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The Role of Agriculture and Agrarian Sectors in the Azerbaijan Economy: Main Trends and Dynamics since 1991

Working Paper No. 1

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Abstract

Agriculture and agrarian sectors have been gone through the serious transformation process since the collapse of the Soviet Union in Azerbaijan. An ever-growing body of academic literature body investigated the resource curse and Dutch disease theories to conceptualize non-oil sectors in Azerbaijan starting from the late 1990s; however, the unanimous conclusion about the status of agriculture, agrarian sectors or manufacturing is still highly anticipated. Modern statistical techniques and accumulated data on the crucial economic indicators allow us to conceptualize the main trends and dynamics of agriculture and agrarian sectors in the context of resource-richness in Azerbaijan. This paper aims to descriptively investigate the collected data related to agriculture and agrarian sectors. Special emphasis has been put on the theoretical relevance of Dutch disease and resource curse to operationalize the research interest and research question. The findings of the correlation analysis show that there is a positive, significant, and strong association between the real effective exchange rate of Azerbaijan and international oil prices. The other findings demonstrate that mainly agriculture-related variables decreased their role in the Azerbaijan economy since 1991 but only value-added per worker gradually rose, also correlating negatively with value-added in agriculture and investments in agriculture.

Key words: Azerbaijan Economy, agriculture, agrarian sectors, polynomial regression trendline, correlation analysis

1. Introduction

The Azerbaijan economy has skewed towards the extractive industry since 1994 when “The Agreement of the Century” established all necessary conditions for Foreign Directed Investments (FDI) to flow in Azerbaijan and boost the oil and gas industry. Needless to say, oil and gas revenue helped Azerbaijan to build an economic capacity after the devastating war with Armenia, political instability, and the collapse of established economic integration with the other ex-soviet countries since 1991. The main economic indicators, competitiveness, socio-economic infrastructure was renewed (World Economic Forum, 2016). Also, the role of oil should be emphasized in terms of how Azerbaijan has become a part of the European Union’s energy security plans and considerations (Hasanov et al., 2020). That is why so many oil and gas pipeline projects are being implemented since the beginning of the twentieth century to connect Azerbaijan and Europe. Even the oil production, price, and export booming are far behind, Azerbaijan continues to concentrate on extractive industries as the main locomotive of the economy. However, has the extractive industry come with no cost? Have the oil and gas sectors benefitted everybody in the country? Especially, has the oil and gas-based economy led to sustainable economic development in the long-term?

These questions are very famous and difficult when it comes to understanding the Azerbaijan economy and national welfare. Nevertheless, numerous studies have evaluated the non-oil economy of the country in the context of sustainable development and the

possible harmful effects of oil and gas sectors. That is why scholars and academicians, as well as practitioners, tried to conceptualize the economy of Azerbaijan within the resource curse (Mahnovski, 2003; Gojayev 2010; Gasimov 2014) and Dutch disease theories (Hasanov, 2013; Niftiyev, 2020) which mainly describe what happens to a small, open and resource-rich countries as they become dependent on a single commodity. The common characteristics of the booming and resource-dependent countries are having a booming sector, shrinking non-resource tradable sectors, and increased services (or tertiary) sectors. The exchange rate appreciation occurs as the increase in mineral revenue leads to the increased current account surpluses in the country's balance of payments. Eventually, the price levels in the national economy rise, production becomes expensive, and national currency overvaluation lags the international competitiveness of the exported goods. These effects have been widely investigated within the Dutch disease theory and resource curse approach.

However, this study sidesteps the popular research direction of the resource curse and Dutch disease in Azerbaijan. The main purpose is to outline the main evolutionary path of the economic indicators related to agriculture and agrarian sectors. At the edge of the thirtieth year of independence from the Soviet Union, the collected data of agriculture and agrarian sectors allow establishing the main trends and dynamics to better understand the nature and possibilities. Notwithstanding, it is difficult to argue about the preciseness and accuracy of macroeconomic and general economic investigations related to agriculture and agrarian sectors in Azerbaijan. There are a tremendous number of local and narrowly defined realities which impose a great amount of importance to comprehend the agriculture and agrarian sectors. However, as a starting point, this working paper aims to investigate the correlational dynamics and main trends in agriculture and agrarian sectors in a comparative manner with the increased oil production and exports. The research simply encompasses the magnitude and size of the association among the chosen variables of interest. It should be noted that the current paper is far from concluding a theoretical or practical phenomenon in the agriculture and agrarian sector in Azerbaijan. The main research motivation is to build an intuition based on descriptive statistics. The follow-up studies will employ model approaches and in-depth analysis to rationalize the Dutch disease effects on agriculture and agrarian exports of Azerbaijan and competitiveness-related issues.

Thus, the next section provides data sources and applied methods. The fourth section documents the results, and the last section concludes in a form of the short takeaway statements to grasp the big picture of the role of agriculture and agrarian sectors in Azerbaijan since the year of 1991.

2. Data and Methods

As the primary research interest of this paper is to determine the main trends and dynamics of Azerbaijan's agriculture and agrarian sectors, graphical visualization, polynomial regression plots, and descriptive statistics have been utilized to outline the main trends and dynamics of the collected data set. Two types of correlation analysis have been utilized: Pearson's R and Spearman's rank (or rho) correlation techniques, as well. The main reason for having two correlational examinations is to separate the effects of the outliers that Pearson's R correlation coefficient usually fails to do. This aspect of the investigation will allow us to correct planned statistical and econometrical techniques that are planned to follow this working paper.

The collected data mainly covers the range of 1991–2018 but for objective reasons, some data series can employ the period of 1994–2018. For convenience purposes, the periods have been depicted below figures and tables where the results have been reported. The data sources are State Statistical Committee of the Republic of Azerbaijan (SSCRA), World Bank, Bruegel data sets (Azerbaijan's REER), and U.S. Energy Information Administration (oil prices).

To contribute to the body of research, the Extractives Dependence Index (EDI) has been calculated for Azerbaijan considering the period of 1994–2018 to understand the correlation between EDI and variables of interest related to agriculture and agrarian sectors. The calculation methodology is based on the academic paper from Hailu and Kipgen (2017). Missing values for the calculation of EDI have been imputed based on the series mean, as well as, missing values for non-resource tax revenue covering the period of 1994–2005 was calculated by multiplying the state budget by 38.7% which is the annual average for the period 2005–2018 of the non-resource income of the state budget.

Particular note has to be made to the polynomial trendline plots that this paper reports. Non-linear approach to the economic variables are not that famous among the body of research in Azerbaijan, so this research draws attention to the non-linear relationships and their interpretation because due to the obvious trends in the visualized data, we can estimate very low R^2 for the fitted line. However, polynomial trendline with 2 orders enables to visualize U shape relationship among the variables of interest.

The software like SPSS version 23 and Microsoft Word version 15.26 has been used to deliver the analytical parts of the paper.

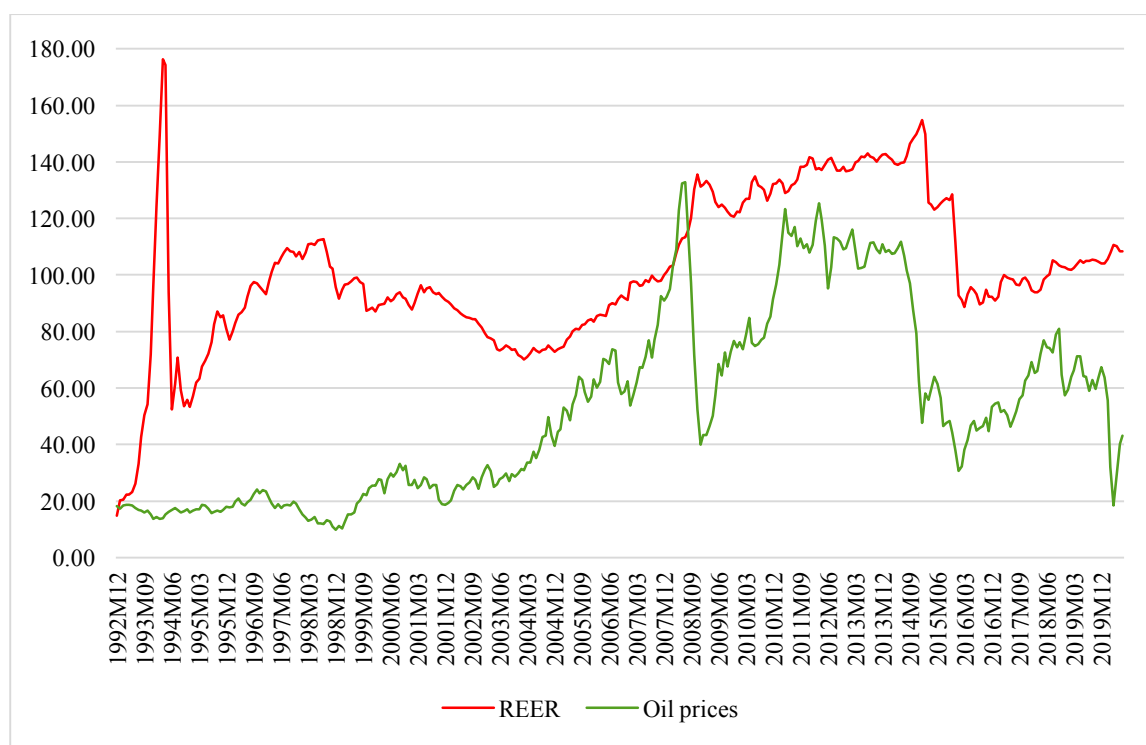
3. Results

This section reports the graphical interpretations, polynomial regression, and the results of the correlation analysis under the different sub-sections. Brief discussions have been incorporated to expand the context and support the arguments based on descriptive reasoning.

3.1. Graphical Interpretations

As already it has been mentioned, REER appreciation in parallel with increasing oil prices is the fundamental observation among resource-rich countries. The main reason behind this is the inflow of foreign currency into the economy (especially USD) in a form of FDI and mineral revenue. Figure 1 demonstrates an increasingly positive trend in oil prices (Brent trademark, USD per barrel) which triggered a gradual REER appreciation in Azerbaijan from the end of 2004 until December of 2014. We observe that for almost 10 years the national economy of Azerbaijan experienced regular REER appreciations on the background of favorable oil prices. During this time, export revenue from oil and gas reached 97% of the total export revenue earnings (SSCRA, 2020) and export revenue from high-skill and technology-intensive manufactures as a share of total bottomed around on average 3.24% of the total between 2008–2018 (SSCRA, 2020). In 2008, the revenue that the extractive industry has generated was 58% higher than the total amount of the generated revenue from 1994 to 2007 (SSCRA, 2020).

Figure 1. Monthly data for Real Effective Exchange Rate (REER, in %,) in Azerbaijan and oil prices (Brent trademark, USD per barrel), 1992M12–2020M07.



Source: REER (Bruegel data sets); Oil prices (U.S. Energy Information Administration)

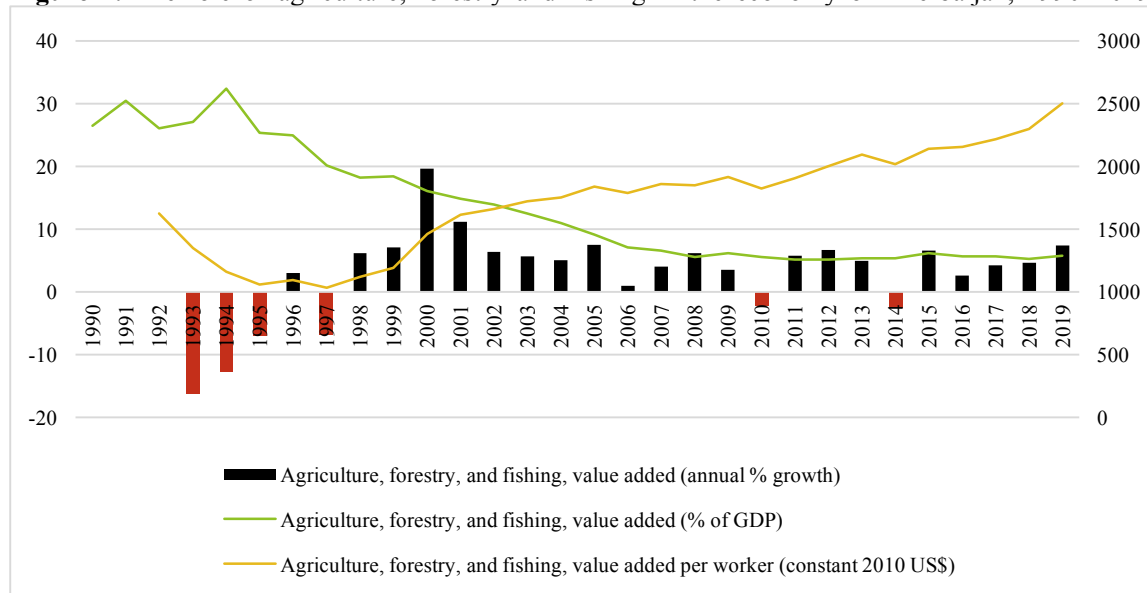
Notes: REER data is CPI based and was calculated based on the 38 main trading partners.

Similar to other ex-soviet countries, Azerbaijan also experienced a collapsed economy and devastated economic relations. Many local sectors failed to continue the production and the domestic market went under the rapid contractions. As Figure 2 shows, the annual growth rate in agriculture, forestry, and the fishing turned to positive numbers starting only from 1998 and continued its regular but modest inclines until 2010. The second negative

growth rate was noticed in 2014 which was - 2.59%. It can be speculated that both nationwide and among the main trading partners (which is primarily Russia) the aggregate demand fell and that shrank the output and value-added level due to the sharp price downturns in the international commodity markets. Moreover, Figure 2 illuminates the decreasing trend in agriculture employment since 1994 and increasing the value-added per worker. Again, by speculating, it can be argued that, because of heavy state subsidies, credits, and other types of supports, the value-added per workers increased even if the total value-added as a percentage of GDP decreased and annual growth rates plummeted.

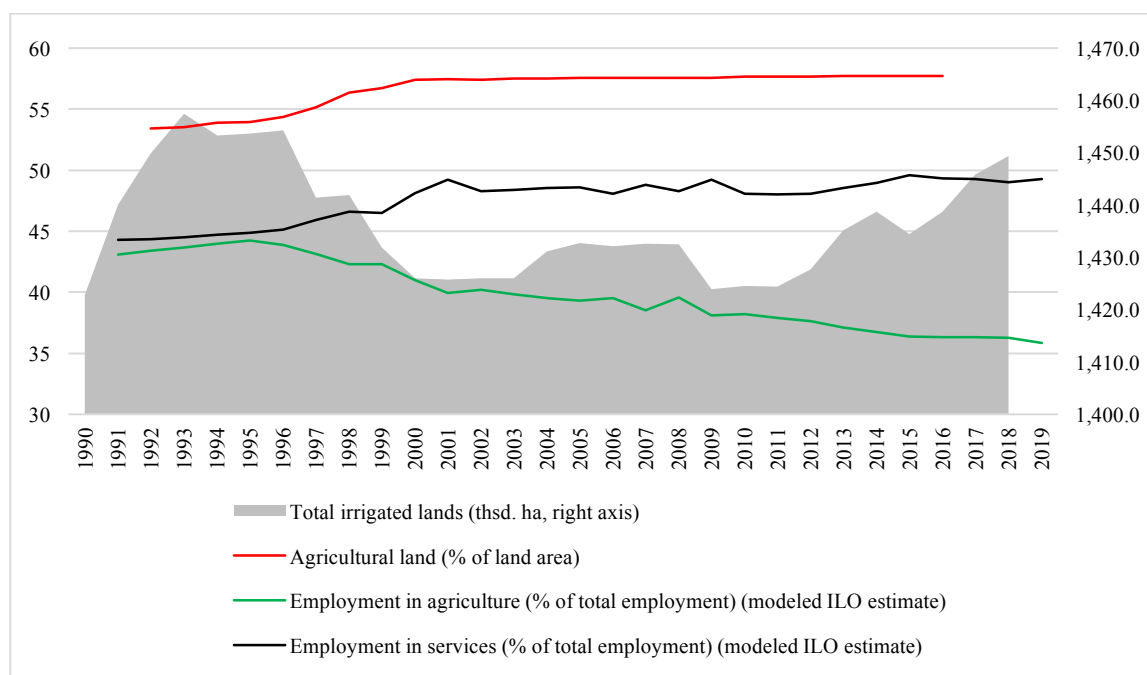
On the background of these general developments since early 1990s, employment, profitability, production cost, and labor input per 100 kg pose importance to foreseeably understand the underlining mechanisms that shaped the trends and dynamics. Figure 3 and Figure 4 focus on the set of issues that underlie many crucial reasons why agricultural and agrarian production and exports gained an immature status rather than cemented its role and influence in the national economy of Azerbaijan.

Figure 2. The role of agriculture, forestry and fishing in the economy of Azerbaijan, 1990–2019.



Source: World Bank

It is interesting that only in 2018 the total irrigated agriculture area caught up with the indicators of 1992–1993 (see Fig. 3) even if the declines and inclines were not considerable. It means that the total of irrigated areas fell from 1,460.0 thousand ha. to approximately 1420.0 thousand ha which is still above 1,400.0 thousand ha. However, employment dynamics are more drastic. Employment in agriculture decreased over time reaching historic low levels of 35.87% of total employment in 2019. As a comparison, the other most important and labor-intensive sector is services in Azerbaijan and it occupied approximately 48–49% between the period of 2000–2019. Non-petroleum manufacturing occupies very low levels, which also indicates the main sign of the Dutch disease hypothesis.

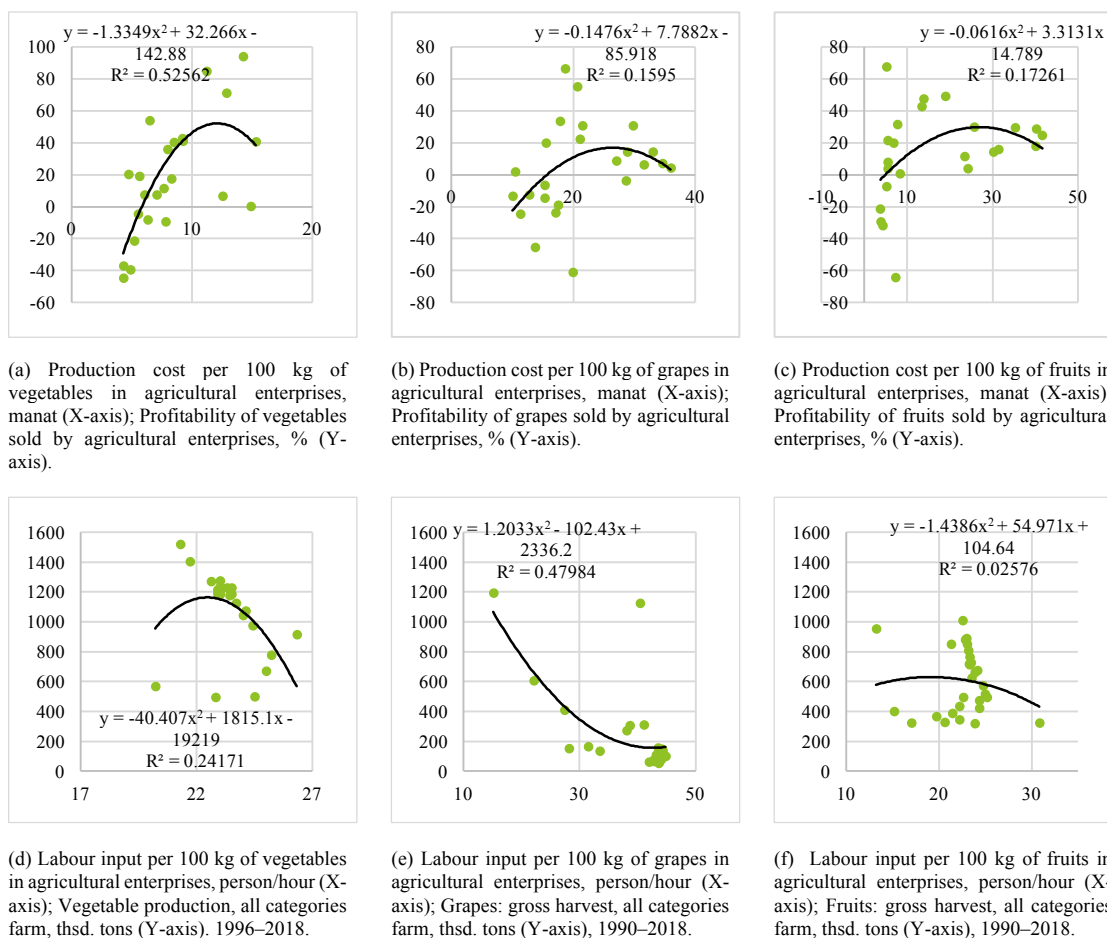
Figure 3. Agricultural land and employment in agriculture and the employment in services, 1990–2019.

Source: World Bank and SSCRA.

Note: ILO stands for International Labor Organization.

Figure 4 reveals intriguing trends regarded on production cost, profitability, labor input, and gross harvest of fruits, vegetables, and grapes via the polynomial regression trendlines. The profitability of vegetables rose from negative numbers to positive between 1990–2018 as production cost per 100 kg increased. It should be noted that profitability of vegetables responded to the increases in cost per 100 kg more rapidly than fruits (Fig. 4, *c*) and grapes (Fig. 4, *b*) which boils down to the fact that vegetable production was the main agricultural activity of the household among the farmers, as well as took a lion's share in the country's export.

The vegetable production has clustered around 1,200 thousand tons when the labor input per 100 kg reaches 23 hours per person (see Fig 4., panel *d*). Similarly, gross harvest in fruits demonstrates the same pattern (see Fig. 4., panel *f*). However, grape harvests diminished considerably since 1991 and hovered between 50–200 thousand kilograms when labor input per 100 kg was between 40–50 hours per person (see Fig. 4., panel *e*). In this case, the grape is more labor-intensive compared to fruits and vegetables and also with a more predictable harvesting level. The production of the grapes is the only category that has a non-inverted U shape in terms of the relationship between labor input cost per 100 kg and gross harvest. These aspects designate important policy implications for the decision-makers and policymakers to shape the non-oil development of the Azerbaijan economy.

Figure 4. The polynomial trendline results of vegetable, fruit and grape categories in terms of production cost, labor input, profitability and gross harvest, 1994–2018.

Source: SSCRA, 2020.

3.2. Correlation Analysis

Azerbaijan's REER and international oil prices are strongly, positively, and significantly correlated between 1992M12 and 2020M07 (see Table 1). Pearson's R correlation coefficient is 0.624 being significant at the 0.01 level. Meanwhile, Spearman's rho correlation coefficient is slightly lower – 0.575 also being significant at the 0.01 level. Spearman's rho correlation technique allows to omit outliers and identify a more realistic correlation coefficient. Both results suggest that favorable oil prices and REER appreciation went hand-in-hand in Azerbaijan which poses a serious danger from the angle of national competitiveness.

Another correlation analysis reported in Table 2 indicates that there is a significant negative association between the value-added in agriculture measured by the percentage of GDP and The Extractives Dependence Index (EDI) between 1991-2018. As the value-added in agriculture as a percentage share in GDP rose, value-added per worker in agriculture shrank (very strong and significant correlation, $r = -0.89$). Surprisingly, value-added in agriculture and employment is positively and significantly associated (because

employment in agriculture constantly fell) but investments are negatively and significantly correlated. Overall, it was highly expected that EDI would be negatively and significantly associated with the agricultural variables in Azerbaijan; however, only value-added in agriculture was in line with the expectations.

Table 1. Pearson's R and Spearman's rho correlation analysis between REER (in percent) and oil prices (USD per barrel, BRENT trademark), 1992M12–2020M07.

Pearson's R		REER	Oil_p
REER	Pearson Correlation	1.000	0.624**
	Sig. (2-tailed)		0.000
	N	332	332
Oil_p	Pearson Correlation	0.624**	1.000
	Sig. (2-tailed)	0.000	
	N	332	332
Spearman's rho		REER	Oil_p
REER	Correlation Coefficient	1.000	0.575**
	Sig. (2-tailed)		0.000
	N	332	332
Oil_p	Correlation Coefficient	0.575**	1.000
	Sig. (2-tailed)	0.000	.
	N	332	332

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2. Pearson's R correlation analysis of the selected variables, 1994–2018.

	1	2	3	4	5	6
1 EDI	1.00					
2 Agriculture VA	-0.48*	1.00				
3 Agriculture VA growth	0.23	-0.38	1.00			
4 VA per worker	0.30	-0.89**	0.30	1.00		
5 Employment	-0.29	0.92**	-0.32	-0.98**	1.00	
6 Investments	0.39	-0.63**	-0.03	0.63**	-0.62**	1.00

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Note: 1) VA denotes value-added; 2) EDI denotes Extractives Dependence Index; 3) Units of measurements can be obtained from the figures; 4) Volume of investments in agriculture is in % of total investments.

Table 3 illustrates the Spearman's rho correlation results for the same variables to see if any outliers biased the overall picture among the analyzed variables. The results are almost identical to the Pearson's R correlation coefficients underlying the minimal role of the outliers in the data set.

Table 3. Spearman's rho correlation results, 1994–2018.

		1	2	3	4	5	6
1	EDI	1.00					
2	Agriculture VA	-0.54**	1.00				
3	Agriculture VA growth	0.32	-0.07	1.00			
4	VA per worker	0.26	-0.85**	0.13	1.00		
5	Employment	-0.26	.086**	-0.12	-0.98**	1.00	
6	Investments	0.30	-0.76**	-0.18	0.71**	-0.66**	1.00

** Correlation is significant at the 0.01 level (2-tailed).

Note: 1) VA denotes value-added; 2) EDI denotes Extractives Dependence Index; 3) Units of measurements can be obtained from the figures; 4) Volume of investments in agriculture is in % of total investments.

4. Concluding Remarks

The Azerbaijan economy experiences high levels of inflation, CPI, and REER appreciation that are common among the resource-rich countries that hinder non-resource sectors since the extractive industry-based economic development and catching up policies have been prioritized. Agriculture and agrarian sectors are not just important or integral parts of the national economies of the resource-rich countries' non-resource sectors but they pose particular importance in terms of food security, spillover effects, backward and forward linkages. The evolution of Azerbaijan's economy on the background of its historical developments since 1991 reveals interesting trends and dynamics that were the main aim of this paper to identify systematically and briefly.

Despite the value-added in agriculture and related sectors rose during the recent year in GDP, fruits and especially grapes are problematic in terms of production cost, labor input per 100kg and gross harvest, as well as profitability. Wine products and exports are in the center of the government's attention to diversify the exports and non-oil sectors of the national economy. However, the analysis shows that compared to the early 90s grapes experienced a kind of irreversible collapse. Even if the wine production and grape exports increased, it is a highly desirable situation to see how the previous high capacity to produce grapes is restored.

Lastly, further studies need to research non-resource sectors of the Azerbaijan economy on the background of Dutch disease and resource curse to determine the main factors behind the agricultural output and exports in a mutual and interactive way. The sub-sectoral dimension bears a noble eminence to accurately follow what happened to the non-resource sectors such as agriculture and agrarian sectors in the Azerbaijan economy since independence from the Soviet Union.

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