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**Working Paper**

## How to Conceptualize the Resource Curse and Dutch Disease Theories in the Case of Azerbaijan? Initial and Negative Findings

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# How to Conceptualize the Resource Curse and Dutch Disease Theories in the Case of Azerbaijan? Initial and Negative Findings

Working Paper No. 5

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## Abstract

Azerbaijan's economy is extractive industry-led and not well-diversified. A comprehensive understanding of the role of the oil industry in the Azerbaijani economy is still a desideratum. Azerbaijan's national economy was a popular case study for the theories such as the natural resource curse (NRS) and Dutch disease (DD); however, a conclusive statement is yet to be found. Many new questions arise as the impact of the crisis periods, institutions, and monetary indicators are being explored. This working paper is nothing more than experimentation results for the Azerbaijan economy within the NRS and DD theories. Surely, not everything can be achieved from the first trial and sound accomplishments need to be built on the shoulders of the negative results and failed hypotheses tests following the already existing analytical frameworks. Despite data issues and lack of proper theoretical conceptualizations of the Azerbaijan economy, this working paper reports the results of the Ordinary Least Squares (OLS) and Robust Least Squares (RLS) to orient the follow-up studies in the near future. Despite academia argues that nowadays linear relationships are hard to obtain, this working paper's main assumption is still a linear association among the variables of interest. Despite the results from this working paper are mixed, particular negative associations between the institutional quality measured via the several political, institutional, and governance indicators, and oil-related variables are present in the case of Azerbaijan between 1996–2019. To explain, although the negative impacts of the real effective exchange rate (REER), REER growth rates, the nominal effective exchange rate (NEER), and NEER growth rates were less than expected, oil prices and changes in oil prices played a great role (negative) in the output, employment, and returns on capital in the Azerbaijani economy. Moreover, particular negative associations between the oil-related variables, and institutional, political, and governance indicators are present, whereas the quantity and quality of the education in the Azerbaijan economy do not fully reflect any serious negative impacts. These experimental models possess a high amount of stability; however, they should be treated as initial starting points. The mentioned facts must be considered by the policymakers when the non-oil development of the Azerbaijani economy is being discussed.

**Key words:** Azerbaijan economy, mineral sectors, oil industry, natural resource curse theory, Dutch disease hypothesis, institutions, economic sectors, OLS regression, Stepwise regression.

## 1. Introduction

Since the late 1990s, the Azerbaijan economy started to show the economic catching-up signs at least with the late 80s due to the low inflation rates, increased Foreign Direct Investments (FDI), and economic and political stability (Laurila 1999). 1994 was the year when the Contract of the Century was made and oil-led economic structure followed the path. Because of huge upstream and downstream oil projects, the Gross Domestic Product (GDP) of Azerbaijan skyrocketed, GDP per capita noticeably increased, and government spendings flushed various domestic sectors. This was a serious and crucial achievement in

the economically “broken region” as De Waal (2012) put. Nevertheless, behind the visible economic success, alarming signals came up in the form of low non-oil tradable manufacturing, real effective exchange rate (REER) appreciation, high domestic inflation, etc. (Niftiyev, 2020a).

As it has been mentioned, despite overall economic growth and development, there has been a set of concerns regarding the diversification of the national economy of Azerbaijan. If the diversification of the national economy is absent, long-term sustainable growth is at the risk according to well-developed theories such as the natural resource curse (NRS) and Dutch disease (DD). Even recent studies voiced concerns about the Azerbaijan economy. For instance, Yasmin et al. (2020) noted that measured by the Herfindahl-Hirschmann Index (Product HHI), Azerbaijan is poorly diversified among the Caspian Basin Countries specializing only in mineral products. Similar results were found by Ahmadova et al. (2020), Bayramov and Abbas (2017), and Hamidova (2018). These concerns shed light on the important development aspect of the Azerbaijani aspect: despite 30 years have passed since the independence from the Soviet Union, and huge oil revenue found its way into the country, the oil-dependency problem remains. Naturally, a lop-sided economic structure brings a big set of mood-worsening challenges to the economy.

Relying only on the mineral industry puts the Azerbaijan economy into a cyclical situation (Niftiyev and Namazova, 2020). Subsequently, as the oil prices rise, important economic variables like GDP, GDP per capita, trade balance, and investments also rise. However, it is a very well-known fact that international commodity markets are highly volatile. This characteristic of the economy ignites the de-industrialization process (Niftiyev, 2020b), DD effects (Niftiyev, 2020c), and lagging non-oil tradable sectors (Niftiyev, 2020d; Niftiyev, 2020e). In a similar manner, Aybar et al. (2015) assigned several serious concerns to the Azerbaijan economy, such as appreciated national currency which demotivates the export potential, discourages the preparation of the skilled labor, decreases the efficiency of the utilization of the accumulated revenue in the oil fund, etc. Expert briefings by Oxford Analytica (2019) keep warning about the urge of diversification in Azerbaijan, despite newly discovered oil and gas reserves, changed fiscal frameworks of the government, as the country experienced foreign debt accumulation and banking crises recently (in 2014–2015 when the prices of the commodities collapsed in international commodity markets). Otherwise, the negative spillovers from the extractive industries might accelerate as of today they can be found in the vegetable exports (Niftiyev and Czech 2020), labor markets (Niftiyev, 2020f), female labor participation (Niftiyev, 2017), etc.

This working paper is far from conclusive and even accurate diagnosis of the NRS and DD signs in the Azerbaijani economy; however, is handy to start the conceptualization way and format. Current work should be treated as the publication of the initial econometric experimentation results. Therefore, the next section briefs the data and methodology, the third section presents the results, and finally, the last section concludes by drawing on the main results of the paper. Also, the author's main recommendations and suggestions have

been included in the conclusion section to guide new follow-up studies about the Azerbaijani economy. To do so, the working paper adopted rather a discussion and non-formal writing and argumentation style as the work is not being considered for any journal publication or expert evaluations.

## 2. Data and Methods

This working paper uses several data sources such as The Global Economy, World Bank, US Energy Information Administration, State Statistical Committee of Azerbaijan (SSCRA), World Bank, and Annual Reports of the State Oil Fund of the Republic of Azerbaijan (SOFAZ). All outliers on the data set have been removed via winsorizing method from the data set. Also, the data are in its first difference to obtain stationarity for the regression equations. TREND function of Google Sheets online software was used to replace the missing values if any were present.

The main assumption of this study is the linear relationship between the institutional variables and oil-related ones. Surely, one must be careful with this initial assumption, as the data endowments increase, linear relationships become harder to obtain. Nevertheless, that is why these experimental results have been reported and share via this working paper. Relevantly, Ordinary Least Squares (OLS) and Robust Least Squares (RLS) techniques have been employed to analyze this assumption.

Each estimation will report the necessary tests to provide the adequacy level of the calculated models. This includes stability tests such as the Ramsey Reset test, Cumulative Sums (CUSUM), Cumulative Sums Squared (CUSUMSQ), and residual tests (serial correlation, normality test, etc.).

Among the explanatory variables, one is important to discuss. Income volatility has been calculated inspired by the formula below offered by Cockx and Francken's (2016) work:

$$Volatility_t = \sqrt{\frac{\sum(GDP\_PC\_GR_t - \overline{GDP\_PC\_GR_\mu})^2}{N}}$$

Where  $t$  represents the individual year, GDP\_PC denotes GDP per capita, GDP\_PC\_GR is GDP per capita growth rate,  $\mu$  is the average GDP per capita for the period 1996–2019,  $N$  is the number of observations. The formula of this working paper for the income volatility is not identical to the work of Cockx and Francken's (2016); however, presents the necessary idea to test the volatility against the institutional quality in the Azerbaijani economy.

As income is a good measure for economic growth, deviations from the main value might overlap with the specific periods when resource curse signs were more observable due to the high dependency on oil and policy failures. Busemeyer (2007) and Akanbi and Schoeman (2010) also used this variable in the resource curse studies, especially against education spendings among oil-rich countries to understand if economic growth leads to

higher demand in education, as there is an expectation that the higher economic development will increase the production complexity (towards non-resource manufacturing), as cited in Cockx and Francken (2016).

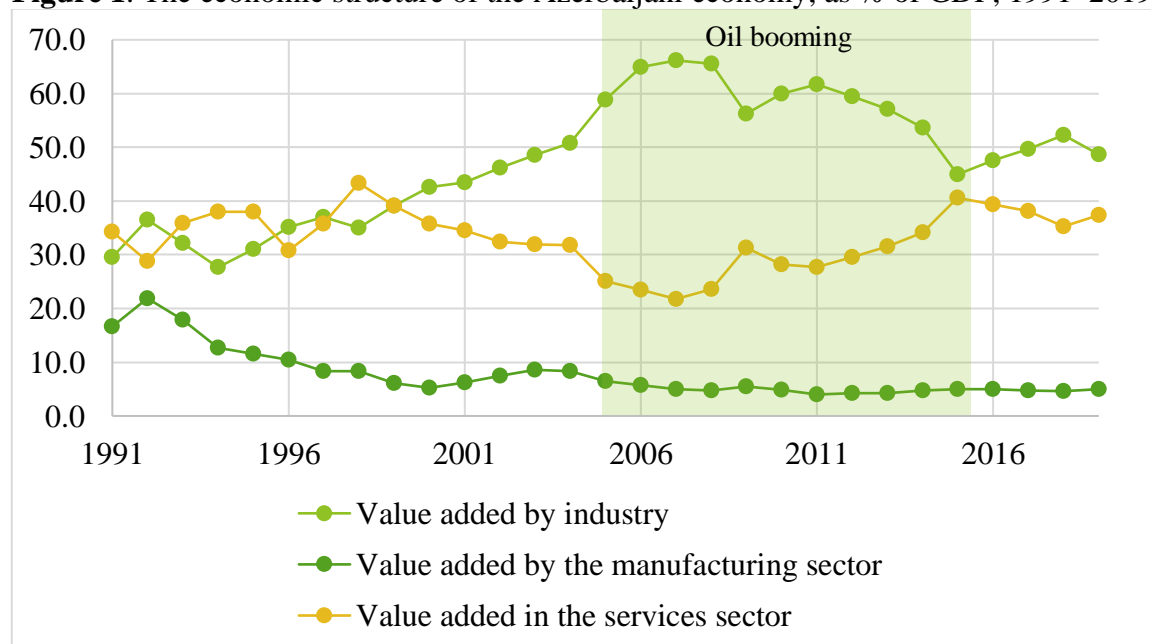
### 3. Results

This analysis was conducted to determine if oil-related economic indicators impact institutional quality in Azerbaijan as the oil-rich countries usually experience the NRS signs. Therefore, it was hypothesized that oil-related variables will harm political and institutional quality. To test this hypothesis, multiple regression analysis has been used employing OLS and RLS. However, also figure analysis will outline some of the main economic and institutional indicators of Azerbaijan since 1991.

#### 3.1. Figure Analysis

Figure 1 shows that the role of the manufacturing sector considerably has decreased since the late 1990s and remained low during the oil booming period, while industry which is mainly extractive industries dominated the economic structure. However, during the oil revenue booming period, the industry's role in economic structure decreased, giving its place to the services sector. This is not accidental. One of the most important signs of DD syndrome is to develop bigger tertiary – non-tradable sectors because of the increased government expenditure. The decrease of extractive industry happened due to the finalization of the most important upstream and downstream projects in the oil sector, at the same time the government started to spend the oil revenue on infrastructure and related projects starting from 2008. Thus, Figure 1 clearly mirrors the fundamental structural reality of the Azerbaijani economy.

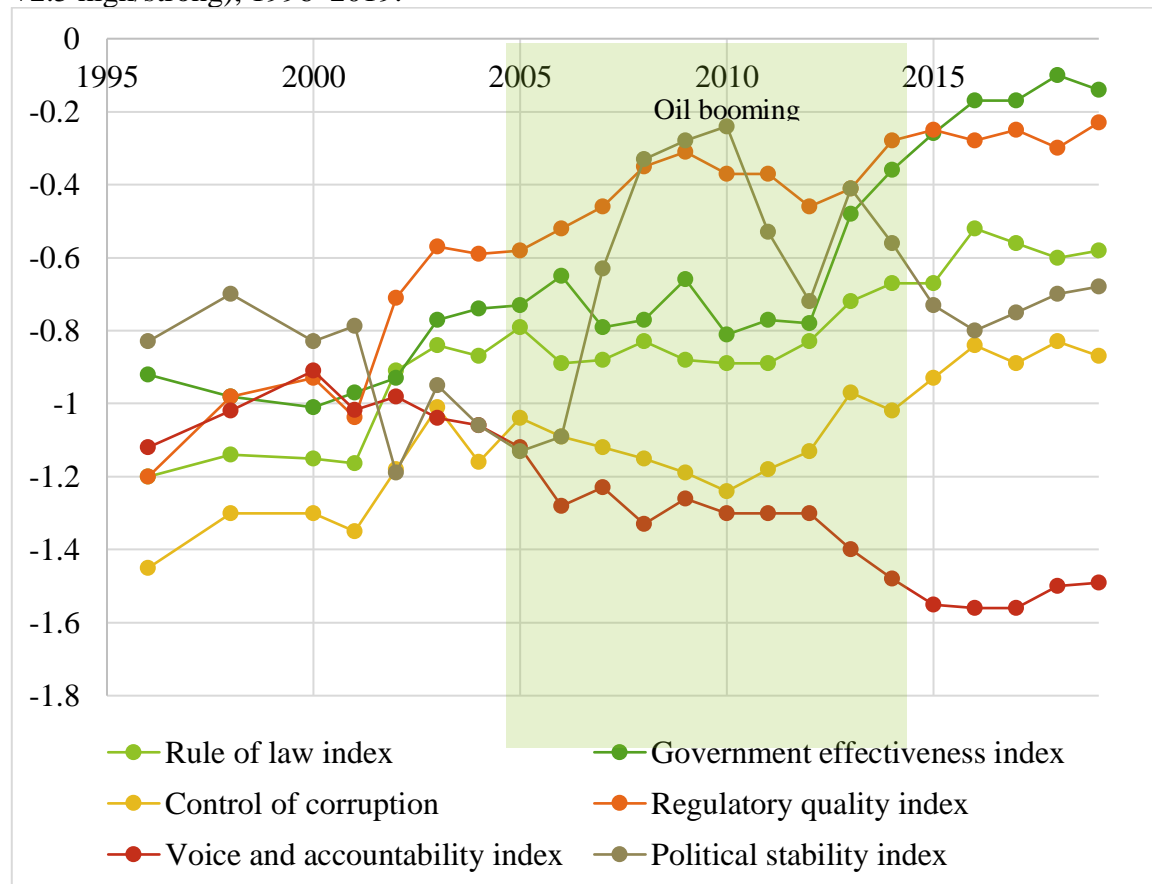
**Figure 1.** The economic structure of the Azerbaijani economy, as % of GDP, 1991–2019.



Source: The Global Economy (2021).

Figure analysis also reveals that the voice and accountability index unambiguously worsened in Azerbaijan between 1996–2019; however, the other institutional variables both strengthened and worsened at the same time, depending on the year (see Figure 2). For instance, the political stability index had an upward and downward trend during the oil boom period while control of the corruption index also both improved and worsened. Regulatory quality and government effectiveness indices showed significant improvements, while rule of law index started to decline after the booming period. All in all, one can assume the period-specific change patterns in the institutional quality in Azerbaijan. As the country is oil-rich and the source of government expenditure comes from mineral revenue, the role of the extractive industry can be easily theorized and modeled.

**Figure 2.** World Bank Governance Indicators in Azerbaijan, index values (-2.5 low/weak, +2.5 high/strong), 1996–2019.



Source: The Global Economy (2021).

### 3.2. OLS Estimations of the Resource Curse

Results show that 38% of the variance in political stability and the number of violence index (POL\_ST) can be accounted for by six predictors, collectively, as F statistics=3.72,  $p < 0.05$ . All explanatory variables were statistically significant. While, oil exports over GDP ( $\beta = -0.93$ ,  $t = -3.04$ ) and non-oil exports ( $\beta = -0.01$ ,  $t = -1.84$ ) had a negative association with political stability, the share of SOFAZ in the state budget ( $\beta = 0.01$ ,  $t = -2.79$ ), income



volatility ( $\beta=-0.03$ ,  $t=3.30$ ), and revenue booming period ( $\beta=0.27$ ,  $t=2.49$ ) positively impacted political stability. These results suggest that political stability and the number of violence index show the necessary amount of negative associations with oil-related economic growth and development in Azerbaijan. Moreover, underdeveloped non-oil tradable sectors decrease political stability as well, contradicting the main expectations of the impact of non-resource development on institutional and political quality.

Control of corruption (CONT\_CORR) in Azerbaijan was tested with the help of the RLS method which was a necessary method that fit the data set. The estimations on control of corruption show that the variation can be accounted for by 25%. Looking at the unique individual contributions of the predictors, it can be seen that SOFAZ's share in the state budget and oil rent negatively influenced corruption in Azerbaijan. Furthermore, the insignificant and small coefficients of oil prices and production of mineral fuels mean that they fail to actively and constructively predict corruption patterns in Azerbaijan.

The rule of law index (R\_O\_L) shows multiple statistically significant results in Table 1. Subsequently, the intercept ( $\beta=0.05$ ,  $t=2.37$ ), the share of SOFAZ ( $\beta=0.01$ ,  $t=1.79$ ), and the revenue booming period ( $\beta=0.17$ ,  $t=2.75$ ) demonstrate statistically significant and positive impacts over the rule of law index. Meanwhile, the extraction booming period ( $\beta=-0.13$ ,  $t=-2.71$ ), oil rents ( $\beta=-0.01$ ,  $t=-1.90$ ), and the production of mineral fuels ( $\beta=-0.01$ ,  $t=-2.38$ ) showed significant negative associations.

Interestingly, the voice and accountability index (VO\_AND\_ACC) showed gradual degeneration in the figure analysis (see Figure 2), but the OLS estimations in Table 1 illustrate a stark difference to that conclusion because out of 5 coefficients, only one is statistically significant and negative, while all others are positively associated with the voice and accountability index. More precisely, the only negative sign of the coefficient related to the non-oil exports ( $\beta=-0.01$ ,  $t=-2.36$ ) tells to us that as the non-oil exports rose in the share, the voice and accountability index worsened. However, usually, the opposite is argued by the NRS literature. Hence, all the results in this estimation are not suited to the main theoretical expectations.

Lastly, the human rights index (H\_RIGHTS) reveals several negative associations with the oil-related variables. For example, revenue booming period ( $\beta=-9.07$ ,  $t=-1.93$ ), non-oil exports ( $\beta=-0.01$ ,  $t=-5.94$ ), crude oil and gas extraction ( $\beta=-0.01$ ,  $t=-7.33$ ), and mining-to-GDP ration ( $\beta=-0.99$ ,  $t=-0.06$ ) negatively impacted the human rights index.

**Table 1.** Estimation Results of OLS and RLS of the political and institutional channel of the resource curse in Azerbaijan, 1996–2019.

	POL_ST	CONT_CORR	R_O_L	VO_AND_ACC	H_RIGHTS
Independent variables					
Constant	0.59** (2.60)	0.05*** (6.32)	0.05** (2.37)	0.44*** (4.25)	0.11* (1.96)
OIL_EXP/GDP	-0.93*** (-3.04)				
SH_SOFAZ	0.01*** (-2.79)	-0.01*** (-12.62)	0.01* (1.79)		
INC_VOL	0.03*** (3.30)				
NON_OIL_EXP	-0.01* (-1.84)			-0.01** (-2.36)	-0.01*** (-5.94)
REV_BOOM	0.27** (2.49)		0.17** (2.75)		-9.07* (-1.93)
EXT_BOOM			-0.13** (-2.71)	0.09*** (3.72)	
OIL_PRICE		0.01 (1.32)	0.01 (1.59)		-0.01 (-1.34)
OIL_RENTS		-0.01*** (-4.05)	-0.01* (-1.90)		0.01*** (3.66)
MIN_FUELS		0.01 (1.35)	-0.01** (-2.38)		
MINING_SHARE				0.01*** (-5.24)	
OIL_GAS_EXT				0.01*** (3.52)	-0.01*** (-7.33)
MINIG/GDP					-0.99* (0.06)
R <sup>2</sup>	0.52	0.40	0.43	0.58	0.80
Adj. R <sup>2</sup>	0.38	0.26	0.22	0.49	0.72
F-Stat.	3.72		2.01	6.30	10.66
F-stat. Prob.	0.02		0.12	0.00	0.00
Variance Inflation	All <10.00		All <10.00	All <10.00	All <10.00
Factors					
CUSUM	Within 5% Sig.		Within 5% Sig.	Within 5% Sig.	Within 5% Sig.
CUSUMSQ	Within 5% Sig.		Within 5% Sig.	Within 5% Sig.	Within 5% Sig.
Ramsey Reset Test	Functional Spec. is true		Functional Spec. is true	Functional Spec. is true	Functional Spec. is true
JBN Test	3.24 [0.20]	0.97 [0.62]	0.70 [0.71]	1.37 [0.50]	0.86 [0.65]
Serial Correlation	0.73 [0.36]		0.26 [0.66]	0.54 [0.48]	1.69 [0.11]
Het. F	0.96 [0.65]		0.70 [0.97]	0.57 [0.87]	1.74 [0.74]
Rn-squared stat.		195.74			
Prob (Rn-squared stat.)		0.00			

*Source:* Own calculations in Eviews.

*Notes:* 1) the symbols \*, \*\*, and \*\*\* indicate statistical significance at 10%, 5%, and 1% levels, respectively; 2) the numbers in the brackets are the corresponding t-statistics; 3) the numbers were rounded to the second decimal point to be compact; 4) Het. F stat denotes heteroscedasticity test based on Breusch-Pagan-Godfrey method, JBN denoted the Jaque-Bera normality test results, and the LM test is the Lagrange Multiplier test for serial correlation. The numbers in the big brackets indicate the p-values for the stability tests.

NRS literature confirmed that NRS effects reveal themselves in a clear way when the primary challenge of the booming sectors becomes visible by the consideration of the governance or government-related indicators. Table 2 reports these estimations in the case of Azerbaijan.

A distinctive and significant channel of NRS is visible in the case of the government effectiveness index (GOV\_EFFEC) where all independent variables showed negative coefficients. Similarly, in the case of the regulatory quality (REG\_QUAL), there are statistically negative findings, namely, oil rents ( $\beta=-0.01$ ,  $t=-2.10$ ), and statistically positive results for the income volatility ( $\beta=0.01$ ,  $t=2.24$ ) also shows that NRS is present in this case too. As the income volatility increases mean the negative impact (interpreted by the formula), then statistically significant and positive impact also means a negative effect on the dependent variable.

Unsurprisingly, non-resource taxes measured in two forms, excluded social securities (NRT\_ESS) and included social securities (NRT\_ISS) showed statistically significant and negative results with oil-related variables such as mining-to-GDP ratio ( $\beta=-24.37$ ,  $t=-3.67$ ;  $\beta=-24.83$ ,  $t=-3.03$ ), and extraction booming period ( $\beta=-1.49$ ,  $t=-2.34$ ;  $\beta=-0.83$ ,  $t=-1.28$ ).

Government integrity (GOV\_INT) and state fragility (ST\_FRAG) are also important indicators of the public administration and governance dimension of a country and in the case of the resource-rich countries, it might reflect the expected relationship in the right modeling. Therefore, there is a weak, statistically significant, and negative relationship between government integrity and oil exports-to-GDP ratio ( $\beta=-15.91$ ,  $t=-2.06$ ). Meanwhile, state fragility shows a higher number of statistically significant results. However, as the negative coefficients mean positive impact, and positive signs mean negative impacts (for more details see how the State Fragility index works), only the mining-to-GDP ratio negatively influenced ( $\beta=9.21$ ,  $t=1.81$ ) the capacity to manage the oil revenue measured by the state fragility index.

Lastly, the estimations of the government integrity and state fragility possess poor  $R^2$  values, and the models overall are insignificant due to  $F\text{-statistic} > 0.05$ . All models passed the tests like Variance Inflation factors (VIF), CUSUM, CUSUMSQ, and Ramsey Reset Test. There were no serial correlation and heteroscedasticity problems, but the residuals of the models related to the government integrity provided non-normally distributed residuals.

**Table 2.** Capacity to manage channels of the resource curse in Azerbaijan, 1996–2019.

	GOV_EFFEC	REG_QUAL	NRT_ESS	NRT_ISS	GOV_INT	ST_FRAG
Independent variables						
Constant	-0.158*(-2.09)	0.06*** (3.82)	0.57*(1.97)	0.49(1.43)	7.44** (2.17)	-0.53** (-2.78)
MINIG_SHARE	0.01** (2.57)					
OIL_PRICE	-0.01** (2.12)					
SH_SOFAZ	0.01*** (-5.08)		0.06(1.61)			
OIL_GAS_EXT	-0.01(-0.06)					
REV_BOOM	-0.08*(-1.92)				-1.02 (-0.25)	
OIL_RENTS		-0.01** (-2.10)	0.10*(1.88)	0.11(1.72)		-0.09** (2.30)
INC_VOL		0.01** (2.24)	0.07(1.34)	0.10 (1.59)		-0.02 (-0.55)
MINING/GDP			-24.37*** (-3.67)	-24.83*** (-3.03)		9.21* (1.81)
EXT_BOOM			-1.49** (-2.34)	-0.83(-1.28)		
OIL_EXP_GDP					-15.91* (-2.06)	
MIN_FUEL					0.01 (1.16)	
R <sup>2</sup>	0.61	0.31	0.46	0.34	0.18	0.19
Adj. R <sup>2</sup>	0.50	0.24	0.30	0.19	0.06	0.06
F-Stat.	5.43	4.54	2.87	2.31	1.43	1.47
F-stat. Prob.	0.00	0.02	0.04	0.09	0.26	0.25
Variance Inflation	All <10.00	All <10.00	All <10.00	All <10.00	All <10.00	All <10.00
Factors						
CUSUM	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.
CUSUMSQ	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.	Within 5% Sig.
Ramsey Reset Test	Functional Spec. is true	Functional Spec. is true	Functional Spec. is true	Functional Spec. is true	Functional Spec. is true	Functional Spec. is true
JBN Test	2.59 [0.27]	0.03 [0.99]	1.30 [0.52]	0.52 [0.77]	16.08 [0.00]	0.28 [0.87]
Serial Correlation	2.54 [0.055]	1.53 [0.19]	0.16 [0.79]	1.15 [0.24]	0.67 [0.43]	0.80 [0.37]
Heterossc	1.09 [0.45]	1.39 [0.38]	2.45 [0.08]	2.34 [0.10]	0.75 [0.20]	0.90 [0.41]

*Source:* Own calculations in Eviews.

*Notes:* 1) the symbols \*, \*\*, and \*\*\* indicate statistical significance at 10%, 5%, and 1% levels, respectively; 2) the numbers in the brackets are the corresponding t-statistics; 3) the numbers were rounded to the second decimal point to be compact; 4) Het. F stat denotes heteroscedasticity test based on Breusch-Pagan-Godfrey method, JBN denoted the Jaque-Bera normality test results, and the LM test is the Lagrange Multiplier test for serial correlation. The numbers in the big brackets indicate the p-values for the stability tests.

### 3.3. OLS Estimations of Dutch Disease Effects

DD studies are highly interested in the sectoral distribution of the resources resulting from the effects that arise from the booming sectors. Usually, the case studies employ small and open economies/systems. Table 3 reports the overall and general distribution of the impacts that oil prices, real effective exchange rate (REER), and nominal exchange rate (NEER) can cause in the case of Azerbaijan. There are four sets of dependent variables that also

have sub-variables. To explain, output, employment, real wages and returns on capital growth rates have boomed, lagging, and non-tradable sectors to fit the collected data and theoretical expectations into the DD hypothesis.

**Table 3.** OLS Estimations of the initial conditions for Dutch disease in Azerbaijan, 2000–2017.

Exp. var.	Dependent variable						Employment growth rate:					
	Output growth rate:						Employment growth rate:					
	S <sub>B</sub>		S <sub>L</sub>		S <sub>NT</sub>		S <sub>B</sub>		S <sub>L</sub>		S <sub>NT</sub>	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	-6.87 [0.18]	-29.35 [-0.86]	-11.58 [-0.96]	-9.70 [-0.85]	48.37** [2.77]	22.04 [1.08]	2.57 [0.43]	4.28 [0.73]	0.90 [0.78]	0.65 [0.60]	-0.12 [-0.22]	-1.27** [-2.75]
Oil price	-0.23 [-0.57]	-0.22 [-1.03]	-0.15 [-1.21]	-0.05 [-0.67]	0.43** [2.36]	0.06 [0.49]	0.01 [0.18]	0.00 [0.12]	0.01 [0.58]	0.00 [0.20]	0.01 [0.86]	6.48 [0.02]
Oil pr.-PC	0.73*** [3.18]	0.71*** [3.82]	0.06 [0.76]	0.11 [1.82]	0.07 [0.66]	0.07 [0.63]	0.04 [1.24]	0.03 [0.64]	0.01 [1.05]	0.00 [0.57]	-0.01* [-2.07]	-0.01** [-2.64]
Economic crisis	-14.91 [-0.87]	-15.85 [-1.20]	-8.57 [-1.55]	-5.60 [-1.27]	1.90 [0.24]	-10.50 [-1.33]	-3.51 [-1.29]	-3.51 [-1.56]	0.29 [0.55]	0.13 [0.31]	0.04 [0.14]	-0.18 [-0.99]
REER	0.24 [0.40]		0.23 [1.19]		-0.75** [-2.71]		-0.02 [-0.19]		-0.01 [-0.76]		-0.01 [-0.25]	
REER-PC	-0.36 [0.44]		0.14 [0.96]		0.45* [2.17]		-0.11 [-1.53]		-0.02 [-1.64]		0.00 [0.50]	
NEER		0.51 [1.15]		0.15 [1.00]		-0.26 [-0.97]		-0.03 [-0.44]		-0.01 [-0.58]		0.01** [2.34]
NEER-PC		-0.25 [-0.67]		0.01 [0.10]		0.45* [2.02]		-0.05 [-0.85]		-0.02 [-1.45]		0.01 [0.96]
R sq.	0.60	0.62	0.39	0.37	0.69	0.52	0.36	0.30	0.15	0.13	0.42	0.55
Adj. R sq.	0.42	0.45	0.11	0.08	0.56	0.30	0.07	-0.02	-0.23	-0.26	0.15	0.35
Obs.	17	17	17	17	17	17	17	17	17	17	17	17

Exp. var.	Dependent variable						Returns on capital growth rate:					
	Real wages growth rate:						Returns on capital growth rate:					
	S <sub>B</sub>		S <sub>L</sub>		S <sub>NT</sub>		S <sub>B</sub>		S <sub>L</sub>		S <sub>NT</sub>	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	-9.82 [-0.37]	-19.87 [-0.81]	-6.76 [-0.44]	-11.29 [-0.80]	-15.17 [-0.91]	-3.17 [-0.19]	-2.03 [-0.03]	54.08 [1.20]	33.47 [0.26]	81.53 [0.87]	-44.56 [-1.40]	-8.54 [-0.29]
Oil price	0.14 [0.51]	0.11 [0.71]	-0.13 [-0.77]	-0.09 [-1.05]	-0.24 [-1.37]	-0.09 [-0.86]	0.19 [0.34]	0.86 [1.84]	1.22 [1.17]	1.56 [1.61]	-0.12 [-0.47]	0.14 [0.44]
Oil pr.-PC	0.01 [0.04]	-0.05 [-0.39]	-0.06 [-0.66]	-0.06 [-0.79]	-0.13 [-1.23]	-0.13 [-1.45]	0.93** [3.34]	0.91*** [4.38]	-1.00 [-1.83]	-1.24** [-2.88]	-0.37** [-2.74]	-0.45** [-3.35]
Economic crisis	-3.61 [-0.30]	-4.82 [-0.51]	-11.42 [-1.61]	-10.75* [-1.98]	-13.62 [-1.78]	-8.50 [-1.33]	12.73 [0.61]	34.06 [1.84]	29.88 [0.74]	42.34 [1.10]	10.70 [1.06]	19.23 [1.59]
REER	-0.01 [-0.02]		0.17 [0.71]		0.33 [1.25]		-0.22 [-0.26]		-1.26 [-0.75]		0.41 [0.98]	
REER-PC	-0.51 [-1.60]		0.01 [0.09]		-0.11 [-0.57]		-0.59 [-1.01]		-0.33 [-0.29]		-0.64* [-2.28]	
NEER		0.12 [0.39]		0.22 [1.20]		0.12 [0.55]		-1.50 [-1.93]		-2.37 [-1.47]		-0.13 [-0.25]
NEER-PC		-0.41 [-1.54]		0.08 [0.54]		-0.06 [-0.34]		-0.96 [-1.92]		0.17 [0.16]		-0.57 [-1.71]
R <sup>2</sup>	0.24	0.25	0.16	0.21	0.32	0.23	0.60	0.71	0.54	0.62	0.87	0.82
Adj. R <sup>2</sup>	-0.10	-0.10	-0.22	-0.15	0.01	-0.12	0.20	0.41	0.09	0.24	0.73	0.64
Obs.	17	17	17	17	17	17	11	11	11	11	11	11

Source: Own calculations in Eviews.

Notes: 1) the symbols \*, \*\*, and \*\*\* indicate statistical significance at 10%, 5%, and 1% levels, respectively; 2) the numbers in the brackets are the corresponding t-statistics; 3) the numbers were rounded to the second decimal point to be compact.

The results show that the intercept was mostly statistically insignificant, yet negative in the case of output and real wages growth rates. Oil prices had a statistically significant and positive impact only in the non-tradable sector's output growth rate. Meanwhile, oil price growth rates also positively impacted output and returns on capital growth rates but negatively impacted employment growth rates in non-tradable sectors. Then, economic crisis periods had only one statistically significant association with real wage growth rates in the lagging sectors.

The exchange rate is a crucial part of DD studies. In Table 3 we can find the OLS estimates of the sectoral distribution of REER, REER growth rates, NEER, and NEER growth rates. REER and REER growth rates seem to be weakly associating with the output, employment, real wages, returns on capital growth rates in the Azerbaijani economy. Only non-tradable sectors (output and returns on capital) have minor statistically significant results. Similarly, the picture is not different in the case of NEER and NEER growth rates.

### 3.4. OLS Estimations for the Quality of Education

In the resource curse literature, human capital and education have been identified as one of the channels that NRS can reveal itself. Therefore, testing human capital or education-related variables might provide the potential to track the resource curse phenomenon. However, the initial modelings described in Table 4 show that the expected negative outcome of the oil-related variables on education might not be the case.

For example, statistically significant results in the equation where the total accepted students (TAS) are the dependent variables are positive (GDP per capita and Oil and gas extraction). Meanwhile, despite the share of the mining industry is negative, the statistical insignificance and low t-Statistic allow us not to consider this channel as an overall meaningful one.

**Table 4.** OLS results for the quality and quantity of education in Azerbaijan.

Variable	Dep. Var: Coefficient	TAS Std. Error	t-Statistic	Prob.
C	-342.177	720.907	-0.475	0.6429
SOFAZ_ASSETS	292.608	183.521	1.594	0.1349
GDP_PC	492.999	194.622	2.533	0.0250
OIL_GAS_EXT	0.398	0.221	1.800	0.0951
MINING_SHARE	-271.658	192.706	-1.410	0.1821
SOFAZ_ASSETS_TO_GDP	109.132	84.545	1.291	0.2193
Variable	Dep. Var: Coefficient	PTRAA Std. Error	t-Statistic	Prob.
C	0.406	0.916	0.443	0.6648
OIL_GAS_EXT	0.001	0.000	3.325	0.0055
EXT_REV_BOOM	7.936	2.091	3.796	0.0022
SOFAZ_ASSETS	-1.598	0.371	-4.303	0.0009
OIL_EXP_GDP	16.123	5.964	2.703	0.0181
GDP_PC	0.205	0.205	0.999	0.3359
Variable	Dep. Var: Coefficient	PTRAM Std. Error	t-Statistic	Prob.
C	-1.332	1.434	-0.929	0.3686
EDI	0.821	0.669	1.227	0.2402
OIL_FDI	0.002	0.001	1.502	0.1553
MINING_SHARE	0.438	0.328	1.336	0.2029
ECON_SHOCKS	2.902	3.053	0.950	0.3580

Source: Own calculations in Eviews.

Next, the percentage share of the right answers in the Azerbaijani language (PTRAA) and the percentage share of the right answers in Mathematics (PTRAM) have been proxied to estimate the impact of the extractive industry on the quality of education. PTRAA showed several statistically significant results; however, most of them are positive, with only one negative result: SOFAZ\_ASSETS ( $\beta=-1.598$ ;  $t=-4.303$ ).

#### 4. Concluding Remarks and Suggestions

The results of this working paper show that NRS seems to be present under the linear estimations; however, DD effects in the form of the sectoral distribution of the impacts of oil prices, REER, and NEER are weak. Also, it can be noted that the quantity and the quality of the education do not fully contemplate the actuality of NRS in the Azerbaijani economy (at least in the form of this working paper). The findings of this current working paper extend the DD investigations by Bayramov and Conway (2010), Hasanov (2013), Niftiyev (2020d). However, the findings related to the negative associations between the oil-related variables such and political and governance indicators that reflect the institutional quality must be considered as the initial experimentation results, rather than a conclusive cause and result relationship. DD effects in the case of the Azerbaijani case must be done in a more specific way, probably dividing the effects into two precise effects, namely resource movement and spending effect, as the original theory by Corden and Neary (1982) implies.

The necessary technical and methodological suggestions for the further follow-up studies or similar investigations for the other authors should be listed as below:

- OLS regression based on the annual data sets is sensitive to the decimal points. To get adequate coefficients, the indicators must be rounded to smaller levels to ignore very small (almost close to zero) results. Otherwise, the interpretation gets harder;
- The case of Azerbaijan poses a barrage of difficulties to apply OLS. However, the RLS method also seems to be appropriate and expedient due to the reason that RLS use less restricted assumptions to test the linear relationship compared to OLS or Two-stage Least Squares (TLS);
- According to the author's opinions of this working paper, TLS is hardly applicable in the case of NRS and DD studies employing the case of Azerbaijan, because it is hard to design a good set of instrumental variables to overcome the endogeneity problem in the modeling. Nevertheless, OLS seems to be appropriate; however, a wide range of the ad hoc tests (CUSUM, CUSUMSQ, Wald test, F statistics, Serial correlation, normality test of the residuals, etc.) to the model estimations must be present to build the necessary level of the confidence for the results (due to the initial stage of this current research, the author have not provided those mentioned tests in many details);
- After acquiring the initial linear estimations applying OLS or RLS, and testing the models for stability, checking for the robustness must be the last

step. To do so, either additional explanatory variables or lagged version of the predictors can be used;

- Some parts of the empirical results of this working paper are based on the outcomes of the stepwise regression. Stepwise regression is being highly criticized nowadays, but under the right conditions, which are without overfitting or undermining of the explanatory variables, NRS and DD studies in the case of the Azerbaijani economy can be used;
- NRS and DD studies require imaginatively analyzed and well-organized scholarly works that could identify the subtle distinctions in the subject matter. These themes are highly stratified and the reproduction requires a high level of expertise and specific research methodology. Not only quantitative research methods, but also qualitative ones, or a mixed approach might reveal a new horizon for the NRS and DD studies in the future in the case of the Azerbaijani economy;
- In addition to the further research design the studies related to the NRS and DD in the case of Azerbaijan, after the initial experimentations and some negative findings, the author suggests a systematic and solid data visualization and figure analysis to conduct to build the necessary set of arguments related to the expected theoretical and experimental connections. Otherwise, fully econometrical, or complete and sole statistical modelings might be misleading, leading to the mismatch between the real world events and scholarly analysis;
- In the case of the figure analysis, detrending, natural logarithm, and calculation of the year-over-year, or cumulative growth rates can be handy to visually inspect the institutional change patterns in the Azerbaijani economy.

It seems that NRS and DD studies allow a greater leeway to understand the Azerbaijani economy in the context of oil booming, as the oil-related variables reaffirm the economic structure of Azerbaijan almost every day. However, the right way of the conceptualization of them is a must. Both quantitative and qualitative methods can work hand in hand to analyze the available data to describe the necessary elements of the phenomenon. In this way, initial experimentations and negative findings in a form of research notes or working papers pose valuable information as this current study aimed.

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