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MODELLING ELASTICITY OF NON-OIL TAX REVENUES TO OIL PRICE CHANGES: IS THERE U-SHAPED ASSOCIATION? EVIDENCE FROM AZERBAIJAN

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Abstract

Oil price changes has a great influence on the behaviour of firms in oil exporting countries which displays itself in amount of non-oil tax receipts of the state budget. Employing FMOLS, DOLS, and CCR cointegration methods for 2001Q1–2015Q4, the study aims to analyse how oil price changes affects non-oil tax revenues in Azerbaijan. Empirical results altogether provide strong scientific evidence that there is U-shaped causality from oil price changes to total non-oil tax revenues , corporate income tax receipts and labour income tax payments , and inverse U-shaped to non-oil VAT revenues of the state budget. Results show that firms face with the trade-off between "produce-and-sell" and "import-and-sell" as oil price rises. In case of higher price than the threshold level, companies prefer the latter choice. Research findings are highly useful for the public policy decision-makers in resource rich economies.

Keywords: oil price changes, firm behaviour, non oil sector, tax revenues, threshold level, produce and sell, import and sell, natural resources

INTRODUCTION

Fiscal dependence on natural resources in oil exporting economies is a crucial issue in the context of maintaining policy sustainability, especially when volatility of oil prices is considered. Higher oil prices cause government size to increase in the economy. Fiscal management is more challenging if the country has relatively weak non-oil tax base (El Anshasy and Bradley, 2012).

Cyclical economic impacts of oil price changes in oil-exporting countries mainly happens through

fiscal policy (Husain *et al.*, 2008). Snudden (2016) argues that budget-balance tax-gap rules are better for stabilization of macroeconomic volatility in oil-exporting countries. Fiscal stance in a number of resource economies is highly sensitive to oil price changes. Hence, it affects directly the amount of receipts from oil sector, indirectly through influencing behaviour of non-oil sector participants. The relationship between oil price and economic growth is studied vastly within resource curse literature, there is no commonly revealed direction of the association (see Havranek *et al.* (2016) for the review of recent studies) which is also depend on institutional quality and other political interests (Kim, Wu and Lin, 2018; Horvath and Zeynalov, 2016; Klomp and Haan, 2016; Farhadi, Islam and Moslehi, 2015). However, studies devoted to investigation of oil price volatility – budget revenues relationship is very limited (see Maji *et al.*, 2017; Lorde *et al.*, 2009; Reyes-Loya and Blanco, 2008) in which none attempted to examine U-shaped association. To our best knowledge, the association of interest is studied in Musayev and Aliyev (2017) and Aliyev (2017) by employing cointegration methods but neither investigated U-shaped link.

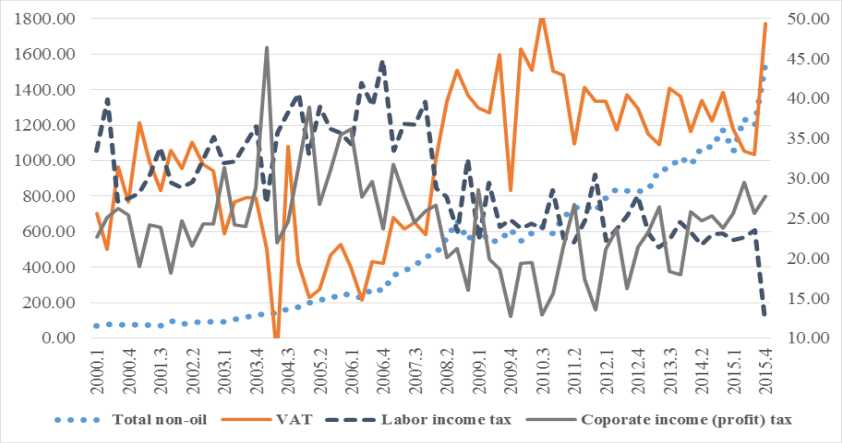
This study attempts to fill the gap in the resource curse literature. Here, existence of U-shaped long-run association between non-oil tax revenues and oil price changes for a resource rich country – Azerbaijan is empirically investigated. Here, the hypothesis is that higher oil price increases non-oil tax receipts, but with diminishing marginal returns and after the threshold level, the impact turns to be negative in an oil exporter due to deindustrialization impact within Dutch disease models as well as decreasing institutional quality (more tax evasion) in Nigerian disease frameworks. More precisely, higher oil price decreases competitiveness of local producers and makes import-and-sell more profitable than produce-and-sell. Oil price shocks increases economic uncertainty (Degiannakis *et al.*, 2018), and firm returns volatility (Narayan and Sharma, 2014). On the other hand, government bodies become relatively less responsive to tax evasion attempts in non-oil sector producers in time of high oil price level.

For robustness, we apply Fully Modified Ordinary Lease Squares (hereafter FMOLS), Dynamic Ordinary Least Squares (hereafter DOLS), and Canonical Cointegration Regression (hereafter CCR) methods to the data for 2000Q1–2015Q4. The results have solid economic justification, and are highly useful for policy implications. Government officials should take into consideration long-run U-shaped impact of oil price changes while making non-oil tax forecasts.

Background

As an oil exporting country, most of Azerbaijan state budget revenues is generated by the oil sector. According to State Oil Fund of Azerbaijan Republic (hereafter SOFAZ), of total state budget revenues, around 57–58% directly transferred from SOFAZ within 2011–2013 which has been decreased to 43.5% in 2016 (SOFAZ, 2016). Simultaneously, participation of oil sector is also substantially high in generation of tax receipts, directly and indirectly.

Azerbaijan's oil boom period started at the end of 2005 when Baku-Tbilisi-Ceyhan pipeline was opened to use accompanied with sharp oil



1: *Sources of non-oil tax revenues*

Source: Authors' own completion

Note: Total non-oil tax revenues are measured in million AZN, displayed in left-hand axes. The right vertical axes show the share of VAT, labor income, and corporate income tax in total non-oil tax receipts

production increase (Aliyev and Suleymanov, 2015) which strongly affected fiscal policy implementation of the country (Aliyev and Gasimov, 2017).

Of non-oil tax revenues, around 90% generated through Value Added Tax (hereafter VAT), labour income tax, and corporate income tax. The biggest share belongs to VAT receipts which is followed by labour income tax (see Fig. 1). In recent years, corporate income tax payments left income tax revenues behind and owned the second biggest share in total non-oil tax receipts.

For general impression, it is noteworthy to briefly review changes in tax rates within 2000–2015. According to Ministry of Taxes of Azerbaijan Republic, VAT rate has been stable, depending on type of product changes between 0–18 percent (http://vn.taxes.gov.az/vd/edv.html). Corporate income tax rate has been 27 percent in 2000–2002, 25 percent in 2003, 24 percent in 2004–2005, 22 percent in 2006–2009, and 20 percent after 2010 (http://vn.taxes.gov.az/vd/menfeet.html). During the period of investigation, labor income tax rate has been 12–35 percent in 2000–2003, 14–35 percent in 2004–2009, 14–30 percent in 2010–2013, and 14–25 percent after 2013 (http://vn.taxes.gov.az/vd/gelir.html). The level of labor income tax rate changes due to the amount of income of workers.

Literature review

The relationship between fiscal policy implementation and oil price volatility has attracted attention of scholars in a number of studies (Bollino, 2007; Pieschacon, 2009; Arezki and Ismail, 2013; Villafuerte and Lopez-Murphy, 2010). Oil price changes also matter for general macroeconomic situation. However, studies investigated the impact of oil price changes over long-run economic growth are not reconciled. Review of 43 empirical studies by Havranek *et al.* (2016) reveals finding negative influence (in 40% of studies), no relationship (in 40%), and positive association (in 20 %). Çatık and Önder (2013) reveals existence of parabolic relationship between oil price changes and economic activity. Nusair (2016) has examined the association between oil price shocks and real total output for Gulf Cooperation Council (GCC) countries. Research concludes that "positive oil price changes have a considerably larger impact on real GDP than negative changes" (Nusair, 2016). In case of Azerbaijan, employing various cointegration methods, Aliyev *et al.*, (2016) do not find statistically significant long-run impact of oil price and oil production over non-oil sector output while the models are controlled for the impact of budget expenditures and non-transfer budget revenues. Considering pass through influence of oil price changes over these two control variable, the result may not show ceteris paribus impact.

Higher oil prices means much more public spending financed by resource revenues which significantly affects performance of non-oil sector producers. Hamdi and Sbia (2013) employ multivariate cointegration analysis and error-correction model for 1960–2010, conclude that oil revenues pass through government spending is the major source of growth in the Kingdom of Bahrain. The same path-through affect is also confirmed empirically in case of Azerbaijan in previous studies (see Dehning *et al.*, 2016; Aliyev *et al.*, 2016; Aliyev and Nadirov, 2016; Hasanov, 2013a among others).

In a number of empirical studies, the relationship between oil price changes and tax revenues is investigated. In case of Trinidad and Tobago, Lorde *et al.* (2009) find existence of causality from oil prices to government revenue. For Malaysia, Maji *et al.* (2017) reveals positive association between oil price changes and tax revenues. Employing monthly data for the period of 1990–2005, Reyes-Loya and Blanco (2008) reveals existence of negative relationship between non-oil tax revenues and oil related revenues in case of Mexico.

To our best knowledge, there are only two attempts – Musayev and Aliyev (2017) and Aliyev (2017) studying the impact of oil price changes over budget revenues. Although both studies reveal statistically and economically significant positive association, none display ceteris paribus impact over non-oil tax revenues. Thus, Musayev and Aliyev (2017) take non-transfer budget revenues as the proxy for total tax receipts which cover also tax payments from oil sector. Aliyev (2017) estimates elasticity of corporate income tax payments (total, from oil sector, and from non-oil sector) to oil price changes. While he reveals positive significant impact over total corporate income tax receipts as well as the amount received from oil sector whileno significant impact detected over non-oil corporate income tax payments. Because Aliyev (2017) estimate elasticity relationship for non-oil corporate income tax revenues, we argue that the model has functional misspecification shortcoming and results are not unbiased.

Therefore, this research fills the detected serious gap in the oil price – tax revenues literature and claim for existence of U-shaped association.

MATERIALS AND METHODS

Data description

The research covers the period of 2000Q1–2015Q4. Consumer Price Index (hereafter CPI) method is used to find real values. Descriptive statistics of variables are presented in the Tab. I.

Real total non-oil tax revenues (RNTR) represent total amount of tax receipts from non-oil sector producers and individuals, measured in million AZN. Quarterly data is obtained from Ministry of Taxes of Azerbaijan Republic.

Real non-oil VAT revenue (VAT) is the amount of VAT receipts from non-oil sector, measured in million AZN. Source of data is Ministry of Taxes of Azerbaijan Republic.

Real non-oil corporate income tax revenues (CITR) stand for corporate income tax payments by non-oil sector legal entities. Measured in million AZN. Source: Ministry of Taxes of Azerbaijan Republic.

Real labour income tax revenues (LITR) displays the amount of labor income tax receipts from non-oil sector employers. Measured in million AZN. Source: Ministry of Taxes of Azerbaijan Republic.

Real non-oil GDP (RNGDP) is total amount of output produced in non-oil sector of Azerbaijan economy, measured in million AZN. The data is publicly available in monthly statistical bulletins published by Central Bank of Azerbaijan (CBAR) and in statistical reports of the State Statistical Committee of Azerbaijan.

Oil production (OPRN) indicates average daily oil production of Azerbaijan for each quarter, measured in thousands of barrels per day. The monthly data is retrieved from Trading Economics database and converted to quarterly frequency.

Oil price (OPRC) displays average price of one barrel of oil in the world market, measured in USD. Monthly data was obtained from the *index mundi* database, and converted to quarterly frequency by using simple average method.

Estimation methodology

Employed theoretical and conceptual framework is developed version of Musayev and Aliyev (2017). Theoretically, tax revenues are mainly determined by total output and tax rates. If we separate total output (Y_t) as oil (Y_t') and non-oil (Y_t'') sectoral production, and show average tax rate with φ, then tax revenues (T_t) could be represented with following function:

$$T_t = f(Y_t', Y_t'', \varphi) \quad (1)$$

Note that t denotes the time, and $Y_t = Y_t' + Y_t''$. Considering that is determined by oil price (OPRC) and daily average oil production (OPRN) amount and expected U-shaped impact of oil price, we can write static elasticity model function as below:

$$\ln(T)_t = \beta_0 + \beta_1 \times \ln(oprc)_t + \beta_2 \times \ln(oprc)_t^2 + \beta_3 \times$$

$$\times \ln(oprn)_t + \beta_4 \times \ln(Y'')_t + u_t \quad (2)$$

Here β stand for regression coeffcients, u is the stochastic error term. Unlike Musayev and Aliyev (2017), we include quadratic form of "oil price" to the model in order to examine existence of U-shaped relationship. Remember that tax rates in Azerbaijan has been almost stable over the investigation period, including that as another control variable is not required and supposed not to have any strong impact. At least, it has no impact over oil price changes. Therefore, omitting tax rate

I: *Descriptive statistics of variables*

Variables	No of obs.	Mean	Maximum	Minimum	Standard dev.	Sum
RNTR	64	236.82	516.73	69.7	117.96	15156.8
VAT	64	82.54	255.24	9.40	55.94	5282.4
CITR	64	55.90	143.72	13.72	29.02	3578.2
LITR	64	64.27	104.04	20.16	25.13	4113.5
RNGDP	64	1778.6	3445.8	514.95	875.44	113833.2
OPRN	64	677.01	1066.0	274.00	291.01	43329
OPRC	64	64.37	121.10	19.30	31.02	-

Source: Authors' own completion

variable will not make the coefficients of oil price biased.

For the dependent variable, $T \in$ (*RNTR, VAT,C CITR, LITR*) estimated separately.

If equation (2) is estimated, it is very easy to calculate threshold level of oil price at which the direction of impact is expected to change. To make it even much more easy, it is better to substitute $\ln(oprc)_t = X$ and find derivative of the estimated equation according to *X*. At the threshold level, marginal impact of oil price is zero. Therefore, we should calculate the value of *X* from the equation, given below:

$$\beta_1 \times X + 2\beta_2 \times X = 0 \quad (3)$$

Finally, we can obtain threshold level of oil price by finding antilog of *X*. Using exponential function in Excel:

$$Exp\left(X\right) = Exp\left(\ln\left(oprc\right)\right) = Exp\left(\frac{\beta_1}{2\beta_2}\right) \quad (4)$$

If the relationship is U-shaped, β_2 is expected to be negative and vice versa. We expect that β_1 and β_2 will be statistically significant ($p < 0.05$).

Primary focus of this paper is to investigate the direction of long-run association between oil price changes and non-oil tax revenues. Therefore, cointegration techniques are employed. For robustness of empirical results, three different cointegration methods are used. These are FMOLS, DOLS and CCR.

Each method has different advantages which makes estimated results more reliable. FMOLS, developed by Philips and Hansen (1990) corrects endogeneity and serial correlation effects while DOLS, advocated by Stock and Watson (1993), allows estimating long-run equilibrium which is corrected for potential simultaneity bias among explanatory variables (Narayan and Narayan, 2004). Developed by Park (1992), CCR leads to obtain asymptotically efficient estimators by employing Ordinary Least Squares (OLS). To conserve the space, we do not discuss technical details of the methods. Existence of long-run association in estimated equations is examined by using Engle-Granger (Engel and Granger, 1987) and Philips-Ouliaris (Philips and Ouilaris, 1990) cointegration tests.

In a time series analysis, determining order of integration of employed series is a pre-condition before estimating cointegration equations. To obtain more reliable results, here, we employ Augmented Dickey Fuller (hereafter ADF), the Phillips-Perron (hereafter PP), and Kwiatkowski-Phillips-Schmidt-Shin (hereafter KPSS) unit root tests. Note that ADF (Dickey and Fuller, 1984) and PP (Philips and Perron, 1988) tests the null hypothesis of "there is unit root problem" while the null hypothesis in KPSS (Kwiatkowski *et al*., 1992) is "series are stationary". To account for trend stationarity, the problem is tested with intercept, and with trend and intercept, separately.

Because production may exhibit seasonality problem and this can influence tax payments, we have included seasonal dummies to all models except labor income tax model as the wages are seasonally changeable and seasonal jobs do not take substantial role in tax payments.

RESULTS

Unit root test results

This sub-section covers discussion of the results obtained from ADF, PP, and KPSS unit root test results with intercept, and with trend and intercept.

Unit root test results from all tests support each other. Without trend, ADF, PP, and KPSS reveal that all variables are non-stationary at level. However, first differenced data is stationary 5% significance level for all variables (*p value* < 0.05). In other words, all variables are integrated of order one of I (1).

Including trend to the test equations does not strongly affect ADF outputs, again all variables are non-stationary at level, but stationary at first difference or I(1).However, PP finds RNTR, VAT, CITR, and RNGDP trend-stationary at level. KPSS produce mixed results.

Because we will not include trend variable to the models, taking unit root test results with only intercept should not have any significant impact over estimation of cointegration equations. Hence, we decide that all variables are I (1). So that FMOLS, DOLS, and CCR can be applied.

Estimating polynomial cointegration equations

To determine if there is cointegration among the variables in estimated models by FMOLS, DOLS and CCR, Engle-Granger and Phillips-Ouliaris cointegration tests are applied. Results are tabulated in Tab. III.

Both cointegration tests provide strong evidence for existence of long-run association among variables in all models regardless the estimation method. Null hypothesis of "series are not cointegrated" is rejected at 5% level of significance

II: *Unit root test results*

	Variable	The ADF test				The PP test		The KPSS test	
		Level	k	First difference	K	Level	First difference	Level	First difference
Intercept	*RNTR*	–0.688	1	–12.27***	0	–0.863	–12.393***	1.012***	0.184
	VAT	–0.499	3	–6.652***	2	–1.132	–11.009***	0.978***	0.459*
	CITR	–0.865	3	–9.179***	2	–1.408	–16.765***	0.904***	0.240
	LITR	–1.980	4	–2.815**	3	–1.829	–11.746***	0.814***	0.351
	RNGDP	–0.592	4	–4.456***	3	–2.006	–21.281***	0.992***	0.096
	OPRN	–1.538	2	–6.561***	1	–1.676	–5.6621***	0.753***	0.227
	OPRC	–1.200	0	–6.560***	1	–1.214	–6.7092***	0.822***	0.225
Intercept and trend	*RNT*	–2.523	1	–12.31***	0	–4.222***	–12.456***	0.087	0.079
	VAT	–1.819	3	–6.639***	2	–3.886**	–11.542***	0.119*	0.347***
	VITR	–0.826	3	–9.316***	2	–5.098***	–17.308***	0.128*	0.133*
	LITR	–1.077	4	–3.097*	3	–2.412	–12.521***	0.195**	0.205**
	RNGDP	–2.311	4	–4.391***	3	–6.76***	–21.079***	0.195**	0.095
	OPRN	–1.007	2	–6.686***	1	–1.394	–5.7892***	0.152**	0.119
	OPRC	–0.763	0	–6.684***	1	–0.952	–0.691***	0.183**	0.124*

Notes: ADF, PP and KPSS denote the Augmented Dickey-Fuller, Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin tests respectively. Maximum lag order is set to 10 and optimal lag order (k) is selected based on Schwarz criterion in the ADF test; ***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels respectively; The critical values are taken from MacKinnon (1996) and Kwiatkowski et al. (1992) for the ADF, PP and KPSS tests respectively. Estimation period: 2000Q1–2015Q4.

III: *Results of the cointegration tests*

	Engle-Granger Cointegration test		Phillips-OuliarisCointegration test	
	Tau-statistic	z-statistic	Tau-statistic	z-statistic
Panel A: Dependent variable is log (RNTR)				
FMOLS	–5.946***	–53.133***	–6.283***	–61.038***
DOLS	–5.946***	-53.133***	–6.283***	–61.038***
CCR	–5.946***	–53.133***	–6.283***	–61.038***
Panel B: Dependent variable is log (VAT)				
FMOLS	–8.400***	–70.065***	–8.466***	–70.702***
DOLS	–8.400***	–70.065***	–8.466***	–70.702***
CCR	–8.400***	–70.065***	–8.466***	–70.702***
Panel C: Dependent variable is log (CITR)				
FMOLS	–5.753***	–47.617***	–5.908***	–50.646***
DOLS	–5.753***	–47.617***	–5.908***	–50.646***
CCR	–5.753***	–47.617***	–5.908***	–50.646***
Panel D: Dependent variable is log (LITR)				
FMOLS	–4.568**	–32.353**	–4.619**	–32.631**
DOLS	–4.568**	–32.353**	–4.619**	–32.631**
CCR	–4.568**	–32.353**	–4.619**	–32.631**

Notes: Null hypothesis for both tests is: variables are not cointegrated; ***, ** and * indicate significance of the coefficients at 1%, 5% and 10% significance level respectively; Optimal lag length is selected based on the Schwarz criterion taking 4 lags as a maximum; p-values are MacKinnon (1996) p-values for tau-statistic.

when tau-statistic or z-statistic values are considered.

Therefore, existence of cointegration relationship in estimated models revealed. So that we can continue with interpretation of estimation results obtained from employed cointegration methods, which all are presented in the Tab. IV.

Here, it is noteworthy once more to mention that our hypothesis is about existence of parabolic relationship between oil price and tax revenues. In other words, we expect diminishing marginal returns of oil price increase for non-oil tax revenues.

Note that oil production, non-oil GDP and seasonal dummies are included only for controlling purposes. Their coefficients are economically and statistically meaningful.

Therefore, our focus is the sign and statistical significance of the coefficients' of oil price. Results are robust and highly reliable as all employed

IV: *Results of long-run estimations*

Independent variables	FMOLS		DOLS		CCR	
	Coefficient	St. error	Coefficient	St. error	Coefficient	St. error
Panel A: Dependent variable is ln (RNTR)						
ln (*oprc*)	2.936***	0.666	4.991***	1.185	3.008***	0.696
ln (*oprc*)²	–0.346***	0.082	–0.528***	0.144	–0.356***	0.086
ln (*oprn*)	0.257***	0.094	0.064	0.108	0.243**	0.096
ln (*GDP*)	0.715***	0.076	0.069	0.201	0.741***	0.085
C	–7.711***	1.240	–6.887***	2.039	–7.932***	1.323
@seas(1)	0.137***	0.049	–0.064	0.118	0.140***	0.049
@seas(4)	–0.104**	0.046	–0.155	0.095	–0.114**	0.048
Panel B: Dependent variable is ln (VAT)						
ln (*oprc*)	–3.815***	1.037	–3.688***	1.315	–3.695***	1.095
ln (*oprc*)²	0.436***	0.127	0.432***	0.162	0.418***	0.135
ln (*oprn*)	0.965***	0.147	0.935***	0.167	0.966***	0.153
ln (*GDP*)	0.968***	0.118	0.897***	0.148	0.987***	0.134
C	–1.029	1.930	-0.589	2.398	-1.394	2.078
@seas(1)	0.228***	0.076	–0.297*	0.149	0.234***	0.076
@seas(4)	–0.090	0.072	–0.181**	0.086	–0.095	0.075
Panel C: Dependent variable is ln (CITR)						
ln (*oprc*)	6.967***	1.514	5.691***	1.858	7.065***	1.593
ln (*oprc*)²	–0.827***	0.185	–0.669***	0.229	–0.840***	0.197
ln (*oprn*)	–0.247	0.214	–0.214	0.236	–0.282	0.218
ln (*GDP*)	0.785***	0.173	0.802***	0.209	0.837***	0.195
C	–14.74***	2.818	–12.49***	3.389	–15.07***	3.028
@seas(1)	0.279**	0.111	0.049	0.212	0.282**	0.111
@seas(4)	–0.223**	0.105	–0.196	0.122	–0.245**	0.109
Panel D: Dependent variable is ln (LITR)						
ln (*oprc*)	5.822***	1.186	7.143***	1.086	5.767***	1.279
ln (*oprc*)²	–0.666***	0.145	–0.739***	0.134	–0.658***	0.159
ln (*oprn*)	0.097	0.162	–0.409***	0.119	0.106	0.161
ln (*GDP*)	0.259**	0.120	–0.164	0.201	0.241	0.148
C	–10.950***	2.193	–8.714***	2.057	–10.773***	2.423

Notes: ***, ** and * indicate significance of the coefficients at 1%, 5% and 10% significance level respectively. Estimation period is 2000q1–2015q4.

cointegration methods do not produce conflicting results.

Results commonly support our hypothesis of parabolic relationship. Coefficient of ln (*oprc*)^2 is always statistically significant. Except Panel B, its coefficient is negative which means diminishing marginal returns of oil price increase to corresponding category of non-oil tax revenues. Mathematically, this can be proven by finding second derivative of each model to ln (*oprc*).

However, in Panel B, coefficient of ln (*oprc*)^2 is positive. Therefore, finding second derivative of this model to ln (*oprc*) will provide a positive number. More precisely, increasing marginal returns of oil price increase to VAT payments from the non-oil sector is found. Actually, this is not contradictory to our expectations. Reasoning will be discussed in the next section.

Consequently, our hypotheses is confirmed by estimation results. Now, the question is what is the threshold level of oil price for each defined category of non-oil tax revenues? Applying equation 3–4 to the estimated models will provide threshold level of oil price. The calculations are done and tabulated in Tab. V.

Threshold level of oil price from FMOLS and CCR are very close to each other while DOLS output varies around these values. According to FMOLS and CCR, threshold level of oil price for total non-oil tax revenues is around 69 USD while it is 80–82 USD for VAT payments, 67 USD for corporate income tax receipts, and 79–80 USD for labor income tax earnings.

Although DOLS estimators are substantially different for three non-oil tax revenue categories, this is quite plausible and should not decrease the robustness of the research findings. The difference is only in magnitude of coefficients, not in the direction or statistical significance of the relationship.

DISCUSSION

Expanding non-oil tax base and maintaining fiscal stability / sustainability is increasing its priority in Azerbaijan economic policy. In 2016, the president Ilham Aliyev approved "Strategic Road Map" of Azerbaijan Republic, of which one of major directions is to strengthen fiscal sustainability of the state budget. Note that all these reform attempts are initiated during and after 2015 when oil price sharply fell and consequently national currency was devalued 2 times against USD within one year – by 33 percent on February 21 (CBAR, 2015), and by 47.6 percent on December 21, 2015 (CBAR, 2015). Devaluations have also substantial impact over tax revenues (Jenkins *et al.*., 2000 and Musayev and Aliyev, 2016).

On the other hand, the major source of budget revenues – SOFAZ assets are limited (currently 36 billion USD), and by October 2017, direct transfers to the state budget amounts 75.8 billion AZN (44.59 billion USD, 1 USD = 1.70 AZN) (http://www.oilfund.az/az_AZ/hesabatlar-ve-statistika/son-reqemler.asp). Financing by transfers cannot last so long. Because this is already in the agenda of top government officials, the president has given tax related messages such as "business people should be responsible and pay taxes in full" (http://en.president.az/articles/17693), "the Ministry of Taxes should try to ensure that taxpayers pay taxes legitimately and in full" (http://en.president.az/articles/16219) , and "we need to move the informal economic activity into the legal plane" to broaden the tax base (http://en.president.az/articles/17442).

From this point of view, the importance of non-oil sector in budget revenues will increase, and precise forecasting of non-oil tax revenues parallel to oil price changes is of great importance. This indicates the practical usefulness of this study.

Empirical results are substantially reliable and economically interpretable as well as support

V: *Threshold level of oil price (USD) and non-oil tax revenues*

Non-oil tax revenue categories	Threshold level of oil price (USD)		
	FMOLS	DOLS	CCR
RNTR	69.60	112.88	68.35
VAT	79.44	71.42	83.08
CITR	67.51	70.34	67.04
LITR	79.11	125.57	80.01

Note: Calculations are done according to equation 3–4. Excel is employed to find actual threshold oil price level by using exponential function.

each other. Research reveals that 69 USD level for oil price is threshold for total non-oil tax revenues. This is understandable in two different context – first economic reasoning, second within institutional framework.

Economic reasoning roots Dutch Disease theory (for theoretical mechanism of Dutch Disease, see Corden and Neary, 1982; Bruno and Sachs, 1982; Buiter and Purvis, 1983; Corden, 1984; Edwards, 1985). It is expected that resource boom leads to direct and indirect de-industrialization, more precisely, movement of labor from non-booming tradable sector to the booming sector as well as to non-tradable sector of the economy (Hasanov, 2013b). There are a number of studied investigated Dutch Disease symptoms in Azerbaijan economy (Kronenberg, 2004; Gahramanov and Fan, 2002; Egert, 2009). Institutional aspects of the issue are more complicated. Empirical studies show that the quality of institutions in resource rich economies determines the impact of natural resources (Horvath and Zeynalov, 2016).

Therefore, high oil prices may crowd-out non-oil domestic production especially if the institutional quality is lower. In this case, companies may be encouraged to import-and-sell instead of producing in the country if this is more profitable. Consequently, this will have certain impact over non-oil tax revenues. That is why found threshold price level (69 USD) for total real non-oil tax revenues is quite understandable.

Threshold price levels for VAT, CITR, and LITR strongly supports the economic reasoning about crowding out effect. Note that for CITR, the price level is around 67 USD while it is approximately 79-80 USD for both VAT and LITR. Oil price level of 67-79 USD is decision making area for corporate income tax payers: to produce-and-sell or import-and-sell.

As the price increases further, companies prefer the latter choice which leads to less demand for labor force, and consequently less labor income tax payments, more import-and-sell policy, and relatively more VAT receipts. In Azerbaijan Tax Code, most small and medium non-oil sector producers are Simplified Tax payers or they pay a certain portion of the total turnover regardless the costs: 4% for those in Baku, and 2% for the tax payers in the regions. Therefore, VAT payments on imported products are not substituted after the sale in domestic market. That is why finding inverse U-shaped association represents the real situation.

About institutional aspects, one should take into consideration the level of tax control vs oil price changes in a resource rich country. State budget should have no challenges in case of high oil prices. Resource revenues are easy gained and transfers based spending do not hurt voters. So that, tax control is expected to be lower if oil price is higher than a certain level. This reminds the issue of institutional quality. Quotations from the speech of President mentioned above also provide some evidence about weak tax control and high tax evasions before 2015 accompanied by high oil price tendency. Meanwhile, observations clearly show the level of struggle against tax evasions by Ministry of Taxes of Azerbaijan republic especially after 2015. Unfortunately, statistics of tax controls and punishments are not publicly available. Tax revenue classification as oil-and-non-oil sector is not also reported for post 2015 period which does not allow including into empirical estimations.

CONCLUSION

This research aimed to estimate the relationship between tax revenues from non-oil sector and oil price changes in a resource rich country – Azerbaijan. Note that the country has rich oil revenues and since 2005 enjoys oil boom. However, oil is an exhausted source of revenues. So that economic policy makers should focus on expanding non-oil tax base in order to maintain fiscal sustainability in the long-run. However, non-oil tax revenues are also depend on oil price changes at some level which has solid economic interpretation in the context of Dutch Disease theory as well as institutional aspects of resource curse.

The study uses quarterly data for 2000–2015 period and estimate the impact of oil price changes over total non-oil tax revenues as well as corporate income tax payments, labor income tax receipts and VAT revenues from non-oil sector, separately. The hypothesis was about existence of U-shaped or parabolic association which is the real novelty of this investigation. Three different cointegration methods – FMOLS, DOLS, and CCR are employed in order to obtain more robust results.

Empirical results absolutely supported our hypotheses without any significant distinction according to employed cointegration techniques. It is revealed that long-run association exists between oil price changes and non-oil tax revenues. The threshold level of oil price for total real non-oil tax revenues

is approximately 69 USD while it is around 79-80 USD for VAT and labor income tax receipts, and nearly 67 USD for corporate income tax payments.

Overall conclusion is that higher oil prices (more than 67–69 USD) discourage and make domestic production less profitable, and stimulate companies to import and sell. Finding inverse U-shaped association for VAT revenues and U-shaped for corporate income tax and labor income tax receipts strongly supports "import-and-sell" argument. Especially, the scientific empirical evidence that threshold level for VAT and labor income tax revenues are almost the same allows no doubt on robustness of empirical results and practical usefulness of the study.

In light of produced scientific knowledge, it is recommended that policymakers in Azerbaijan should take into consideration existence of parabolic association between oil price and non-oil tax payments while making tax forecasts.

Stable control over tax evasions should be maintained. In time of high oil price levels, from local production to import-and-sell transition happens. However, when oil price sharply falls, the reverse does not realize immediately. Hence, more severe tax control and punishments may discourage domestic production even further and lead to delaying of this return.

Forecasting tax revenues and maintain sustainability of fiscal policy is a key challenge for resource rich economies due to volatility in commodity prices. When natural resource price falls, governments concentrate on expanding non-resource tax base or increase the amount of tax revenues from non-resource sector which is found to be also strongly elastic to oil prices in case of Azerbaijan. Therefore, the research should stimulate scholars and researchers in governance institutes to examine the relationship between natural resource price changes and tax revenues from non-resource sector.

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