Ibrahim Niftiyev

DUTCH DISEASE-LED DE-INDUSTRIALIZATION IN THE AZERBAIJAN'S ECONOMY: ANALYSIS OF THE CHEMICALS INDUSTRY

Thesis book of the PhD dissertation

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UNIVERSITY OF SZEGED
FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION
DOCTORAL SCHOOL IN ECONOMICS

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Supervisor:
Prof. Dr. Miklós Szanyi
Institute of Finance and
International Economic Relations
Division of World Economics and
European Economic Integration

Author:
Ibrahim Niftiyev
University of Szeged
Faculty of Economics and Business
Administration
Doctoral School in Economics

Szeged, 2022

Structure of Thesis Book

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1. Research background and motivation

Industrialization—particularly manufacturing—has helped developed countries to achieve higher income levels and living standards, especially in the early years of their development (Szirmai–Verspagen 2015). In addition, approximately 80% of developing countries' exports have shifted from commodity extraction to industrial production-based goods since 1960 (Gelb 2010). This shift has created opportunities for low-income countries to participate in global value chains (GVCs)[1] across a variety of sectors. Manufacturing-centered economies increase the complexity of exports and ensure economic prosperity for their citizens. A recent study also demonstrated that the great importance of manufacturing as an engine of economic development has not changed significantly since 1990 (Haraguchi et al. 2017). In other words, manufacturing continues to contribute significantly to the wealth of nations.

Azerbaijan is a small and oil-rich post-Soviet country. It has rich oil and gas resources and an unbalanced economy; it underwent a painful transition process from a command economy to a market economy in the early 1990s; and it has pursued extractive industry-driven economic development since 1994. As a result, Azerbaijan has a lopsided economic structure that is vulnerable to international commodity shocks, as was the case from 2014 to 2015. The main driver of gross domestic product (GDP) is the oil industry, and the country's main exports are based on crude oil and petroleum products.

Because of the country's overdependence on oil exports and revenues, Azerbaijan's economy has been studied by some using the natural resource curse (NRC)[2] doctrine and Dutch disease[3] (DD). However, the other aspects of the NRC and DD, such as deindustrialization and de-agriculturalization, have not been studied in depth.[4] The literature still lacks unequivocal arguments on the negative consequences of extractive industry-dominated economic structures in Azerbaijan. This has resulted in both theoretical and practical gaps in guidance

[1] "GVC" means value added in the process of design, production, marketing, distribution, and support for the consumer of a product or service where firms and workers perform in inter-firm networks on a global scale (Gereffi–Fernandez–Stark 2011).

[2] NRC refers to the side effects of economic performance of oil-, mineral-, and other resource-rich countries compared to non-resource-rich countries. However, oil-, mineral-, and other resource-rich countries are considered to have better opportunities to grow rapidly and develop their societies because of available short-term revenue opportunities.

[3] DD is an expression of the contradiction that arises when good news, such as the discovery of enormous oil reserves, harms a country's overall economy. It may have its origin in a substantial influx of foreign capital to exploit a newly discovered resource.

[4] This dissertation will mainly focus on de-industrialization; however, the agricultural sector is also an economic priority, as it employs the highest share of the labor force in Azerbaijan. Therefore, some parts of the quantitative analysis will include some data from the agricultural sector.

for decision makers, policy makers, and academics in how to conceptualize Azerbaijan's economy within a widely accepted and tested theoretical framework. The strong and positive relationship between Azerbaijan's GDP and oil prices, or simply the appreciation of the REER—as claimed in previous studies—is not sufficient to explain why the NRC or DD is solely due to oil wealth. Undoubtedly, the NRC and DD theories should be considered, but the production and export of difficulties in certain sectors of the economy, such as non-oil tradeable sectors (e.g., industrial producers), should also be analyzed. To develop effective and targeted industrial policies that reduce the potentially harmful effects of an oil-based economy, new research should focus on oil-related de-industrialization and industrial diversification in Azerbaijan. If the results provide a clearer picture of the negative consequences of the oil industry's dominance in Azerbaijan's economy, both scholars and policymakers would be able to more effectively shape their policies.

When examining the economy of Azerbaijan, the mere assumption of oil dependence and the need for diversification lead researchers to naively expect signs of the NRC and effects of DD. However, the supposed final theoretical outcome of the NRC or DD is the de-industrialization of nonbooming sectors in terms of output and employment. Therefore, after testing the NRC doctrine and the DD model, this study analyzed Azerbaijan's economy in terms of the de-industrialization of the chemicals industry. The aim was to more accurately capture the negative consequences of oil-based economic growth and development.

To date, only a handful of studies (mainly journal articles) have addressed the de-industrialization process in Azerbaijan. Troubling, yet-to-be-resolved issues are the stage at which oil revenues were misdirected and why Azerbaijan's economy has been unable to develop non-oil manufacturing. Without solutions, research on Azerbaijan's economy will not be specific or relevant enough to provide comprehensive solutions for a more diversified economic structure. In times of low commodity prices, the current industrial structure certainly threatens national income, employment, and the monetary side of the economy. Finally, Szirmai and Verspagen (2015) argued that former centrally planned economies are underrepresented in studies that treat manufacturing as an engine of growth. The present study therefore sought to fill this research gap by extending NRC and DD studies on Azerbaijan.

Lastly, I would like to state my personal motivation for this study: In 2015, I personally experienced two national currency devaluations of the AZN against

the USD and the EUR. This shook the society and abruptly changed citizens' saving and spending behaviors, as well as their plans to engage in the domestic economy. Various companies laid off their employees, imported goods became more expensive, and domestic prices skyrocketed. This situation clearly showed that the "honeymoon" of the oil boom in Azerbaijan was over and that long-term and sustainable macroeconomic stability was at risk. As an economist, this situation worried me, and I decided to investigate the Azerbaijani economy with new methods to find out the past and current structural challenges. My initial assumption was that the lopsided industrial structure in favor of oil production is the main reason for the high vulnerability of the Azerbaijani economy to commodity price shocks. The result is my dissertation, which I present after five years of hard work.

2. Problem statement and study purpose

Lower manufacturing value-added and exports have been demonstrated to have adverse effects on long-term sustainable economic development in mineral-rich countries, such as Nigeria (Schubert 2006), Russia (Bogetic et al. 2010), and Ghana (Acquah-Andoh et al. 2018). If institutional, political, and governance aspects of the economy fail in addition to the economic crowding-out mechanisms of DD, a country is likely to become dependent on a single commodity. This, in turn, will lead to a constrained growth environment for noncommodity tradeable sectors, as one of the main factors determining the competitiveness of a given economy is macroeconomic stability (Khyareh–Rostami 2022). However, monetary pressures and procyclical fiscal policies usually hinder the competitiveness of commodity-rich countries.

Industrialization is often argued to be an engine of balanced economic growth and development, whereas the opposite (i.e., de-industrialization) is allegedly harmful to a country. In any study on the impact of Azerbaijan’s oil industry, the country’s postcommunist legacy, small size, and de facto oil wealth must be considered as part of the background. Simply assuming that de-industrialization has been a negative development since the collapse of the USSR would not be helpful for furthering knowledge about Azerbaijan’s economy. In other words, resource-poor countries have no other option than industrialization through their manufacturing sector. Meanwhile, mineral-rich countries tend to use their available natural resources in the short term to avoid painful reforms and changes. In Azerbaijan, the decreasing role of the manufacturing sector and the related structural changes can be attributed to oil.

In this dissertation, the research design and main theses were based on the idea that the de-industrialization process of Azerbaijan's economy since 1995 has been an extension of the NRC doctrine and its economic explanation (i.e., DD). This is not the first study to examine the NRC and DD in the case of Azerbaijan; rather, it was motivated by recent developments in Azerbaijan's economy, such as decreased GDP, devaluation of the national currency, and increased domestic price levels. These developments followed the volatility in international commodity markets in 2014 and 2015. The threats posed by volatile oil prices appear to be caused by the low diversification of Azerbaijan's economy and poor oil revenue management. Therefore, the relevance of oil-related adverse effects in booming sectors was studied using both quantitative and qualitative research methods.

3. Justification of the study

The case of Azerbaijan provides a unique opportunity to deepen the studies of NRC and DD to get a complete picture of the negative impact of the lopsided industrial structure on the rest of the economy. The end of the oil boom (as measured by oil prices) in 2014 had a devastating impact on Azerbaijan. GDP per capita fell from $7,891 in 2014 to $5,500 and $3,880 in 2015 and 2016, respectively, but all of this was due to inefficient management of oil revenues, which various international economists and experts had warned about since 1995, when the economy entered the recovery phase. Some other post-Soviet countries (e.g., Russia and Kazakhstan) share the same fate, but their GDP per capita and its recovery in the post-boom period (between 2015 and 2020) were higher.

Focusing this work on a single country and sector allowed to avoid the problems associated with case selection, levels, and scope of comparative studies and allowed for a more focused and in-depth examination of the specific NRC and DD signs in Azerbaijan. Although Azerbaijan can be compared to at least some post-Soviet oil-rich countries, it was initially challenging to focus precisely on establishing equivalence between the countries and their non-oil-producing industries.

The author's previous education and ability to directly observe the main macroeconomic events in Azerbaijan related to specific subsectors allowed obtaining valuable and detailed information (e.g., expert interviews, calculation of the Extractive Dependency Index, or EDI) that could only be analyzed in the context of a country- and sector-specific approach instead of a comparative and cross-sector scenario.

4. Research objectives

The main objective of this study was to identify the adverse effects of the booming oil sector on lagging sectors in Azerbaijan. The specific objectives of this study were as follows:

1. To examine whether the dominance of the oil sector has negatively affected Azerbaijan's economy at the level of politics, institutions, governance, education, and human capital;
2. To determine whether the economic explanation provided by the NRC doctrine (i.e., DD) is applicable to Azerbaijan's economy and whether it hinders non-oil manufacturing growth and development;
3. To demonstrate the relevance of the de-industrialization process that results from resource dependence and how it decreases the opportunity for sustainable and long-term prosperity;
4. To analyze available policy alternatives in the short, medium, and long term using the proposed explanatory framework.

5. Hypotheses, research questions and conceptual framework

To achieve the aforementioned research objectives, the following key research questions and side questions were formulated:

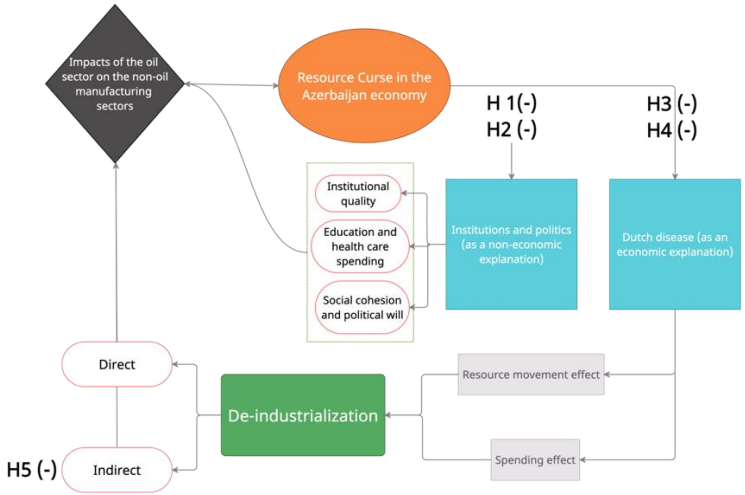
1. What are the main stages of development of Azerbaijan's economy reflected in the main macroeconomic indicators? *Side questions*: Are there subtle differences between the stages of development that were influenced by the oil sector? What were the main policy measures taken by the government to make the transition from a command economy to an economic system based on a free market economy? (Chapter 2)
2. What impact has the oil sector had on institutional quality in Azerbaijan? *Side questions*: Has the oil boom led to lower spending on education and health care (corresponding to human capital in the case of the NRC)? Did public opinion reflect a societal desire to more effectively manage oil revenues during the oil boom period in Azerbaijan's economy? (Chapter 3)
3. Has the oil boom in Azerbaijan's economy created signs or effects of DD since the completion of major oil and natural gas projects (one possible consequence being the de-industrialization of non-oil manufacturing sectors)? (Chapter 4)

4. Has the chemicals industry experienced de-industrialization of its production since 1995 due to the oil sector? *Side question*: What are the reasons for the differences between the deindustrialized and reindustrialized subsectors of the chemicals industry? (Chapter 5)

Also, this section presents the conceptual framework and research hypotheses. Figure 1.1 depicts the research phases and interconnected parts required to explain the DD-induced de-industrialization of Azerbaijan's economy. The impact of the oil sector on Azerbaijan's non-oil manufacturing sectors is explained using both the noneconomic and economic components of the NRC doctrine. The noneconomic side emphasizes the role of institutions, education, and health care, as well as social cohesion and political will. This allowed the ability of the Azerbaijani government to manage oil revenues to be demonstrated. Furthermore, DD as an economic explanation was tested by examining how changes in resource movement and spending can lead to direct or indirect de-industrialization.

This study adopted a step-by-step deductive approach and was based on several hypotheses. These were derived from the NRC and DD theories, in which de-industrialization is assumed to be a negative effect of the oil boom. Based on the conceptual framework proposed in Figure 1, the process of de-industrialization was expected to be observed at the fiscal and monetary levels due to the negative impact of oil revenue mismanagement. The hypotheses are described below.

Figure 1: Conceptual framework for the study.



Source: Author's illustration.
Note: Here, H1–H5 denote the four key hypotheses and the expected sign of the relationship between the oil sector and national economy of Azerbaijan.

Set 1: Presence of the NRC

Based on previous studies, relying only on economic explanations (which mainly employ the DD hypothesis) or simply assuming that oil-rich countries suffer the same fate is not sufficient for determining whether the oil sector in Azerbaijan has created backward non-oil sectors. Noneconomic explanations of the NRC doctrine emphasize institutional, political, and governance indicators (Gelb 1988; Deacon 2011; Heller 2006; de Medeiros Costa–dos Santos 2013; Abdulahi et al. 2019). The data set provided by the World Bank's Worldwide Governance Indicators allows the statistical correlation and association between oil industry dominance and institutional quality to be analyzed. The NRC-related hypotheses used in this study are presented in Table 1.1:

Table 1: Research hypotheses related to the natural resource curse (NRC) doctrine in Azerbaijan's economy.

1	$H_0$1: The oil sector does not have any significant influence on institutional quality: $\beta_1=\beta_2=...=\beta_k=0$; H_a1: Oil-related variables have a negative influence on political and institutional quality: $\beta_j < 0$ for at least one j.
2	$H_0$2: There is no statistically significant association between the oil-related variables and human capital indicators, such as education and health care: $\beta_1=\beta_2=...=\beta_k=0$; H_a2: Oil-related variables (e.g., oil rents, oil dependency, and oil abundance) have a negative relationship with human capital indicators, such as education and health care: $\beta_j < 0$ for at least one j.

Set 2: Diagnosing DD

Studies related to DD should be well planned and empirically based. The main problem with previous studies on DD in Azerbaijan (Gahramanov–Fan 2002; Yıldırım Mızrak–Gurbanov 2013; Zulfigarov–Neuenkirch 2019; Şanlisoy–Ekinci 2019) is their one-sided investigation of exchange rate issues and GDP without proper consideration of the original theory of Corden and Neary (1982) and Corden (1984). In other words, these studies have only analyzed the relationship among Azerbaijan's oil prices, GDP, and REER. However, research on DD should also consider the sectoral movement of resources and government

expenditure. Accordingly, the second set of hypotheses is presented in Table 2.

Table 2: Research hypotheses related to Dutch disease (DD) syndrome in Azerbaijan's economy.

1	$H_0$3: Oil prices do not have positive relationship with the Azerbaijani REER: $\beta_1=\beta_2=...=\beta_k=0$; H_a3: Oil prices appreciate the Azerbaijan's REER: $\beta_j > 0$ for at least one j.
2	$H_0$4: The nominal or real effective exchange rate and oil-related variables do not have a negative relationship (growth-reducing) with non-oil manufacturing: $\beta_1=\beta_2=...=\beta_k=0$; H_a4: The nominal or real effective exchange rate and oil-related variables have a negative relationship (growth-reducing) with non-oil manufacturing: $\beta_j < 0$ for at least one j.
3	$H_0$5: Higher oil prices and the appreciation of the REER do not have a statistically significant and theoretically meaningful impact on non-oil manufacturing output and employment in Azerbaijan: $\beta_1=\beta_2=...=\beta_k=0$; H_a5: Higher oil prices and the appreciation of the REER had either a direct or indirect impact on sectoral output and employment in the non-oil manufacturing sector in Azerbaijan: $\beta_j < 0$ for at least one j.
4	$H_0$6: Oil revenue does not create any inflationary effects through government revenue or spending and population income[5]: $\beta_1=\beta_2=...=\beta_k=0$; H_a6: Oil revenue creates inflationary effects through government revenue or spending and population income: $\beta_j < 0$ for at least one j.

Set 3: De-industrialization

De-industrialization has not been studied in much depth for Azerbaijan. The theories of DD and NRC allow the occurrence of de-industrialization to be conceptualized. The main hypothesis examined in Chapter 5 is presented in Table 3.

[5] Total income is the sum of primary incomes including salaries of employees, incomes from entrepreneurial activities, incomes from property, and current and capital transfers.

Table 3: Research hypotheses related to the de-industrialization process in Azerbaijan's economy.

1	$H_0$5: Dutch disease in Azerbaijan has not led to the de-industrialization of non-oil tradeable industrial sectors since 1995, especially in the chemicals industry: $\beta_1=\beta_2=...=\beta_k=0$; H_a5: Dutch disease in Azerbaijan has led to the de-industrialization of non-oil tradeable industrial sectors since 1995, especially in the chemicals industry: $\beta_j < 0$ for at least one j.

6. Dissertation Outline

This dissertation consists of six chapters, the remainder of which are organized as follows: Chapter 2 reviews the main macroeconomic indicators and policy decisions in Azerbaijan since 1991 and presents the necessary facts about the country's economy. Chapter 3 reviews the literature on the level of NRC, DD, and de-industrialization. Chapter 4 presents the data collection process and methods used. Chapter 5 reports on the results. Chapters 3 and 4 present the methods and results at three levels: NRC, DD, and de-industrialization of the chemical industry. Finally, Chapter 6 reviews the economic policy responses, policy implications, and suggestions for future research based on a literature review of other oil-rich countries, where the NRC and DD have been common obstacles to overcoming excessive oil dependence.

7. Data and Methodology

The source of quantitative data is from the State Statistical Committee of the Republic of Azerbaijan, the World Bank, Bruegel datasets, etc. The source of qualitative data is interviews with the chemical industry specialists and economists who have published on the industrialization of the chemical industry in Azerbaijan. Figure 2 briefly lists all the methods used in each chapter. However, more detailed information can be found in subsection 5.1 of this material. Meanwhile, Figure 3 presents the theoretical framework of the dissertation work.

Figure 2: Short list of methods used in the dissertation.

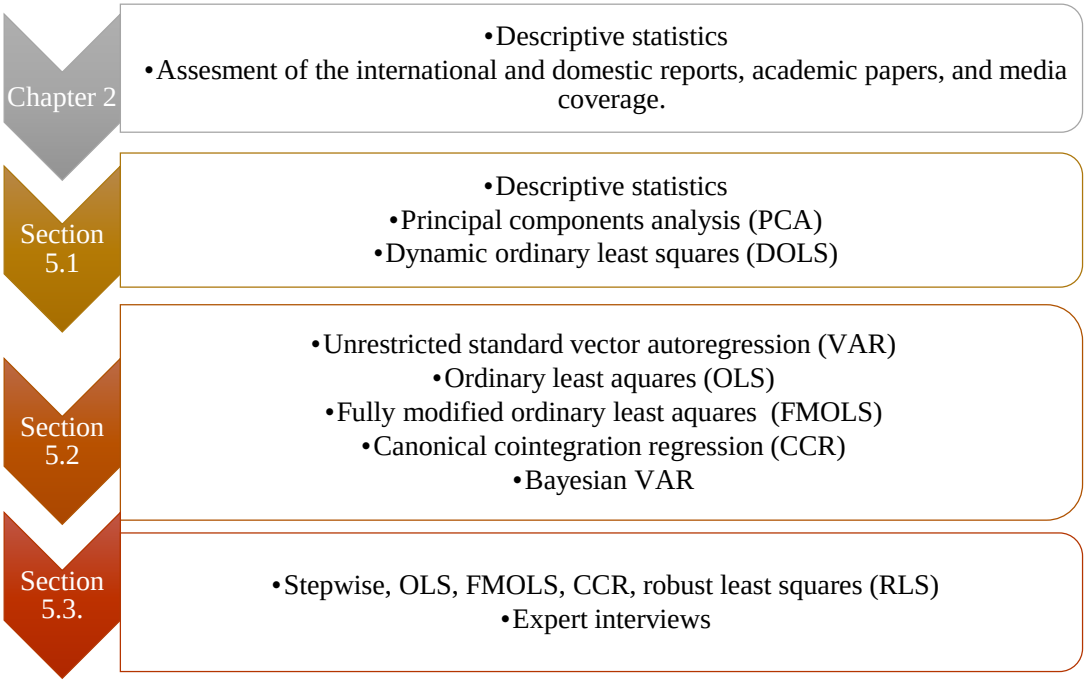
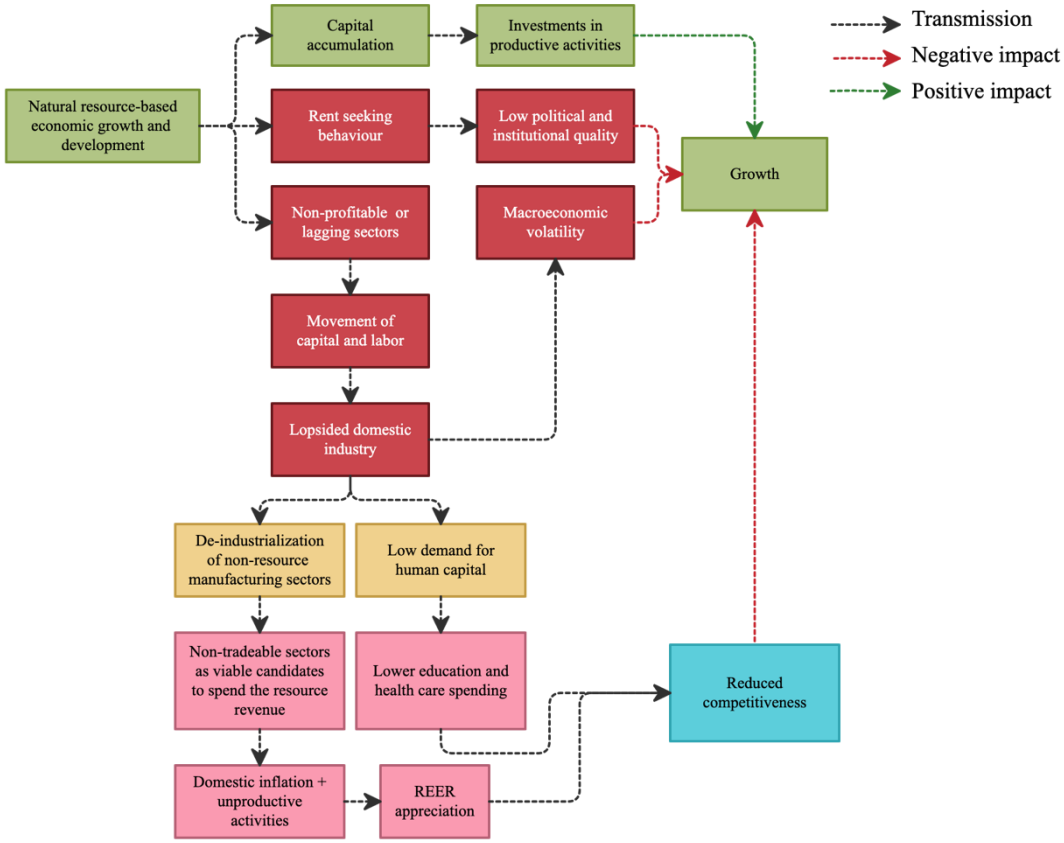


Figure 3: Theoretical framework of the dissertation based on NRC and DD theories.



Source: Author's own construction based on the literature review.

8. Key results of the PhD dissertation, and its practical importance

This section briefly reviews the main findings of the studies in the dissertation, their connection to the main objectives and hypotheses of the research, and the practical and policy implications. Limitations and suggestions for future studies are also presented.

8.1. Key results

Prior to the empirical research, a brief overview of the economy of Azerbaijan was provided in Chapter 2. This included the following aspects: macroeconomic stability and stimulation policies, institution building, liberalization of the economy, foreign economic relations, and creation of a private sector. The main analytical benefit clarified was the periodic classification of the Azerbaijani economy: recession (1991–1994), transition (1995–2004), oil boom (2005–2014) and post-boom period (2015–2020). Thanks to this classification, the oil boom period was included in the empirical estimates as a dummy variable.

Another important finding from the brief historical assessment of the Azerbaijani economy was the role of oil prices: oil-based economic development in Azerbaijan has boosted economic indicators such as GDP, GDP per capita, foreign direct investment (FDI), and exports. However, long-term sustainable economic growth and development have not been achieved as the share of non-oil manufacturing has declined. The Azerbaijani government increased its efforts to reform institutions and governance only when oil prices were low. Overall, the Azerbaijani economy clearly shows that the oil boom period changed the government's attitude toward reforms in institutions and industrial structure. This has led to a lopsided economy that is highly vulnerable to external shocks when commodity prices fall dramatically. These phenomena are usually studied within the framework of NRC and DD theories. For this reason, Chapters 5 Section 5.1 and 5.2 aimed to shed light on this, while Chapter 5, Section 5.3 had a narrower focus on the chemical industry.

The descriptive assessment in Chapter 1 (Section 1.3) showed that Azerbaijan had the highest oil dependence among the 15 post-Soviet economies, as measured by oil rents as a percentage of GDP. This was accompanied by low institutional quality, as measured by the indices of voice and accountability, and for control of corruption (other institutional indices showed the same correlation with oil rents indicators) between 1996 and 2020. At the same time, the one-sample t-test showed that Azerbaijan's institutional quality was lower than that of neighboring nonresource countries such as Armenia and Georgia between 2005

and 2014 (Chapter 5, section 5.1). With the exception of the government effectiveness and political stability indices, all other institutional measures examined consistently had lower growth rates during the oil boom period. Finally, the government implemented reforms mainly in the post-oil boom period, suggesting that it neglected to reform and diversify the economy during the oil boom period. All these observations allowed to apply principal component analysis (PCA) and regression methods to strengthen the expected relationship between oil-related variables and institutions.

The alternative hypothesis analyzed in Chapter 5 (Section 5.1.) was accepted, indicating that oil variables have a negative impact on institutional quality, as determined by dynamic ordinary least squares (DOLS). This was possible thanks to the correct PCA results, which clearly grouped the oil-related variables on the first principal component and the institutional variables on the second principal component. Then the NRC human capital channel was tested by focusing on health care, education, and human rights. Again, several statistically significant negative coefficients indicated the relevance of the NRC phenomenon in the Azerbaijani economy. Finally, the World Value Surveys (WVS) were analyzed descriptively to determine the possible changes in social cohesion and political will of the population during the oil boom. The survey results showed that during the oil boom period, the percentage of the population willing to sign a petition or boycott decreased. In addition, trust and interest in politics and politicians decreased during the oil boom, although trust in the incumbent government increased.

The next phase of the research was to test the precise impact of DD on the three-sector aggregate Azerbaijani economy. Both alternative hypotheses established in Chapter 5 (Section 5.2) were accepted. To explain, the increase in Azerbaijan's REER happened at the same time that oil prices went up. This was tested using standard unrestricted VAR, VAR Granger causality, fully modified OLS (FMOLS), and canonical cointegration regression (CCR). The increase in REER negatively affected manufacturing output and value-added as well as agriculture (so-called lagging sectors in DD theory). All of this was observed in the context of increasing dependence on the oil industry and prices measured by the EDI. In other words, manufacturing and agriculture value-added, as well as manufacturing value-added, were negatively affected by increasing oil dependence. In parallel, the higher the EDI, output and employment in the booming sectors increased significantly.

In terms of resource movement and spending effects of DD in Azerbaijan’s

economy between 2000 and 2019, the following can be noted: There is evidence both for and against the resource movement effect. The growth rates of output and employment of S_B did not cause statistically significant deteriorations of S_L or S_{NT}. However, the growth rates of output and employment in S_{NT} had a significantly negative effect on the employment dynamics in S_L. This suggests the outcome of the indirect de-industrialization of the resource movement effect. The proxy variables for domestic demand—income in AZN and USD—also exhibited positive effects on the output growth rates in each sector, but employment growth rates declined in S_L and S_{NT} when domestic demand increased. The estimated standard unrestricted VAR model revealed that the REER, oil prices, and service sector jobs all had negative effects on manufacturing jobs.

The test of the spending effect demonstrated that higher population income, MPC, and government spending were associated with higher levels of CPI. Moreover, the CPI responded positively to shocks in state budget spending during the 16 months covered by the BVAR model.

The ultimate goal of this dissertation was to link NRC and DD to the de-industrialization of the non-oil processing sectors. To this end, the chemical industry was chosen as a case study in Chapter 5.3 because the chemical industry has a high average share of exports and domestic non-oil production and is thus the sector for which most future trade is promised. The six subsectors, namely chlorine, hydrochloric acid, liquid soda, caustic soda, isopropyl alcohol, and sulfuric acid, were analyzed in terms of key variables in the theory of DD, such as REER, oil prices, oil boom, and service sector employment. Quantitative methods included stepwise, OLS, FMOLS, CCR, and robust least squares (RLS). The qualitative method was based on interviews with 10 industry experts and 5 economists who have studied the Azerbaijani non-oil industry over the past 10-15 years.

The regression estimates (stepwise + OLS, FMOLS, and CCR) showed that subsectors such as chlorine and liquid soda were significantly negatively affected by the oil boom in the short run. However, in the long run, the impact of the oil boom on chlorine and hydrochloric acid production in these subsectors was significantly positive. Oil prices were also an important factor for chemical production. For example, chlorine and liquid soda are positively affected by oil prices in the short and long run. Interestingly, however, the production of isopropyl alcohol and sulfuric acid can only be explained by oil prices and their one-year lagged version. Next, REER appreciation and service sector employment were found to have negative and significant short-run effects on

subsectors such as caustic soda, liquid soda, and chlorine. In the long run, service sector employment and REER appreciation have a negative impact on hydrochloric acid and sulfuric acid.

Interviews with industry experts and professional economists revealed that the specific subsectors of the chemical industry have experienced de-industrialization for several reasons. For example: (i) outdated Soviet technology that no longer met economic and environmental requirements; (ii) decreased domestic demand; (iii) inability to compete with imported chemicals; (iv) termination of government support; and (v) increased production costs.

The quantitative and qualitative results overlap in the following way: (i) between 1995 and 2020, there was both a negative and a positive correlation between oil prices and the production of chemical subsectors; (ii) after 2005 and 2006, Azerbaijan experienced a dramatic structural change in industrial production - the rise of the oil industry. This led to an increase in the REER and the high cost of domestic production. Then, rent-seeking behavior of state agencies with respect to oil revenues led to the collapse of certain non-oil manufacturing subsectors, including the chemical industry; (iii) both quantitative and qualitative analyzes did not identify productivity-related reasons for de-industrialization, which is a common cause of de-industrialization in advanced economies. Both methods pointed to the adverse indirect effects of the rise of the oil industry in Azerbaijan. This supports the hypothesis of DD -led de-industrialization due to oil-dominated industrial production; (iv) Since the state is the main producer of oil, chemicals, and petrochemicals, short-term profitability signals play an important role in the production of chemicals. When crude oil is more profitable, the government increases oil exports, which has a negative impact on the chemical industry. However, when oil prices fall dramatically, the government diverts oil revenues into investments to renovate some old production facilities or to adopt technologies from abroad to process crude oil. The latter leads to high volatility of production in the chemical industry. Thus, the fifth alternative hypothesis is accepted and de-industrialization of Azerbaijan's non-oil chemical subsectors can be linked to DD-induced negative effects of the oil boom period.

8.2. Policy implications of the findings

The REER puts the most monetary pressure on non-oil manufacturing sectors to increase their domestic competitiveness and production levels. This, in turn, leads to lower tax revenues outside the oil sector as efficient domestic producers exit,

either because of high production costs or because of the harmful effects of REER appreciation. For this reason, the exchange rate should be designed so that the government counteracts deindustrialization by supporting and encouraging domestic non-oil producers.

Industrial policy, especially its main components related to human capital development and institutional quality, should be taken more seriously to overcome the current and upcoming de-industrialization of non-oil sectors in Azerbaijan. It seems that the main industrial policy tool of the Azerbaijani government is the creation of SOEs to increase both oil and non-oil production and exports through the same actor—SOCAR. However, SOCAR is a non-transparent and inefficient SOE (EEI 2018). The lack of institutional mechanisms to control SOCAR and its dominant position in the national economy put the entire national economy at risk (EEI 2018). This is the most critical problem to be solved in terms of policy implications for the development of non-oil production by SOEs.

Upgrading human capital is an essential component of measures for combatting de-industrialization (Rasiah 2011). Local professionals and specialists must be developed to achieve a sufficient supply of engineers, scientists, and researchers ready to apply innovative solutions in the chemical and other non-oil sectors. However, instead of creating a clear framework for attracting young and talented workers, Azerbaijan is experiencing a brain drain as they migrate to Turkey and Russia (Gurbanov 2014).

Based on the proposals of Mehrara (2009), Beverelli et al. (2011), Benkhodja (2014), Chang (2015), Bunte (2016), Popov (2019), Majumder et al. (2020), Alssadek and Benhin (2021), and Raifu (2021) for oil-rich countries, this study recommends the following specific directions to government decision makers: 1) implement appropriate exchange rate policies, tax cuts, more transparency, and greater efficiency in subsidy mechanisms; 2) attract more new players to domestic markets, especially in non-oil manufacturing, which would mean less state-led re-industrialization (although the example of the chemical industry in Azerbaijan indicates the opposite); 3) have the central bank introduce inflation targeting and flexible exchange rate policies to address the effects of DD during an oil boom[6]; 4) modernize the chemical and petrochemical industries, which consume much oil and natural gas, to make their production more

[6] However, if a country already suffers from NRC or DD, then a free-floating exchange rate may jeopardize the economy's future growth. This was found by Zhan et al. (2021). The authors found a persistent and statistically negative relationship between natural resource rents and the flexibility of exchange rates.

efficient[7]; 5) prioritize the development of international trade policies that promote trade openness (e.g., free trade agreements and tariff reductions)—joining the WTO could help to reduce the oil curse; 6) increase investment in education and health sectors to maximize gains from oil revenues; 7) accelerate ICT and maintain e-government improvements to reduce interactions between citizens and corrupt public officials and employees; however, it should be noted that Azerbaijan ranks 56th in e-government development as measured by the E-Government Development Index (EGDI); nevertheless, the necessary drivers for eradicating corruption to improve institutional quality remain a challenge and invite a focus on inefficiencies in e-government development; 8) limit wage increases and employ egalitarian wage policies to regulate the labor market, mitigating the resource movement effect of DD and thus preventing direct or indirect de-industrialization; 9) increase the efficiency of SOFAZ, which could be achieved by developing deeper capital markets (which, according to Conrad [2012] seem weak and problematic in Azerbaijan); the government and stakeholders should save when oil prices are high and spend when they are low, thereby reducing vulnerability to oil price shocks; 10) undervalue the exchange rate, which may be a necessary policy decision for supporting current industrialization efforts and overcoming the effects of DD; and 11) implement policies aimed at improving the quality of decision making and institutions. This is because, regardless of industrial or other economic policies, the government is likely to fail if its capacity is constrained by an incompetent bureaucracy; selective industrial policies are implemented under high uncertainty and with limited information.

The other strand of the industrial policy suggestions are as follows: 4) Tariffs and subsidies can be useful industrial policy tools for creating and protecting infant industries in the non-oil sector. To this end, excess oil revenues could be rechanneled to non-oil sectors. However, the government has generally chosen to use oil revenues for infrastructure projects—particularly in construction—rather than for high value-added production. Previous experiences with subsidies and government support have been accompanied by high levels of corruption and illegal practices. 5) Selective industrial policies targeting non-oil-tradeable sectors could bring quick results. Creating an enabling environment by improving institutions and building the state takes time. The emergence of export-

[7] Beverelli et al. (2011) argue that countries which intensively export oil are more prone to DD effects compared to countries that domestically consume oil. Therefore, by encouraging domestic industries to utilize rich natural resources, one can increase manufacturing output and boost economic growth. This is known as the Rybczynski theorem.

oriented industrial sectors from this favorable environment could take even longer. Thus, both domestic production and exports could be diversified and, in turn, a diversified economy could ensure macroeconomic stability in Azerbaijan. Lebdioui (2020) stated that this argument is consistent with the idea that macroeconomic policies alone are not sufficient for ensuring macroeconomic stability in a resource-rich country. 6) Industrial policy instruments should not only stimulate the private sector of the economy through, for example, tax cuts and subsidies but also promote technological progress—either through domestic private actors or FDI. Naudé (2013) discussed the case of Indonesia—a country that successfully rid itself of DD—where SOEs dominated technology promotion and prevented the private sector of the economy, universities, and foreign companies transferring their experience to the domestic economy. According to Naudé (2013), this led to stagnation in manufacturing growth and created a supply-side industrial policy. Although the countries and economies of Azerbaijan and Indonesia are different, similarities do exist between the two resource-rich countries. The Azerbaijani government should strive for an optimal and efficient level of technology promotion to support the growth of domestic industry. 7) Horizontal industrial policy should aim to integrate Azerbaijan's regions into industrial production through the non-oil manufacturing sectors. The oil and chemical industries are located in the Absheron Economic Zone, where the capital is located and the population density is high. There is a general lack of understanding of the regions' comparative advantages as well as of the possible strategies for integrating them into global and regional trends. With flexible regulation and appropriate risk optimization (e.g., through greater private sector participation and regional co-financing), cross-sectoral regional specialization in some manufacturing sectors could be achieved. Such specialization could increase the share of non-oil production.

8.3. Limitations and recommendations for future studies

The main limitation of the quantitative analysis was the lack of alternative theories to explain the possible negative impacts of the oil boom. DD and the NRC are common theories for modeling resource-rich, small, and open economies, but this also limits the ability to test whether the negative impacts are truly due to resource abundance. The small sample size and the limited ability to maneuver between explanatory variables were also main limitations of the quantitative analysis. Put differently, although new explanatory variables such as the EDI, oil rents, and oil boom (a dummy variable) were introduced to analyze DD effects and de-

industrialization, real labor productivity, the impact of globalization, and the role of the service sector should also be included in the analysis when the available statistical data are introduced. In addition, the transition period had an enormous impact on the post-Soviet countries, which should also be included in analyses. Moreover, this study was limited to the linear effects of oil- or DD-related variables on institutional quality, the economy, and manufacturing subsectors. Although non-linear studies could be useful for elucidating other factors in Azerbaijan's economy, it is likely that variables such as oil price would lose value after a business cycle. This makes non-linear studies highly challenging.

There are several directions for future studies. For example, further studies could focus on the other manufacturing subsectors outside the chemical industry. Before selecting the chemical industry, the author also analyzed the textile and machinery industries, but the data did not suggest patterns of production decline that overlapped with the onset of the oil boom. Perhaps a more individualized approach is needed here. Indeed, the limitations of statistical data are a clear obstacle to quantitative methods. Qualitative methods are proposed to provide new insights into the de-industrialization of the non-oil industry through primary data collection techniques such as expert interviews, archival work, case studies, etc.

It is crucial to analyze the de-industrialization process in Azerbaijan's economy, in the context of not only the oil boom but also the collapse of the Soviet Union, since the main industrialization period fell during that time (forced de-industrialization). For the output of Azerbaijani industrial producers, it is at least possible to obtain statistical data from Soviet archives and compare them with things that have changed over time and in the system. Through a descriptive analysis, Niftiyev (2022) found the subsectors of the textile industry to display signs of de-industrialization during the post-Soviet years, but not during the Soviet period. However, the exact reasons for and concrete details of this process remain for future studies to uncover.

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