). However, this theoretically predicted proportion may differ from country to country in empirical studies. Empirical research shows that in the case of developing and emerging economies such as Azerbaijan, the share of labor is generally not considerably greater than that of capital. The impact of employment is statistically significant for the non-oil tradable sector but not for the non-tradable sector. Usually, manufacturing and agriculture, which are the core of the tradable sector, are labor intensive, and labor is one of the main determinants of economic growth, alongside other factors of production. As proof of this concept, it is noteworthy that the average share of agriculture employment in total employment over the period 1995-2013 was approximately 37%, and if we add manufacturing to that, the share becomes 42%. However, the share of construction, one of the main components of the non-tradable sector, was in total less than 5% (The State Statistical Committee of the Republic of Azerbaijan [SSCA], 2016). Moreover, the development of the non-tradable sector in Azerbaijan, especially during the period 2004-2008, has also been driven by huge government infrastructure spending, as discussed in Hasanov (2013b).

Finally, we find that the dummy variables appear statistically significant in the specification for the non-oil tradable sector as reported in Table 2. This finding is statistical confirmation of our discussion in the Data section about the shifts and shows that structural changes in the economy caused by the boom in the oil sector were negatively associated with the development of the non-oil tradable sector.

7. Conclusion and Policy Implications

Since Azerbaijan is an oil-exporting economy, developing the non-oil tradable sector is very important to avoid negative consequences of the oil boom such as Dutch Disease. In this regard, investigating various issues affecting the non-oil tradable sector is very important. To the best of our knowledge, this is the first study to analyze the impact of state infrastructure and social expenditures on the non-tradable and non-oil tradable sectors in the Azerbaijani economy.

The dataset needed to conduct a quantitative analysis is not publicly available and had to be constructed. We did so while covering the non-tradable and non-oil tradable value added, the capital expenditures from the state budget and social projects, the non-oil capital stock and employment in the non-oil tradable and non-tradable sectors. The dataset is reported in this paper. Making it publicly available should inspire researchers to conduct more research on this topic.

We applied the Engle-Granger and Phillips-Ouliaris cointegration tests to the estimation results from FMOLS to examine whether the variables are cointegrated. We concluded that the non-oil tradable and non-tradable value added move together with state expenditures as well as capital and labor. The long-run estimation results suggest that state expenditures have statistically significant and positive impacts on the non-tradable sector, whereas only infrastructure expenditure is significant for the non-oil tradable sector. We also find that the non-tradable sector generally benefits from government spending more than does the non-oil tradable sector. Moreover, we find statistically significant and positive effects of capital and labor on non-oil tradable output. Importantly, our research findings should be considered with caution because we have a small sample. Nevertheless, we hope that they are reasonable for drawing some useful policy implications.

Developing the non-resource tradable sector and curbing the negative consequences of resource revenues such as the "Resource Curse", particularly the Dutch Disease, are vital for natural resource-rich countries. From this perspective, our findings may be useful for Azerbaijani decision makers.

After following expansionary fiscal policy throughout the oil boom period, the Azerbaijani government switched to a contractionary fiscal policy in early 2015 due to the lower oil price environment in world energy markets (Aliyev and Gasimov, 2017). When reconsidering the state budget in light of low oil revenues, the government officials should bear in mind that expenditures on the national economy lead to development in the non-oil tradable sector, while expenditures on social projects do not. However, recent statistical figures show that the state budget expenditures on the national economy were reduced by 7.4% and 15.7% in 2014 and 2015, respectively (SSCA, 2016). It is expected that this reduction will negatively contribute to the sector's development. However, the Azerbaijani government called for and developed measures to increase the efficiency of government spending, particularly after the decline in oil prices. Taking the efficiency of public expenditures into consideration, Aliyev and Gasimov (2017) argue that there are still strong opportunities to avoid the negative effects of fiscal contraction on non-oil economic growth. Thus, the negative effect of the reduction can be neutralized if government spending is made more efficient.

Moreover, policy makers should recognize that the capital stock plays an important role in the development of the non-oil tradable sector. In addition to increasing capital allocations in the state budget, they should also take measures to attract private investment, especially foreign direct investment, to the sector. The latter is more important because it can considerably improve the competitiveness of the sector in both domestic and foreign markets. Finally, decision makers should pay attention to the finding that labor is one of the determinants of growth in the non-oil tradable sector. We found that the more the government spends in the non-tradable sector, the more development there is in the sector. In this regard, prior research on the Azerbaijani economy found some evidence, albeit weak, of the Dutch Disease. Hence, an expansion of the non-tradable sector could draw labor from the non-oil tradable sector, and decision makers should also be careful about this issue.

References

ADB. (2007). Asian Development Outlook 2007: Growth amid Change. Manila, Philippines. Retrieved from https://www.adb.org/sites/default/files/publication/27709/ado2007.pdf

Alexiou, C. (2009). Government spending and economic growth: Econometric evidence from the South Eastern Europe (SEE). *Journal of Economic and Social Research*, *11*(1), 1-16.

Aliyev, K. (2014). *WTO Membership and South Caucasus Economies*. Saarbrucken: LAP Lambert Academic Publishing.

Aliyev, K., Dehning, B., & Nadirov, O. (2016). Modelling fiscal policy impact over non-oil GDP in a resource rich country: Evidence from Azerbaijan. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 64(6), 1869-1878.

Aliyev, K., & Gasimov, I. (2017). Fiscal policy implementation in Azerbaijan before-within-and-after the oil boom. *Contemporary Economics*, *12*(1), 81-93.

Aliyev, K., & Nadirov, O. (2016). How fiscal policy affects non-oil economic performance in Azerbaijan?. *Academic Journal of Economic Studies, 2(3)*, 11-29.

Aliyev, K., & Mikayilov, C. (2016). Does the budget expenditure composition matter for long-run economic growth in a resource rich country? Evidence from Azerbaijan. *Academic Journal of Economic Studies, 2(2)*, 147-168.

Aliyev, K., & Suleymanov, E. (2015). Macroeconomic Analysis and Graphical Interpretation of Azerbaijan Economy in 1991-2012. *Expert Journal of Economics*, *3*(1), 40-49.

Alshahrani, M. S. A., & Alsadiq, M. A. J. (2014). *Economic growth and government spending in Saudi Arabia: An empirical investigation*. International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/ft/wp/2014/wp1403.pdf

Aschauer, D. A. (1989a). Is government spending productive? *Journal of Monetary Economics*, *23*(2), 177-200.

Aschauer, D. A. (1989b). Does public capital crowd out private capital? *Journal of Monetary Economics*, *24*(2), 171-188.

Aschauer, D. A. (1989c). Public investment and productivity growth in the Group of Seven. *Economic Perspectives*, *13*(5), 17-25.

Auty, R. M. (1997). Natural resource endowment, the state and development strategy. *Journal of International Development*, 9(4), 651-663.

Auty, R. M. (Ed.). (2001). *Resource abundance and economic development*. New York, NY: Oxford University Press.

Barro, R. (1990). Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy, 98,* 103-125.

Barro, R. (1991). Economic growth in a cross section of countries. *Quarterly Journal of Economics*, 106(2), 407-443.

Belgrave, A., & Craigwell, R. (1995). The Impact of government expenditure on economic growth in a small Caribbean Economy: A disaggregated approach. The Central Bank. Retrieved from http://www.centralbank.org.bb/Portals/0/Files/WP1995-20.PDF

Bose, N., Haque, M. E., & Osborn, D. R. (2007). Public expenditure and economic growth: a disaggregated analysis for developing countries. *The Manchester School*, *75*(5), 533-556.

Bosworth, B., & Maertens, A. (2010). Economic growth and employment generation: The role of the service sector In E. Ghani (Ed.), *The Service Revolution in South Asia* (pp. 103-146). New Delhi: Oxford University Press.

Brouwer, G. D., & Ericsson, N. R. (1998). Modeling inflation in Australia. *Journal of Business & Economic Statistics*, *16*(4), 433-449.

Budina, N., Pang, G., & Van Wijnbergen, S. (2007). Nigeria's Growth Record: Dutch Disease or Debt Overhang? (Working Paper No. 4256). The World Bank.

Bulte, E. H., Damania, R., & Deacon, R. (2003). Resource abundance, poverty and development. Santa Barbara, CA: University of California. Retrieved from https://escholarship.org/uc/item/66z854gv

Campbell, J. Y., & Perron, P. (1991). Pitfalls and opportunities: What macroeconomists should know about unit roots. In O. J. Blanchard & S. Fischer (Eds.), *NBER macroeconomics annual* (Vol. 6, pp. 141-201). Cambridge, MA: The MIT Press.

Chan, S. G., Ramly, Z., & Karim, M. Z. A. (2017). Government Spending Efficiency on Economic Growth: Roles of Value-added Tax. *Global Economic Review*, *46*(2), 162-188.

Clemens, M. (2007). *Azerbaijan between resource curse and foreign direct investments*. Postdam: University of Postdam. Department of Economics.

Cobb, C. W., & Douglas, P. H. (1928). A theory of production. *The American Economic Review*, *18*(1), 139-165.

Collins, S. M., Bosworth, B. P., & Rodrik, D. (1996). Economic growth in East Asia: Accumulation versus assimilation. *Brookings papers on economic activity*, *27*(2), 135-203.

Cooray, A. (2009). Government expenditure, governance and economic growth. *Comparative Economic Studies*, *51*(3), 401-418.

Corden, W. M., & Neary, J. P. (1982). Booming sector and de-industrialisation in a small open economy. *The economic journal*, *92*(368), 825-848.

Corden, W. M. (1984). Booming sector and Dutch disease economics: survey and consolidation. *Oxford economic Papers*, 36(3), 359-380.

Dehning, B., Aliyev, K., & Nadirov, O. (2016). Modelling 'productivity' of budget expenditure items before-and-after the oil boom in a resource rich country: Evidence from Azerbaijan. *International Journal of Economic Research*, 13(4), 1793-1806.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*(4), 1057-1072.

Enders, W. (2010), *Applied Econometrics Time Series* (4th ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Dolado, J. J., Jenkinson, T., & Sosvilla-Rivero, S. (1990). Cointegration and unit roots. *Journal of Economic Surveys*, *4*(3), 249-273.

Douglas, P.H. (1976). The Cobb-Douglas Production Function Once Again: Its History, Its Testing, and Some New Empirical Values. *Journal of Political Economy 84*, 903–16.

Fan, S., & Rao, N. (2003). Public spending in developing countries: trends, determination and impact (Discussion paper No. 99). Environment and Production Technology Division. International Food Policy Research Institute. Retrieved from https://ageconsearch.umn.edu/bitstream/16080/1/ep030099.pdf

Folster, S., & Henrekson, M. (2001). Growth effects of government expenditure and taxation in rich countries. *European Economic Review*, *45*(8), 1501-1520.

Francois, J., & Hoekman, B. (2010). Services trade and policy. *Journal of economic literature*, *48*(3), 642-692.

Gemmell, N., Kneller, R., & Sanz, I. (2016). Does the Composition of Government Expenditure Matter for Long-Run GDP Levels? *Oxford Bulletin of Economics and Statistics*, *78*(4), 522-547.

Ghani, E. (2010). Is service-led growth a miracle for South Asia. In E. Ghani (Ed.), *The Service Revolution in South Asia* (pp. 35-102). New Delhi: Oxford University Press.

Grossman, P. (1988). Growth in Government and Economic Growth: the Australian Experience. *Australian Economics Papers, 27,* 33-45.

Gylfason, T. (2004). Natural resources and economic growth: from dependence to diversification (Discussion Paper No. 4804). Centre for Economic Policy Research.

Hamilton, J. D. (1994). *Time series analysis* (Vol. 2). Princeton, NJ: Princeton University Press.

Hasanov, F., & Alirzayev, E. (2016). Is Fiscal Policy Supportive for Non-oil Sector Development: The Case of Azerbaijan. Society of Policy Modeling. Available at http://www.econmodels.com/public/dbArticles.php

Hasanov, F. J., Bulut, C., & Suleymanov, E. (2016). Do population age groups matter in the energy use of the oil-exporting countries? *Economic Modelling*, *54*, 82-99.

Hasanov, F. (2013a). The role of the fiscal policy in the development of the non-oil sector in Azerbaijan. *Hazar Raporu*, 4, 162-173.

Hasanov, F. (2013b). Dutch disease and the Azerbaijan economy. *Communist and Post-Communist Studies*, *46*(4), 463-480.

Hasanov, F., Mammadov, F. and Al-Musehel, N. (2018). The Effects of Fiscal Policy on Non-Oil Economic Growth. *Economies, 6(2)*, 27, 1-21.

Ighodaro, C. A., & Oriakhi, D. E. (2010). Does the relationship between government expenditure and economic growth follow Wagner" s law in Nigeria? *Annals of University of Petrosani Economics*, *10*(2), 185-198.

IMF. (2007). *The role of fiscal institutions in managing the oil revenue boom*. International Monetary Fund, Washington DC.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, *12*(2-3), 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration-with applications to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

Josaphat, P. K., & Morrissey, O. (2000). Government Spending and Economic Growth in Tanzania, 1965–1996 (Research Paper No. 00-6). *Centre for Research in Economic Development and International Trade. University of Nottingham*. Retrieved from https://www.nottingham.ac.uk/credit/documents/papers/00-06.pdf

Kalyuzhnova, Y., & Kaser, M. (2006). Prudential management of hydrocarbon revenues in resource-rich transition economies. *Post-Communist Economies*, *18*(2), 167-187.

Kim, D., & Perron, P. (2009). Unit root tests allowing for a break in the trend function at an unknown time under both the null and alternative hypotheses. *Journal of Econometrics, 148*(1), 1-13.

Koeda, J., & Kramarenko, V. (2008). Impact of government expenditure on growth: The case of Azerbaijan (*Working Papers* No. 08/115). International Monetary Fund. Retrieved from https://www.imf.org/~/media/external/pubs/ft/wp/2008/wp08115.ashx

Krause, J., & Lücke, M. (2005). Political and economic challenges of resource-based development in Kazakhstan and Azerbaijan. Kiel: Institute of Political Science, Kiel University.

Krugman, P. (1987). The narrow moving band, the Dutch disease, and the competitive consequences of Mrs. Thatcher: Notes on trade in the presence of dynamic scale economies. *Journal of Development Economics*, *27*(1-2), 41-55.

Landau, D. (1986). Government and economic growth in the less developed countries: an empirical study for 1960-1980. *Economic Development and Cultural Change*, *35*(1), 35-75.

Leamer, E. E., Maul, H., Rodriguez, S., & Schott, P. K. (1999). Does natural resource abundance increase Latin American income inequality? *Journal of Development Economics*, *59*(1), 3-42.

Lucas, R. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics 22*, 3–42.

Lupu, D., & Asandului, M. (2017). The Nexus between Economic Growth and Public Spending in Eastern European Countries. *Engineering Economics*, *28*(2), 155-161.

MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, *11*(6), 601-618.

Matsuyama, K. (1992). Agricultural productivity, comparative advantage, and economic growth. *Journal of Economic Theory*, *58*(2), 317-334.

Michael, B., & Jan-Erik, W. (2014). Estimating aggregate capital stocks using the perpetual inventory method: A survey of previous implementations and new empirical evidence for 103 countries. *Review of Economics*, 65(1), 1-34.

Narayan, S., & Narayan, P. K. (2004). Determinants of demand for Fiji's exports: an empirical investigation. *The Developing Economies*, *42*(1), 95-112.

Nehru, V., & Dhareshwar, A. (1993). A new database on physical capital stock: sources, methodology and results. *Revista de análisis económico*, *8*(1), 37-59.

Oomes, N., & Kalcheva, K. (2007). Diagnosing Dutch disease: does Russia have the symptoms. (Discussion Paper No. 6). Bank of Finland. Retrieved from http://www.suomenpankki.fi/bofit_en/tutkimus/tutkimusjulkaisut/dp/Documents/dp0707.pdf

Olukayode, M. E. (2009). Does government spending spur economic growth in Nigeria? (Working Paper No. 17941). University Library of Munich, Germany. Retrieved from https://mpra.ub.uni-muenchen.de/17941/1/MPRA_paper_17941.pdf

Paczynski, W., & Tochitskaya, I. (2008). The Economic Aspects of the Energy Sector in CIS Countries. Warsaw: *Center for Social and Economics Research.*

Perron, P. (2006). Dealing with structural breaks. *Palgrave handbook of econometrics, 1*(2), 278-352.

Perron, P. (1989). The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis. *Econometrica, 57*, 1361–1401

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Phillips, P. C., & Hansen, B. E. (1990). Statistical inference in instrumental variables regression with I (1) processes. *The Review of Economic Studies*, *57*(1), 99-125.

Quy, N. H. (2017). The Role of Public Expenditures in Economic Growth at Provincial Level: Empirical Study in Vietnam. *Journal of Politics and Law, 10(2)*, 88-96.

Ram, R. (1986). Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and TimeSeries Data. *The American Economic Review 76(1)*, 191-203.

Romer, P. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5), 71-102.

Saad, W., & Kalakech, K. (2009). The nature of government expenditure and its impact on sustainable economic growth. *Middle Eastern Finance and Economics*, *1*(4), 39-47.

Sachs, J. D., & Warner, A. M. (1999). The big push, natural resource booms and growth. *Journal of Development Economics*, *59*(1), 43-76.

Sahin, O., Can, N., & Demirbas, E. (2014). The effects of infrastructure determinants on economic growth: European Union sample. *Eurasian Journal of Business and Economics*, 7(13), 11-27.

Sahoo, P., Dash, R. K., & Nataraj, G. (2010). Infrastructure development and economic growth in China

(Discussion Paper No. 261). Institute of Developing Economies. Japan External Trade Organization. Retrieved from http://www.ide.go.jp/English/Publish/Download/Dp/pdf/261.pdf

Sala-i-Martin, X., & Subramanian, A. (2003). Addressing the natural resource curse: an illustration from Nigeria (*Working Paper No. 9804)*. The National Bureau of Economic Research. Retrieved from https://www.nber.org/papers/w9804.pdf

Sojoodi, S., Mohseni Zonuzi, F., & Mehin Aslani Nia, N. (2012). The Role of Infrastructure in Promoting Economic Growth in Iran. *Iranian Economic Review*, *16*(32), 111-132.

SSCA. (2016). State budget. Expenditure-total (million manat). Available at http://www.azstat.org/MESearch/search?departament=10&lang=en

Stijns, J. P. C. (2005). Natural resource abundance and economic growth revisited. *Resources Policy*, *30*(2), 107-130.

Sturm, M., Gurtner, F. J., & Gonzalez, J. (2009, June). Fiscal policy challenges in oil-exporting countries-a review of key issues (Occasional Paper No. 104). European Central Bank. Retrieved from http://www.arabdevelopmentportal.com/sites/default/files/publication/250.fiscal_policy_challenges_in_oil-exporting_countries_a_review_of_key_issues.pdf

Stock, J. H., & Watson, M. W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica, 61*(4), 783-820.

Taban, S. (2010). An examination of the government spending and economic growth nexus for Turkey using the bound test approach. *International Research Journal of Finance and Economics*, *48*, 184-193.

The World Bank. (1994). *World Development Report 1994: Infrastructure for development,* New York, NY: Oxford University Press.

Wakeman-Linn, J., Mathieu, P., & Van Selm, B. (2003). Oil funds in transition economies: Azerbaijan and Kazakhstan. In J. M. Davis, R. Ossowski, & A. Fedelino (Eds.), Oil Producing Countries (pp. 339-358). Washington, DC: International Monetary Fund.

Vogelsang, T. J., & Perron, P. (1998). Additional tests for a unit root allowing for a break in the trend function at an unknown time. *International Economic Review*, *39*(4), 1073-1100.

Zivot, E., & Andrews, D. W. K. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business & Economic Statistics, 10*, 251–270.

Acknowledgments

We are grateful to the anonymous referees and the editors for their comments and suggestions that have helped to considerably improve the paper; nonetheless, we are of course responsible for all errors and omissions. The views expressed in this paper are those of the authors and do not necessarily represent the views of their affiliated institutions.

Appendix

Table A1. Description of the constructed data

Variable Name	Mnemonics	Description	Source
Non-Oil Tradable Value Added	RGDP_NOT	$RGDP_{NOT}=\frac{GVA_{AFF}+GVA_{M}}{CPI_{FNF}}*100$; GVA_AFF is gross value added in agriculture, forestry, fishery in millions of manats; GVA_M is gross value added in manufacturing in millions of manats; CPI_FNF is the Consumer Price Index of food and non-food goods, 2010=100.	GVA_AFF and GVA_M are from http://www.azstat.org/MESearch/search?departament=1&lang=en CPI_FNF is from http://www.azstat.org/MESearch/search?departament=11&lang=en
Non-Tradable Value Added	RGDP_NT	$RGDP_{NT}=\frac{GDP-\left(GVA_{AFF}+GVA_{M}\right)}{CPI_{NFS}}*100$; GDP is total value added in the economy in millions of manats; CPI_NFS is the Consumer Price Index of non-food goods and services, 2010=100.	GDP is from http://www.azstat.org/MESearch/search?departament=1&lang=en CPI_NFS is from http://www.azstat.org/MESearch/search?departament=11&lang=en
State Budget Expenditures to the National Economy	RBE_E	$RBE_{E}=\frac{BE_{I}+BE_{G}}{CPI}*100$; BE_I is expenditures from the central budget used for investments in millions of manats; BE_G is expenditures from the central budget for government purchases in millions of manats; CPI is the Consumer Price Index, 2010=100.	BE_I and BE_G are from http://www.azstat.org/MESearch/search?departament=10&lang=en CPI is from http://www.azstat.org/MESearch/search?departament=11&lang=en
Social Expenditures in the State Budget	RBE_S	$RBE_{E}=\frac{BE_{RPB}+BE_{MDF}}{CPI}*100$; BE_RPB is expenditures from the central budget for remuneration, pension and benefits in millions of manats; BE_MDF is expenditures from the central budget for the purchase of medicines, dressing materials, food products, etc. for social purposes in millions of manats;	BE_RPB and BE_MDF are from http://www.azstat.org/MESearch/search?departament=10&lang=en

DOI: 10.5709/ce.1897-9254.300

Table A1. Description of the constructed data (Continued)

Variable Name	Mnemonics	Description	Source
Non-Oil Capital Stock	RCS_NO	$NCS\_NO_t = NCS\_NO_{t-1} * (1-\delta) + I\_NO_t$; $RCS\_NO_t = \frac{NCS\_NO_t}{CPI_t} * 100$; NCS_NO is the capital stock in the non-oil sector in millions of manats; δ is the depreciation rate; I_NO is non-oil gross fixed capital formation in millions of manats; t indicates time; The initial capital-output ratio is 1.5 of non-oil GDP, and the depreciation rate is 5%.	I_NO is from http://www.azstat.org/MESearch/search?departament=4&lang=en
Non-Oil Tradable Employment	E_NOT	E_NOT = E_AFF + E_M E_AFF is employment in Agriculture, Forestry, Fishery in thousands of persons; E_M is employment in Manufacturing, in thousands of persons.	E_AFF and E_M are from http://www.azstat.org/MESearch/search?departament=22&lang=en
Non-Tradable Employment	E_NT	E_NOT = E_NO – (E_AFF + E_M) E_NO is employment in the non-oil sector in thousands of persons.	E_NO is from http://www.azstat.org/MESearch/search?departament=22&lang=en

Notes: The data span the period 1995-2014.

Table A2. Constructed data over the period 1995-2014

	Non-Oil Tradable Value Added, millions of manats, 2010 prices	Non-Tradable Value Added, millions of manats, 2010 prices	State Budget Expenditures to the National Economy, millions of manats, 2010 prices	Social Expenditures of the State Budget, millions of manats, 2010 prices	Non-Oil Capital Stock, millions of manats, 2010 prices	Non-Oil Tradable Employment, thousands of persons	Non-Tradable Employment, thousands of persons
Mnemonic	**RGDP_NOT**	**RGDP_NT**	**RBE_E**	**RBE_S**	**RCS_NO**	**E_NOT**	**E_NT**
1995	1774.15	2863.06	123.45	364.00	6745.44	1464.90	2107.60
1996	1851.46	2800.06	153.85	450.38	5609.79	1455.30	2190.90
1997	1719.10	2953.10	159.68	527.18	5545.26	1313.30	2340.30
1998	1764.24	3517.91	102.93	556.32	6022.45	1390.70	2270.30
1999	1973.69	3530.84	137.87	712.62	6943.69	1754.10	1988.20
2000	2117.15	3898.56	182.60	800.45	7561.68	1696.70	2117.60
2001	2305.43	4270.84	206.08	816.26	8015.72	1709.70	2142.90
2002	2581.85	4847.27	268.21	902.31	8355.78	1721.50	2170.30
2003	2921.74	5880.10	465.24	1056.69	9027.58	1738.40	2192.30
2004	2959.43	6975.82	522.26	1189.05	9861.60	1750.10	2224.70
2005	3227.23	7779.21	728.42	1428.50	10537.07	1772.00	2248.00
2006	3615.28	9618.88	1885.81	1635.97	12288.19	1786.60	2280.10
2007	4266.14	11947.04	3045.62	2221.62	13665.98	1804.30	2313.60
2008	4381.70	16122.85	5319.82	2547.58	14975.60	1822.70	2348.60
2009	4381.72	16900.61	4623.08	3008.46	21438.07	1842.80	2386.20
2010	4246.50	18854.46	4889.90	2994.20	24935.03	1863.90	2423.70
2011	4360.13	21545.98	6305.10	3293.14	28392.45	1867.70	2466.30
2012	4641.83	24779.17	6380.70	3840.50	35596.76	1889.40	2514.10
2013	4997.74	27747.00	7347.81	3759.00	43369.45	1901.50	2577.40
2014	5235.79	29930.00	6708.48	4068.69	51891.67	1918.80	2642.60