DESIGNING AN OIL CURSE INDEX (OCI): MEASURING THE OIL CURSE TENDENCY OF THE COUNTRIES WITHIN AN ECONOMIC GROWTH PERSPECTIVE

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Doctor of Philosophy in Economics.

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ABSTRACT

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Ozyorulmaz Akcura, Evrim

Ph.D. in Economics

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The economic performance of the countries rich in natural resources is relatively low compared to the resource-poor countries, which is called “resource curse” in the economics’ literature. Since the endowment with abundant natural resources is an important production factor in terms of growth and development processes of countries, the unplanned and unconscious use of these resources led to face several vital problems resulting in nondevelopment trap such as Dutch Disease, corruption, authoritarian regime, poor governance, income distribution inequality, rent-seeking, as well as the risk of civil war and conflict. The unplanned and unconscious use of natural resources, as well as the linking of the dynamics of the economy to the resource use, are fueling the emergence of the Resource Curse hypothesis. In this context, with the empirical series of studies conducted by Sachs and Warner (1995; 1997; 1999; 2001), the Resource Curse literature has begun to spread to a deepening framework, emphasizing the negative impacts of natural resources on economic growth. Many econometry-based research and studies in the current literature focus on the adverse economic effects of natural resources, while some studies have shown that countries such as Norway and Botswana have been exemplified and that natural resources can turn from being a curse into a blessing with suitable policy implications and practices. Oil is the most important fossil fuel, and in this context, regions with abundant oil reserves such as Organization of Petroleum Exporting

Countries (OPEC), Middle East, Middle East and North Africa (MENA), Sub-Saharan Africa, and oil-rich countries such as Iraq, Venezuela, United Arab Emirates, Nigeria have often been the subject of the Resource Curse literature. However, when the existing literature is reviewed, it is seen that there is not a detailed study that focuses on the countries with abundant oil resources measuring the tendency of the related countries to the oil curse. Within this context, this thesis examined the oil curse performance of 41 countries with proven oil reserves for the first time in the literature by creating a systematic and comprehensive index that included six different economic and political indicators using the Principal Component Analysis (PCA) method. The index results showed that Italy, China, and the USA are the least prone countries to the oil curse, whereas Iraq, Saudi Arabia, Sudan and Kuwait are the countries with the lowest oil curse performance. The calculations of the index also highlighted the factors that played a role in the success of the countries, as mentioned earlier with lower oil curse tendency and analyzed the dynamics of the countries with high oil curse tendency comparatively. The significant finding of the Oil Curse Index (OCI) is the difference in the oil curse performance between developed and developing economies. The OCI also underlines some exceptional cases where natural resource abundance is achieved to turn into a blessing. Moreover, the harmful effects of corruption, political instability, rent-seeking behavior, and the risk for conflict, as well as Dutch Disease through lack of economic diversification, have attracted attention in the discussion of the results. Accordingly, in the second part of this thesis, to validate and verify the constructed OCI, it is accepted as an indicator in the economic growth model conducted by Mankiw-Romer-Weil (1992); and in this context, cross-country regression analysis was performed for the same countries for the period between 2002 and 2015 with numerous economic, political and social variables. In light of our empirical findings, the adverse effects of the OCI on economic growth have been identified through several channels of the Natural Resource Curse phenomenon.

Keywords: Resource curse, oil curse index, natural resources economy, models of economic growth, Principal Component Analysis.

ÖZET

PETROL LANETİ ENDEKSİ (PLE) OLUŞTURULMASI: ÜLKELERİN PETROL LANETİNE YATKINLIĞININ EKONOMİK BÜYÜME PERSPEKTİFİNDEN ÖLÇÜLMESİ

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Doğal kaynaklar bakımından zengin olan ülkelerin ekonomik performanslarının, kaynak yoksulu ülkelere kıyasla nispeten düşük olması, ekonomi literatüründe "kaynak laneti" olarak adlandırılmaktadır. Zengin doğal kaynaklara sahip olunması, ülkelerin büyüme ve gelişme süreçleri açısından önemli bir üretim faktörü olduğu için, bu kaynakların plansız ve bilinçsiz kullanımı neticesinde, Hollanda Hastalığı, yolsuzluk, otoriter rejim, zayıf yönetişim, gelir dağılımı eşitsizliği, iç savaş ve çatışma riski ile rant arayışı gibi gelişememezliğin yol açtığı birçok önemli sorunla karşı karşıya kalınması kaçınılmaz olmaktadır. Bu plansız ve bilinçsiz kullanıma ilaveten, ekonominin dinamiklerini tamamen doğal kaynak kullanımına bağlamak, kaynak laneti hipotezine çekilen dikkatin günümüzde daha da artmasına neden olmaktadır. Bu kapsamda, Sachs and Warner (1995; 1997; 1999; 2001) tarafından gerçekleştirilen seri halindeki ampirik çalışmalarla birlikte kaynak laneti literatürü, doğal kaynakların ekonomik büyüme üzerindeki negatif etkisine vurgu yaparak, oldukça geniş bir çerçeveye yayılmaya başlamıştır. Mevcut yazındaki ekonometrik tabanlı birçok araştırma ve çalışma doğal kaynakların olumsuz ekonomik etkileri üzerine yoğunlaşırken; bazı çalışmalar da Norveç ve Botswana gibi ülkeler örnek gösterilerek, doğal kaynakların bir lanet olmaktan çıkıp, doğru uygulama ve politikalarla aslında bir nimete döneşebileceğini vurgulamıştır. Uzun yıllardır, en önemli fosil yakıt kaynaklarından biri olan petrol ve bu kapsamda özellikle Petrol İhraç Eden Ülkeler Teşkilatı, Orta Doğu, Orta Doğu ve Kuzey Afrika, Sahra Altı Afrika gibi zengin petrol kaynağına sahip bölgeler ile Irak, Venezuela, Birleşik Arap Emirlikleri, Nijerya gibi ülkeler kaynak laneti literatürüne de bu yolla sıklıkla konu olmuştur. Ancak mevcut literatür incelendiğinde petrol kaynağına sahip ülkeleri merkezine alan ve ilgili ülkelerin petrol lanetine yatkınlıklarının ölçüldüğü detaylı bir çalışma olmadığı görülmektedir. Bu kapsamda, bu tez literatürde ilk defa petrol rezervine sahip 41 ülkenin 2002-2015 yılları arasındaki petrol laneti performasını, altı farklı ekonomik ve politik göstergenin yer aldığı Ana Bileşenler Analizi metodunu kullanarak, sistematik ve kapsamlı bir endeks oluşturulması yoluyla incelemiştir. Endeks sonuçlarına göre, petrol laneti bağımlılığı en az olan ülkeler İtalya, Çin, İngiltere ve Amerika olurken; Irak, Suudi Arabistan, Sudan ve Kuveyt petrol laneti performansı en düşük ülkeler olarak dikkati çekmektedir. Endeks sonuçlarına bakılarak, petrol laneti performansı düşük olan ülkelerin başarısında rol oynayan faktörler, petrol laneti performansı yüksek olan ekonomilerin dinamikleri ile karşılaştırmalı olarak analiz edilmiştir. Petrol Laneti Endeksi'nin en dikkat çekici bulgusu, gelişmiş ve gelişmekte olan ekonomiler arasındaki petrol laneti performansındaki farktır. Endeks ayrıca, doğal kaynak zenginliğinin bir lanetten öte nimete dönüşmesinin gerçekleşebildiği bazı istisnai durumların da altını çizmektedir. İlaveten, endeksin sonuçları, doğal kaynak zenginliğinin getirdiği yolsuzluk, siyasi istikrarsızlık, rant arayışı davranışı ve çatışma riskinin yanı sıra, ekonomik çeşitlendirmedeki eksiklik nedeniyle Hollanda Hastalığı'yla sonuçlanan bozucu etkilere de dikkati çekmektedir. Bu kapsamda tezin ikinci kısmında, oluşturulan endeksin geçerliliğini kanıtlamak ve doğrulamak amacıyla endeks sonuçları, Mankiw-Romer-Weil (1992)'in ekonomik büyüme modelinde aynı ülkelerin yer aldığı ve 2002 ve 2015 yıllarını kapsayan birçok ekonomik, politik ve sosyal değişkenin yer aldığ panel regresyon analizlerinde bir gösterge olarak kabul edilmiştir. Ampirik bulgular, oluşturulan endeksin ekonomik büyüme üzerindeki bozucu etkilerini kanıtlamaktadır.

Anahtar Kelimeler: Kaynak laneti, petrol laneti endeksi, doğal kaynak ekonomisi, ekonomik büyüme modelleri, Temel Bileşenler Analizi.

Dedicated to my lovely parents,

Sevgi Özyorulmaz

and

İbrahim Özyorulmaz…

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CHAPTER 1. INTRODUCTION

Debates arguing that the richness of natural resources is an unfortunate factor began to come to the agenda more prominently, especially in the 1970s and 1980s. Lately, many researchers examined the economic performance of several countries that were exporting natural resources and concluded that these countries performed poorer in terms of economic performance than those with less or no natural resources. It was also observed that the growth rates of the countries that are rich in natural resources were relatively low in the long run. This phenomenon is referred to as the “Resource Curse” in the literature of economics.

In the traditional approach, the intuitive increase in production factors of a country is expected to contribute to economic growth. However, studies revealing that natural resource richness inhibits economic growth through different channels has produced an extensive literature (Sachs and Warner, 1997, 1999, 2001; Gelb, 1988; Gylfason et al., 1999; Bulte et al., 2005). As mentioned, this paradoxical finding has come into the literature with the phrase “Resource Curse”. Especially empirical studies showing that resource-rich developing countries grew more slowly than developing countries in the 1960s (Lederman and Maloney, 2006). Some of the studies focus on the causes and development channels of the Natural Resource Curse, especially Dutch Disease, and some examined the effects of institutional and governance indicators.

There are two different approaches to the effects of natural resource wealth on economic growth. In the first approach, rich natural resource endowment is considered as a blessing for the national economy, while in the second one, it is seen as a curse (see Sachs and Warner, 1997, 1999, 2001; Gylfason, 2001; Lederman and Maloney, 2006).

In the first approach, countries with rich natural resources are expected to show faster growth performance, while the second approach suggests that countries with rich natural resources exhibit growth inhibitory effects. Some studies on developing countries after the 1950s point to an evident paradox in the relationship between natural resource endowment and economic growth. This paradox implies that countries that are rich in natural resources have lower growth rates compared to those with relatively less or no resources.

Today, there is still an ongoing debate in the literature regarding the economic, political, and social explanations that could enlighten this negative relationship between economic growth and an abundance of natural resources. Accordingly, the most important reasons may be grouped under some headings such as civil war, education, institutions, rent-seeking behavior, corruption, democracy, and Dutch Disease.

The wealth of natural resources provides governments with more income than they can effectively manage. If the foreign currency obtained from the export of natural resources can be directed to investment and employment, both the disruptive economic effects will be eliminated, and the investments and employment in the country will increase. However, countries that are unable to manage the income in question are more likely to suffer from the benefits they expect from these sources in the long run (Gelb et al., 1988).

Regarding the oil-exporting countries, the structural change in those economies started to attract attention in the literature especially after the discovery of North Sea oil and the effects of this discovery on the industrial structure of economies such as the Netherlands and Britain. Economists interested in this issue have focused on the decline in industrial output and employment following the discovery of oil (Di John, 2011).

Resources curse thesis was first used by Richard Auty (1993) to explain the reasons why natural resource-rich countries could not use these resources to accelerate economic growth and how they grew slower than countries without natural resource endowment (Pessoa, 2008). Many hypotheses have been developed on the adverse effects of natural resource abundance, some of which point out to despot regimes and weak institutionalization (Ross, 2001), civil war and political instability (Collier and Hoeffler, 2004), and the Dutch Disease (Sachs and Warner, 1995).

However, besides the theoretical approaches, it is seen that there exists a gap in the literature since there is no systematic index to measure Resource Curse of varying countries by utilizing unique indicators that are significant to evaluate and enough to explain the symptoms of the Resource Curse, as well as rank the countries, accordingly. Therefore, since there is not any Resource Curse index in the existing literature, the main contribution of this thesis is to fill this gap by grounding its discussions on the Resource Curse literature. In this sense, the fundamental purposes of this study are two-fold. Firstly, it has an aim to construct an index to measure the Resource Curse tendencies in terms of oil. Thus, it contributes to the literature by comparing the Resource Curse performance of the selected countries by utilizing the constructed Oil Curse Index. Secondly, the study uses this Oil Curse Index as an independent variable into an economic growth model and presents the validity and verification of the Oil Curse Index by utilizing the negative relationship between Oil Curse Index and economic growth.

Hence, this study aims to answer the following research questions:

i. What are the key indicators to measure the resource curse?
ii. Can the Resource Curse be measured statistically through econometric analysis?
iii. Is it possible and significant to create an Oil Curse Index?
iv. Which selected countries have a better Resource Curse performance according to the recently introduced Oil Curse Index?
v. How can the Oil Curse Index be verified and validated through economic, political, and social indicators in an economic growth model?

This thesis consists of a total of six chapters. **Chapter 1** introduces the "Resource Curse" topic and provides a background for the thesis by defining its objectives. Furthermore, it formulates the research questions in detail.

Chapter 2 illustrates a comprehensive and state-of-the-art literature review. Firstly, it defines the Resource Curse and shows varying historical perspectives and different approaches to the Resource Curse Hypothesis. Secondly, the chapter discusses three various aspects of the Resource Curse paradox: Political Economy Aspect of the Resource Curse, Dutch Disease Model, and Social-Life Side Effects of the Resource Abundance.

Chapter 3 presents the different theoretical approaches to the hypothesis of the Resource Curse. The role of natural resources in the economy is also discussed in this chapter.

Moreover, regarding the effects of the Resource Curse, a total of seven approaches are categorized in this chapter as Dutch Disease and Crowding-Out Effect, Lower Performance on Economic Growth, Lowering Conditions of Living, Poverty and Income Inequality, Corruption and Political Economy, Authoritarianism and Poor Governance, the Risk for Civil War and Conflict, and Rent-Seeking Behavior.

The outcome of the thesis, the Oil Curse Index (OCI), is presented in **Chapter 4**. First, the indicators used to design an innovative Oil Curse Index are presented in this chapter. After introducing the methodology for constructing the Oil Curse Index, the data/indicator selection process has been identified accordingly. Next, the chapter discusses the strength of these indicators to measure the Oil Curse. Moreover, this chapter also designs how this research is conducted by visualizing the research framework/model. Next, findings and analysis are shown, and a discussion regarding the empirical results has been utilized as a conclusion.

Chapter 5 provides a natural resource perspective on economic growth literature. Firstly, a general framework regarding the economic growth models is presented in the chapter. Besides the history of the economic growth model, a critical emphasis is given to the two widely known growth models: Solow-Swan and Extended Solow (Mankiw-Romer-Weil). This chapter also discusses the convergence framework concisely. Furthermore, conducting an economic growth model of the Mankiw-Romer-Weil (1992), which includes human capital in the production function as a proxy, Oil Curse Index (OCI) has been utilized as an independent variable in the extended neoclassical growth equation to present the inverse relationship between OCI and economic growth along with a variety of economic, social, and political indicators.

Chapter 6 is the concluding part of this thesis. It provides a final assessment of the Oil Curse Index (OCI) from the perspective of economic growth.

CHAPTER 2. LITERATURE REVIEW

One of the most fundamental areas of the discussions in the science of economics is the impact of natural resources, supported by economic growth, and its effects in terms of development theories and practices. Here, economists, as expected already, have two conflicting perspectives about the role of natural resources on the economy. A more positive approach has been adopted by Adam Smith (1812) since he assumes a positive impact of the natural resources on economic growth. Whereas prevailing his optimistic view, the opposite perspective has been started to be advocated from the second half of the 20th century (Singer, 1950; Prebisch, 1959; Nankani, 1979), accompanied with the second more pessimistic perspective - known as Dutch Disease at this time (Corden and Neary, 1982). To summarize the evolution of the Resource Curse hypothesis, the timeline of the milestones in the literature, are depicted in Figure 1, and the studies, including the timeline is discussed accordingly in the chapter.

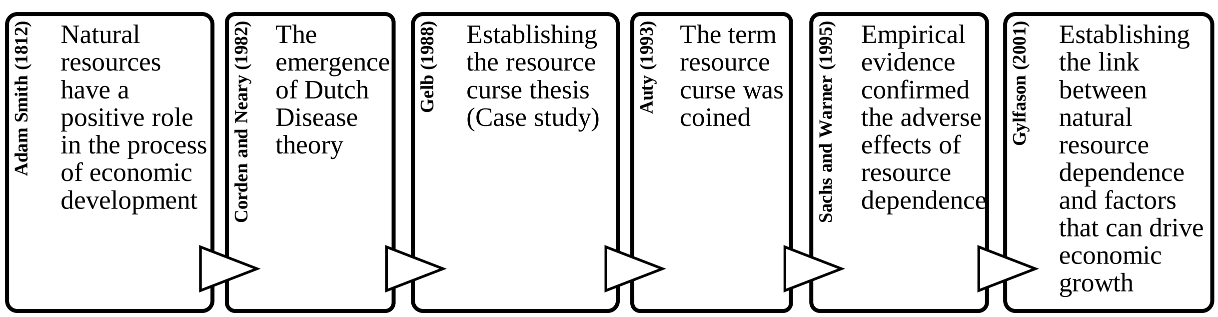

Figure 1. Timeline for the Evolution of the Resource Curse Hypothesis (Source: Badeeb et al., 2017)

The role of natural resources on economic growth has begun to be discussed more intensively in different aspects of economics literature with the pioneering study conducted by Meadows et al. (1972), namely "Limits to Growth". Moreover, the research has been the primary source of concern for the realization of sustainable economic growth in a world with limited resources, i.e., scarcity.

It has been suggested by Stiglitz (1974) that as a result of incorporating non-renewable natural resources as a factor of production into the neoclassical production function, the non-renewable sources with limited resources constitute a constraint on growth. In the following article, the "Dutch Disease", which is the sudden increase in the natural resources of the country and the overvaluation of the real exchange rate, adversely affect the long-term economic development of the relative decline in manufacturing industrial production and exports (The Economist, 1977).

Nordhaus (1992) argued that natural resources would constitute an obstacle to economic growth and that world output would be on average lower in the next century, as population increases and natural resources are non-renewable. In Nordhaus's study (1992), the relationship between emissions and climate change was defined using the DICE (Dynamic Integrated Model of Climate Change and the Economy) model, which is based on the neoclassical models. In parallel with the related literature, the relationship between natural resources and economic growth was examined in terms of the relationship between electricity consumption (energy production and consumption) and economic growth in the studies conducted by Stern (1993), and Masih and Masih (1996). With these studies, the authors opened the way for renewable energy sources to be added as a variable to growth models.

Given the historical experience, countries that are poor in terms of natural resources have better growth performance than countries with rich natural resources, which confirms that such a relationship between growth and natural resources is not surprising. For example, in the 17th century, the Netherlands, which is poor in terms of natural resources, had a much better growth performance than Spain, which has a large number of gold and silver resources thanks to its colonies. Similarly, in the 19th and 20th centuries, countries such as Switzerland and Japan, which are poor in natural resources, developed more than Russia, which is also rich in natural resources. Besides, it cannot be ignored that the newly industrialized countries such as South Korea, Taiwan, Hong Kong, and Singapore in Asia which are also not resource-abundant, have a much better growth performance comparing to other countries that are rich in terms of natural resources such as oil and natural gas.

Since following the classical economic thinking, the abundance of natural resources is expected to affect economic growth positively, yet it does not seem possible to understand that it influences negatively. Because the thing we will look in this context is the view that if natural capital as a factor of production is higher, then the economic growth will also be more significant to the same extent. The hypothesis of the Resource Curse is still not enough to disprove this view. It should not be forgotten that Resource Curse is an alleged hypothesis for countries and/or regions that are rich only in natural capital, but other factors such as physical and human capital are still inadequate.

Although not tested empirically, the experience of the countries with rich natural resources in the historical process has been explored in the years before Sachs and Warner (1995). For example, Gelb (1988), Auty (1990), and Berge et al. (1994) examined the hypothesis and found that the unpleasant effect of natural resource abundance on economic growth has emerged as a result of many social, economic and political conditions. Gylfason (2001) states that an abundance of natural capital excludes other factors such as physical, human, institutional, and foreign capital. Along with this fact, for example, the export of resources such as petroleum or natural gas, which has an abundance in a country, provides plenty of foreign exchange to the country and the appreciation of the national currency of the country increases the importation of the country, resulting in the competitiveness of the domestic production. The revenues channeled to the sectors to which more natural capital belongs causes the other sectors to be neglected. Moreover, in such a case, countries tend to become more dependent on imports by ignoring the activities that would increase productivity and competitiveness in other sectors, such as technological development and education. Those countries also become immune to a high level of unemployment, decreasing production in different sectors, and eventually, a lower growth rate (Krugman, 1987).

Singer (1950) and Prebish (1950), who drew attention to the terms of trade that were deteriorating in terms of the emergence of this relationship, confirm the thesis of growth and the impoverishment of Bhagwati (1958), implying that the abundance of resources will have a negative effect on economic growth. Similarly, it is possible to explain this by Rybczynski's (1955) theorem that the increase in the supply of one of the production factors will reduce the production of other goods, which would intensify the production of goods used by that factor intensively. The situation happened in 1959 after the exploration of natural gas in the North Sea of the Netherlands. This phenomenon, also known as Dutch Disease in the literature, resembles a natural Resource Curse. However, the effects of the Dutch Disease and the Natural Resource Curse are different.

The "Resource Curse" phenomenon -although it may be seen as a mystical concept from an adventure movie- was accepted in the economics literature in a wide range, and is also considered to be quite realistic with its adverse effects on countries' economies. As mentioned before, the curse of the resources means that resource-rich economies have experienced lower economic performance than resource-poor economies paradoxically. In its basic definition, “Resource Curse”, in other words, the “paradox of plenty”, tends to be the abundance of natural resources with less economic growth. The term was first used by Richard Auty (1993), whereas the seminal work on the Natural Resource Curse is conducted by Sachs and Warner (1995; 1997; 2001) in their several papers. The theories and academic debate in the existing literature mainly discuss the reasons and exceptions of the Resource Curse through the concepts of universality and inevitability as well.

Following the study conducted by Sachs and Warner (1995), a growing empirical literature on the Resource Curse Paradox was generated. According to Sachs and Warner (1995), the control variables are initial per capita GDP and are measured in natural logarithms as 1970 the year; the average investment rate, measured in logs; and openness, defined as the part of years in which an economy is considered as open. They found that dependency on oil and mineral sources economically is correlated with slower economic growth by checking for other structural country-specific qualifications. Sachs and Warner (2001) also summarize and extend their previous research by showing evidence that countries with substantial natural resources tend to grow more slowly than resource-poor countries. They argued that there is little direct evidence that omitted geographical or climate variables to explain the curse, or that there is a bias in their estimates resulting from some other unobserved growth disincentive (Frankel, 2012).

In the study carried out by the World Bank, the relationship between natural resource exports and economic growth in the developing countries with natural resources in the

1990-1999 period was investigated by a comparative analysis, and a negative correlation was found (World Bank, 2002). Atkinson and Hamilton (2003) examined the period 1980-1995 by panel data for 91 countries and found that natural resources have a negative effect on economic growth. Lederman and Maloney (2003) reviewed 65 countries using the panel data method for the period 1975-1999 and obtained the opposite result of the Natural Resource Curse Hypothesis. Butkiewicz and Yanikkaya (2010) examined 100 developed and developing countries and found findings supporting the curse of natural resources searched by the SUR method for the period 1970-1999. Similarly, the most critical oil exporters, such as Iran, Venezuela, Libya, Iraq, Kuwait, and Qatar also experienced negative growth rates during the last few decades. Indeed, the OPEC as a whole saw a decline in GNP per capita while other comparable countries enjoyed growth in terms of GNP per capita (Ploeg, 2006). Also, the study published in 2007 by Humphreys et al. found paradoxical relations showing that wealth and opportunities based on natural resource discovery are elements that make the path of balanced and sustainable development difficult.

Gylfason (1999) used cross-sectional and panel regression data of 125 countries for the period 1960-1992 and found a statistically significant and negative relationship between primary sector and economic growth. On the other hand, Gylfason (2001) and Gylfason and Zoega (2006) used the method of Instrumental Variable (IV) and estimated that the 1970 share of primary exports in GDP was endogenous to per capita GDP growth. Both studies use the 1994 share of natural capital in national wealth to analyze the link between the abundance of natural resources in a country and per capita GDP growth. To the extent that natural capital wealth, which is calculated by the World Bank as the discounted flow of future resource rents from natural capital, is more exogenous to per capita GDP growth than the share of primary exports in GNP instrumental variable regressions yielding a more consistent estimate than the least-squares regression (Brückner, 2010). Other studies have found a negative correlation between oil abundance and economic performance of the country, including Ross (2001), Sala-i-Martin and Subramanian (2013), and Smith (2004).

There is another case where the resource abundance negatively affects economic growth through some channels other than the trade merits and competitive power effect. For example, savings and investments can slow growth by negatively affecting sectors outside the natural resource sector. Gyflason and Zoega (2006) argue that if natural resources become the primary sector, they will reduce the capital demand and lower interest rates, thereby reducing savings and growth rates.

Distortions created by the rich natural resources other than economic ones due to the harmful effects of poor management are also available. The rich natural resources attract all sectors, including particularly foreign investors. There will be an unfair distribution among these natural resources. A large part of the export revenues from those of natural resources could also be transferred to the subcontractors reinforced by the government or to the foreign investors, and the bureaucrats are likely to support them. The share of the people in the country could also be meager. Abundant natural resources could pave the way for bad governance and corruption, and also the bureaucracy often tends to have a relationship based on self-interest with foreign investors. As a result, a part of the wealth from natural resources is transferred to some specific segments as rent, while the public cannot get the deserved share from this wealth (Ross, 2004). In the words of the well-known economists Joseph Stiglitz, Resource Curse creates rich countries in which poor people are living (Stiglitz, 2004).

On the other side, there are also some studies showing the positive effects of resource abundance. In the case of Botswana, although 40% of its GDP comes from the diamonds, the country was successful in managing the Resource Curse. Except for Botswana, there are only three other notable economies among 65 resource-rich countries that could achieve long-term investment exceeding 25% of GDP and an average GDP growth exceeding 4%, namely Indonesia, Malaysia, and Thailand (Gylfason, 2001). These three-resource rich Asian countries have managed to do this by economic diversification and industrialization.

Norway has also shown a remarkable growth performance of manufacturing and the rest of the economy compared with its neighbors despite the growth in oil exports since 1971 (Andersen, 1993; Larsen, 2006). Indeed, Norway is the world's third-largest oil exporter after Saudi-Arabia and Russia. What is interesting is that Norway is among the least corrupt countries in the world too. The United Arab Emirates also accounts for nearly 10% of the world's crude oil and 4% of the world's natural gas reserves but has turned its Resource Curse into a blessing (Fasano, 2002).

A cross-country analysis, when including in the study of other variables such as corruption, investments, openness, terms of trade, and schooling, and treating these variables as independent; Papyrakis and Gerlagh (2003) found a positive impact of natural resources on economic growth as well. For the post-Soviet and former-Soviet countries which are also oil abundant ones, Egert (2012) and Bildirici and Kayikci (2012) ran panel data analysis and found that oil production and economic growth is positively correlated and cointegrated accordingly. Torres et al. (2012) investigated the 1980-2005 period for 48 oil producers in the panel data analysis and obtained the opposite result of the Natural Resource Curse Hypothesis as well.

From another side, some of the previous studies could not find any evidence of the Natural Resource Curse like Delacroix (1977), Davis (1995) who used the mineral dependence index for 91 of the 127 countries defined as developing by UNDP, and Herb (2005). One of the more recent studies conducted by Alexeev and Conrad (2009) has found that oil and mineral wealth have positive effects on income per capita when controlling for several variables, including dummies for East Asia and Latin America (Frankel, 2010).

In this thesis, researches have reviewed Web of Science, Science Direct, Scopus, Google Scholar, and RePEc databases to have a detailed literature examination. The research was constructed by using the following combinations of keywords: «Resource Curse + economic growth», «Resource Curse + sustainable development», «Dutch Disease», «Resource Curse + democracy», «natural resources + corruption», «natural resource abundance + economic growth», «natural Resource Curse + institutions». Overall, a total of more than 500 journal articles and study papers have been evaluated. Those are mainly econometric studies examining the effect of natural resources on economic, political, and social development outcomes with different regression specifications. The variables used in the literature on the testing of the Natural Resource Curse Hypothesis supported by country experiences that are rich in natural resources vary in terms of established models, selected periods, and country groups. Some studies achieve results that support the hypothesis, whereas some studies yield opposite results or neutral ones. Table 1 illustrates a summary of the recent literature related to the empirical evidence of the effects of natural resources on different variables associated with economic growth. Most of the mentioned studies report a negative relationship between natural resource abundance or dependence and the variables of interest.

The settlement of the literature review from now on will be divided into three subtitles. The first branch has analyzed the political aspect by highlighting democratization, institutional quality, corruption, and rent-seeking competition. The second stream has interpreted the Dutch Disease literature as a separate model from the Resource Curse Theory considering the negative economic impacts of natural resource abundance. Finally, the third part of the chapter also discusses the social-life effects of the Resource Curse like low wages in the health and education sectors, as well as decreasing the number of school enrollments and hospitals.

Table 1. Summary of the recent literature on natural resources and economic variables (Source: Badeeb et al., 2017)

Authors	Period	Sample	Variable	Natural Resource Measure	Main Findings
Gylfason (2001)	1980–1997	65 resource-rich countries	Human capital development	Share of natural capital in national wealth	The adverse effects of natural resource abundance on economic growth may, in part, reflect a negative impact on education.
Atkinson and Hamilton (2003)	1980–1995	103 countries	Genuine savings	Share of natural resource rent in GDP	The countries where growth has lagged have a combination of natural resource, macroeconomic, and public expenditure policies that have led to a low rate of genuine savings (net savings adjusted for resource depletion).
Gylfason and Zoega (2006)	1965–1998	85 countries	Savings and investment	Share of natural capital in national wealth	Heavy dependence on natural resources may hurt saving and investment indirectly by slowing the development of the financial system.
Stijns (2006)	1970–1999	102 countries	Human capital	Natural resource rent per capita	Resource wealth and its corresponding rents make a significantly positive difference in allowing countries to invest in human capital.
Dietz et al. (2007)	1970–2001	115 countries	Genuine savings	Share of fuel and mineral products in total exports	The negative effect of natural resource dependence on genuine savings.
Papyrakis and Gerlagh (2007)	1986–2001	United States	Investment, human capital and openness	The share of the primary sector's production in GDP	Natural resource dependence decreases investment, schooling, and openness.
Bornhorst et al. (2008)	1992–2005	30 hydrocarbons producing countries	Fiscal policy	Share of hydrocarbon revenue in GDP	There is a statistically significant negative relationship between non-hydrocarbon revenues and hydrocarbon revenues.
Bond and Malik (2009)	1970–1998	78 developing countries	Export structure and investment	The share of natural capital in total wealth	Finds important differences between fossil fuels and non-fuel resources. Significant fuel exports tend to increase private (and public) investment, but there is also a robust negative effect on export concentration.

Blanco and Grier (2012)	1975–2004	17 Latin American countries	Investment and human capital	Total exports of primary commodities divided by GDP	Overall, resource dependence has no significant direct effect on physical and human capital. When disaggregating, petroleum export dependence has a significant positive impact on physical capital but a negative impact on human capital.
Boos and Holm-Müller (2013)	1970–1990	87 developing countries	Genuine savings	Share of natural resource rents in GDP	The determinants that are responsible for the resource curse also have a negative effect on genuine savings.
Apergis et al. (2014)	1970–2011	MENA countries	Agriculture value-added	Share of oil rent in GDP	Finds a negative relationship between oil rents and long-run agriculture value-added.
Bhattacharyya and Hodler (2014)	1970–2005	133 countries	Financial development	Share of natural resource rents in GDP	Resource rents hinder financial development only if institution quality is relatively poor.
Bhattacharyya and Collier (2014)	1970–2005	45 developed & developingcountries	Public capital	Share of natural resource rents inGDP	Resource rents significantly reduce the public capital stock, but this effect is mitigated by good institutions.
Farhadi et al. (2015)	1970–2010	99 countries	Productivity growth	Share of natural resource rents in GDP	The adverse effects of resource rents on productivity growth may turn positive in countries with greater economic freedom.
Cockx and Francken (2016)	1995–2009	140 countries	Education Spending	The share of natural capital in total national wealth	There is an adverse effect of resource dependence on public education expenditures relative to GDP.

2.1.Political Aspect of the Resource Curse

Investigating the Resource Curse Theory at first glance, the economists and researchers believed that natural resource abundance can only be harmful and have negative effects on the economic growth patterns of the resource-rich countries. The Resource Curse literature broadened its scope to other development variables gradually. The scholars and theorists then argued that natural resource abundance also influences the political life of the so-called countries. Because studies and researches started to be conducted by pointing out the Resource Curse literature as well.

Determining the robustness of previous findings that correlate with growth and natural resource endowments, Korhonen (2004) tried to explain the long-term growth of more than 100 countries for a period longer than 30 years by using institutional and political variables as well. The results show that a higher level of democracy in political institutions of a country can lead to lower the level of the Resource Curse. Similarly, revisiting the Resource Curse Hypothesis in Sub-Saharan Africa, the study conducted by Basedau (2005) argues whether natural resource abundance is destructive to a country's socio-economic and political development or not. As a result, the paper concluded that sensitive research of the political economy of natural resources seems to be a precondition for development.

According to Brückner (2010), additional control variables used in the related studies are the Polity IV revised combined democracy score (Marshall and Jaggers, 2005); checks and balances obtained from the Database of Political Institutions (Keefer and Stasavage, 2003); ethnic fractionalization (Alesina et al., 2003); corruption (Knack and Keefer, 1995); the number of civil conflict onsets (based on the information provided in the PRIO/UPSALLA, 2007 database) and dummy variables particularly for Africa, Asia, and Latin America.

A panel data analysis constructed on Sachs and Warner's influential work by Mehlum et al. (2002) argues that differences in the quality of institutions are important in terms of economic growth in natural resource-rich countries. The empirical panel data analysis shows in contrast that institutions do not play a role. In a further study by Mehlum et al.

(2006), they claimed that the quality of institutions determines whether natural resource abundance is a blessing or a curse. Using the same data and the same methodology as Sachs and Warner, with one addition, they construct and institutional quality index. Empirical testing implies that 33 out of the 87 countries in the sample have an institutional quality sufficient to avoid the Resource Curse as well.

Torres et al. (2012) re-evaluated the effect of natural abundance on economic growth by using panel data and showed the negative impacts in low institutional-quality countries. Another panel data approach for oil-rich African countries conducted by Eregha and Ekundayo (2016), showed that institutional quality insignificantly enhanced per-capita income growth; i.e., the quality of institutions in these countries would not be able to reverse the Resource Curse. Libman (2010) also, separately looking at economic and political institutions, showed that sub-national variation of the quality of institutions indeed matters for the effects of resources. Aside from the quality of institutions, also considering the trade policies of the countries, Arezki and Ploeg (2010) offers a cross-country evidence that the Resource Curse is less severe in countries with less restrictive trade policies and good institutions.

In contrast, the paper of Yang (2008) argues that institutional quality does not seem to have much influence in developing countries. More recent research done by Sarmidi et al. (2012) also finds new evidence on the role of institutions in terms of the Resource Curse. Using an innovative threshold estimation technique, they found that the impact of natural resources is meaningful to economic growth only after a certain threshold point of institutional quality has attained.

Al-Iriani (2012) revisited the oil curse problem in Yemen and argued that bad (or non-existent) institutions led to mismanagement of oil wealth as well. From only the fiscal policy institutions' point of view, Schmidt-Hebbel (2012) also suggested that strong fiscal (and political) institutions can turn the Resource Curse into a blessing providing a comparative review of Chile's and Norway's experience. Libman (2013) found a conditional result that the growth effect of resources differs on the quality of institutions in the non-resource sector. Zuo and Schieffer's (2013) paper empirically shows the existence of the Resource Curse in the U.S. supporting the crowding-out effect rather than the institutional explanation. In a cross-country setting between the years 1970 to 2010, Murshed (2004) suggests that there is a Resource Curse adversely affecting growth via an institutional deterioration in the longer term, while certain institutions also matter more for growth.

Zeynalov (2013) tested institutional governance and its performance to achieve a positive relationship between natural resources and economic growth in the long run. The main finding is that an abundance of natural resources does not guarantee economic growth, where sustainable economic growth can be guaranteed only if the resource-rich country has good institutional governance. Further research done by Horváth and Zeynalov (2014) examines the effect of natural resource abundance on economic performance during the 1996-2011 period in the 15 independent countries that formerly comprised the Soviet Union. Using several panel regressions models that address the endogeneity issues, the results suggest that natural resources crowd out the manufacturing sector unless the quality of domestic institutions is sufficiently high. Conversely, trade policies do not help convert the Natural Resource Curse into a blessing. Using the econometric model of System GMM, Oyinlola et al. (2015) also found that institutions have a dampening effect on the resource curse-economic growth nexus. Also, an ARDL approach for 17 major oil producers was used to examine the long-run effects of oil revenue and its volatility on economic growth as well as the role of institutions by El-Anshasy et al. (2015). The empirical results showed that better fiscal policy (institutions) could offset some of the adverse effects of oil revenue volatility as well. Similarly, Brunnschweiler (2008) showed no evidence of negative indirect effects of natural resources through the institutional channel, while he also found a positive relationship between natural resource abundance and economic growth.

A more recent study conducted by Hartwell (2016) analyses the efficiency of institutional basis in resource-rich countries. Understanding the link between institutions and resource use efficiency, the paper examined 130 countries from 1970 to 2011 and concluded that several key institutions are necessary for increasing resource use efficiency, and by improving primary institutions, resource-rich countries can thus see more environmentally sustainable growth as well.

Another channel is that the wealth of natural resources makes people and governments more prone to activities like rent-seeking, bribery, and corruption (Gylfason, 2001). Apart from that, governments have been able to ignore pro-growth methods and models such as free trade, bureaucratic activity, and the healthy establishment and operation of institutional infrastructures (Sachs and Warner, 1999). Having two primary forms, rent-seeking and patronage, corruption tends to be the main reason for resource-abundant countries to behave in a wrong way economically. A literature survey conducted by Kolstad and Søreide (2009) reviews the studies and researches on natural resources and corruption and outlines the main policy implications for donors and domestic policymakers.

Defining the role of corruption in the economic growth of a country and determining the neoclassical growth model, da Cunha Leite and Weidmann (1999) discussed the interrelationship between natural resources, corruption, and economic growth. The empirical results showed that natural resource abundance produces opportunities for rent-seeking and also is a critical element for determining the level of corruption of a country.

Kronenberg (2004) also considers increased corruption as the prime reason for the curse of natural resources in the transition economies. Using a panel dataset with a large number of countries and an extended period, Busse and Gröning (2011) employed the IV model, and the results showed that exports of natural resources led to an increase in corruption.

According to Dietz et al. (2007), considering the negative relationship between resource abundance and genuine savings, they found in their study that reducing corruption has a positive impact on genuine savings in interaction with resource abundance. That is, the negative effect of resource abundance on genuine saving reduced, as corruption reduced.

The paper of Kolstad and Wiig (2009) revisited the transparency concept in natural resource revenues in terms of a key to reduce corruption. The findings showed that transparency is insufficient in itself as a mechanism to minimize corruption and needs to be complemented by other types of policies.

West African evidence for assessing the role of natural resources in determining corruption, Vicente (2010) conducted surveys in two different islands and analyzed the changes in perceived corruption across a wide range of public services and allocations.

The relationship between exports and corruption across countries was identified empirically in Goel and Korhonen's (2011) research paper. Consistent with the existing literature, the findings showed that fuel exports increase corruption and contribute to corruption in the least corrupt nations. Also, corruption is to be found to decrease with income and larger government size. Similarly, Petermann et al. (2007) also examined the links between mineral dependency and corruption. In their study, it is found that fuel and non-fuel mineral exports affect corruption differently. The results also indicated that corruption increases with fuel exports unambiguously, while in wealthier countries, non-fuel mineral exports reduce corruption.

The study conducted by Al-Kasim et al. (2013) has a policy discussion paper on the relationship between corruption and reduced oil production. Combining a review of the Resource Curse and oil production literature, they focused on feasible connections between corruption and oil production levels and suggested that corruption may reinforce suboptimal oil production.

A Chinese example by Zhan (2017) identifies first the causal channels through which resources contribute to corruption by a qualitative study, and then using cross-regional and longitudinal statistical analysis, he found that resource dependence significantly increases the propensity for corruption by state employees. Chen and Kung (2016) also found empirical evidence of a political Resource Curse in China. By analyzing a panel on the political turnovers of 4390 county leaders in China for the period between 1999-2008, they found that promotion is positively correlated with both signaling efforts, and corruption as well.

As a subtitle, democracy (or democratization) also matters in the Resource Curse literature widely. It is still questionable whether Natural Resource Abundance leads the level of democracy of the country to decrease, resulting in the Resource Curse, or the Natural

Resource Abundance is a blessing resulting in a higher level of democracy and good governance.

Altincekic and Bearce (2014) proposed that foreign natural resource aids like oil will hinder democracy -the so-called “political resource curse”. In their study, Jensen and Wantcheckon (2004) found that there is empirical evidence that suggests a negative relationship between the natural resource sector and the level of democracy in African countries. In different model specifications, Werger (2009) also found evidence for a Resource Curse of oil on democracy in a set of countries. Polterovich et al. (2010) suggested a dynamic game-theoretic model explaining why Resource Abundance may lead to instability of democracy and found that the probability of democracy conservation is decreasing in the number of resources if the institutional quality is low enough. Likewise, Bhattacharyya and Hodler (2010), also using a panel game-theoretic model, covering the period 1980-2004 and 124 countries, confirmed that the relationship between resource rents and corruption depends on the quality of the democratic institutions.

Since resource-rich countries tended to be autocratic, Collier and Hoeffler (2009) examined whether or not the effect of democracy on economic performance is distinctive in resource-rich societies. Using a global panel dataset, the study found that in developing countries, the combination of high natural resource rents and open democratic systems has been growth-reducing.

Ramsay's (2011) research also estimated the causal effect of shocks to oil revenues on levels of democracy, resulting in more significant impacts than expected. Al-Ubaydli (2012) predicted that natural resource abundance has a negative effect on economic performance and transition to democracy in authoritarian regimes but not in democracies using fixed-effects regressions on an international panel from 1975 to 2000. The analysis of the study conducted by Bhattacharyya et al. (2016) using a dataset of 77 countries over the period 1970-2012 resulted in higher oil resource rent leading to more centralization, and the effect was moderated by democratization. Constructing descriptive statistics and interview data, Siakwah (2017) analyzed the impact of Ghana's oil in a democratic setting and resulted that democratic policy can partly mitigate the problematic effects of natural resources.

As an explanation to the contradictory results, Ombga (2015) also measured the number of years between the beginning of oil production and the attainment of political independence in oil-producing countries and found that the greater the number of years, the higher the level of democracy, ceteris paribus.

2.2.Dutch Disease Model

The economic problems generally accompany the curse of natural resources in resource-rich countries due to the overvaluation of their local currency. As a result of the overvalued currency, exporting activities creates a disadvantage, whereas import becomes more attractive. This situation also does not create jobs except the natural resource export-oriented sectors, resulting in higher unemployment and current account deficit depending on the rising import volume. As mentioned before, this is referred to and known as the "Dutch Disease" in the literature.

When we look at the point of origin of the Resource Curse, it can be seen that high foreign currency accumulation in the resource-abundant economy cannot be treated effectively. However, if this foreign currency could be among the investment and employment, then both the distorting economic effects caused by the curse of the resources will be eliminated, and the investments and employment will increase within the country. As mentioned before, the number of accumulated foreign currency in the country lead to an overvalued national currency. Thus, imported goods become cheaper, and therefore, the demand for those goods will increase accordingly. This situation finally leads the country to have a severe current account deficit and a critical contraction in the import substitution sectors.

A vast body of literature has accounted for the Dutch Disease (e.g., Gelb, 1988; Karl, 1997; Wood and Berge, 1997; Auty, 2001). The phenomenon may be caused by a slow saving and investment route as Sachs and Warner (1997; 1999), Gylfason (1999, 2001), Gylfason, and Zoega (2003), Barbier (2002), and Auty (2007) suggested. Another explanation for the Dutch Disease is the exchange rate mechanism discussed in the papers conducted by Corden and Neary (1982), Corden (1984), Gylfason et al. (1999), and Bulte et al. (2005) (Wizarat, 2014).

One of the most critical country examples is Nigeria. The country has been a major oil exporter since 1965 but experienced the typical Dutch Disease story of worsening competitiveness of the non-oil export sector resulting with also a worsening economic performance (Sala-i-Martin and Subramanian, 2013).

Rosenberg and Saavalainen (1998) were the first scholars who studied resource abundance in Azerbaijan. Arguing that the oil boom will result in Resource Curse and Dutch Disease in the country, the empirical findings show that economic growth was positive just after the independence in 1996 and 1997; however, long-term results of oil exports caused Dutch Disease for Azerbaijan as well. Similarly, Singh and Laurila (1999), Clemens (2008), Gojayev (2010), Bayramov and Conway (2010), and Hasanov (2010; 2013) also studied the symptoms of the Dutch Disease in the economy of Azerbaijan concluding with suggestions to overcome economic problems linking Dutch Disease and the resource abundance.

Assessing recent economic developments in Russia, Oomes and Kalcheva (2007) tested the symptoms of Dutch Disease empirically. The study concluded that, while Russia has all of the symptoms, the diagnosis of Dutch Disease remains to be confirmed. In the most recent study of Mironov and Petronevich (2015), the problem of Dutch Disease in Russia during the oil boom of the 2000s was examined both theoretically and empirically. Based on the classical model of Dutch Disease by Corden and Neary (1982), the relationship between changes in the real effective exchange rate of the ruble and the evolution of the Russian economic structure during the period 2002-2013 were analyzed. Then, the main effects of Dutch Disease were empirically tested by controlling for specific features of the Russian economy and the results showed the presence of several signs of Dutch Disease as well. The study conducted by Eromenko (2016) also tested the theoretical approach of the Dutch Disease as described by Corden (1984) and Corden and Neary (1982) empirically for the resource-poor countries of Central Asia. The results showed that the symptoms of Dutch Disease are present in Kyrgyzstan and Tajikistan.

Also, using a panel dataset at the provincial level, the study conducted by Zhang et al. (2008) showed that Chinese provinces with abundant resources perform worse than their resource-poor counterparts in terms of per capita consumption growth, as a proof for

Dutch Disease. Another single-country empirical assessment of the Dutch Disease was conducted by Kablan and Loening (2012). Using the structural VAR model, the study examined the effects of the Natural Resource Curse on Chad and found little evidence for Dutch Disease.

A successful case of Canada was evidenced by Dube and Polese (2015) within the local context by looking at 135 urban areas over a time period for 1971–2006. Employing a mix of descriptive statistics and econometric modeling, the results cannot show any evidence for a robust Dutch Disease wage effect for the resource extraction sector as expected. In contrast, testing the CAD/USD exchange rate in terms of commodity prices, Beine et al. (2012) found evidence for a Dutch Disease in Canada. The findings showed that between 33 and 39 percent of the manufacturing employment loss that was due to exchange rate developments between 2002 and 2007 is related to the Dutch Disease phenomenon.

The case of Timor-Leste was analyzed by Rasiah et al. (2014) to understand how a newly independent but petroleum-rich country could avoid experiencing Dutch Disease by offering some policy recommendations. The Norwegian experience was also analyzed in terms of oil and gas policy as a successful model exportable to combat Dutch Disease in the recent study of Ramírez-Cendrero and Wirth (2016). From this analysis, the authors formulated the case of Norway lessons that they can provide to foster the improved management of oil and gas resources in other economies. Although Botswana has high rates of per capita GDP growth, Pegg (2010) asks whether or not there is a Dutch Disease in the country. Describing as an African miracle (Samatar, 1999) in the literature, it was found that Botswana, which was suffering from many of the symptoms of the Dutch Disease but not for the causal reasons posited in the Dutch Disease Model. In a comparative study of Indonesia and Mexico, Usui (1997) attempted in their policy adjustments to the oil boom with particular reference to the Dutch Disease. The findings showed that Mexico provides a clear-cut example of the Resource Curse Thesis, but Indonesia is an exception.

Along with the successful cases of Botswana, Indonesia, and Norway, a comparative case study of these three-natural resource-intensive economies was conducted by Hjort (2006) to examine the relationship between citizen funds and the Dutch Disease. The analysis showed that citizen funds are likely to carry detrimental indirect effects on the ability of governments to surmount the Dutch Disease as well.

A more recent study conducted by Behzadan et al. (2017) has mixed the theory and empirical work in a dynamic panel model. Separating inequality from an institutional quality, the results also showed that the inequality effect could be significant in explaining the Dutch Disease.

2.3.Social-Life Side Effects of the Resource Abundance

The hypothesis of the Resource Curse also has an impact on the social side of a country. There is limited literature on investigating the resource abundance problem considering the social side effects, especially in terms of human capital. Most of the research papers examine the issue by pointing out the positive/negative impacts in both the education and health sector.

Both Aldave and García-Peñalosa (2009) and Wadho (2014) argue that corruption and education are also interrelated and that both crucially depend on a country's endowment of natural resources in their studies as well.

Gylfason et al. (1999) and Gylfason (2001) argue that the ability to generate income from natural resources causes to ignore the effect of education and also neglect education, thereby hindering the formation and development of human capital. Pelle et al. (2016) also provide micro-level evidence on an important channel through which mineral resources may adversely affect development in the long run: lower educational attainment. Similarly, Cockx and Franken (2016) used a panel dataset of 140 countries covering the period from 1995 to 2009, and the results showed that an inverse relationship emerged between resource dependence and education spending.

James (2015) evidenced a contrary result by using a panel of state-level data for the United States. The paper found that public spending on education in resource-rich states exceeds in the resource-scarce ones, and private education services are imperfectly crowded out as a result.

A case study for Australia's Hunter Valley, Colagiuri, and Morrice (2015) evaluated the health impacts of coal mining and discussed that the health impacts of coal mining should include in discussions of the Resource Curse. From the public spending point of view, Cockx and Franken (2014) examined the effect of natural resources on public health expenditures resulting in a negative relationship between natural resources and health spending as well.

In a mixing and a recent contribution to the literature, Dong-Hyeon and Shu-Chin (2017) analyzed the impact of human capital on natural resource dependence in terms of education and health. They found that natural resource dependence improves education but worsens health.

CHAPTER 3. THEORETICAL APPROACHES TO THE HYPOTHESIS OF THE RESOURCE CURSE

The Resource Curse leads to disruptive effects not only on the macroeconomic balance directly; but also, on the national economy through such means as poor governance and corruption if necessary. In this sense, the damaging effects in the economy of the resources are listed and reviewed theoretically along in the chapter below.

3.1.The Role of Natural Resources in the Economy

The economic description of the Resource Curse mainly argues that the phenomenon where the countries abundant on natural resources, such as fossil fuels and minerals, tend to experience relatively weak rates of economic indicators, especially in terms of stagnant economic growth and worsening economic development. Moreover, according to the political scientists and economists, the curse of resources also encompasses the failure stemming from social and political challenges concerning mainly democracy, conflicts, inefficient spending and borrowing, weaker institutional development, limited government capture of benefits, patriarchy and gender-based difficulties, as well as environmental problems (Natural Resource Governance Institute, 2015).

In the strategies developed after World War II, the assessment of natural resources' reserves for many countries became a hope for the improvement of the economies of the countries. Natural resources will not only create financial income and employment but will also provide capital accumulation necessary for the take-off of the economy. However, countries such as Chile and Malaysia have mobilized the natural resources sector and made severe improvements; this kind of success stories did not happen much. Instead, a range of countries rich in natural resources but with poor peoples emerged in response to authoritarian systems and human rights violations. Experiences by many countries dependent on natural resources in exports also supported the Resource Curse Hypothesis (Le Billion, 2001).

The Resource Curse Hypothesis, in general, suggests that the resource-rich countries, in a paradoxical way, have recorded lower economic performance than the resource-poor countries. Suppose you find a cube of gold. Is it better or worse for you in the long run? The most precise answer to this is that, in general, the situation will be better, and there will not be many people to discuss the accuracy of this. Because the prevailing economic theory tells us that the positive welfare effect will not create a negative situation, but the answer may not always be that sharp: As Goethe puts it, "*All theory, dear friend, is gray, but the golden tree of life springs evergreen.*" Whether your situation is better or worse depends on how you evaluate this unexpected gain. If you try to quit your job because you are rich, you can finish all your earning in a few years, even get used to these new living conditions, and also if you have enough gold, you can even borrow from it. Besides, you cannot start your business again after the gold runs out. But if you invest the gold in your hands in rationally chosen resources that can bring in further income, you can make income from it and live in better conditions until the end of your life (Sarraf and Jiwanji, 2001).

3.2.The Effects of the Resource Curse

Recent researches reveal that countries being abundant in natural resources are both economically and socially under-performed compared with the resource-deficient ones (Lal and Myint, 1996; Sachs and Warner, 1999; Auty, 1993, 1994, 2001; Ascher, 1999). The curse of natural resources in resource-rich countries often results from the over-valuation of the national currency and the associated economic problems. A large amount of foreign currency from natural resource exports overestimates the local currency. The overvalued local currency makes it disadvantageous for the country while it makes imports attractive. This includes the fact that sectors for natural resource export do not create job opportunities rather than their activities, resulting in high unemployment and a high current deficit due to increasing imports in the country. This is referred to as Dutch Disease in the economics literature.

Looking from the point of origin of the Resource Curse, it is seen that the high foreign currency accumulated in the natural resource-rich country cannot be evaluated effectively. However, if these foreign currencies could be directed to investment and employment, both the economic impacts caused by the resource abundance would be eliminated, and the investments and employment in the country would increase. The amount of foreign currency accumulated in the country leads to an excessive appreciation of the national currency. This means that the goods imported from outside are cheaper, and therefore, the demand for these goods increases. This situation leads to severe current account deficits in the country, as well as a sharp contraction of the substitution sectors.

Apart from the economic ones, the damaging effects caused by rich natural resources also have some unfavorable effects on poor management. Abundant natural resources appeal to all segments of the investors, especially foreign ones. There can be a great injustice in the sharing of these resources. A large part of the revenues from natural resource exports is likely to be transferred to the state-strengthened subcontractors or foreign investors and to the bureaucrats who support them.

The share of the people of this country can be quite low. Rich natural resources can lead to bad governance, bribery, and bureaucracy often tends to coexist with strong foreign investors. As a result, some of the wealth from natural resources are transferred to specific segments as rent, and people cannot get the share they deserve from this wealth (Ross, 2003). As an important economist, Joseph Stiglitz stated that the Resource Curse creates rich countries where poor people live (Stiglitz, 2004).

3.2.1. The "Dutch Disease"

In the economics literature, Dutch Disease is the economic phenomenon in which the discovery and exploitation of natural resources deindustrialize a nation's economy (Besada, 2013). In its simplest and most narrow sense, the Dutch Disease is the "contraction of the tradable sector" (Stevens, 2003). Since the phenomenon was first observed in the Netherlands in the 1960s when vast reserves of natural gas in the North Sea were initially exploited. For this reason, the term is referred to as the name of this country (Gasmi and Laourari, 2017).

Dutch Disease starts with high foreign currency entry and overvalued local currency. The increase in foreign currency inflows, and the value of local currency seems to be a positive situation at first sight, but they have severe consequences. The high amount of foreign currency coming from natural resource exports circulating in the country overvalues the national currency. As a result, trade conditions become more difficult (Sarno and Taylor, 2003).

We assume a basic model with two countries. Namely, in an open economy, under the conditions of a perfect competition market, the cost of this commodity is EUR 1, and the international price is USD 1. Assume that USD/EUR is 2 at the start point. In this case, producer X in Europe produces the product of Y for EUR 1 (the cost for the product is EUR 1) and sells for USD 1, where the producer gains a profit for EUR 1 or 50 cents. Suppose now that natural resource exports have led to a high volume of foreign exchange entrance into the country, and as a result, the USD/EUR parity has reached the level of 1. In this case, the production cost of the goods will remain unchanged at EUR 1. At the same time, the international price will not change and will be sold for USD 1. But producer X will see that s/he does not make any profits by selling the goods and then replaces the currency which will be brought to the country. The USD 1 that the producer brings to the country is equal to EUR 1, which only meets the production cost. If this change in the currencies is even greater, local producers will also have difficulties in determining the market price as well.

On the other hand, if we consider a foreign company that constructs its costs in USD terms under the same conditions, in the beginning, another product Z, costs EUR 2 B and sold for USD 1 in the U.S. market. Under these conditions (USD/EUR=2), product Z will be able to sell only at the breakeven point. Since the foreign firm cannot impose a higher market price due to the perfect competition market conditions, goods that are the import substitute goods of the product Z will be produced and sold in the economy. If local currency exports overvalue the economy as a result of natural resource exports and the USD/EUR parity reaches the level of 1, and product Z will still be produced from USD 1, and because of the changing parity, a selling price of EUR 2 will be at a tradeable level on the Russian market. With parity reaching the level of 1, products produced from USD 1 will be sold at EUR 2, while EUR converted to USD will also earn a profit of USD 1.

As can be seen, the overvaluation of the country's money makes it easier to import while creating disadvantages in exports. As a result, the economy will become more advantageous than the import substitutes in many sectors, and the production of these goods will be abandoned. Workers in the abandoned production sectors will also be unemployed, and the unemployment rate in the country will increase. However, as sectors for natural resource exports are more attractive, investments will shift in this direction. This situation can be named as an industrial escape. In addition to the increase in unemployment, Dutch Disease also causes countries to have higher current account deficits. Imports will ease and increase due to overvalued exchange rates, whereas exports will become difficult and even reduce.

To summarize, the effect of Dutch Disease theory on a country's economy is twofold. First, increasing domestic income and the demand for goods lead inflation to increase and the real exchange rate to appreciate. Accordingly, non-resource commodity price increases and becomes more expensive compared to the world market prices, resulting in decreasing competitiveness and the volume of investment of these non-resource commodities. This negative effect is known as the "spending effect" (Sachs and Warner, 1995; Gylfason, 2001; Papyrakis and Gerlagh, 2004; Frankel, 2010; Badeeb et al., 2017). Secondly, shifting domestic factors of production such as labor and capital to the natural resources sector leads the prices of these inputs to become expensive in the domestic market, and results in increased production costs of other industries such as manufacturing and agriculture. This adverse effect is known as "pulling effect" in the literature (Humphreys et al., 2007). These two outcomes of Dutch Disease are presented in Figure 2 and Figure 3 below.

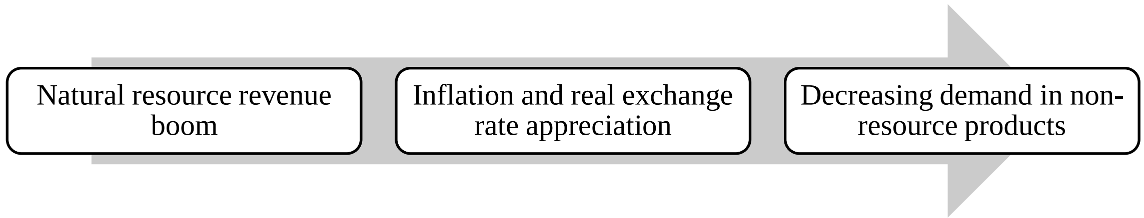

Figure 2. Spending Effect (Source: Badeeb et al. (2017)

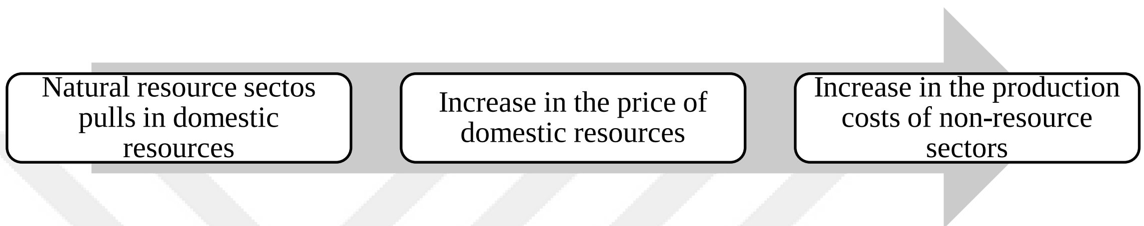

Figure 3. Pulling Effect (Source: Badeeb et al., 2017)

3.2.2. Lower Performance on Economic Growth

Natural resource-rich countries, on average, have shown a lower performance over the past decades than in relatively poor countries. Small countries dependent on natural resource exports are the ones that are most affected by this situation. For instance, Zambia, a copper exporter, was severely affected by the fall of copper prices in the mid-70s. Similar failures can be seen in many countries that are dependent on oil exports (Le Billion, 2001).

It seems quite paradoxical that valuable resources such as gold and oil have negative effects on the economy. However, this situation is supported by many studies. In a survey carried out by the World Bank, the economic performance of countries with abundant natural resources in the 1990s was examined (World Bank, 2002). According to the research, in the countries with a total export ratio of between 6-15% of the natural resources sector, over ten years, per capita GDP decreased by 0.7% annually. This was experienced by the countries where natural resource exports were between 15% and 50% of total exports as a decrease of 1.1% in per capita GDP per year on average. Also, in countries where natural resource exports account for more than 50% of the total exports, per capita GDP declined by an average of 2.3% annually. In addition to this, the decrease in GDP per capita in the three groups of countries was 1.15% per annum.

The study conducted by Sachs and Warner (1995) examined the effects of countries' natural resource exports on economic growth. In this respect, 1971 was the base year of the study; and the economic growth performances of the countries with high natural resource exports in the base year were evaluated for the years between 1971-1989. In the results of the research, it was determined that there is a negative relationship between natural resources and economic growth (Sachs and Warner, 1995).

In their research paper, Atkinson and Hamilton (2003) examined the relationship between savings, economic growth, and Resource Curse Hypothesis. The negative correlation between natural resources and economic growth was confirmed again for the years between 1980-1995. However, the study focused on the role of politics in explaining the curse phenomenon, especially the impact of investments and savings. The study also stated that natural resource incomes could be mismanaged by using it in the financing of public expenditures. It was reported that natural resource income could be mismanaged in terms of financing public spending.

On the contrary, it is highlighted that countries can avoid the curse of resources if they can finance natural resource revenues and public investments. The countries that are spending the earned income from natural resources are exposed to the Resource Curse more seriously. It is also emphasized that the countries facing the curse of resources have either low or negative savings, too (Atkinson and Hamilton, 2003).

3.2.3. Lowering Conditions of Living, Poverty and Income Inequality

Certain studies identify a cause and effect relationship between the dependence on natural resources in exports and poverty alleviation; resulting in decreasing infant and child mortality rates, as well as worsening life expectancy at birth (Auty, 1994; Sarraf and Jiwanji, 2001). The dominant cause of this situation stems from the fact that natural resource-rich countries often fail in governments' education and health services. Ross (2003) found a high correlation between natural resource exports and child mortality rates. According to his study, a five-point increase in mine and mineral dependency increases the under-five child mortality rate by 12.7%. On the other hand, a five-point increase in oil dependency seems to cause child mortality rate below the age of five raise by 3.8%.

Natural resource dependence in exports correlates with low social development indicators such as high child mortality rates. Dependence on oil, for example, is associated with a higher number of undernourished children, lowering health expenditures, decreasing primary and secondary school enrollment, and falling adult literacy. Similarly, mineral dependency has also been associated with poverty and declining life expectancy, as well as increased inequalities in income distribution (Leamer et al., 1999; Spilimbergo et al., 1999). Even in the countries that exhibit true success stories such as Botswana, which provide a high level of sustainable growth among Sub-Saharan African countries, there are significant income distribution inequalities too. Sixty percent of Botswana's population is living on two dollars a day (Le Billion, 2001).

3.2.4. Corruption and Institutional Quality

The most important mechanism of the Resource Curse affecting countries in the context of governance has emerged with increasing corruption. There is strong evidence in the literature for the hypothesis that an increased income from natural resources leads the country to become more vulnerable to corruption. Two reasons cause this problem. First, governments are only able to record a certain percentage of rapidly growing natural resource revenues. Being rich in natural resource provides much more income than the governments can manage effectively. The secondary cause of this problem is due to the volatility of natural resource revenues. The rapid rise and fall in prices weaken the institutions in the country, adversely affecting budgeting procedures too (Ross, 2003).

Natural resource-dependent countries are more vulnerable to corruption as a result of arbitrarily controlling high natural resource rents. Corruption is more prevalent in countries with less developed and weaker institutional structures. It is reported that General Sani Abacha has embezzled 2.2 billion dollars in oil-rich Nigeria in his four-year rule (Le Billion, 2001).

Gelb et al. (1988) found that the rise in oil prices in the 1970s was associated with a decline in productivity in public investments as a sign of rising corruption levels (Gelb et al., 1988). Similarly, Collier and Gunning (1999) noted that the rising prices of raw materials in developing countries had lowered their investment efficiency (Collier and Gunning, 1999). Ross (2001), studying the timber industry of Indonesia, Malaysia, and the Philippines, noted that rising timber prices increased corruption and weakened the effectiveness of the institutions that protect forest land in the country (Ross, 2001). Similar results were also confirmed in many studies conducted by Marshall (2001), Sachs and Warner (1995), Gylfason (2001), and Leite and Weidmann (1999).

In their study, Mehlum et al. (2006) tested the hypothesis of the Resource Curse. It was stated that it is not enough to examine the Resource Curse only in terms of Dutch Disease. Clarifications made through the Dutch Disease will be limited to the exclusion of the Resource Curse from the economic growth of the production of commercial goods. According to the survey, the quality of the institutions, as well as the Dutch Disease, is gaining importance in experiencing the curse of resources. Institutions that provide support to producers and industrialists can avoid the negative effects of the Resource Curse, as well as turn this wealth into a comparative advantage (Mehlum et al., 2006).

Larsen (2006), monitoring the economic performance of Norway for the last 25 years where oil was discovered in 1969, revealed that Norwegian sources were not affected by the so-called curse. Economic performance test, in comparison with its neighbors Sweden and Denmark, it was stated that Norway had been growing steadily within the last 25 years. In the same study, it was also emphasized that Norway was immune to the Resource Curse because of the higher quality of Norwegian institutions (Larsen, 2006).

3.2.5. Authoritarianism and Poor Governance

It is seen that oil and mineral richness restrict democracy and decrease the quality of governance. The rent of natural resources empowers the largely autocratic power rather than to support democracy. The autocracy in the oil-producing Middle East countries is a clear sign of this relationship. This seems to be a specific case of the history and cultural structure of the Middle East, but it can be applied to many resource-dependent countries in other regions as well (Le Billion, 2001).

Natural resource wealth weakens governments; social conflicts reduce prevention and resolution skills, and public services such as education and health have become more challenging to provide. Although this seems ironic indeed, it occurs in two ways: Firstly, it appears to be weakening of the state authority in a particular region. If there are natural resources available to explore with a lower level of education and investment, after a certain period, it becomes complicated to dominate those regions by the state. This may cause gangs, war dealers, and crime-prone military officers to become strong enough to commit, and that these elements can come into conflict with the state. Secondly, the wealth of natural resources can cause public institutions to weaken. However, the reduction and the inefficiency of public goods become issues. This also increases the likelihood and danger of a civil war (Ross, 2003).

Countries with abundant natural resources are trying to buy social peace because of their failure in social politics. The most important factor is that they emphasized the strengthening of their authorities; in other words, the establishment of internal security. This also leads to the transfer of most of the revenues from natural resources to military spending.

3.2.6. The Risk for Civil War and Conflict

Since the mid-90s, researches on the causes of civil wars has been escalated. One of the most surprising and most important findings of the studies is that natural resources have a significant influence on the triggering, sustaining, and financing of these conflicts. The natural resources that lead to conflict are mainly oil and valuable metals such as coltan, diamond, and gold. However, other precious metals or materials, even lumber, can lead to internal conflicts. Besides, if drugs are considered as natural resources, they will also play a significant role in many conflicts. Among the recent seventeen conflicts on natural resources, precious metals have been influential in eight of the conflicts, where oil and/or natural gas in six, drugs in five, and lumber in three of the inner conflicts as well (Ross, 2003).

Natural resource-dependent countries, especially oil-dependent ones, buy social peace by implementing populist policies or by suppressing internal rivalries (unless there is no terrorism or international intervention). Strong energy importers also support the political stability of these countries by ignoring military aid or anti-democratic practices and human rights violations in the country. For this very reason, the countries of the international oil states - namely the United States, Great Britain, and France - have supported the regimes of Guinea and the Persian Gulf for an extended period (Le Billion, 2001).

The resource-rich countries are riskier in terms of civil wars and conflicts. This risk increases even more as the ratio of natural resource exports to GDP increases. A country with a ratio of 32% of the exports of its natural resources to GDP has a risk of a civil war of 22%, while in a similar country with a zero percent of natural resource exports to GDP, the risk of civil war is only 1%. Countries with a lower level of dependency on natural resources are relatively industrialized democracies, and they have no risk in terms of civil war (Le Billion, 2001).

Similarly, there appears to be a statistical and theoretical explanation for the link between a country's abundance of natural resources and an increased risk of violent conflict (Collier, 2000; Collier and Hoeffler, 2000). With a focus on civil war, "the most powerful risk factor is that countries which have a substantial share of their income (GDP) coming from the export of primary commodities are radically more at risk of conflict" (Collier and Hoeffler, 2000). With primary commodities at 26% of GDP, an average country has a 23% risk of civil war in any given five-year period. However, if the same country has no primary commodities sector, this risk falls to 0.5% (Collier and Hoeffler, 2000).

At this point, it is important to highlight two facts. First, natural resources are never the primary source of any conflict. The combination of rather complex events accomplishes each of the conflicts described above. Poverty, ethnic and religious reasons, and inconsistent poor management play a significant role in conflicts. However, even when these factors are taken into account, researches show that natural resources increase the risk of starting a civil war and make it very difficult to resolve if the civil war begins. Secondly, natural resources do not make conflicts inevitable. Resource richness raises the danger of civil war. However, while almost all of the resource-rich countries are exposed to conflict, some may avoid it. Redirecting the resource richness to the areas such as education, health, and poverty alleviation and applying better policies can reduce the similarity of natural resources to civil wars (Ross, 2003).

Other factors do statistically increase the risk of conflict, but possibly less than the Resource Curse. These include geography, history, economic decline, rate of population growth, economic opportunity (e.g., access to secondary education), and ethnic dominance. This negative contribution of the other factors, which are known to have negative impacts on the risk of civil conflict, has not been proven statistically. This includes income inequality and ethnic diversity. It should be noted, however, that the conclusions drawn from the statistical analysis are, in some quarters, controversial, not least the extent to which legitimate social and economic grievances underpin violence and the use of statistics in this way.

3.2.7. Rent-Seeking

While Tullock (1967) developed the idea of the rent-seeking concept, the expression itself has been invented by Krueger (1974). As a political reason for the Resource Curse, Lam and Wantchekon (2003) labeled rent-seeking as “Political Dutch Disease”. Distinguishing from the theory of profit-seeking, rent-seeking, as a prominent theme in theoretical explanations of the Resource Curse, is where entities seek to extract value by engaging in mutually beneficial transactions through their political influence (Schenk, 2006). Furthermore, there is extensive literature about natural resources affecting growth through rent-seeking behavior, which makes economic progress slow down (Baland and Francois, 2000; Gallagher, 1991; Torvik 2002). Here, the case of Trinidad and Tobago experienced in the early-1970s is quoted as a typical example (Hilaire, 1992).

Within the context of natural resource revenues, an increasing amount of natural resources leads to activities or resources to be diverted away from productive employment (Deacon and Rode, 2012). For instance, the number of potential entrepreneurs engaging into rent-seeking rather than wealth creation rises, since private capital could be removed to a less productive but secure sector; as the number of entrepreneurs running productive firms is declining while labor is also competing for a resource rent prize (Torvik, 2002).

On the other hand, Kolstad and Soreide (2009) showed corruption as the main reason for the poor economic performance of resource-rich countries and stated that corruption in resource-rich countries emerged in two ways as rent-seeking and favoritism. Moreover, Wantchekon (1999) argues that the anger resulting from the unfair distribution of natural resources rents encourages internal conflicts and is likely to lead to instability.

CHAPTER 4. OIL CURSE INDEX (OCI)

For many decades, oil -as fossil fuel- has been a vital energy input for world economies. One of the most important reasons for this is the high share of oil in the world's total energy consumption. Nowadays, oil has a wide range in terms of usage from electricity generation to transportation. In today's world, where energy has become an indispensable part of human life, it is also undeniable that oil has become an essential part of the economic development of the countries, as well as economic growth. Besides economic growth, economic development also means that countries show efforts to develop socially and culturally and even politically. Although the concept of development has been included in the economics literature along with industrialization, its importance has started to increase gradually after World War II. The determinants of development can be divided into two as social and economic. Since GDP per capita and growth rate are the two most important indicators for economic determinants, life expectancy, rate of literacy, years of schooling, etc. are some of the significant factors among social determinants.

Herein, looking at the economic development concept from the perspective of oil, a vital input for energy, in addition to its effect on economic growth in terms of production and income, it seemed also as an essential element for economic development in terms of increasing standard of living. Therefore, oil can be denoted as necessary for both social and economic determinants of economic development. In other words, oil is accepted as a crucial resource for fulfilling economic factors such as industrialization, economic growth, and per capita income increase, which are required for the realization of economic development.

It is one of the most common issues in the literature that energy can be included in the economic growth process in addition to the two fundamental factors of production: capital and labor. Thus, Hamilton (2012) proved that energy is among the determinants of real GDP within the production function. Nevertheless, in the growing literature on both theories of the “Resource Curse” and the “Paradox of Plenty”, there are several articles, research papers, as well as books directly dealing with oil as an important natural resource, and the effects of oil curse on both the country's economy and its institutions distinctively (Ross, 2011, 2012; Gelb, 1988; Di John, 2009; Birdsall and Subramanian, 2004; Gelb and Grasman, 2009; Watts, 2004; Schubert, 2006; Luong, 2010; Katz, 2004; Shaxson, 2007; Apergis and Payne, 2014; Mehlum et al., 2006; Bayulgen, 2005; Basedau and Lay, 2009; Liou and Musgrave, 2014; Bainomugisha et al., 2006).

However, the existing literature suggests that there is a gap that there is not an index to measure the Oil Curse tendency systematically among various countries based on the most critical indicators highlighted in the Resource Curse literature. There are only some indices that are constructed to measure the vulnerability of the countries such as Resource Governance Index (RGI), Climate Change Vulnerability Index (CCVI), and Environmental Vulnerability Index (EVI). These indices mainly use primary data obtained from interviews and questionnaires by utilizing different social, economic, and environmental factors. To measure the Resource Curse vulnerability, a more recent study conducted by Biresselioglu et al. (2019) has created a Resource Curse Vulnerability Index (RCVI). In the study, the RCVI composed of 9 sub-indicators, and the calculations presented the RCVI values of 55 countries for the time interval between 2005 and 2015.

4.1. Research Design and Indicator Selection

This study follows the research framework exhibited in Figure 4. Accordingly, in the primary stage, it is crucial to select appropriate indicators to obtain the result accurately. For this reason, in the indicator selection process, the existing literature has been reviewed in detail to reveal the most common indicators cited. For the Resource Curse literature, the databases of Web of Science, Science Direct, Scopus, Google Scholar, and RePEc has already been searched. As a result, more than 500 journal articles and working papers - econometric studies examining the effect of natural resources on economic and political development outcomes- with different regression specifications have been reviewed and summarized in Chapter 2. This time, to narrow it, the same databases were reviewed by using the combinations of keywords such as «oil curse + economic growth», «oil curse + sustainable development», «oil curse + democracy», «oil curse + corruption», «oil abundance + economic growth», «oil curse + institutions». Lastly, a final representative set was included in the primary analysis after contextual screening identifying the most frequently mentioned indicators for the Oil Curse.

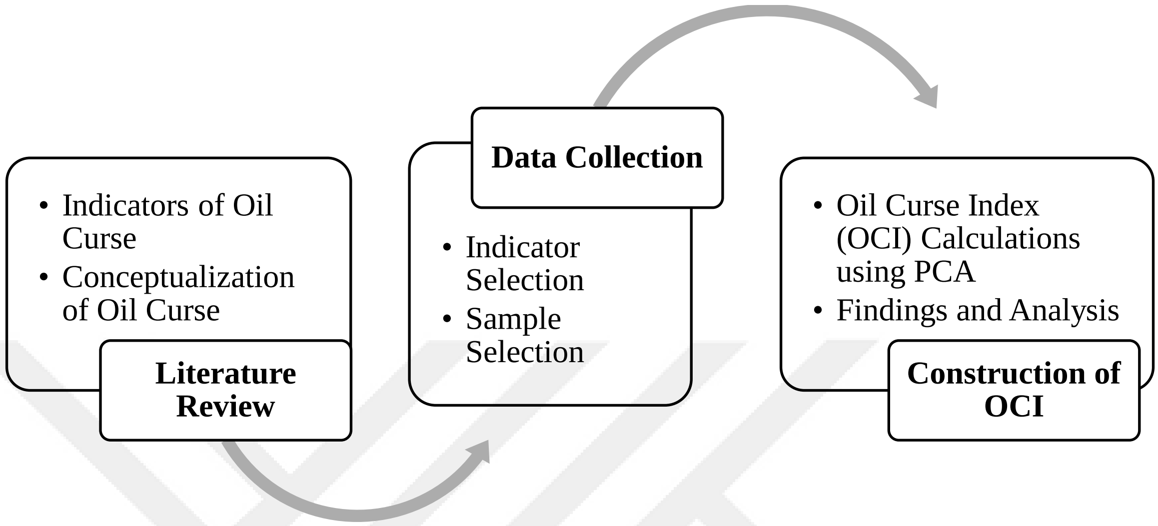

Figure 4. Research Framework

After having an extensive literature review, a synthesized and workable framework for analyzing the Oil Curse Hypothesis will also be proposed. Utilizing several different approaches, the chapter suggests that the Oil Curse Paradox encompasses both economic, political, and social development outcomes. Reviewing more than 120 articles in the existing literature, the most common Resource Curse indicators were selected and utilized in the econometric analysis. Following the research design and indicator selection process in the study of Biresselioglu (2019), to narrow the set of articles into the most relevant ones, three main criteria were considered: (1) relevance with the Oil Curse theme, (2) being recent and/or ground setting, and (3) number of cites as an impact measurement, in this case, having higher than 500 cites (Biresselioglu, 2019). These criteria interpreted a final representative set of 19 articles that classified thirteen most often mentioned indicators related to Resource Curse.

The systematically reviewed literature on resource/oil curse indicators reveals the most frequently mentioned five indicators as *Gross Domestic Product (GDP), Natural Resources Rent (NRR), Control of Corruption (CC), Manufactures Exports (ME),* and *Political Stability and Absence of Violence/Terrorism (PSAVT)* having a relationship with different dimensions of the Resource Curse framework. Accordingly, these indicators are expected to give an intuition about the tendency for the Oil Curse of the sample countries. The structuring process of the Oil Curse framework derived from the aforementioned literature review is illustrated in Table 2.

Table 2. Indicators derived from the related literature review (As of May 10, 2019)

			Indicators				
#	**Article**	**Cites**	**GDP**	**NRR**	**CC**	**PSAVT**	**ME**
1	Sachs and Warner (1995)	5833	x	x			x
2	Sachs and Warner (2001)	4207	x	x			
3	Mehlum et al. (2006)	2589	x	x	x	x	
4	Ross (1999)	2202	x	x			
5	Robinson et al. (2006)	1601	x	x		x	
6	Sala-i Martin and Subramanian (2013)	1465	x	x	x	x	
7	Brunnschweiler and Bulte (2008)	919	x	x	x		
8	Haber and Menaldo (2011)	869	x	x			x
9	Smith (2004)	818	x	x		x	x
10	Papyrakis and Gerlagh (2004)	752	x	x	x		
11	Frankel (2010)	751		x	x	x	x
12	Alexeev and Conrad (2009)	690	x	x	x	x	
13	Watts (2004)	630	x	x	x		
14	Bulte et al. (2005)	607	x	x			x
15	Rosser (2006)	574		x	x		x
16	Boschini et al. (2007)	563	x	x	x		
17	Atkinson and Hamilton (2003)	521	x	x	x	x	
18	Auty (1994)	518	x	x			x
19	Brollo et al. (2013)	503	x	x	x	x	

The literature review suggests that the most common indicator for natural resource dependence is measured by the ratio of rents from natural resources relative to Gross Domestic Product (GDP) (Atkinson and Hamilton, 2003; Stijns, 2006; Ross, 2007; Auty, 2007; Collier and Hoeffler, 2009; Boos and Holm-Müller, 2013; Bhattacharyya and Hodler, 2014; Bhattacharyya and Collier, 2014; Apergis et al., 2014; Farhadi et al., 2015). Therefore, as the first indicator -the key one-, since the OCI of the countries is calculated, the data for the share of oil rent in GDP, referring to economic diversification, as well as deindustrialization, has been utilized as a measure of natural resource dependence. Likewise, there are several studies in the literature directly referring to oil rents, which were conducted by Basedau and Lay (2009), Watts (2004), Bjorvatn et al. (2012), Papyrakis and Gerlagh (2004), Alexeev and Conrad (2009), Hammond (2011), Ramsay (2011), Smith (2004), Harford and Klein (2005), Arezki and Brückner (2011), Karl (2004), Mähler (2012), Ross (2001; 2012), Satti et al. (2014), Henry (2004), Basedau and Lacher (2006), Obi (2010), Olarinmoye (2008), Cotet and Tsui (2010; 2013), and Sala-i-Martin and Artadi (2002).

The second indicator, GDP, is considered a key measurement of a country's economic growth, and many articles noticed an inverse relationship between natural resource dependence and growth rate, as mentioned earlier. Since many researchers would agree that GDP per capita is far from being a perfect indicator of the quality of life, as well as of the economic growth (Kurecic and Kokotovic, 2017), several researchers highlighted that GDP itself could practically use as a synonym for it (Costanza et al., 2009). Thus, this relationship is also underlined in several articles related to the Resource Curse literature (Neumayer, 2004). The third indicator, Manufactures Exports, referring to the share in total merchandise exports, describes the Dutch Disease effect of the Resource Curse (Wood and Berge, 1997). The fourth and fifth indicators, Control of Corruption and Political Stability and Absence of Violence/Terrorism, are linked to institutional quality and political economy perspectives of the Resource Curse. In addition to these five indicators, the Oil Proved Reserves, is also included as the sixth indicator, allowing this study to take a broader perspective.

The advanced design of this research based on the acknowledged important indicators can be regarded as unique and exceptional for the Resource Curse literature since the constructed Oil Curse Index (OCI) constitutes the first quantitative study measuring the Oil Curse tendency of sample countries in academia. The study is originated from a comprehensive and state-of-the-art literature review and is enhanced by a quantitative data collection method and relevant sample selection. Finally, the recently introduced Oil Curse Index provides a scientific basis to measure the Oil Curse tendency and categorize the sample countries according to their performances.

4.2.Data

The data of the study covers the period between 2002 and 2015, where the data on all six indicators are available for 41 countries from various geographical regions, and aims to establish OCI scores for each country. The dispersed sample of countries enables the establishment of a generalized index score. A total of 41 countries constitute the sample, including Algeria, Angola, Argentina, Australia, Azerbaijan, Brazil, Canada, China, Colombia, Denmark, Ecuador, Egypt, Gabon, India, Indonesia, Iran, Iraq, Italy, Kazakhstan, Kuwait, Libya, Malaysia, Mexico, Nigeria, Norway, Oman, Peru, Qatar, Congo, Rep., Romania, Russian Federation, Saudi Arabia, Sudan, Thailand, Trinidad & Tobago, Tunisia, United Arab Emirates, United Kingdom, United States, Venezuela, and Yemen. Although having proved reserves of oil, Turkmenistan, Uzbekistan, Syria, Chad, Equatorial Guinea, Brunei Darussalam, and Vietnam are excluded from the analysis because of the lack of data.

For the data of oil-proved reserves, to reach the consistency and unbiasedness every year, information for a range of selected countries was taken from BP’s (British Petroleum) Statistical Review of World Energy Reports published between 2002 and 2015. Allowing an extended study period, the rest of the data were obtained from the World Bank’s database. While the data for GDP, Oil Rent, and Manufactures Exports were retrieved from the World Development Indicators of World Bank, Control of Corruption and Political Stability and Absence of Violence/Terrorism data were adopted from World Bank’s Worldwide Governance Indicators. The definitions of the indicators are presented in Table 3.

Table 3. Definitions of the Indicators

Indicator	Definition	Source[1]
GDP (constant 2010 US$)	GDP at purchasers' prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2010 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.	World Bank, World Development Indicators
Oil: Proved reserves in thousand million barrels	Total proved reserves of oil - Generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions.	BP Statistical Review of World Energy 2018

[1] For details, see: World Bank, World Development Indicators. 2018. GDP (constant 2010 US$). [online] Retrieved from: https://data.worldbank.org/indicator/ny.gdp.mktp.kd. (Accessed 5 November 2018).; BP. 2018. Statistical Review of World Energy 2018. [online] Retrieved from: https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html. (Accessed 7 November 2018).; World Bank, World Development Indicators. 2018. Oil Rent (% of GDP). [online] Retrieved from: https://data.worldbank.org/indicator/ny.gdp.petr.rt.zs. (Accessed 5 November 2018).; World Bank, World Development Indicators. 2018. Manufactures Exports (% of merchandise exports). [online] Retrieved from: https://data.worldbank.org/indicator/TX.VAL.MANF.ZS.UN. (Accessed 5 November 2018).; World Bank, Worldwide Governance Indicators. 2018. Control of Corruption. [online] Retrieved from: https://data.worldbank.org/data-catalog/worldwide-governance-indicators. (Accessed 6 November 2018).; World Bank, Worldwide Governance Indicators. 2018. Political Stability and Absence of Violence/Terrorism. [online] Retrieved from: https://data.worldbank.org/data-catalog/worldwide-governance-indicators. (Accessed 6 November 2018).

Oil Rent (% of GDP)	Oil rents are the difference between the value of crude oil production at world prices and total costs of production.	World Bank, World Development Indicators
Manufactures Exports (% of merchandise exports)	Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals).	World Bank, World Development Indicators
Control of Corruption	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of the standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.	World Bank, Worldwide Governance Indicators
Political Stability and Absence of Violence/Terrorism	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of the standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.	World Bank, Worldwide Governance Indicators

4.3. Research Model: Principal Component Analysis (PCA)

To construct the Oil Curse Index, Principal Component Analysis (PCA), which was invented by Karl Pearson in 1901 and named by Harold Hotelling in the 1930s, is selected as the method for this thesis. The use of PCA is widespread since it is the simplest of the eigenvector-based multivariate analyses, and is a well-established multivariate statistical technique used in specific disciplines as a tool in exploratory data analysis and for making predictive models (Abdi and Wiley, 2010). Among the main objectives of the PCA methodology are diminishing the dimension of the variables in the dataset and solve the multicollinearity problems (Bair et al., 2006; Chatterjee and Price, 1977; Green, 1997; Hair et al., 1987; Hotelling 1933, 1936; Judge et al., 1985; Maddala, 1992; Malinvaud, 1997). The principal component analysis considers several linear combinations of the variables that can be used to summarize the data without losing too much information in the process (UNCTAD, 2005). The study conducted by Nagar and Basu (2002) was the first one that used the method.

PCA also aimed at converting the correlated variables into uncorrelated ones named components that are the linear combinations of the original variables (Hotelling, 1933; Jackson, 1993; Pearson, 1901). Similarly, according to Jollife (2004), the main idea of this technique is to reduce the size of the data set containing interrelated variables by using the covariance between these data while maintaining the most considerable amount of the variance available in the data set. This is done by a linear transformation of the data so that they become orthogonal to each other (Jollife, 2004).

With PCA, it is possible to make dimension reduction, estimation, and calculation of the scores for the associated variables, as well as sorting the variables according to these scores (Maitra and Yan, 2008). Principal Component Analysis can be performed using the original values or standardized values of the data. Since the analysis is sensitive to the unit of measure, it is more appropriate to use normalized values in cases where the units of measure of the variables are different (Singh and Harrison, 1985).

The latent variable has been calculated as a synthetic index score in the PCA methodology (Roupas et al., 2009). Assuming the index variables to be linearly correlated with the latent variable, the method also demonstrates the Oil Curse performance of each country. On the other hand, PCA captures the interconnections of the indicators and the aforementioned indicators of the Oil Curse Index without an observed variable. Consequently, the covariance of the independent/observable variables, rather than being subjective judgments, are the weights of those variables for the model, which leads the robustness of the PCA results to increase (Kruyt et al., 2009).

Principal Component Analysis is a technique in which all variables are considered together, unlike multiple regression and/or discriminant analysis, where one variable is considered to be strictly dependent, while the others as independent variables (Hair et al., 1990). Also, differing from other methods, the benefit of principal component analysis will be seen clearly when the correlation structure between the variables is taken into consideration (Falissard, 1999).

A further advantage of using the PCA is that, unlike the conventional methods of index construction, the PCA does not assign subjective ad hoc weights – as such assigning equal weights – to different indicators. Here, the weights are the result of multivariate statistical analysis of the proposed indicators (Gupta, 2008).

4.3.1. The Methodology of Principal Component Analysis

The basis of PCA is based on the spectral properties of the covariance and correlation matrices between variables. These matrices are symmetric and positive definite. The eigenvalues of these matrices are identical to their variances. In other words, PCA is the process of finding eigenvalues and eigenvectors of covariance and correlation matrices of the datasets. In the analysis, the variables with a number of p and with n measure of interdependence; are converting into new variables with a number of k $(k \leq p)$, which are linear, orthogonal and independent from each other.

According to Johnson et al. (2002), let the variables are denoted as $X_1, X_2, \ldots, X_p$, and the standardized version of these vectors are $Z_1, Z_2, \ldots, Z_p$. Then, the principal components of these standardized vectors can be written as:

$Y_1 = (a_t)'Z = a_{11} Z_1 + a_{21} Z_2 + \ldots + a_{p1} Z_p$
$Y_1 = (a_t)'Z = a_{12} Z_1 + a_{22} Z_2 + \ldots + a_{p2} Z_p$
…

$$Y_1 = (a_t)'Z = a_{1p} Z_1 + a_{2p} Z_2 + \ldots + a_{pp} Z_p \quad (4.3.1.1)$$

Here, $Z_1, Z_2, \ldots, Z_p$ are the rows of the standardized data matrix, $Y_1, Y_2, \ldots, Y_p$ denotes principal components, and a_{ij} stands for the coefficients indicating the rate at which each principal component is associated with which variable. These coefficients are also the weights that exhibit the contribution in terms of variance of the principal components to the variables and the weights of the variables that define the principal components.

The principal components $Y_1, Y_2, \ldots, Y_p$ will be selected as the linear combinations of the original variables so that they are independent of each other and their variances can describe the total variance as much as possible. To do so, the first principal component (Y_1) is defined as linear combinations of $Z_1, Z_2, \ldots, Z_p$, so that the contribution to the total variance is at maximum. The second principal component (Y_2) is independently determined from the first principal component so that its contribution to the total variance that remains after the variance explained by the first principal component is again at maximum. Likewise, the third and the subsequent principal components are defined so that their contribution to the total variance is at maximum.

The i^{th} principal component is $(a_i)'Z$ linear combination that provides: i) max Var $((a_i)'Z)$, ii) $(a_i)'(a_i)=1$ and, iii) Cov $(Y_i, Y_k)=0$ for $k<i$. The objective is to determine the coefficients a_{ij} ($i=1, 2, \ldots, p$; $j=1, 2, \ldots, p$) that allow the development of linear combinations of variables, depending on the required conditions.

The principal components (Y_i) are independent of each other and their variances are equal to the eigenvalues (λ_i) of the corresponding correlation matrix. So, as exhibited in Equation 4.3.1.2, the total variance of the system is equal to the total variance of the principal components.

$$s_1 + s_2 + \ldots + s_p = \sum_{i=1}^{p} Var(z_i) = \lambda_1 + \lambda_2 + \ldots + \lambda_p = \sum_{i=1}^{p} Var(Y_i) \quad (4.3.1.2)$$

Since the total variance of the data matrix is equal to the total variance of the principal components, then:

The proportion of variance of the k^{th} principal component $= \dfrac{\lambda_k}{\lambda_1 + \lambda_2 + \ldots + \lambda_p}$ (4.3.1.3)

where k = 1, 2, …, p.

Moreover, the correlation coefficients between the variables and the principal components are denoted as follows:

$$r_{Y_i, Z_k} = \frac{e_{ki}\sqrt{\lambda_i}}{\sqrt{s_k}} \qquad (4.3.1.4)$$

where i = 1, 2, …, p and k = 1, 2, …, p.

The eigenvectors (e_1, e_2, …, e_p) are proportional to the correlation coefficients between variables and principal components. Every e_{ki} indicates the importance of the k^{th} variable in the formation of the i^{th} principal component.

To sum up:

- The data matrix for the variable *p* in the *n* measurement is standardized,
- A correlation matrix related to the standardized data matrix will be identified,
- Eigenvalues and eigenvectors of the correlation matrix are calculated,
- The ratios of principal components which explain the total variance will be provided from the eigenvalue calculations,
- The principal component values are gathered through the multiplication of the transpose of each eigenvector and the standardized data matrix.

4.3.2. PCA-based Oil Curse Index Generation

The model to compute the Oil Curse Index (OCI) will be briefly described in this section. The tendency to oil curse is interpreted as an unobserved or a latent variable that cannot be observed directly. OCI scores is assumed to be linearly related to the above six indicators and a disturbance term capturing the error. As shown in Equation (4.3.2.1), the index deals with the variables of the countries for each year.

$$OCI_j = \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j} + \beta_4 x_{4j} + \beta_5 x_{5j} + \beta_6 6_{1j} + \varepsilon \qquad (4.3.2.1)$$

The variables represented as x_{1j}…….x_{6j} were adopted from their sources of origins mentioned earlier. In the formula also, "*j*" denotes the country, and "ε" is the error term. Thus, the total variation in the OCI is composed of two orthogonal parts—variation due to the proposed components and variation due to error.

We compute the principal components (PCs) as follows. Initially, indicators are scaled (normalized) between 0 and 1 in the form of Υ_{1j},…, Υ_{6j} considering their effects on the OCI, either positive or negative. In terms of a scaled outcome, "0" denotes the lowest value for each indicator related to the Oil Curse, while "1" signifies the highest amount of the selected indicator for that country. The indicators and their relations with the Oil Curse tendency, as well as the equations to obtain scaled outcomes are as follows:

x_{1j} : *Control of Corruption.* The effect of x_{1j} on the index is negative, as the decreasing value of the control of corruption increases the oil curse tendency.

$$\Upsilon_{1j} = \frac{\text{Max}(x_1) - x_{1j}}{\text{Max}(x_1) - \text{Min}(x_1)} \qquad (4.3.2.2)$$

x_{2j} : *Gross Domestic Product (GDP).* The effect of this indicator on the index is negative, as a higher value of GDP will decrease the oil curse tendency.

$$\Upsilon_{2j} = \frac{\text{Max}(x_2) - x_{2j}}{\text{Max}(x_2) - \text{Min}(x_2)} \qquad (4.3.2.3)$$

x_{3j} : *Manufactures Exports*. The effect of this indicator on OCI is negative since the increasing share of manufactures exports in merchandise exports leads to a decreasing tendency to the oil curse.

$$\Upsilon_{3j} = \frac{\text{Max}(x_3) - x_{3j}}{\text{Max}(x_3) - \text{Min}(x_3)} \qquad (4.3.2.4)$$

X_{4j} : *Oil Proved Reserves*. The effect of x_{4j} on our index is positive since an increasing amount of reserves of natural resources; in this case, oil reserves leads to an increasing oil curse tendency.

$$\Upsilon_{4j} = \frac{x_{4j} - \text{Min}\,(x_4)}{\text{Max}\,(x_4) - \text{Min}\,(x_4)} \tag{4.3.2.5}$$

X_{5j} : *Oil Rents*. The effect of x_{5j} on OCI is positive, as the share of oil rent in GDP increases, the oil curse tendency increases.

$$\Upsilon_{5j} = \frac{x_{5j} - \text{Min}\,(x_5)}{\text{Max}\,(x_5) - \text{Min}\,(x_5)} \tag{4.3.2.6}$$

x_{6j} : *Political Stability and Absence of Violence/Terrorism.* The effect of x_{6j} on the index is negative since the value of x_{6j} decreases; the oil curse tendency also increases.

$$\Upsilon_{6j} = \frac{\text{Max}\,(x_6) - x_{6j}}{\text{Max}\,(x_6) - \text{Min}\,(x_6)} \tag{4.3.2.7}$$

After we calculate the 6 x 6 correlation matrix *R* of the normalized indicators, the determinantal equation below is then solved:

$$\left| R - \lambda I \right| = 0 \text{ for } \lambda \tag{4.3.2.8}$$

which gives a sixth-degree polynomial equation in λ and therefore, six roots which are the eigenvalues corresponding to R, can be derived. Afterward, for each value of λ, the following matrix equation will be solved:

$$(R - \lambda_j I) F'_j = 0 \tag{4.3.2.9}$$

where $F_j = (f_{1j}, f_{2j}, \ldots, f_{6j})$ is a 1 x 6 eigenvector relating to λ_j, also subject to $F_j' F_j = 6$. Thus, we get six eigenvectors as F_1, F_2, F_3, F_4, F_5, and F_6, corresponding to λ in descending order of magnitudes. Accordingly, the six PCs are calculated by weighting scaled indicators with eigenvectors corresponding to eigenvalues as follows:

$P_{1k} = x_k F'_1$,

.

$P_{6k} = x_k F'_6,$ (4.3.2.10)

where $x_k = [x_{k1}, x_{k2}, \ldots, x_{k6}]$ is a vector of scaled variables for country k.

As a result of the interdependency of the indicators, the correlation among the standardized variables supports the PCA model. To calculate the variance maximization, results for a total of six eigenvalues were collected through the analysis of the variables. The formulation for the variance maximization is as follows:

$$P_{1j} = \sum_{i=1}^{7} F_{1ij} * \gamma_{1j} \quad (4.3.2.11)$$

Here, the first principal component signifies the maximum variance, while the second one represents the maximum variation of the remaining variance of the original variables. The number of PCs for the Oil Curse is considered for the total variation of all the principal components together, considering all the PCs are mutually orthogonal. As $\lambda_j = var(P_j)$, the total variation in the OCI is reached by the summation of $\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_5 + \lambda_6$ (Gupta, 2008). Therefore, $\lambda_j/\sum\lambda_j$ is equal to the proportion of total variance accounted for by P_j. As a result, the OCI is computed as:

$$OCI_j = \frac{\lambda_1 P_{1j} + \lambda_2 P_{2j} + \lambda_3 P_{3j} + \lambda_4 P_{4j} + \lambda_5 P_{5j} + \lambda_6 P_{6j}}{\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_5 + \lambda_6} \quad (4.3.2.12)$$

4.4.Findings and Analysis

Using the descriptive statistics for six scaled indicators utilized in the construction of the index between 2002-2015, the dataset characteristics were evaluated from Table 4 to Table 17. In the tables it is observed that the position of samples are effectively diversified throughout the sample selection process and supported by the centralized mean and median, as well as the low levels of standard deviation in the sample.

Table 4. Descriptive Statistics 2002

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.3640	0.6344	0.6171	0.1227	0.2133	0.5027
Median	0.3710	0.7056	0.7621	0.0194	0.1103	0.4563
Std. Dev.	0.2280	0.2894	0.3536	0.2177	0.2408	0.2890
Skewness	-0.2731	-0.8312	-0.5474	2.3546	1.3069	0.0019
Kurtosis	2.6153	2.5624	1.6803	8.4634	4.2257	1.8151

Table 5. Descriptive Statistics 2003

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6524	0.3705	0.6265	0.1233	0.4370	0.2228
Median	0.7107	0.3708	0.7619	0.0200	0.3746	0.1178
Std. Dev.	0.2775	0.2272	0.3497	0.2180	0.2911	0.2438
Skewness	-0.9351	-0.2769	-0.5506	2.3427	0.2454	1.1852
Kurtosis	2.8904	2.6021	1.7065	8.3971	2.0266	3.8590

Table 6. Descriptive Statistics 2004

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6440	0.3731	0.6350	0.2573	0.1232	0.3505
Median	0.7031	0.3629	0.7907	0.1468	0.0194	0.3369
Std. Dev.	0.2714	0.2259	0.3443	0.2715	0.2173	0.2356
Skewness	-0.9259	-0.2403	-0.5661	0.9656	2.3472	0.3009
Kurtosis	2.8367	2.6260	1.7050	2.9129	8.4539	2.6565

Table 7. Descriptive Statistics 2005

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6519	0.3817	0.6537	0.1240	0.3085	0.3628
Median	0.7149	0.3734	0.8111	0.0207	0.1824	0.3358
Std. Dev.	0.2779	0.2252	0.3395	0.2182	0.3135	0.2420
Skewness	-0.9851	-0.2481	-0.6256	2.3301	0.7837	0.2284
Kurtosis	2.9736	2.6515	1.7603	8.3420	2.2829	2.3743

Table 8. Descriptive Statistics 2006

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6562	0.3902	0.6649	0.1252	0.3111	0.3465
Median	0.7009	0.3827	0.8284	0.0199	0.1850	0.3851
Std. Dev.	0.2637	0.2240	0.3362	0.2185	0.3180	0.2449
Skewness	-1.0286	-0.2427	-0.6619	2.3099	0.8207	0.2965
Kurtosis	3.1064	2.6966	1.8081	8.2387	2.3577	2.3957

Table 9. Descriptive Statistics 2007

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6593	0.3979	0.6683	0.1287	0.3142	0.3677
Median	0.7133	0.3899	0.8182	0.0224	0.1887	0.4048
Std. Dev.	0.2646	0.2219	0.3255	0.2193	0.3212	0.2582
Skewness	-1.0310	-0.2293	-0.6628	2.2536	0.7905	0.3754
Kurtosis	3.1357	2.7352	1.8602	7.9803	2.2598	2.4289

Table 10. Descriptive Statistics 2008

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6531	0.4076	0.6833	0.1351	0.2560	0.3641
Median	0.7082	0.4009	0.8234	0.0230	0.1418	0.3710
Std. Dev.	0.2701	0.2222	0.3154	0.2305	0.2689	0.2678
Skewness	-0.9662	-0.2126	-0.6946	2.1048	0.9771	0.3701
Kurtosis	2.9543	2.7683	2.0020	6.8927	2.9070	2.3516

Table 11. Descriptive Statistics 2009

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6727	0.4252	0.6729	0.1385	0.2773	0.3745
Median	0.7157	0.4167	0.8176	0.0230	0.1297	0.3508
Std. Dev.	0.2767	0.2235	0.3179	0.2390	0.3028	0.2661
Skewness	-1.0336	-0.2293	-0.6622	2.1121	0.9691	0.3691
Kurtosis	3.0112	2.7977	1.9232	6.7511	2.7149	2.2869

Table 12. Descriptive Statistics 2010

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6813	0.4361	0.6741	0.1324	0.2823	0.3519
Median	0.7383	0.4288	0.8226	0.0215	0.1317	0.3170
Std. Dev.	0.2872	0.2250	0.3140	0.2383	0.3118	0.2575
Skewness	-1.0215	-0.2386	-0.6743	2.3160	0.9745	0.4644
Kurtosis	2.9968	2.7882	1.9757	7.7867	2.5914	2.4310

Table 13. Descriptive Statistics 2011

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6838	0.4484	0.6894	0.1350	0.2747	0.3889
Median	0.7391	0.4337	0.8447	0.0217	0.1410	0.3806
Std. Dev.	0.2791	0.2307	0.3097	0.2412	0.2940	0.2568
Skewness	-1.0706	-0.1934	-0.7102	2.2452	0.9513	0.1628
Kurtosis	3.1539	2.6837	2.0418	7.3877	2.6411	2.3277

Table 14. Descriptive Statistics 2012

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6565	0.4523	0.6862	0.1356	0.2653	0.4084
Median	0.7223	0.4397	0.8363	0.0221	0.1351	0.4265
Std. Dev.	0.2742	0.2275	0.3089	0.2411	0.2959	0.2623
Skewness	-1.0428	-0.2146	-0.6918	2.2419	1.0960	0.0917
Kurtosis	3.1126	2.7658	2.0167	7.3863	2.8951	2.2298

Table 15. Descriptive Statistics 2013

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6591	0.4597	0.6840	0.1360	0.2628	0.3948
Median	0.7277	0.4462	0.8290	0.0221	0.1339	0.3956
Std. Dev.	0.2720	0.2280	0.3079	0.2412	0.2868	0.2673
Skewness	-1.0119	-0.2150	-0.7031	2.2317	1.0179	0.1374
Kurtosis	3.0933	2.7682	2.0366	7.3391	2.8129	2.2043

Table 16. Descriptive Statistics 2014

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.4694	0.6417	0.6729	0.1357	0.4090	0.2476
Median	0.4565	0.7076	0.8156	0.0205	0.3928	0.1228
Std. Dev.	0.2307	0.2808	0.3155	0.2403	0.2682	0.2811
Skewness	-0.2150	-0.9418	-0.6499	2.2383	0.5362	1.1753
Kurtosis	2.7453	2.9371	1.9478	7.4033	2.6384	3.2963

Table 17. Descriptive Statistics 2015

	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Mean	0.6218	0.4772	0.6498	0.1342	0.1576	0.4277
Median	0.6916	0.4636	0.7822	0.0220	0.0584	0.4490
Std. Dev.	0.2759	0.2339	0.3163	0.2398	0.2251	0.2514
Skewness	-0.9687	-0.1715	-0.5968	2.2535	2.0736	0.3108
Kurtosis	3.0378	2.7528	1.8708	7.4669	7.1804	2.5218

Moreover, correlation between at least some of the variables within the dataset is needed to construct a precise Principal Component Analysis. The use of the PCA becomes unsuitable if there is no correlation between any of the variables, meaning that there is already a set of uncorrelated axes. Hence, the 6 x 6 correlation matrix was calculated to conduct PCA following the scaling process of the related indicators. As seen in the tables between 18 and 31, the correlation coefficients among indicators are strong enough for the implementation of Principal Component Analysis.

Table 18. Correlation matrix 2002

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.454553	1				
Υ_3	0.368575	0.604891	1			
Υ_4	0.121126	0.21691	-0.24768	1		
Υ_5	-0.36143	-0.54024	-0.69939	0.312073	1	
Υ_6	0.786625	0.290383	0.39301	0.041868	-0.3016	1

Table 19. Correlation matrix 2003

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.486954	1				
Υ_3	0.39405	0.584519	1			
Υ_4	0.075214	0.207867	-0.25943	1		
Υ_5	-0.39116	-0.53501	-0.71787	0.3783	1	
Υ_6	0.718908	0.161235	0.27658	0.063906	-0.17633	1

Table 20. Correlation matrix 2004

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.486954	1				
Υ_3	0.39405	0.584519	1			
Υ_4	0.075214	0.207867	-0.25943	1		
Υ_5	-0.39116	-0.53501	-0.71787	0.3783	1	
Υ_6	0.718908	0.161235	0.27658	0.063906	-0.17633	1

Table 21. Correlation matrix 2005

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.462723	1				
Υ_3	0.353457	0.596348	1			
Υ_4	0.074738	0.219587	-0.25046	1		
Υ_5	-0.41377	-0.57223	-0.74026	0.351172	1	
Υ_6	0.709206	0.127461	0.224576	-0.01546	-0.18529	1

Table 22. Correlation matrix 2006

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.455693	1				
Υ_3	0.366517	0.593664	1			
Υ_4	0.047219	0.217944	-0.25291	1		
Υ_5	-0.43296	-0.57501	-0.72327	0.351856	1	
Υ_6	0.738094	0.170101	0.27186	-0.042	-0.2096	1

Table 23. Correlation matrix 2007

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.453309	1				
Υ_3	0.374847	0.581128	1			
Υ_4	0.040165	0.212344	-0.27065	1		
Υ_5	-0.43606	-0.58033	-0.73467	0.346221	1	
Υ_6	0.694053	0.126908	0.22711	-0.02561	-0.14295	1

Table 24. Correlation matrix 2008

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.443584	1				
Υ_3	0.320853	0.570961	1			
Υ_4	0.012937	0.208093	-0.29626	1		
Υ_5	-0.44264	-0.56307	-0.71883	0.284007	1	
Υ_6	0.688262	0.140322	0.19309	-0.03826	-0.23547	1

Table 25. Correlation matrix 2009

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.408711	1				
Υ_3	0.301502	0.522827	1			
Υ_4	-0.00532	0.199694	-0.30152	1		
Υ_5	-0.37741	-0.55405	-0.67778	0.267526	1	
Υ_6	0.648457	0.100298	0.202508	-0.0639	-0.14779	1

Table 26. Correlation matrix 2010

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.410337	1				
Υ_3	0.271998	0.491725	1			
Υ_4	-0.0358	0.189081	-0.28836	1		
Υ_5	-0.37022	-0.57133	-0.65123	0.215658	1	
Υ_6	0.700763	0.116021	0.204191	-0.08915	-0.15402	1

Table 27. Correlation matrix 2011

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.425981	1				
Υ_3	0.293847	0.478449	1			
Υ_4	-0.0687	0.187832	-0.30291	1		
Υ_5	-0.40334	-0.57915	-0.66084	0.266964	1	
Υ_6	0.778824	0.195581	0.252745	-0.0874	-0.24383	1

Table 28. Correlation matrix 2012

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.420811	1				
Υ_3	0.295422	0.482157	1			
Υ_4	-0.05678	0.19831	-0.29674	1		
Υ_5	-0.34046	-0.53354	-0.62631	0.306666	1	
Υ_6	0.796305	0.239845	0.244672	-0.06901	-0.1184	1

Table 29. Correlation matrix 2013

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.409264	1				
Υ_3	0.29215	0.473932	1			
Υ_4	-0.05912	0.198107	-0.30064	1		
Υ_5	-0.35931	-0.53253	-0.64999	0.330715	1	
Υ_6	0.798712	0.224485	0.20394	-0.08089	-0.18537	1

Table 30. Correlation matrix 2014

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.430732	1				
Υ_3	0.294637	0.456788	1			
Υ_4	-0.03993	0.197511	-0.30346	1		
Υ_5	-0.3381	-0.50921	-0.61644	0.326261	1	
Υ_6	0.782253	0.253234	0.221906	-0.05914	-0.25503	1

Table 31. Correlation matrix 2015

Indicators	Υ_1	Υ_2	Υ_3	Υ_4	Υ_5	Υ_6
Υ_1	1					
Υ_2	0.44685	1				
Υ_3	0.329632	0.474029	1			
Υ_4	-0.05183	0.186308	-0.30346	1		
Υ_5	-0.32046	-0.39477	-0.54706	0.367716	1	
Υ_6	0.807989	0.280626	0.253501	-0.0938	-0.30775	1

Along with the correlation matrices, the data were considered to be suitable for the Principal Component Analysis. Accordingly, eigenvalues and eigenvectors were calculated to obtain principal components, and are illustrated in the tables from 32 to 45. Since eigenvectors and eigenvalues are always estimated in pairs, it means that each eigenvector has its corresponding eigenvalue. Theoretically, eigenvectors specify a direction, while eigenvalues indicate the amount of the variation related to that direction. Thus, the eigenvector with the highest eigenvalue indicates the direction with the greatest variation. As a result, since the significance of the contribution per each vector to the total variance is high, all the eigenvectors were involved in the calculation process of the OCI.

Table 32. Eigenvalues & Eigenvectors 2002

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.928	0.488	0.488	Υ_1	0.446	0.376	-0.341	-0.317	0.301	0.593
λ_2	1.380	0.230	0.718	Υ_2	0.439	0.099	0.573	-0.049	0.568	-0.379
λ_3	0.952	0.159	0.877	Υ_3	0.478	-0.298	0.166	0.694	-0.170	0.382
λ_4	0.316	0.053	0.929	Υ_4	-0.048	0.715	0.482	0.036	-0.486	0.126
λ_5	0.267	0.045	0.974	Υ_5	-0.453	0.376	-0.139	0.595	0.524	0.074
λ_6	0.157	0.026	1.000	Υ_6	0.415	0.327	-0.526	0.247	-0.214	-0.581

Table 33. Eigenvalues & Eigenvectors 2003

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.816	0.469	0.469	Υ_1	0.459	0.381	-0.250	-0.478	0.154	0.574
λ_2	1.432	0.239	0.708	Υ_2	0.442	0.093	0.577	-0.252	0.406	-0.484
λ_3	1.013	0.169	0.877	Υ_3	0.494	-0.263	0.121	0.704	0.217	0.360
λ_4	0.335	0.056	0.933	Υ_4	-0.088	0.663	0.525	0.255	-0.422	0.186
λ_5	0.242	0.040	0.973	Υ_5	-0.476	0.375	-0.073	0.214	0.759	0.075
λ_6	0.163	0.027	1.000	Υ_6	0.339	0.444	-0.556	0.318	-0.099	-0.517

Table 34. Eigenvalues & Eigenvectors 2004

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.816	0.469	0.469	Υ_1	0.459	0.381	-0.250	-0.478	0.154	0.574
λ_2	1.432	0.239	0.708	Υ_2	0.442	0.093	0.577	-0.252	0.406	-0.484
λ_3	1.013	0.169	0.877	Υ_3	0.494	-0.263	0.121	0.704	0.217	0.360
λ_4	0.335	0.056	0.933	Υ_4	-0.088	0.663	0.525	0.255	-0.422	0.186
λ_5	0.242	0.040	0.973	Υ_5	-0.476	0.375	-0.073	0.214	0.759	0.075
λ_6	0.163	0.027	1.000	Υ_6	0.339	0.444	-0.556	0.318	-0.099	-0.517

Table 35. Eigenvalues & Eigenvectors 2005

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.804	0.467	0.467	Υ_1	0.447	0.434	-0.219	-0.449	0.024	0.601
λ_2	1.378	0.230	0.697	Υ_2	0.446	0.067	0.545	-0.213	0.568	-0.364
λ_3	1.109	0.185	0.882	Υ_3	0.492	-0.293	0.123	0.697	0.054	0.410
λ_4	0.321	0.054	0.935	Υ_4	-0.095	0.619	0.589	0.238	-0.451	0.035
λ_5	0.216	0.036	0.971	Υ_5	-0.497	0.343	-0.047	0.282	0.686	0.288
λ_6	0.172	0.029	1.000	Υ_6	0.320	0.469	-0.540	0.361	0.023	-0.505

Table 36. Eigenvalues & Eigenvectors 2006

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.857	0.476	0.476	Υ_1	0.452	0.410	-0.258	-0.406	-0.043	0.628
λ_2	1.330	0.222	0.698	Υ_2	0.437	0.100	0.550	-0.156	0.654	-0.211
λ_3	1.104	0.184	0.882	Υ_3	0.484	-0.286	0.155	0.719	-0.123	0.358
λ_4	0.331	0.055	0.937	Υ_4	-0.104	0.661	0.547	0.163	-0.472	-0.059
λ_5	0.216	0.036	0.973	Υ_5	-0.488	0.349	-0.098	0.398	0.572	0.380
λ_6	0.162	0.027	1.000	Υ_6	0.348	0.426	-0.546	0.331	0.069	-0.534

Table 37. Eigenvalues & Eigenvectors 2007

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.803	0.467	0.467	Υ_1	0.451	0.426	-0.211	-0.470	-0.145	0.574
λ_2	1.352	0.225	0.693	Υ_2	0.442	0.069	0.547	-0.112	0.689	-0.115
λ_3	1.116	0.186	0.879	Υ_3	0.495	-0.283	0.092	0.698	-0.186	0.380
λ_4	0.334	0.056	0.934	Υ_4	-0.112	0.605	0.606	0.181	-0.458	-0.107
λ_5	0.222	0.037	0.971	Υ_5	-0.499	0.340	-0.075	0.348	0.488	0.520
λ_6	0.172	0.029	1.000	Υ_6	0.308	0.502	-0.524	0.354	0.146	-0.481

Table 38. Eigenvalues & Eigenvectors 2008

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.780	0.463	0.463	Υ_1	0.448	0.429	-0.229	-0.494	0.145	0.546
λ_2	1.308	0.218	0.681	Υ_2	0.438	0.075	0.549	-0.180	0.487	-0.480
λ_3	1.120	0.187	0.868	Υ_3	0.480	-0.358	0.128	0.622	0.162	0.460
λ_4	0.323	0.054	0.922	Υ_4	-0.113	0.612	0.602	0.263	-0.375	0.202
λ_5	0.273	0.046	0.967	Υ_5	-0.506	0.280	-0.073	0.237	0.757	0.178
λ_6	0.196	0.033	1.000	Υ_6	0.329	0.479	-0.512	0.459	-0.049	-0.432

Table 39. Eigenvalues & Eigenvectors 2009

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.639	0.440	0.440	Υ_1	0.441	0.480	-0.151	-0.484	0.151	0.544
λ_2	1.298	0.216	0.656	Υ_2	0.440	0.009	0.552	-0.118	0.525	-0.461
λ_3	1.161	0.193	0.850	Υ_3	0.493	-0.336	0.020	0.653	0.114	0.452
λ_4	0.379	0.063	0.913	Υ_4	-0.133	0.499	0.689	0.265	-0.385	0.201
λ_5	0.296	0.049	0.962	Υ_5	-0.504	0.312	-0.083	0.297	0.723	0.173
λ_6	0.227	0.038	1.000	Υ_6	0.313	0.557	-0.437	0.409	-0.130	-0.466

Table 40. Eigenvalues & Eigenvectors 2010

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.626	0.438	0.438	Υ_1	0.452	0.504	-0.015	-0.353	0.067	0.642
λ_2	1.290	0.215	0.653	Υ_2	0.441	-0.157	0.510	-0.244	0.570	-0.369
λ_3	1.172	0.195	0.848	Υ_3	0.473	-0.366	-0.104	0.710	0.142	0.327
λ_4	0.395	0.066	0.914	Υ_4	-0.127	0.257	0.820	0.343	-0.333	0.130
λ_5	0.312	0.052	0.966	Υ_5	-0.496	0.341	-0.031	0.282	0.729	0.160
λ_6	0.204	0.034	1.000	Υ_6	0.340	0.636	-0.237	0.338	-0.087	-0.550

Table 41. Eigenvalues & Eigenvectors 2011

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.771	0.462	0.462	Υ_1	0.462	0.446	-0.216	-0.243	0.086	0.688
λ_2	1.260	0.210	0.672	Υ_2	0.420	0.039	0.572	-0.313	0.551	-0.307
λ_3	1.140	0.190	0.862	Υ_3	0.451	-0.398	0.079	0.747	0.152	0.225
λ_4	0.385	0.064	0.926	Υ_4	-0.143	0.540	0.658	0.341	-0.353	0.117
λ_5	0.279	0.047	0.973	Υ_5	-0.486	0.324	-0.155	0.309	0.730	0.085
λ_6	0.165	0.028	1.000	Υ_6	0.388	0.494	-0.404	0.271	-0.092	-0.601

Table 42. Eigenvalues & Eigenvectors 2012

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.682	0.447	0.447	Υ_1	0.470	0.434	-0.211	-0.257	-0.107	0.685
λ_2	1.359	0.227	0.674	Υ_2	0.432	0.042	0.566	-0.134	0.681	-0.093
λ_3	1.123	0.187	0.861	Υ_3	0.459	-0.358	0.068	0.772	-0.147	0.199
λ_4	0.409	0.068	0.929	Υ_4	-0.145	0.500	0.686	0.171	-0.478	-0.016
λ_5	0.275	0.046	0.975	Υ_5	-0.457	0.407	-0.147	0.501	0.524	0.280
λ_6	0.151	0.025	1.000	Υ_6	0.389	0.516	-0.371	0.201	-0.019	-0.636

Table 43. Eigenvalues & Eigenvectors 2013

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.702	0.450	0.450	Υ_1	0.466	0.443	-0.214	-0.131	-0.060	0.721
λ_2	1.353	0.226	0.676	Υ_2	0.420	0.057	0.584	-0.256	0.631	-0.128
λ_3	1.129	0.188	0.864	Υ_3	0.453	-0.379	0.111	0.791	-0.025	0.114
λ_4	0.377	0.063	0.927	Υ_4	-0.158	0.511	0.666	0.229	-0.467	-0.011
λ_5	0.270	0.045	0.972	Υ_5	-0.476	0.370	-0.119	0.460	0.616	0.179
λ_6	0.168	0.028	1.000	Υ_6	0.388	0.509	-0.379	0.168	-0.017	-0.647

Table 44. Eigenvalues & Eigenvectors 2014

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.703	0.451	0.451	Υ_1	0.468	0.394	-0.296	-0.037	0.207	-0.703
λ_2	1.342	0.224	0.674	Υ_2	0.421	0.154	0.575	-0.228	0.569	0.305
λ_3	1.069	0.178	0.853	Υ_3	0.442	-0.371	0.190	0.789	-0.073	-0.056
λ_4	0.395	0.066	0.918	Υ_4	-0.145	0.630	0.551	0.192	-0.475	-0.125
λ_5	0.302	0.050	0.969	Υ_5	-0.468	0.345	-0.174	0.528	0.586	0.101
λ_6	0.188	0.031	1.000	Υ_6	0.410	0.409	-0.461	0.094	-0.242	0.620

Table 45. Eigenvalues & Eigenvectors 2015

Eigenvalues	Value	Proportion	Cumulative Proportion	Eigenvectors	F_1	F_2	F_3	F_4	F_5	F_6
λ_1	2.719	0.453	0.453	Υ_1	0.483	0.344	-0.335	0.094	-0.122	-0.716
λ_2	1.322	0.220	0.674	Υ_2	0.401	0.263	0.575	-0.005	-0.621	0.233
λ_3	1.017	0.170	0.843	Υ_3	0.437	-0.301	0.338	0.625	0.462	-0.005
λ_4	0.447	0.075	0.918	Υ_4	-0.166	0.706	0.398	-0.156	0.536	-0.071
λ_5	0.328	0.055	0.972	Υ_5	-0.436	0.362	-0.169	0.759	-0.253	0.102
λ_6	0.167	0.028	1.000	Υ_6	0.444	0.304	-0.505	-0.026	0.190	0.647

Hence, as displayed in Tables 46 and 47, this study includes the calculations of the Oil Curse Index for the selected 41 countries, as well as the OCI scores themselves. Higher scores represent a higher tendency to Oil Curse.

The ranking of the selected countries is shown in Figure 5 for the years between 2002 and 2015. Moreover, Figure 6 illustrates how a selected country's OCI ranking changed over the years due to the oil export policies that may affect its standings in the ranking.

Table 46. OCI scores from 2002 to 2008

	2002	2003	2004	2005	2006	2007	2008
1	Iraq [0.821]	Iraq [0.838]	Iraq [0.818]	Iraq [0.794]	Iraq [0.792]	Iraq [0.778]	Saudi Arabia [0.702]
2	Saudi Arabia [0.681]	Saudi Arabia [0.667]	Saudi Arabia [0.713]	Saudi Arabia [0.743]	Saudi Arabia [0.747]	Saudi Arabia [0.764]	Sudan [0.683]
3	Congo, Rep. [0.643]	Kuwait [0.599]	Kuwait [0.622]	Kuwait [0.659]	Kuwait [0.648]	Kuwait [0.650]	Iraq [0.664]
4	Kuwait [0.623]	Congo, Rep. [0.573]	Congo, Rep. [0.593]	Congo, Rep. [0.626]	Congo, Rep. [0.637]	Congo, Rep. [0.626]	Kuwait [0.577]
5	Angola [0.612]	Libya [0.567]	Libya [0.580]	Angola [0.617]	Libya [0.615]	Libya [0.602]	Congo, Rep. [0.521]
6	Libya [0.600]	Yemen [0.566]	Angola [0.573]	Libya [0.589]	Angola [0.578]	Angola [0.600]	Yemen [0.511]
7	Yemen [0.568]	Angola [0.544]	Yemen [0.551]	Yemen [0.572]	Yemen [0.565]	Yemen [0.562]	Angola [0.501]
8	Iran [0.536]	Iran [0.521]	Iran [0.509]	Iran [0.533]	Azerbaijan [0.541]	Iran [0.528]	Libya [0.499]
9	Azerbaijan [0.524]	Azerbaijan [0.505]	Azerbaijan [0.488]	Azerbaijan [0.513]	Iran [0.537]	Azerbaijan [0.518]	Venezuela [0.486]
10	Gabon [0.474]	Oman [0.468]	Oman [0.481]	Gabon [0.504]	Gabon [0.498]	Gabon [0.508]	Iran [0.483]
11	Nigeria [0.472]	Nigeria [0.459]	Nigeria [0.459]	Oman [0.500]	Oman [0.492]	Oman [0.489]	Gabon [0.457]
12	Qatar [0.469]	Qatar [0.456]	Qatar [0.458]	Qatar [0.496]	Qatar [0.474]	Nigeria [0.487]	United Arab Emirates [0.443]
13	Oman [0.466]	Venezuela [0.453]	Gabon [0.457]	Nigeria [0.475]	Nigeria [0.468]	Sudan [0.480]	Nigeria [0.429]
14	Sudan [0.457]	Algeria [0.448]	United Arab Emirates [0.457]	United Arab Emirates [0.468]	United Arab Emirates [0.450]	Qatar [0.458]	Azerbaijan [0.426]
15	Venezuela [0.452]	Sudan [0.446]	Venezuela [0.449]	Venezuela [0.451]	Venezuela [0.442]	United Arab Emirates [0.458]	Oman [0.418]
16	United Arab Emirates [0.444]	United Arab Emirates [0.433]	Sudan [0.421]	Sudan [0.432]	Sudan [0.437]	Algeria [0.442]	Qatar [0.413]
17	Algeria [0.443]	Gabon [0.404]	Algeria [0.418]	Algeria [0.419]	Algeria [0.428]	Venezuela [0.442]	Algeria [0.400]
18	Ecuador [0.376]	Ecuador [0.379]	Ecuador [0.382]	Ecuador [0.387]	Ecuador [0.382]	Ecuador [0.388]	Ecuador [0.361]
19	Russian Federation [0.370]	Russian Federation [0.377]	Russian Federation [0.367]	Russian Federation [0.366]	Trinidad & Tobago [0.355]	Russian Federation [0.335]	Trinidad & Tobago [0.314]
20	Trinidad & Tobago [0.349]	Trinidad & Tobago [0.347]	Kazakhstan [0.352]	Kazakhstan [0.359]	Kazakhstan [0.335]	Trinidad & Tobago [0.329]	Russian Federation [0.306]
21	Kazakhstan [0.338]	Kazakhstan [0.333]	Trinidad & Tobago [0.321]	Trinidad & Tobago [0.352]	Russian Federation [0.334]	Kazakhstan [0.329]	Canada [0.302]
22	Peru [0.324]	Colombia [0.333]	Peru [0.298]	Egypt [0.292]	Egypt [0.293]	Egypt [0.292]	Kazakhstan [0.291]
23	Colombia [0.324]	Peru [0.324]	Colombia [0.295]	Peru [0.291]	Peru [0.283]	Canada [0.284]	Peru [0.282]
24	Argentina [0.273]	Egypt [0.282]	Egypt [0.284]	Colombia [0.289]	Norway [0.273]	Peru [0.283]	Colombia [0.280]
25	Canada [0.272]	Canada [0.270]	Canada [0.271]	Canada [0.286]	Colombia [0.273]	Norway [0.267]	Norway [0.256]

26	Egypt [0.271]	Norway [0.265]	Norway [0.270]	Norway [0.279]	Canada [0.270]	Colombia [0.266]	Egypt [0.233]
27	Norway [0.254]	Argentina [0.241]	Argentina [0.233]	Argentina [0.197]	Indonesia [0.184]	Indonesia [0.193]	Australia [0.202]
28	Indonesia [0.221]	Indonesia [0.231]	Indonesia [0.204]	Australia [0.193]	Argentina [0.183]	Tunisia [0.187]	Indonesia [0.188]
29	Tunisia [0.188]	Australia [0.186]	Australia [0.186]	Indonesia [0.193]	Australia [0.182]	Australia [0.186]	Argentina [0.179]
30	Australia [0.181]	Tunisia [0.165]	Tunisia [0.172]	Tunisia [0.169]	Tunisia [0.167]	Argentina [0.183]	Tunisia [0.166]
31	India [0.142]	Denmark [0.137]	Denmark [0.143]	Denmark [0.151]	Denmark [0.152]	Malaysia [0.148]	Malaysia [0.166]
32	Malaysia [0.128]	India [0.132]	Malaysia [0.136]	Malaysia [0.125]	Malaysia [0.137]	Denmark [0.147]	Denmark [0.153]
33	Denmark [0.126]	Malaysia [0.129]	Thailand [0.122]	Thailand [0.124]	Thailand [0.128]	Thailand [0.136]	Thailand [0.141]
34	Brazil [0.117]	Brazil [0.121]	Brazil [0.118]	Brazil [0.111]	Brazil [0.109]	Brazil [0.128]	Brazil [0.130]
35	Romania [0.103]	Thailand [0.114]	India [0.108]	India [0.098]	India [0.107]	Mexico [0.126]	India [0.118]
36	Thailand [0.093]	Romania [0.095]	Romania [0.100]	Romania [0.098]	Mexico [0.104]	India [0.121]	Mexico [0.115]
37	Mexico [0.089]	Mexico [0.083]	Mexico [0.080]	Mexico [0.096]	Romania [0.095]	Romania [0.094]	Romania [0.092]
38	United Kingdom [0.074]	United Kingdom [0.079]	United Kingdom [0.075]	United Kingdom [0.083]	United Kingdom [0.049]	United Kingdom [0.068]	United Kingdom [0.081]
39	United States [0.052]	United States [0.037]	United States [0.041]	United States [0.036]	China [0.003]	United States [0.025]	United States [0.025]
40	China [0.041]	China [0.031]	China [0.005]	China [0.002]	United States [0.001]	China [0.008]	China [-0.004]
41	Italy [-0.001]	Italy [0.006]	Italy [0.003]	Italy [-0.003]	Italy [-0.005]	Italy [0.005]	Italy [-0.004]

Table 47. OCI scores from 2009 to 2015

	2009	2010	2011	2012	2013	2014	2015
1	Saudi Arabia [0.728]	Saudi Arabia [0.694]	Sudan [0.690]	Iraq [0.760]	Saudi Arabia [0.734]	Iraq [0.767]	Libya [0.789]
2	Iraq [0.701]	Iraq [0.687]	Saudi Arabia [0.687]	Saudi Arabia [0.751]	Iraq [0.733]	Libya [0.755]	Iraq [0.711]
3	Sudan [0.694]	Sudan [0.680]	Iraq [0.676]	Libya [0.688]	Libya [0.685]	Saudi Arabia [0.693]	Kuwait [0.621]
4	Kuwait [0.611]	Venezuela [0.630]	Kuwait [0.613]	Kuwait [0.684]	Kuwait [0.667]	Kuwait [0.687]	Saudi Arabia [0.608]
5	Libya [0.570]	Kuwait [0.573]	Venezuela [0.606]	Venezuela [0.637]	Venezuela [0.630]	Sudan [0.581]	Venezuela [0.576]
6	Yemen [0.525]	Libya [0.546]	Libya [0.586]	Congo, Rep. [0.623]	Sudan [0.548]	Venezuela [0.549]	Sudan [0.510]
7	Venezuela [0.523]	Iran [0.531]	Congo, Rep. [0.535]	Angola [0.531]	Congo, Rep. [0.539]	Congo, Rep. [0.508]	Yemen [0.485]
8	Iran [0.516]	Yemen [0.517]	Iran [0.498]	Yemen [0.528]	Iran [0.536]	Iran [0.503]	Iran [0.473]
9	Congo, Rep. [0.494]	Congo, Rep. [0.485]	Yemen [0.488]	Iran [0.525]	Oman [0.487]	Yemen [0.487]	Congo, Rep. [0.466]
10	Angola [0.463]	Angola [0.452]	Oman [0.459]	Gabon [0.516]	Yemen [0.486]	Oman [0.484]	Azerbaijan [0.442]
11	Gabon [0.462]	Nigeria [0.434]	Angola [0.458]	Oman [0.503]	Angola [0.478]	Gabon [0.469]	Gabon [0.436]
12	Oman [0.455]	Gabon [0.427]	Gabon [0.443]	Azerbaijan [0.491]	Gabon [0.471]	Angola [0.451]	Oman [0.424]
13	Azerbaijan [0.444]	Algeria [0.419]	United Arab Emirates [0.436]	Sudan [0.479]	United Arab Emirates [0.448]	United Arab Emirates [0.447]	United Arab Emirates [0.415]
14	United Arab Emirates [0.442]	Azerbaijan [0.416]	Azerbaijan [0.431]	Nigeria [0.463]	Azerbaijan [0.435]	Azerbaijan [0.437]	Algeria [0.414]
15	Nigeria [0.441]	Oman [0.415]	Algeria [0.412]	Algeria [0.461]	Algeria [0.430]	Algeria [0.426]	Angola [0.400]
16	Qatar [0.437]	United Arab Emirates [0.411]	Qatar [0.405]	United Arab Emirates [0.459]	Nigeria [0.424]	Qatar [0.415]	Nigeria [0.393]
17	Algeria [0.422]	Qatar [0.389]	Nigeria [0.402]	Qatar [0.415]	Qatar [0.395]	Nigeria [0.402]	Qatar [0.386]
18	Ecuador [0.346]	Russian Federation [0.367]	Ecuador [0.354]	Ecuador [0.388]	Kazakhstan [0.357]	Russian Federation [0.344]	Ecuador [0.348]
19	Russian Federation [0.345]	Ecuador [0.338]	Kazakhstan [0.335]	Kazakhstan [0.384]	Ecuador [0.347]	Kazakhstan [0.340]	Russian Federation [0.338]
20	Trinidad & Tobago [0.345]	Colombia [0.312]	Russian Federation [0.333]	Russian Federation [0.371]	Russian Federation [0.344]	Ecuador [0.337]	Kazakhstan [0.333]
21	Kazakhstan [0.308]	Peru [0.303]	Colombia [0.297]	Colombia [0.343]	Colombia [0.316]	Colombia [0.308]	Colombia [0.314]
22	Canada [0.299]	Canada [0.300]	Canada [0.286]	Egypt [0.316]	Egypt [0.300]	Egypt [0.295]	Trinidad & Tobago [0.309]
23	Peru [0.298]	Kazakhstan [0.294]	Peru [0.278]	Peru [0.315]	Trinidad & Tobago [0.290]	Trinidad & Tobago [0.282]	Peru [0.301]

24	Colombia [0.293]	Trinidad & Tobago [0.286]	Trinidad & Tobago [0.272]	Trinidad & Tobago [0.296]	Peru [0.289]	Peru [0.273]	Egypt [0.296]
25	Norway [0.246]	Egypt [0.255]	Egypt [0.263]	Canada [0.272]	Canada [0.280]	Canada [0.256]	Tunisia [0.293]
26	Egypt [0.234]	Norway [0.215]	Norway [0.251]	Tunisia [0.262]	Tunisia [0.251]	Norway [0.254]	Norway [0.267]
27	Australia [0.205]	Indonesia [0.205]	Australia [0.205]	Norway [0.244]	Norway [0.233]	Tunisia [0.247]	Canada [0.249]
28	Argentina [0.194]	Thailand [0.193]	Tunisia [0.196]	Indonesia [0.215]	Thailand [0.190]	Argentina [0.193]	Argentina [0.222]
29	Tunisia [0.174]	Argentina [0.188]	Indonesia [0.181]	Thailand [0.205]	Indonesia [0.187]	Australia [0.188]	Australia [0.219]
30	Indonesia [0.173]	Australia [0.188]	Argentina [0.161]	Argentina [0.201]	Argentina [0.185]	Indonesia [0.178]	Indonesia [0.203]
31	Thailand [0.164]	Tunisia [0.175]	Denmark [0.156]	Malaysia [0.194]	Malaysia [0.179]	Malaysia [0.173]	Denmark [0.199]
32	Denmark [0.154]	India [0.166]	Thailand [0.155]	Australia [0.191]	Australia [0.179]	Thailand [0.166]	Thailand [0.196]
33	Malaysia [0.148]	Brazil [0.155]	Brazil [0.154]	India [0.182]	Brazil [0.171]	Denmark [0.162]	Malaysia [0.183]
34	India [0.131]	Malaysia [0.149]	Malaysia [0.149]	Brazil [0.173]	India [0.163]	Brazil [0.159]	Brazil [0.178]
35	Brazil [0.130]	Mexico [0.144]	India [0.134]	Mexico [0.170]	Denmark [0.159]	India [0.147]	Romania [0.172]
36	Mexico [0.120]	Denmark [0.137]	Mexico [0.122]	Denmark [0.164]	Mexico [0.148]	Mexico [0.145]	India [0.147]
37	United Kingdom [0.107]	Romania [0.102]	United Kingdom [0.104]	Romania [0.142]	Romania [0.127]	Romania [0.142]	Mexico [0.139]
38	Romania [0.093]	United Kingdom [0.093]	Romania [0.096]	United Kingdom [0.110]	United Kingdom [0.095]	United Kingdom [0.098]	United Kingdom [0.106]
39	United States [0.055]	United States [0.075]	United States [0.060]	United States [0.083]	United States [0.080]	United States [0.089]	United States [0.074]
40	Italy [0.021]	China [0.060]	China [0.016]	China [0.069]	China [0.053]	China [0.049]	Italy [0.064]
41	China [0.013]	Italy [0.027]	Italy [0.008]	Italy [0.045]	Italy [0.033]	Italy [0.039]	China [0.051]

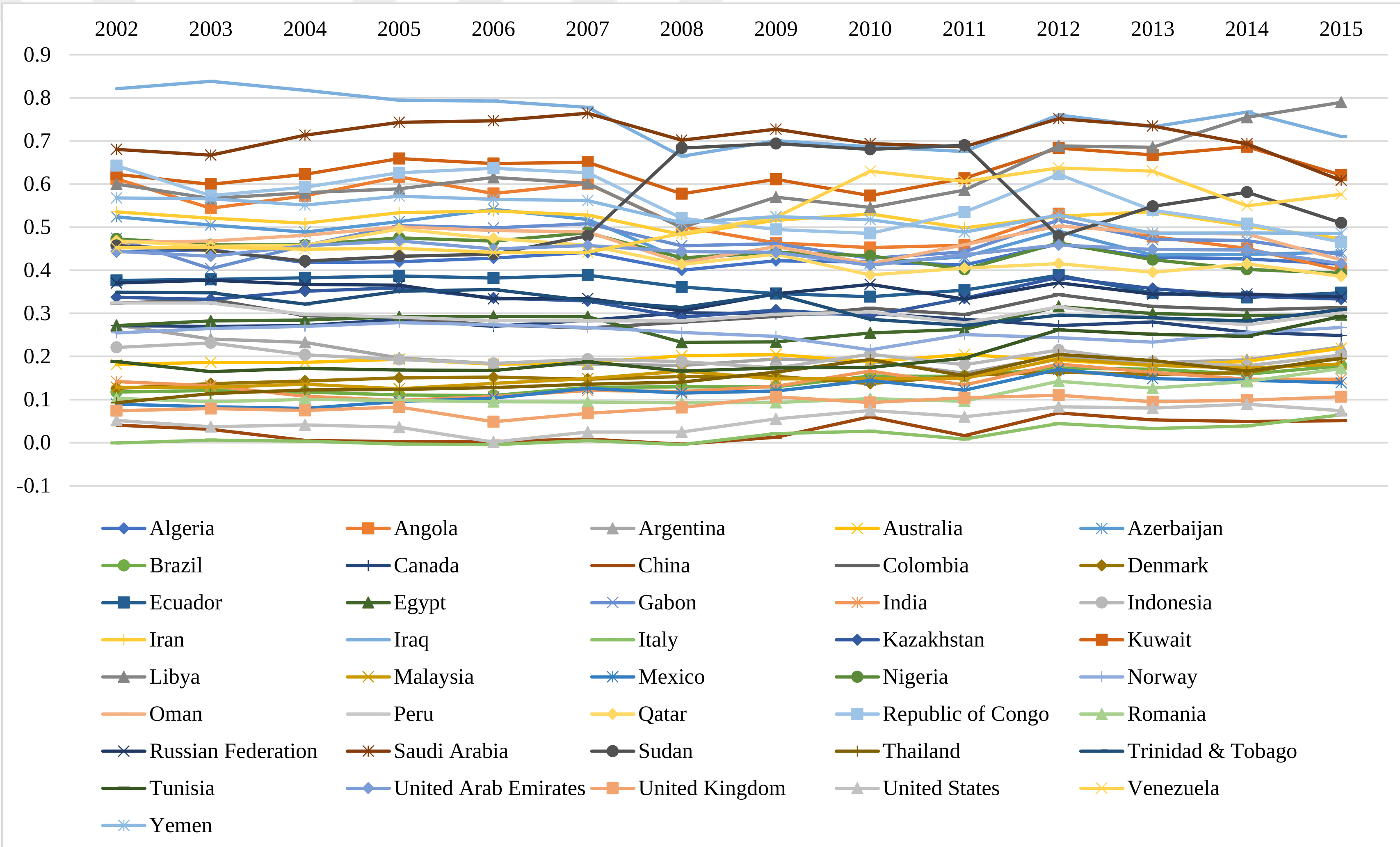

Figure 5. Ranks of the selected countries from 2002 to 2015

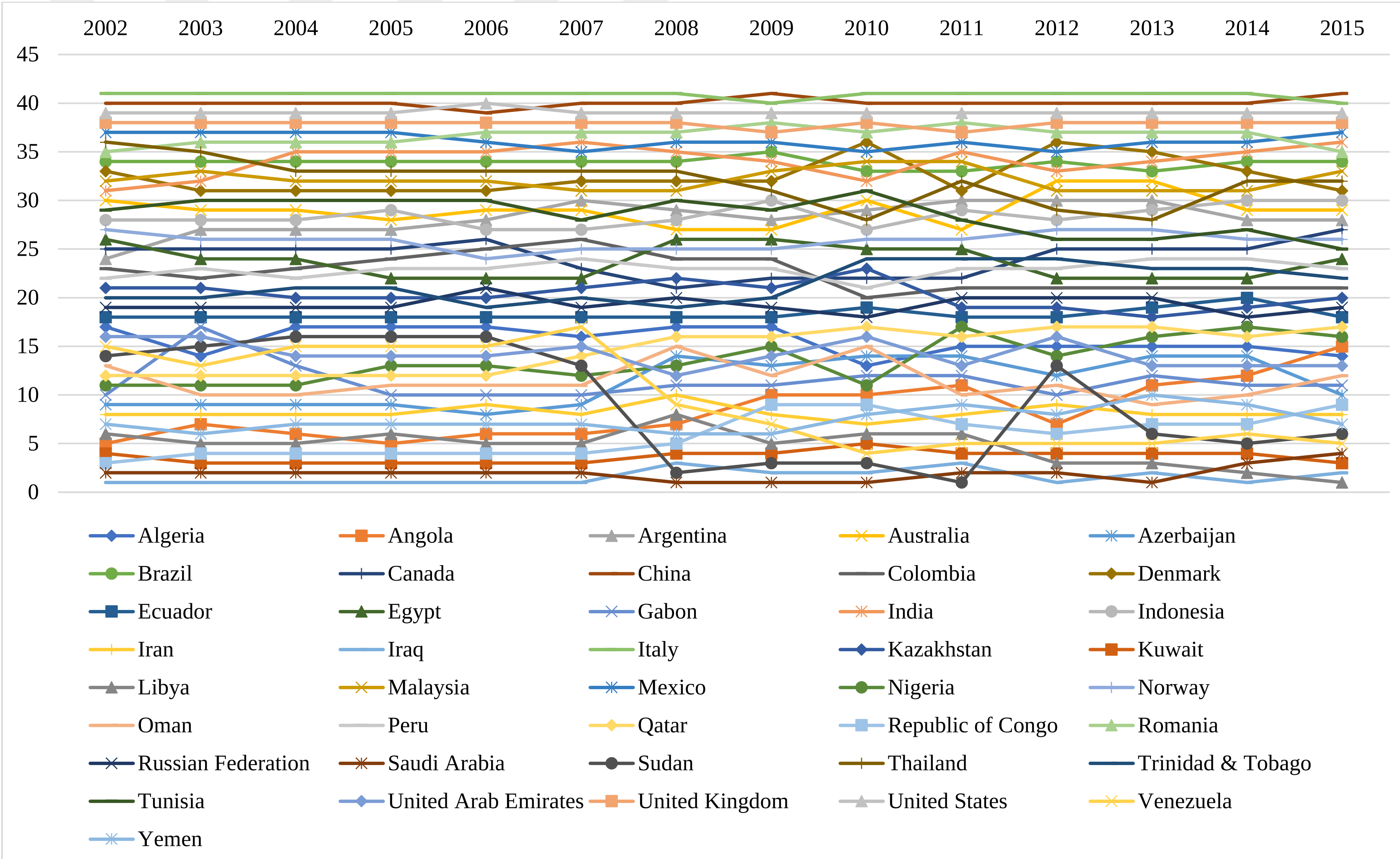

Figure 6. Changes in the ranking of the selected countries from 2002 to 2015

4.5.Discussion of the Results

The countries that are listed in the Tables 46 and 47 as the top-15 of the ranking with the higher values of OCI for the aforementioned time period from 2002 to 2015 are seen to have a higher tendency in terms of Oil Curse - namely Iraq, Saudi Arabia, Republic of Congo, Kuwait, Libya, Yemen, Iran, Azerbaijan, Gabon, Oman, Sudan, Venezuela, Algeria, Nigeria, and Angola. Having a higher tendency to the Oil Curse, these countries face severe problems in several areas. This fact is also observed in the data of the six indicators that construct the OCI: They lack political stability and have higher levels of corruption, as well as rent-seeking.

As the worst case, for example, Iraq was a predatory autocracy before the invasion of the US in 2003 (Looney, 2004). According to Looney (2004), along with the lacking transparency, the economic implication of this autocratic government is counted as high procyclical expenditure and high government consumption through corruption, as well as patronage. He also considers that the rent-seeking behavior of the Iraqi government causes slowing growth rates, and poverty becomes inevitable despite the abundance of oil-proved reserves. The citizens of Iraq also suffer from social inequalities especially in terms of health and education, as well as an increasing level of unemployment. In addition to all, wars and conflicts fueled by these factors led Iraq to suffer more besides the natural resource abundance.

Starting in late 2010 with the Tunisian uprising and followed in 2011 by Egypt, Syria, Libya, and Yemen, an unraveling of the Arab autocracy, i.e., the so-called Arab Spring, led the dynamics to be changed in this region. The Arab Spring mainly increases fragility and vulnerability to unanticipated shocks for the autocratic regimes (Campante and Chor, 2012). Moreover, the economic trend became downward since social support decreased sharply, and also the view of the political systems has changed as the perception of corruption increased (Cammett et al., 2013). According to Ross (2011), the primary motivation behind this rebellion movement was the difference in terms of citizen's freedom and autocratic governance between the countries with little or no oil - Egypt, Jordan, Lebanon, Morocco, and Tunisia - and states with lots of oil - Bahrain, Iraq, Kuwait, Libya, and Saudi Arabia. Libya was the one that the Arab Spring seriously threatened this oil-funded country. As a result of the harmful effects of the Oil Curse, such as authoritarianism, corruption, and economic instability, as well as violent conflicts, these countries also evidenced a downward trend in the OCI. For instance, Libya jumped to the first ranking in the OCI as of the end of 2015, with a sharp increase in 2011 from the sixth rank.

Similarly, Sudan is seen that it lost the seven rank, from 13 to 6, after the year of 2012. Kuwait, Iran and Yemen were comparatively stable from 2002 through 2015 in the ranking with much lower upward and downward shifts - 1st or 2nd ranks. Algeria was ranked as the least affected country from Arab Spring among others in the region since its ranking changed between 14 and 17 during the same period.

As one of the leading countries of the region, Saudi Arabia - the world's largest oil producer and exporter - was observed among the three most prone countries to the Oil Curse between 2002 and 2015. Since the economy of Saudi Arabia relied on oil revenues as the primary source of national income, it can be claimed that the price of oil has a direct effect on the Saudi economy (Albassam, 2011; Aldukheil, 2013; Ramady and Saee, 2007). Looking historically at the economic growth trend of the country, it is seen that economic booms were caused by the increasing oil prices, and nothing else. Here it should be highlighted that Saudi Arabia lacks economic diversification as a tool for better governance like the Dutch Disease phenomenon of the Resource Curse also implies (Albassam, 2015). Moreover, increasing corruption and unemployment, as well as lowering institutional quality accompanied by lack of support to the non-oil sectors, led Saudi Arabia to suffer more from Oil Curse Index, also evidenced in its OCI ranking.

The analysis of the OCI of the selected countries also points out several countries experiencing short-term or long-term shifts in rank between 2005 and 2015. As an OPEC country, Venezuela, which suffered from the Oil Curse especially after 2008, needs special attention in that case. The case of Venezuela shows that a strong economic management, as well as a political and social revolution, is required to overcome the Resource Curse to achieve a full serving for the interests of the total population in the country (Hammond, 2011). Likewise, experiencing corruption and autocracy since its independence in 1975, Angola, a typical case of the Resource Curse by relying on enormous revenues from oil exports, regarded as a “Successful Failed State” in the literature (Soares de Oliviera, 2007). A decreasing tendency to Oil Curse has been observed from the OCI in the country after 2008, reflecting the EU’s approach to promoting democratic governance and improving transparency (Hackenesch, 2018).

Being a Post-Soviet rentier state, the effects of the Oil Curse has doubled in Azerbaijan through oil revenues and autocratic regime (Franke et al., 2009). The study also highlights that the higher shares of oil and gas production in Azerbaijan lead an asymmetrical development in the country where there is less attention to the non-oil markets since the government lack of emerging diversification policies and restructuring of the non-resource sectors. However, along with rising revenues in the 2000s, the institutions of the country changed the meaning to some extent an improvement (Pomfret, 2012). This also explains the less prone position of Azerbaijan after 2007 in the OCI.

To summarize, despite their abundance in oil, the countries, as mentioned above, are seen to suffer from severe economic and political, as well as social dilemmas. Several causes are behind this failure of adequate utilization of natural resources - in this case, oil - such as insufficient management of resources, lack of economic and social planning and development, and inaccurate or no diversification policies. Besides, oil import bans and sanctions from the Western World in several countries also increase the harmful effects of the oil curse.

Following the first group of countries, the ranking of the three countries, namely Ecuador, the Russian Federation, and the United Arab Emirates falls between 15th to 20th in the OCI. According to Polity IV Country Reports (2008), Ecuador was vulnerable to the oil curse, since the institutional environment was affected by the rent-seeking behavior. As emphasized in the Dutch Disease theory, Ecuador failed to focus on the regional development by directing oil revenues on central government spending, resulting in insufficient incentives to non-oil sectors and decreasing competitiveness (Cori and Monni, 2014). Addressing the high volatility in terms of the country’s economic growth as a sub-indicator of the OCI increased the inefficiency of the institutions as well as the unemployment rates (Rodríguez García, 2014). Blessing with vast reserves of both oil and gas, the United Arab Emirates (UAE) seems to have escaped from the Oil Curse. Haouas and Soto (2012) discussed that UAE has not been immune to the Oil Curse, but still, some of the symptoms of the Resource Curse are present in the country. They argued that using resource rents for economic development and higher welfare, accompanied by a minimum level of corruption, brought success to UAE, but still, proper management is needed to compensate for the negative effects of oil exports and turn into benefits by especially providing export diversification.

Regarding the case of the Russian Federation, although the country has several attempts to diversify, innovate and modernize its economy for more than a decade, its efforts seemed still to be away from the realization. The main motivation behind this is the heavy dependence on the natural resources and energy-related sectors on Russia's economic growth (Ahrend, 2005). Being over-reliant on energy revenues, the country is also affected by fluctuating oil prices. Another explanation for Russia's Oil Curse is the idea that natural resource wealth tends to weaken the quality of governance and democracy in the country (Treisman, 2010). Thus, the privately-owned oil sector in majority restricts the detrimental effects of the oil abundance resulting in a decreasing tendency in terms of Oil Curse during the analysis period of 2002-2015.

Being relatively independent of their natural resources, five countries, namely Columbia, Peru, Argentina, Egypt, and Trinidad and Tobago, are ranked between 20th and 30th rank in the OCI. Among the Latin American countries, Columbia had an opportunity to escape the Resource Curse by the institutional transformation which reduced the effects of the curse. The country has also succeeded in decreasing its dependence on oil by promoting non-resource sectors (DANE, 2014). Another country from the same region, Peru, has experienced a historically long-term evolution in terms of economic growth which heavily relies on natural resource exports such as gold, silver, and copper as well as oil and gas. Employing several measures at the beginning of the mid-1990s, the Peruvian government aims at structural reforms in the country. In this period accordingly, Peru succeeded in developing local productive capacities and services in different sectors rather than the extraction of natural resources. This remarkable economic progress and changes, as well as the free-market structure and neoliberal economic policies in the last twenty years, led the extreme dependence of Peru on natural resources to be reduced also limiting the inverse effects of the Resource Curse (Arellano-Yanguas, 2011).

Moreover, focusing on the energy-growth nexus, the rentier structure of Egypt, the fifth larger oil producer in Africa, seemed to be different and considered as a semi-rentier economy (Beblawi, 2008). Since the revenues of the country do not depend on only one industry, so-called hydrocarbon industries (oil and natural gas), the country is then able to reach economic diversification despite the autocratic regime (Fuinhas and Cardoso Marquez, 2013). From the perspective of institutional quality and governance structure, the two sub-indicators of OCI, namely, control of corruption and political stability, show that Egypt also performs better compared to other countries in the oil-rich African region such as Algeria, Nigeria, Libya, and Angola. Also, depending highly on the world market prices in terms of oil and gas, Trinidad and Tobago are experiencing a volatile economic growth path following the oil discoveries at the beginning of the 20^{th} century. Again, the presumptions of Dutch Disease can easily be observed in Trinidad and Tobago since the countries are not engaged in diversifying the variety of economic activities, the worst case for future economic development (Zenthöfer, 2011). However, the country has reached a better performance by taking proper measures to handle its political stability as well as overcome economic fluctuations.

The OCI performance of the three countries from the Association of Southeast Asian Nations (ASEAN) Indonesia, Malaysia, and Thailand, and also India, all denoting as the developing economies, is seen at a moderate in the ranking being around the beginning of 30^{th} rank since they share similar geographical and cultural characteristics in common. These countries accomplished better performances considerably by focusing on their political stability as well as economic situations. Moreover, in terms of the sub-indicators of the OCI, these countries can become less corrupt, diversify the economy, decrease the risk of armed and ethnic conflict, provide political stability compared to the group of countries with higher values in the OCI, which led them to escape from the Oil Curse, as well as Dutch Disease in a manner. Having relatively lower levels of oil-proved reserves, Romania was also included in this group of countries with a moderate tendency to the Oil Curse. In addition, Mexico's Oil Curse performance is considered to be modest, since the country can use its advantageous position in terms of geographical location and benefit from the free trade cooperation with the United States in recent decades which, leads the country to succeed in diversifying its economy.

On the other hand, some countries share the lower tendency area of the OCI, namely Italy, China, the United States, the United Kingdom, Brazil, Denmark, Canada, Norway, and Australia. These countries refer to both developed economies and abundance in natural resources with their lower values in terms of Oil Curse Tendency. Major oil producers in this group of countries, namely Norway, Canada, and Denmark, are known as stable in terms of liberal democracies. Several types of research also confirm that they are not subject to any Oil Curse since they adopted the right economic policies (Ross, 2009). As an excellent example in the Resource Curse literature, Norway had succeeded in turning natural resource abundance into a blessing with strong mechanisms from the 1960s related to oil revenue management. Besides its right natural resources policy design, the country's improved quality of its institutions, as well as the values of ethical awareness, which can be translated into transparency, also promote an advanced economy both in economic and social terms (Holden, 2013). Likewise, the other two Nordic states, Denmark and Canada, are also considered among the least prone countries to the Oil Curse achieved by higher growth rates and performing better on indicators of democracy. Another well-endowed country with natural resources, Australia is blessed since it uses its natural resources to foster democracy and boost living standards, as well as the successfully diversified resource-based economy in the late 20th century (Goodman and Worth, 2008). As a medium-income country with abundant natural resources, Brazil is among the countries with better performance in terms of Resource Curse in the OCI. Although Brazilian oil windfalls translate into an improvement in the delivery of public goods and/or living standards of the citizens, oil royalties still seem to be somehow more "*stealable*" than other types of revenues (Caselli and Michaels, 2009). China, United Kingdom and United States, following Italy, are the least prone countries to Oil Curse despite the abundance of oil reserves as a result of higher share of manufacture exports that prevent the countries from experiencing Dutch Disease, low levels of both corruption and political stability, as well as rent-seeking denoted in the sub-indicators of OCI. As a result, all four countries are enjoying higher levels of growth rates along with the higher levels of OCI performance.

CHAPTER 5. A GENERAL FRAMEWORK ON ECONOMIC GROWTH: NATURAL RESOURCE PERSPECTIVE

At its simple meaning, economic growth, one of the main areas of interest in macroeconomics discipline, refers to the change in the real Gross Domestic Product (GDP) per capita over time. The real GDP per capita used in the measurement of economic growth is the ratio of the market value of the final goods and services produced in a certain period in terms of a base year to the total population. With the use of this definition, the concept of growth has been freed from the effect of both inflation and population growth rate (Krugman and Wells, 2013). Although economists have sought to identify the dynamics of economic growth, in other words, the underlying causes of economic growth since the beginning of economic history, "*economic growth is still the best-kept secret of economists*" (Yeldan, 2011).

Accordingly, this chapter has been developed in order to verify and validate the use of the Oil Curse Index as an independent indicator into an economic growth model in addition to using various economic, political, and social indicators. To do so, first, the historical development of the two growth models will be mentioned to determine the position of the "Solow" model and the "Extended Solow" model developed by Mankiw-Romer-Weil in economic growth theories. Accordingly, the basic concepts and assumptions about Solow and Extended Solow models will be emphasized. Moreover, the idea of "convergence" will also be overviewed in short. Following the theoretical approach, indicators and the research model will be explored along a broader perspective. Finally, the results of the adopted synthesized growth framework have been discussed in detail.

5.1.The History of Economic Growth Models

The economics literature has focused on the concept of economic growth since Adam Smith published his "The Wealth of Nations" in the 18th century. Though the views on economic growth date back to the pre-classical period, Mercantilism and Physiocracy, scientifically, the idea of economic growth has attracted much attention as of the middle of the 20th century after the World War II. From the historical perspective of modern economic growth, theories are that Ramsey (1928) was the first scholar who mathematically analyzed the intertemporal optimization decisions of households. However, until the 1960s, economists did not take advantage of this approach.

Since the process of economic growth has evolved due to many different factors, the simplification of the process is required. These simplifications are made by modeling. Growth models have been divided into four headings from the second half of the 20th century as Neo-Keynesian Harrod-Domar model, Solow-Swan neoclassical model, endogenous growth models, and modern economic policy models (Snowdon and Vane, 2005).

In most of the growth models, the share of capital and population growth is assumed to be external. Again, these models can be divided into two groups according to the endogenous and exogenous assumption of the saving rate. The two examples of the economic growth models where the saving rate is assumed to be exogenous are the Harrod-Domar Growth Model using the AK-type production function and the neoclassical models of Solow and Uzawa. The second group, which considers the saving rate as an endogenous variable of the growth model, is the neoclassical growth model of Ramsey and Keynes-based growth model of Kaldor and Pasinetti. Apart from these classifications, growth models can be classified according to the fixed rate of capital ratio and time dimension as well. Classical economists such as Adam Smith, David Ricardo, and Thomas Malthus, and economists such as Frank Ramsey, Allyn Young, Frank Knight, and Joseph Schumpeter, who came after them, made significant contributions to modern growth theories (Barro and Sala-i-Martin, 1995).

The article by Ramsey (1928) can be accepted as the beginning of modern growth theories. Ramsey’s inter-time detachable utility function is now widely used as the Cobb-Douglas production function. However, his approach was not widely accepted in the economics literature until the end of the 1960s, and later became very important (Barro and Sala-i-Martin, 1995). After Ramsey, Harrod (1939) and Domar (1946) also tried to analyze economic growth through the Keynesian approach. Subsequently, significant contributions were made by Solow (1956) and Swan (1956), respectively. In his study, Solow (1956) included labor from the Harrod-Domar Model as a factor of production. The technology was highlighted as one of the main sources of growth adopted from neoclassical growth models.

Japanese economist Uzawa (1963) introduced the two-sector model in which the first sector produced the consumer goods in the model, and the second sector produced the capital goods. In this model, stability is ensured if the capital-labor ratio in the consumer goods-producing sector is higher than in the capital goods-producing sector.

Another neoclassical growth model was developed by Cass (1965) and Koopmans (1965), based on the determination of the optimal savings rate of Frank Ramsey (1928), so it is often referred to as the Ramsey-Cass-Koopmans Model. The Ramsey Model has addressed savings rates as endogenous and was based on consumer decisions. In the model developed by Cass (1965) and Koopmans (1965), households are both producers and consumers.

The neoclassical model developed by Diamond (1965), similar to the model of Cass and Koopmans, has households that regularly enter the economy. In this model, the life of the households is divided into two periods. In the first period, households receive salaries and use it for their consumption and savings. In the second period, no salary payments are made to households, and they finance their current consumption with the savings they accumulated in the first period. Thus, the economy can reach equilibrium in the long term. Neoclassical growth models acknowledge the validity of the convergence hypothesis that the economies will reach a long-term equilibrium and that the poor countries will develop faster than the rich countries.

However, since the neoclassical models could not explain the long-term growth with the assumption of the law of diminishing returns, the convergence hypothesis that the poor countries would catch up with the rich countries did not correspond with the real-world data and could not explain the economic recession starting from the 1970s. With the work of Romer (1986) and Lucas (1988), the endogenous growth period began.

Romer (1986) and Lucas (1988) attempted to identify the main factors that provided long-term economic growth, unlike the Neoclassical Growth Theory that was based solely on exogenous technological development. Endogenous growth theories have led to the identification of fundamental endogenous factors such as education, research, and development activities, as well as human capital that enables growth in per capita output (Park, 2006). The first question that endogenous growth models are trying to answer is: "*Why are countries producing goods individually in quantities more than a hundred years ago?*". According to Romer (1990), this is due to the increasing return of labor. Secondly, endogenous growth models tried to explain the role of the human in the process of economic growth. Thirdly, they decided to show the reasons for the significant differentiation between the world economies (Pietak, 2014). Apart from all these, the contribution of endogenous growth theories has been to provide an analytical framework for economic growth and to enable growth and development to be analyzed together. Again, endogenous growth models have seen the accumulation of knowledge and human capital as the main power of growth. In this way, unlike neoclassical growth models, the effectiveness of labor and dissemination of knowledge has been able to model more clearly and in an interpretable manner (Romer, 1994).

The foundations of endogenous growth models were laid by Frankel (1962) and Arrow (1962). In his model, Frankel (1962) tried to combine the function of production with the neoclassical function and the AK type. In this context, while using the neoclassical production function for each firm, it modeled the macroeconomic developments with the help of the AK-type production function. Arrow (1962), on the other hand, began to study the results obtained from neoclassical growth models in detail. He also argued that knowledge emerged through "learning by doing". Despite the use of the production function with increasing returns to scale, Arrow's model could not provide longer terms due to saving rates, and as in the Solow Model, the steady-state was determined by exogenous variables.

The main effort that made growth theories famous was Paul Romer's work in 1986. Assuming that all production factors in production function are increasing and that capital has a fixed rate of return, it provided the basis of endogenous growth. In the model of

Romer, information is considered as an input in the production function, and it is stated that the new information, which is the determinant of long-term economic growth, will emerge with investment in technological research. In the knowledge production and spillover model developed by Romer, he benefited from Arrow's philosophy of “learning by doing”. Arrow (1962) clarified the production of knowledge as an investment-oriented product while destroying diminishing returns to scale and defined it as “*the company learns how to produce more effectively, it is then able to increase its physical capital. Thus, the positive effect of the increase in productivity is called learning by doing*”.

Arrow (1962), Sheshinski (1967), and Romer (1986) made two assumptions about the increase in productivity. Learning by doing is the first one relating to the firm's investments, and the rise in capital stock is considered to be a growth in information stock. According to the other assumption, information discovered by the company is a public property that all other companies can access with zero cost. This is due to the fact that non-competitive knowledge can be immediately disseminated to the entire economy once it has been discovered (Sala-i Martin, 1997). The non-competitive feature indicates that there is an increasing return to scale (Jones, 1998). According to this fact that a firm's new knowledge will create positive externalities for all other companies in the market through spillovers and production opportunities will increase.

In his study, Romer (1986) succeeded in addressing the deficiency of Neoclassical growth theory by integrating technology into his model. This was achieved by violating the law of diminishing returns to capital. It also included capital externalities in the neoclassical production function. In the model of Romer, according to the AK-type production function, the growing economy must meet certain conditions. First, the size of the externalities must be meaningful. Otherwise, the economy will continue to grow according to the Cobb-Douglas Production Function. Furthermore, Romer's Model predicts existing scale effects.

Lucas (1988) managed to define the scale effects in Romer's Model as per capita capital. For this reason, unlike Romer, Lucas did not need to assume that the increase in labor was equal to zero. In the two-sector model developed by Lucas, he took into account the assumption of increasing returns to scale and the structure of Arrow in the concept of "learning by doing". In this model, the source of externalities based on the accumulation of human capital. In this context, the model of Lucas was able to explain differences in terms of economic development between the countries.

In the endogenous growth models developed later, economic growth based on the internalization and modeling of the R&D sector in the technical process. The endogenous technological process shows itself in two ways: The increase of the goods used in the production process; and the increase in the quality of existing goods (Pietak, 2014). Romer (1990) linked the technical process with the increases in the supply of intermediate goods because it is a determinant of economic growth. In this model, where economic growth depends on the level of human capital, countries with abundant human capital are developing more rapidly. In another endogenous growth model developed by Aghion and Howitt (1992), the technical process is associated with improvements in existing goods in the market. According to this model, countries with more educated human capital will grow faster (Aghion and Howitt, 1992).

The models of modern economic policies, which are considered as the last wave in the growth models, have been used to investigate the determinants of growth in detail. These models examine the effects of factors such as quality of management, ethnic discrimination, democracy, trust, and corruption on growth. Discussions about the determinants of economic growth in the recent literature are mainly concentrated on the geographical constraints (Bloom and Sachs, 1998; Sachs, 2005), the effect of natural resources (Sala-i-Martin and Subramanian, 2013), and growth through international economic interaction (Sachs and Warner, 1995; Bhagwati, 2004; Wolf, 2004) (Snowdon and Vane, 2005).

5.1.1. Solow-Swan Growth Model

Since the early 1950s, the issue of economic growth has become more popular than ever. The reason for this was the economic competition between the Soviet Union and the United States during the Cold War. Another reason is the growing concerns about economically underdeveloped countries.

The Neoclassical Growth Model, also known as the Exogenous Growth Theory, dominated the literature of growth from the 19th century until the mid-20th century. The Neoclassical Growth Theory focused on productivity increase. The reason for naming the model as the Exogenous Growth Model is that an exogenous variable caused the alteration of the system. Economists assumed these variables exogenous until they succeeded in certain endogenizing variables. Here, the population is leading those crucial variables, which Malthus (1798) endogenized according to the physical conditions of the economy.

Technological progress and improvement of human capital constitute the primary source of economic growth. However, in the Neoclassical Growth Model, the Neoclassical Growth Theory emphasizes the same variables and factors as neoclassical economics. Robert Solow and Trevor Swan's independent studies have led to increasing the popularity of the Neoclassical Growth Theory. In 1956, Solow incorporated labor into the Harrod-Domar Model as a factor of production in a manner appropriate to the income that was separate from the capital and to a diminishing return to scale. In this way, the knife-edge problem in the Harrod-Domar Model was also solved (Hacche, 1979). In the model, saving rate, population growth rate, and technological development were taken as the sources of the data. This means that it was determined exogenously by endogenous variables in the system. In the model, there were two inputs as Capital (C) and labor (L).

Y_t, K_t, L_t, and A_t denote the total output, capital, labor, and technology (knowledge or activity of labor), respectively. In the model, t shows continuous-time and is not directly included in the production function. Production inputs can take varying values over time. The production function A_t is usually included in the form of a A_tL_t multiplication. In the Solow-Swan Growth Model, the production function is defined as follows:

$$Y_t = F\,(K_t, A_tL_t) \qquad (5.1.1.1)$$

Solow (1957), in his study, named A_t as the technological change and defined it as the developments in labor force training, slowdowns and accelerations, and everything else that might cause a change in the production function. A_t measures, the cumulative effect of the changes over time, and is considered Harrod-Neutral.

Also, the assumptions about the production function in the Solow Growth Model are as follows: (Barro and Sala-i-Martin, 1995):

1. The factors of production in the production function (capital and effective labor) have a constant return to scale. This assumption requires that the production function to be chosen is homogeneous in the first order.

$F\,(cK, cAL) = cF\,(K, AL)$ and where $c \geq 0$ (5.1.1.2)

Within this assumption, we can work in the form of per capita income in the intensive form of production function (Solow, 1957).

2. Production factors are positive, e.g., K>0 and L>0. Also, the law of decreasing productivity in production factors applies. Increases in capital and labor lead to an increase in production when everything else and technology are stable, and this increase is declining as the law of decreasing efficiency is valid. All these are provided with the following limitations:

$$\frac{\partial F}{\partial K} > 0 \quad \frac{\partial F}{\partial L} > 0 \qquad (5.1.1.3)$$

$$\frac{\partial^2 F}{\partial K^2} < 0 \quad \frac{\partial^2 F}{\partial L^2} < 0 \qquad (5.1.1.4)$$

3. Inada (1963) conditions are provided:

$$\lim_{K \to 0}(F_K) = \lim_{L \to 0}(F_L) = \infty \qquad (5.1.1.5)$$

$$\lim_{K \to \infty}(F_K) = \lim_{L \to \infty}(F_L) = 0 \qquad (5.1.1.6)$$

The most widely used production function that provides all the features mentioned above is the Cobb-Douglas production function developed by Cobb and Douglas. In this context, we can write our production function with Cobb-Douglas production function as follows:

$$Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha} \;,\; 0 < \alpha < 1 \tag{5.1.1.7}$$

The model assumes that labor and technology grow exogenously at constant rates of n and g, respectively:

$$L_t = L_0 e^{nt} \tag{5.1.1.8}$$

$$A_t = A_0 e^{gt} \tag{5.1.1.9}$$

According to these definitions, Hicks is considered to be $A_t L_t$,, which is also neutral. That is, the growth of effective labor is $n + g$. The main determinant of economic growth in the Solow-Swan Growth Model is capital accumulation. Changes in the number of capital cause changes in the total income level through the following equation. The model also assumes that a fixed rate of the output, such as s, is allocated to investment. In the model, the capital stock ($k = K / AL$) defined as k, and the output per active labor ($y = Y / AL$) defined as y, as well as δ is the depreciation rate ($0<\delta<1$) $\dot{k}_t$ denoting the time-based derivative of the k. In this context, the capital accumulation equation is as follows:

$$\dot{k}_t = s y_t - (n + g + \delta) k_t \tag{5.1.1.10}$$

When the production function in its intensive form is replaced in the capital accumulation equation, the equation can be rewritten as follows:

$$\dot{k}_t = s k_t^{\alpha} - (n + g + \delta) k_t \tag{5.1.1.11}$$

Since k* in the equations is in the steady-state as $\dot{k}_t = 0$ to indicate the steady-state of k, when the equation is replaced by k*, then k*is:

$$k^* = \left(\frac{s}{n + g + \delta} \right)^{\frac{1}{1-\alpha}} \tag{5.1.1.12}$$

To find out the output per labor in the steady-state by replacing k^* in the intensive form of the production function, it will be found as follows:

$$y^* = \left(\frac{s}{n+g+\delta} \right)^{\frac{\alpha}{1-\alpha}} \tag{5.1.1.13}$$

When k^* is written in the production function, and the logarithm of both sides is taken, the steady-state per capita output has become:

$$\ln\left(\frac{Y_t}{L_t}\right) = \ln\left(A_0\right) + gt + \frac{\alpha}{1-\alpha}\ln(s) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) \tag{5.1.1.14}$$

Per capita income in the steady-state in the Solow-Swan Growth Model is determined by saving rate and population growth rate exogenously. The reason why it is considered to be exogenous is that countries will reach different levels of steady status due to different savings and growth rates. According to the Solow-Swan Model, countries with higher savings rates are richer, and countries with higher population growth rates are poorer. Again, the Solow-Swan Model provides predictable estimations of how savings and population growth affect per capita income levels (Mankiw et al., 1992).

To predict the model by OLS, Mankiw, Romer, and Weil (1992) rearranged the equation by assuming α as a constant and ε as a country-specific shock. Assuming that ln (A_t) = α + ε, the equation becomes:

$$\ln\left(\frac{Y_t}{L_t}\right) = \alpha + gt + \frac{\alpha}{1-\alpha}\ln(s) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) + \varepsilon \tag{5.1.1.15}$$

According to Mankiw, Romer, and Weil (1992), Equation (5.16) can predict both the signs of variables and the magnitude of the effects of these variables. From the econometric point of view, coefficients can be interpreted as elasticity because both sides are logarithmic.

According to the literature, the share of capital in income is expected to be approximately 1/3, the elasticity of the per capita income according to the saving rate is approximately

0.5, and the elasticity of ($n+g+\delta$) is expected to be approximately -0.5 (Mankiw et al., 1992).

To summarize, the primary result of the Solow-Swan Model is that in the long run, the growth rate of the economy is equal to the sum of labor force growth and endogenously determined technological development in the model. Another point that should be noted is that the saving rate affects only the level of Gross Domestic Product (GDP). However, this effect does not sustain in the long term. A higher saving rate will cause temporary increases in labor productivity and GDP. The growth rate in the long term will also be as much as the rate of change in the labor force, and the rate of technological development (Gould and Ruffin, 1993).

5.1.2. Extended Solow Growth Model (Mankiw-Romer-Weil (1992))

Economists have long emphasized the importance of human capital in the growth process, but have concluded that the problems related to the exclusion of human capital have come to the forefront with the wrong results that have emerged from the practices. The human capital variable added to the model changed both the theoretical model and the analysis of the economic growth process in practice. In the new model called as "Mankiw-Romer-Weil Model (MRW)" or "Extended Solow Model", the production function with the addition of human capital is defined as follows:

$$Y_t = K_t^{\alpha} H_t^{\beta} \left(A_t L_t\right)^{1-\alpha-\beta} \qquad (5.1.2.1)$$

Unlike the Solow Model, the *H* variable added here represents the human capital stock. In the Solow Model, while only a fraction of the output is used for investments denoted as *s*, the investments in the MRW Model will consist of two parts: Physical and human capital investments. To demonstrate investments in both physical (s_k) and human capital (s_h), capital accumulation equations can be defined as follows:

$$\dot{k}_t = s_k y_t - (n+g+\delta)k_t \qquad (5.1.2.2)$$

$$\dot{h}_t = s_h y_t - (n + g + \delta) h_t \tag{5.1.2.3}$$

The *y* and *k* in the equations are the same as previously described in the Solow Model. *h* is defined as *H/AL*. The MRW Model also assumes that the same production function applies to human capital, physical capital, and consumption. In this way, a unit of consumption can be replaced both by a unit of physical or human capital without any costs.

Furthermore, unlike Lucas (1988), the model assumes that human capital is depreciated at the same rate as physical capital. Again, the assumption of α + β < 1 is made in the model. This assumption shows diminishing returns for both physical and human capital. Otherwise, there will be no steady-state of the model, if there is a constant return, for instance, α + β = 1 (Mankiw et al., 1992).

Values of *k* and *h* in the steady-state are:

$$k^* = \left(\frac{s_k^{1-\beta} s_h^{\beta}}{n + g + \delta} \right)^{1-(1-\alpha-\beta)} \tag{5.1.2.4}$$

$$h^* = \left(\frac{s_k^{\alpha} s_h^{1-\alpha}}{n + g + \delta} \right)^{1-(1-\alpha-\beta)} \tag{5.1.2.5}$$

If the *k** and *h** are put in place in the production function, and the logarithm of both sides is taken, output per person will be obtained in a similar way to the Solow model are as follows:

$$\ln\left(\frac{Y_t}{L_t}\right) = \ln\left(A_0\right) + gt - \frac{\alpha + \beta}{1 - \alpha - \beta} \ln(n + g + \delta) + \frac{\alpha}{1 - \alpha - \beta} \ln(s_k) + \frac{\alpha}{1 - \alpha - \beta} \ln(s_h) \tag{5.1.2.6}$$

5.1.3. Convergence

The Neoclassical Model predicts long-term economic growth, which is determined exogenously. Due to the decreasing efficiency of capital, economies will be able to converge to a common level as the emerging countries will grow faster than the developed countries. This convergence is defined as the “absolute convergence” phenomenon.

Again, according to the Absolute Convergence Hypothesis, the growth rates of countries with lower per capita income are higher than the countries with higher income levels at the beginning (Knight et al., 1993). However, it is possible under the Absolute Convergence Assumption that the production functions and relevant parameters (saving rate, population growth, and depreciation rate) of the countries or regions are of the same value. These countries or regions will only reach the same per capita real income and the capital amount under this assumption (Barro and Sala-i-Martin, 1995). At that point, the absolute convergence hypothesis has been criticized, and the concept of Conditional Convergence has emerged.

In the case of Conditional Convergence, per capita income levels of the countries will be different as the savings rate, depreciation, population growth, and technologies are allowed to be differentiated, and the growth rates will converge.

5.2. Indicators and Research Model

To verify and validate the significance of the OCI, as well as to identify the negative relationship on the nexus between economic growth and the constructed OCI, a modified neoclassical growth model will be utilized. As discussed earlier, the literature suggests three channels for the influence of natural resources to growth: (1) economic perspective, (2) modern economic policy and governance/institutional quality, and (3) social effects. However, along with a broad literature review, these channels were broken down into further various determinants of a country’s growth which includes human capital, geography, government policies, inflation, and technological progress.

The first factor of economic growth, human capital, is considered in the form of *life expectancy at birth, current health expenditure,* and *labor force* in the model. Similarly, there are numerous research papers and studies in the literature that emphasizes the relationship between economic growth and human capital (Barro, 1991, 1995; Barro and Lee, 1993; Sachs and Warner, 1997; Levine and Zervos, 1993; Brunetti et al., 1998; Martin and Xavier, 1997; Levine and Renelt, 1992; Gallup et al., 1998; Nelson and Phelps, 1966; Romer, 1990; Becker et al., 1990; Rebelo, 1990).

Another factor that determines economic growth in the literature is *geography*. However, it has been researched by very few scholars, and there are only a limited cross-country growth studies taking into account the effects of geography on a country's growth (Gallup et al., 1998; Sachs and Warner, 1998; Hall and Jones, 1997). To reveal the effect of the geographical location, this thesis utilizes several dummy variables, as well as some interaction variables.

Government policies are also among the determinants that have a crucial role in the growth of a country. The level of *openness* to the global economy - as one of the underlying government policies, and the ratio of *government consumption to GDP* - as an indicator for the role of government in economic activity, are the two indicators that are adopted in our model to find their impact on economic growth. In the recent literature, Gallup et al. (1998), and Sachs and Warner (1995) are the two studies that explore the relationship between openness and economic growth, while also highlighting the better position of open economies. Furthermore, Levine and Zervos (1993), and Barro (1991) also attempted to measure the relationship between government consumption to GDP and growth, concluded with an inverse relation, though insignificant.

The fourth factor that has a substantial impact on economic growth is *inflation*. In the literature, while most authors find out that inflation and growth is related inversely (Clark, 1993; Fischer and Modigliani, 1978; Fischer, 1993; Levine and Renelt, 1992; Cozier and Selody, 1992; Dewan, Hussein and Morling, 1999; Jarrett and Selody, 1992; Selody, 1990; Clark, 1982; Grimes, 1990; Buck and Fitzroy, 1988; Barro, 1995), there are also some exceptions with insignificant link, as well as with little or no relationship cases (Fisher, 1991; Sala-I-Martin, 1991; Clark, 1993; Levine and Zervos, 1993).

Finally, the last indicator of growth in our model is *technological progress*. Romer (1990) was the leading one that advocates a growing world economy due to the technological progress, through the design and innovation of new ideas.

Besides that, the four World Development Indicators – *Government Effectiveness, Regulatory Quality, Rule of Law, Voice and Accountability* – also included empowering the strength of the model.

Finally, as mentioned before, regional dummy variables, as a spatial factor, are included in the model for African, Latin American, Middle Eastern and European countries.

The empirical specification of this study is simple and general enough to capture the aforementioned three effects and furtherly discussed five determinants of growth along with the four World Development Indicators. To identify the dependence of growth on natural resource abundance, cross-country regressions in a human-capital augmented neoclassical growth framework will be estimated. This model argues that the quality and quantity of both labor force and physical capital determines the total output of the economy at any time. Though, when the equilibrium level is reached, growth in the stock of capital per worker can be sustained by productivity increase, through capital stock enrichment or labor force development in terms of quality.

Following the empirical work of Knight, Loayza, and Villanueva (1993) and Dewan and Hussein (2001), the equations will be based on the conventional growth model and the production function is used to explain the determinants of growth. Apart from the macroeconomic variables that affect economic growth in the neoclassical model of Solow (1956) and Swan (1956), this approach also highlights and takes into account several factors such as exogenous technological growth, the level of openness, government activity in the economy confirmed already in an earlier work conducted by Mankiw, Romer and Weil (1992).

Consider the Cobb-Douglas production function is :

$$Y_t = F(K_t, L_t, H_t, A_t) \tag{5.2.1}$$

Here, K denotes the physical capital, and L the labor force. Also, H_t stands for the human capital measured by life expectancy at birth and current health expenditure. Moreover, A_t is an overall efficiency factor that consists of government policies, technological progress, development indicators etc.

Considering the production function in the Equation 5.2.1, the new growth model in this thesis will be predicted by taking into account both the human capital besides physical capital measurement and overall efficiency factor dimensions as mentioned above such as high technology exports as a proxy for technology, four Worldwide Governance Indicators (WGI), and openness to trade and inflation ratios as a proxy for development indicators, as well as government consumption to GDP ratio as a proxy for the efficiency of government policies. So, the basis for our empirical work can be characterized as follows:

$$GDPPC_{it} = \alpha + \beta_{1,it} (GCF/LF_{it-1}) + \beta_{2,it} (HTE_{it}) + \beta_{3,it} (CHE_{it}) + \beta_{4,it} (LEB_{it}) + \beta_{5,it} (OCI_{it}) + \beta_{6,it} (GE_{it}) + \beta_{7,it} (RQ_{it}) + \beta_{8,it} (RoL_{it}) + \beta_{9,it} (VAcc_{it}) + \beta_{10,it} (INF_{it}) + \beta_{11,it} (OPEN_{it}) + \beta_{12,it} (GCGDP_{it}) + \varrho_t + \mu_i + \varepsilon_{i,t} \quad (5.2.2)$$

where ϱ_t and μ_i are time- and country-specific effects. Also, $\varepsilon_{i,t}$ denotes the error term, while $\beta_1, \beta_2 \ldots, \beta_{12}$ are the parameters to be estimated.

Table 48 lists the variables and data sources. From the cross-country regression analysis, it is expected that all the casual channels from natural resources to growth are captured in Equation (5.2.2), and all the explanatory variables are correctly measured for the same countries and period of time while we are constructing OCI.

Table 48. List of Variables and Data Sources

Indicator	Definition	Source
GDP per capita growth (GDPPC)	Average annual growth in real GDP per person from 2002 to 2015.	World Bank, World Development Indicators
Oil Curse Index (OCI)	The OCI is a summary measure of country performances in terms of oil curse through the critical dimensions of the resource curse literature: economic, political, and social.	Own calculations
High technology exports (HTE)	High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.	World Bank, World Development Indicators
Gross Capital Formation / Labor Force (GCF/LF)	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchase; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Data are in constant 2010 U.S. dollars. Labor force comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Not everyone who works is included, however. Unpaid workers, family workers, and students are often omitted, and some countries do not count members of the armed forces. Labor force size tends to vary during the year as seasonal workers enter and leave.	World Bank, World Development Indicators

Current health expenditure (%of GDP) (CHE)	Level of current health expenditure expressed as a percentage of GDP. Estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include capital health expenditures such as buildings, machinery, IT and stocks of vaccines for emergency or outbreaks.	World Bank, World Development Indicators
Life expectancy at birth, total (years) (LEB)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	World Bank, World Development Indicators
Government effectiveness (GE)	Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank, Worldwide Governance Indicators
Regulatory quality (RQ)	Regulatory Quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank, Worldwide Governance Indicators
Rule of Law (RoL)	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank, Worldwide Governance Indicators
Voice and Accountability (VAcc)	Voice and Accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate gives the country's score	World Bank, Worldwide Governance Indicators

	on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	
Inflation, GDP deflator (annual %) (INF)	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.	World Bank, World Development Indicators
Openness to Trade (OPEN)	Openness is measured by the trade volume as a percentage of GDP, where Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank, World Development Indicators
Government Consumption to GDP (GCGDP)	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security but excludes government military expenditures that are part of government capital formation.	World Bank, World Development Indicators

5.3. Results and Discussion

5.3.1. Pooled Estimation

In its general presentation, the basic model of the pooled estimation can be written as follows:

$$Y_{it} = \alpha + X_{it}` \beta_{it} + \delta_i + \Upsilon_t + \varepsilon_{it} \quad (5.3.1.1)$$

where Y_{it} is the dependent variable, and X_{it} is a k-vector of regressors, and ε_{it} are the error terms for $i = 1, 2, \ldots, M$ cross-sectional units observed for dated periods $t = 1, 2, \ldots, T$. The α parameter represents the overall constant in the model, while the δ_i and Υ_t represent cross-section or period-specific effects (random or fixed). Finally, β_{it} coefficients denotes for the sets of common (across cross-section and periods), and/or cross-section specific, as well as period-specific regressor parameters.

Using a pool object, the detailed results of our analysis are shown in Table 49.

Table 49. Pooled Estimation Results

Dependent variable: GDP per capita growth, estimation period: 2003-2015				
Explanatory variables:	*Pooled Estimation*	*Pooled Estimation (with dummies)*	*Pooled Estimation (with interaction variables)*	*Pooled Estimation (with dummies & interaction variables)*
Gross capital formation / Labor force$_{t-1}$	0.000 (2.757)**	-0.000 (3.529)**	0.000 (2.999)**	0.000 (2.815)**
High technology exports$_t$	-0.010 (-0.348)	-0.094 (-3.325)**	-0.086 (-2.772)**	-0.100 (-3.241)**
Inflation$_t$	0.004 (0.167)	0.013 (0.534)	0.007 (0.287)	0.034 (1.354)
Life expectancy at birth$_t$	-0.086 (-1.502)	-0.188 (-3.353)**	-0.117 (-2.159)*	-0.227 (-3.589)**
Current health expenditure$_t$	0.026 (0.211)	0.094 (0.834)	0.064 (0.543)	0.093 (0.802)
Oil Curse Index$_t$	-4.475 (-2.117)*	-1.090 (-0.512)	-1.586 (-0.705)	-1.198 (-0.547)
Openness to trade$_t$	-0.004 (-0.427)	0.007 (0.852)	0.009 (0.974)	0.013 (1.520)
Government consumption to GDP$_t$	-0.116 (-1.725)	-0.059 (-0.970)	-0.038 (-0.498)	-0.170 (-2.176)*
Rule of law$_t$	-0.664 (-0.677)	2.061 (2.185)*	1.262 (1.285)	1.609 (1.684)
Voice and accountability$_t$	-0.828 (-2.038)*	-2.292 (-5.521)**	-2.178 (-4.903)**	-2.015 (-4.664)**
Government effectiveness$_t$	0.960 (0.949)	-0.590 (-0.970)	0.949 (0.973)	0.736 (0.769)
Regulatory quality$_t$	0.301 (0.433)	-0.936 (-1.432)	-0.525 (-0.747)	-0.064 (-0.092)

$Dummy\_afr_t$		-5.447 (-7.023)**		-9.865 (-3.663)**
$Dummy\_me_t$		-6.659 (-6.493)**		-14.583 (-3.722)**
Interaction variable_1 (Dummy_me*Gross Capital Formation/Labor Force)			-0.001 (-3.829)**	0.000 (-1.163)
Interaction variable_2 (Dummy_me*Government consumption to GDP)			-0.041 (-0.345)	0.254 (1.839)
Interaction variable_3 (Dummy_me*Current health expenditure)			0.281 (0.641)	1.711 (3.013)**
Interaction variable_4 (Dummy_afr* Gross Capital Formation/Labor Force)			0.000 (-0.472)	0.000 (-0.747)
Interaction variable_5 (Dummy_afr* Government consumption to GDP)			-0.213 (-1.138)	0.244 (1.131)
Interaction variable_6 (Dummy_afr* Current health expenditure)			-0.226 (-0.470)	0.475 (0.912)
Constant	12.352 (3.063)*	19.833 (4.953)**	14.028 (3551)**	23.519 (5.085)**
Summary statistics				
Adjusted R^2	0.134	0.243	0.220	0.267

Notes: t-values are in parentheses. ** (*) denotes significance at the one (five) percent levels.

For the pooled estimation models, four different specifications were adopted in the study. Following the first and basic model, we enriched the second and third models with two dummy variables and six interaction variables, respectively. The final and last model depicts the combination of all models as well.

The results of all pooled estimation models highlight that the impact of the one-year lagged variable, the ratio of gross capital formation over labor force, is positive and statistically significant within one percent levels, also lines up with the neoclassical growth theory.

High technology exports, as a proxy for technological progress, however, constitutes a significant relationship with growth levels, though in a negative way when including dummies and/or interaction variables in the model.

As one of the human capital measures life expectancy at birth has an inverse relationship with economic growth but in a significant way, while the other measure, current health expenditure, is positively correlated, though insignificantly.

Moreover, the two channels of government policies openness to trade and government consumption to GDP shows insignificant signs, apart from the fourth model where government consumption to GDP is statistically significant within one per cent levels but still indicates a negative correlation.

Among the four worldwide governance indicators, the measure for voice and accountability was the only one showing a statistically significant relationship with the dependent variable in all four models of pooled estimation, but with a negative sign.

The relationship between the constructed OCI and economic growth is negative as expected, but only significant in the first model within five percent levels.

The two dummy variables, one for Middle East and other for African countries, as a proxy for spatial factors, have the most significant impacts on economic growth in both models. Likewise, the disadvantageous position in the ranking of OCI with higher tendency to oil curse due to abundant oil resources, those countries are also lack experiencing higher growth rates, which indicates a negative relationship with economic growth levels.

Among the six interaction variables, only two of them showed significant relationship with economic growth. In the third model, the ratio of Gross Capital Formation over Labor Force indicates a negative impact in the Middle Eastern countries, while in the fourth model increasing ratio of current health expenditures in GDP levels causes higher growth rates in the same region within one percent levels of significance applicable for both.

5.3.2. Lagrange Multiplier (LM) Test for Random Effects

The Lagrange Multiplier (LM) test helps to determine between the two regression model of either random effects or a simple OLS. The null hypothesis in the LM test is that variances across entities are zero. This is no significant difference across units (i.e., no panel effect) (Torres-Reyna, 2007).

Table 50. Lagrange Multiplier Test Results

	Test Hypothesis		
	Cross-section	**Time**	**Both**
Breusch-Pagan	71.53313 (0.0000)	38.01830 (0.0000)	109.5514 (0.0000)

The results are shown in Table 50 highlights that we reject the null hypothesis and assumed that random effects are applicable for our model since there is clear evidence of significant differences across countries.

5.3.3. Multicollinearity

For any multicollinearity problems, we check the correlations between the four Worldwide Governance Indicators. The results are depicted in Table 51.

Because of the higher rates of correlation, the two indicators, namely Regulatory Quality and Government Effectiveness, have been excluded from the model. However, the fixed and random effects models have run without these two indicators in the next section.

Table 51. Results of Correlation Analysis

Indicators	*Regulatory Quality*	*Rule of Law*	*Voice and Accountability*	*Government Effectiveness*
Regulatory Quality	1	0.9322	0.7587	0.9254
Rule of Law	0.9322	1	0.7353	0.954
Voice and Accountability	0.7587	0.7353	1	0.7355
Government Effectiveness	0.9254	0.954	0.7355	1

5.3.4. Fixed and Random Effects Estimators

The basic regression model for a balanced panel data set is as follows:

$$Y_{it} = X_{it}\,\beta + \mu_{it,} \qquad (5.3.4.1)$$

where i = 1, …, I and t = 1, …, T.

These two types of estimators are included to capture the systematic tendency of μ_{it} to be higher for some individuals than for others (individual effects) and possibly higher for some time periods than for others (time effects) (Dewan and Hussein, 2001).

The fixed effect estimator does this by (in effect) using a separate intercept for each individual or time period. The random effect estimator is based on the following decomposition of μ_{it} where ε is the individual effect, μ is the time effect, and η is the random effect (Keane and Runkle, 1992). Also, β is estimated by the structure imposed upon μ_{it} by this assumption.

Both fixed and random effects adjust for heteroskedasticity.

Table 52. Results of Fixed and Random Effects

Dependent variable: GDP per capita growth, estimation period: 2003-2015				
Explanatory variables:	*Random effects*	*Random effects (with dummies)*	*Fixed effects*	*Fixed effects (with interaction variables)*
Gross capital formation / Labor force$_{t-1}$	0.000 (2.321)	0.000 (3.235)**	0.000 (1.442)	0.000 (2.580)**
High technology exports$_t$	-0.081 (-2.028)*	-0.118 (-3.252)**	0.129 (2.276)*	0.088 (2.946)**
Inflation$_t$	0.007 (0.293)	0.009 (0.374)	-0.023 (-0.823)	-0.044 (-1.548)
Life expectancy at birth$_t$	-0.241 (-2.648)**	-0.261 (-2.888)*	-0.832 (-4.416)**	-0.092 (-1.757)
Current health expenditure$_t$	0.257 (1.272)	0.211 (1.251)	0.196 (0.534)	0.096 (0.848)
Oil Curse Index$_t$	-3.183 (-0.957)	1.578 (0.471)	-12.110 (-1.860)*	-1.401 (-0.638)
Openness to trade$_t$	0.024 (1.930)*	0.018 (1.592)	0.068 (3.565)**	0.009 (1.040)
Government consumption to GDP$_t$	-0.157 (-1.607)	-0.125 (-1.410)	-0.070 (-0.481)	-0.001 (-0.013)
Rule of law$_t$	-1.357 (-1.047)	0.692 (0.512)	1.625 (0.878)	1.523 (1.623)
Voice and accountability$_t$	-0.161 (-0.235)	-1.753 (-2.518)**	0.851 (0.676)	-2.341 (-5.513)**
Dummy_afr$_t$		-6.056 (-4.989)**		
Dummy_eu$_t$		1.193		

		(0.958)		
$Dummy\_la_t$		-0.920		
		(-0.727)		
$Dummy\_me_t$		-6.722		
		(-4.404)**		
Interaction variable_1				-0.000
(Dummy_me*Gross Capital Formation/Labor Force)				(-2.956)**
Interaction variable_2				-0.125
(Dummy_me*Government consumption to GDP)				(-1.085)
Interaction variable_3				0.104
(Dummy_me*Current health expenditure)				(0.248)
Interaction variable_4				0.000
(Dummy_afr* Gross Capital Formation/Labor Force)				(-0.534)
Interaction variable_5				-0.281
(Dummy_afr* Government consumption to GDP)				(-1.569)
Interaction variable_6				-0.083
(Dummy_afr* Current health expenditure)				(-0.181)
Constant	21.841	24.569	57.381	11.917
	(3.380)**	(3.878)**	(4.354)**	(3.091)**
Summary statistics				
Adjusted R^2	0.050	0.110	0.402	0.298

Notes: t-values are in parentheses. ** (*) denotes significance at the one (five) percent levels.

Here, it is noteworthy to mention that there are some structural differences in modelling fixed and random effects differing from the pooled estimation in terms of explanatory variables. First, two more dummies for European and Latin American countries have been included in both models. Next, due to the multicollinearity problems as mentioned before, two worldwide governance indicators, namely government effectiveness and regulatory quality, have been excluded from the model.

These modifications also affect the result of both fixed and random effects models. Since gross capital formation over labor force ratio still indicates a positive relationship, the negative signs of high technology exports turn into a positive and significant one in fixed effects model estimations. Without interaction variables in the fixed effects model, technological progress has a stronger effect on the GDP per capita growth rates.

Both coefficients of inflation have the right signs, as negative, again in the fixed effects model, while showing a positive relationship for random effects estimations. Though, its relationship with the dependent variable is still seemed to be statistically insignificant in both models.

Among the human capital proxies, current health expenditure has the right sign but in an insignificant way, while life expectancy at birth measures still have a negative correlation.

Implying a negative and significant relationship in fixed effects models, Oil Curse Index is again able to verify its validity in terms of economic growth perspective.

Regarding the two government policies, they indicate contradictory results. While trade openness contributes increasing growth rates in a significant way, increasing ratio of government consumption to GDP become harmful for the economic growth, though insignificantly.

While in the first random effects model, both rule of law and voice and accountability shows a negative sign, including dummies in random effects model and interaction variables in the fixed effects model helped the sign of rule of law to become positive, with no effect on voice and accountability measure.

Including two more dummy variables has shown no effect on the negative signs and significant relationship of African and Middle Eastern effect on economic growth. Nevertheless, the model highlights the distorting effect of the dummy for Latin America and contributory position of the dummy for Europe along with their negative and positive signs, respectively, but in an insignificant way.

Finally, considering interaction variables, the only significant relationship was observed in terms of the first one. Like the results of the pooled estimations, increasing ratios for gross capital formation over labor force deteriorates the growth in the Middle East.

5.3.5. Correlated Random Effects - Hausman Test

Hausman (1978) offers a discrimination test between the estimators of fixed and random effects. The test is based on comparing the difference between the two estimators of the coefficient vectors. The random effects estimator is efficient and consistent under the null hypothesis and inconsistent under the alternative hypothesis, while the fixed effects estimator is consistent under both the null and the alternative hypothesis. If the null is true, then the difference between the estimators should be close to zero. The calculation of test statistics (distributed) requires the χ^2 computation of the covariance matrix of β_1 – β_2. In the limit, the covariance matrix simplifies to Var (β_1) – Var (β_2), where β_1 and β_2 are estimators for fixed and random effects, respectively.

The result of the Hausman test of our model is represented in Table 53 below.

Table 53. Hausman Test Results

Test Summary	**Chi-square statistics**	**p-value**
Cross-section random	47.44826	0

When the probability value of the Hausman test statistic is greater than 0.05, then the random effects model is valid. Since the probability value of the above Hausman test statistic is significant (p-value < 0.05), it was revealed that the fixed effects model was valid, not the random effects.

5.3.6. Further Research

For further research, several modifications have been made in the same economic model adopted before. Employing the same analysis with the same indicators and time period, i.e. ceteris paribus, the only difference is that the natural logarithm (ln) of the ratio of gross capital formation over labor force has been utilized in the analysis. Furthermore, beside pooled estimation and fixed and random effects models, the fixed effects model has also been run by using 3-years moving averages of all indicators. Finally, the results for the cross-section estimation has been reported additionally. The data has also been tested in terms of multicollinearity and heteroscedasticity problems as well. The results of the analysis are depicted in Tables between 54 and 58 below.

In the overall results, the presence of the oil curse has evidenced reasonably within an economic growth model perspective, however there isn’t ample results for robust effects here. That means, there is still potential for future works. So, the Oil Curse Index (OCI) can also be verified and validated by modifying the model through several additional indicators, such as financial volatility etc., and/or by an extending the period of the analysis.

Table 54. Pooled Estimation Modified Results

Dependent variable: GDP per capita growth, estimation period: 2003-2015				
Explanatory variables:	*Pooled Estimation*	*Pooled Estimation (with dummies)*	*Pooled Estimation (with interaction variables)*	*Pooled Estimation (with dummies & interaction variables)*
ln (Gross capital formation / Labor force)$_{t-1}$	-1.966 (-4.704)**	-2.055 (-5.255)**	-2.260 (-5.035)**	-2.011 (-4.513)**
High technology exports$_t$	0.011 (0.399)	-0.064 (-2.275)*	-0.073 (-2.390)*	-0.085 (-2.848)**
Inflation$_t$	0.043 (1.677)	0.027 (1.123)	0.027 (1.082)	0.050 (1.970)*
Life expectancy at birth$_t$	0.020 (0.352)	-0.106 (-1.789)	-0.037 (-0.645)	-0.151 (-2.262)*
Current health expenditure$_t$	0.079 (0.668)	0.158 (1.403)	0.152 (1.286)	0.163 (1.413)
Oil Curse Index$_t$	-0.362 (-0.168)	0.972 (0.455)	0.371 (0.167)	0.313 (0.144)
Openness to trade$_t$	-0.005 (-0.648)	0.006 (0.690)	0.007 (0.839)	0.011 (1.347)
Government consumption to GDP$_t$	-0.069 (-1.064)	-0.008 (-0.139)	0.013 (0.166)	-0.121 (-1.533)
Rule of law$_t$	-0.705 (-0.792)	1.591 (1.796)	1.123 (1.224)	1.402 (1.565)
Voice and accountability$_t$	-0.868 (-2.225)*	-2.238 (-5.445)**	-2.342 (-5.297)**	-2.138 (-4.941)**
Government effectiveness$_t$	1.327	0.908	1.158	0.952

	(1.395)	(1.018)	(1.204)	(0.315)
Regulatory quality$_t$	0.608 (0.910)	-0.426 (-0.657)	-0.000 (-0.001)	0.349 (0.511)
Dummy_afr$_t$		-5.223 (-6.870)**		-9.251 (-3.456)**
Dummy_me$_t$		-5.626 (-5.869)**		-13.636 (-3.548)**
Interaction variable_1 (Dummy_me*Gross Capital Formation/Labor Force)			-0.000 (-3.283)*	-0.000 (-0.888)
Interaction variable_2 (Dummy_me*Government consumption to GDP)			-0.076 (-0.640)	0.213 (1.546)
Interaction variable_3 (Dummy_me*Current health expenditure)			0.416 (0.961)	1.728 (3.085)**
Interaction variable_4 (Dummy_afr* Gross Capital Formation/Labor Force)			0.000 (1.055)	0.000 (0.633)
Interaction variable_5 (Dummy_afr* Government consumption to GDP)			-0.223 (-1.214)	0.212 (0.992)
Interaction variable_6 (Dummy_afr* Current health expenditure)			-0.530 (-1.106)	0.153 (0.293)
Constant	18.231 (4.685)**	28.012 (6.870)**	24.262 (5.763)**	32.323 (6.955)**
Summary statistics				
Adjusted R^2	0.165	0.270	0.251	0.290

Notes: t-values are in parentheses. ** (*) denotes significance at the one (five) percent levels.

Table 55. Modified Results of Fixed and Random Effects

Dependent variable: GDP per capita growth, estimation period: 2003-2015				
Explanatory variables:	*Random effects*	*Random effects (with dummies)*	*Fixed effects*	*Fixed effects (with interaction variables)*
ln (Gross capital formation / Labor force)$_{t-1}$	-2.562 (-4.089)**	-2.776 (-5.294)**	-1.969 (-1.987)*	-1.960 (-4.493)**
High technology exports$_t$	-0.056 (-1.447)	-0.074 (-2.249)*	-0.131 (-2.248)*	-0.075 (-2.566)**
Inflation$_t$	0.017 (0.679)	0.020 (0.848)	-0.020 (-0.699)	-0.023 (-0.819)
Life expectancy at birth$_t$	-0.084 (-0.892)	-0.060 (-0.687)	-0.640 (-2.838)**	-0.029 (-0.521)
Current health expenditure$_t$	0.297 (1.535)	0.277 (1.888)*	0.200 (0.543)	0.162 (1.437)
Oil Curse Index$_t$	0.645 (0.190)	5.537 (1.782)	13.218 (2.020)*	0.001 (0.001)
Openness to trade$_t$	0.020 (1.673)*	0.008 (0.808)	0.068 (3.573)**	0.007 (0.885)
Government consumption to GDP$_t$	-0.112 (-1.190)	-0.093 (-1.183)	-0.065 (-0.449)	0.036 (0.490)
Rule of law$_t$	-1.556 (-1.270)	-0.413 (-0.339)	1.243 (0.664)	1.318 (1.501)
Voice and accountability$_t$	-0.340 (-0.520)	-1.720 (-2.786)	1.204 (0.937)	-2.440 (-5.758)**
Dummy_afr$_t$		-5.596 (-5.540)**		

$Dummy\_eu_t$		1.584 (1.521)		
$Dummy\_la_t$		-2.171 (-1.962)*		
$Dummy\_me_t$		-5.598 (-4.527)**		
Interaction variable_1 (Dummy_me*Gross Capital Formation/Labor Force)				-0.000 (-2.528)*
Interaction variable_2 (Dummy_me*Government consumption to GDP)				-0.139 (-1.231)
Interaction variable_3 (Dummy_me*Current health expenditure)				0.218 (0.524)
Interaction variable_4 (Dummy_afr* Gross Capital Formation/Labor Force)				0.000 (0.850)
Interaction variable_5 (Dummy_afr* Government consumption to GDP)				-0.280 (-1.581)
Interaction variable_6 (Dummy_afr* Current health expenditure)				-0.370 (-0.801)
Constant	28.988 (4.647)**	30.137 (5.458)**	58.517 (4.459)**	21.382 (5.168)**
Summary statistics				
Adjusted R^2	0.074	0.172	0.404	0.321

Notes: t-values are in parentheses. ** (*) denotes significance at the one (five) percent levels.

Table 56. Results of Fixed Effects With 3-Years Averages

Dependent variable: GDP per capita growth, estimation periods (3-years):	2004-2006 2007-2009 2010-2012 2013-2015
Explanatory variables:	
ln (Gross capital formation / Labor force)	-2.289 (-3.756)**
High technology exports	0.038 (0.959)
Inflation	0.050 (1.090)
Life expectancy at birth	0.037 (0.451)
Current health expenditure	0.060 (0.356)
Oil Curse Index	-0.367 (-0.118)
Openness to trade	-0.006 (-0.497)
Government consumption to GDP	0.0220 (0.241)
Rule of law	-0.186 (-0.142)
Voice and accountability	-0.727 (-1.318)
Government effectiveness	0.390 (0.278)
Regulatory quality	0.812 (0.836)
Constant	18.210 (3.419)**
Summary statistics	
Adjusted R^2	0.218

Notes: t-values are in parentheses. ** (*) denotes significance at the one (five) percent levels.

Table 57. Cross-Section Estimation Results

Dependent variable: GDP per capita growth, estimation period: 2002-2015	
Explanatory variables:	
Gross capital formation / Labor force$_t$	0.000 (0.844)
GDP per capita (2002)	-0.000 (-1.277)
High technology exports$_t$	(0.844) (0.208)
Inflation$_t$	-0.031 (-0.292)
Life expectancy at birth$_t$	-0.101 (-0.034)
Current health expenditure$_t$	-0.310 (-1.247)
Oil Curse Index$_t$	-6.480 (-1.490)
Openness to trade$_t$	-0.028 (-1.465)
Government consumption to GDP$_t$	0.038 (0.304)
Rule of law$_t$	-0.875 (-0.454)
Voice and accountability$_t$	-0.537 (-0.717)
Government effectiveness$_t$	2.716 (-1.136)
Regulatory quality$_t$	-0.924 (-0.696)
Constant	14.881 (2.064)*
Summary statistics	
Adjusted R^2	0.409

Notes: t-values are in parentheses. ** (*) denotes significance at the one (five) percent levels.

Table 58. Multicollinearity

Indicators	*Current Health Expenditures*	*GDP Per Capita Growth*	*Government Consumption to GDP*	*Government Effectiveness*	*Gross capital formation / Labor force*	*High Technology Exports*	*Inflation*	*Life Expectancy at Birth*	*OCI*	*Openness to Trade*	*Reg. Quality*	*RoL*	*V. and Acc.*
Current Health Expenditures	1	-0.2679	0.4838	0.6229	0.5806	0.1547	-0.2179	0.5987	-0.4712	-0.4810	0.5801	0.6293	0.7241
GDP Per Capita Growth	-0.2679	1	-0.3607	-0.3694	-0.5346	0.2084	0.2606	-0.3065	-0.2674	-0.2622	-0.3798	-0.4219	-0.2577
Government Consumption to GDP	0.4838	-0.3607	1	0.5690	0.6240	0.0686	-0.3656	0.5698	-0.0822	0.0230	0.6012	0.6426	0.4287
Government Effectiveness	0.6229	-0.3694	0.5690	1	0.7972	0.4691	-0.5201	0.7382	-0.4570	0.1048	0.9270	0.9628	0.7349
Gross capital formation / Labor force	0.5806	-0.5346	0.6240	0.7972	1	0.1408	-0.4123	0.5964	-0.0998	0.0210	0.7412	0.8384	0.6096
High Technology Exports	0.1547	0.2084	0.0686	0.4691	0.1408	1	-0.3108	0.2455	-0.5419	0.3247	0.3834	0.3446	0.2246
Inflation	-0.2179	0.2606	-0.3656	-0.5201	-0.4123	-0.3108	1	-0.3301	0.2650	-0.2906	-0.6384	-0.5598	-0.4121
Life Expectancy at Birth	0.5987	-0.3065	0.5698	0.7382	0.5964	0.2455	-0.3301	1	-0.4405	-0.0648	0.6866	0.6847	0.5353
Oil Curse Index (OCI)	-0.4712	-0.2674	-0.0822	-0.4570	-0.0998	-0.5419	0.2650	-0.4405	1	0.2646	-0.4764	-0.3863	-0.6160
Openness to Trade	-0.4810	-0.2622	0.0230	0.1048	0.0210	0.3247	-0.2906	-0.0648	0.2646	1	0.0540	0.0600	-0.2600
Regulatory Quality (Reg. Quality)	0.5801	-0.3798	0.6012	0.9270	0.7412	0.3834	-0.6384	0.6866	-0.4764	0.0540	1	0.9360	0.7558
Rule of Law (RoL)	0.6293	-0.4219	0.6426	0.9628	0.8384	0.3446	-0.5598	0.6847	-0.3863	0.0600	0.9360	1	0.7516
Voice and Accountability (V. and Acc.)	0.7241	-0.2577	0.4287	0.7349	0.6096	0.2246	-0.4121	0.5353	-0.6160	-0.2600	0.7558	0.7516	1

CHAPTER 6. CONCLUSION

In the growing body of the literature related to the Resource Curse phenomenon, the abundance of natural resources, which turns into oil in this study, and economic growth are linked with an inverse relationship. According to Sachs and Warner (2001), the countries rich in natural resources - almost without any exception - have had stagnant economic growth, i.e., disappointing growth levels since the beginning of the 20^{th} century. In the empirical literature, many studies highlight this curse as a reasonably reliable fact. Contrary to the curse, there are also several examples of countries with less or no abundance of natural resources experiencing sustainable and robust growth. Also, exceptions can be found to this phenomenon, namely Norway and Qatar, since they witnessed remarkable growth rates along the 20^{th} century despite their abundance of natural resources and succeeded to turn the curse into a blessing.

The initial literature put emphasize on the negative impacts of the inspiring Resource Curse term by focusing on the economic indicators initially. Nevertheless, as discussed in the state-of-the-art literature review, a natural resource economy could suffer from a variety of indicators such as corruption, political stability, institutional quality, transparency, type of the political regime, human capital, manufacturing sector, rent-seeking behavior, besides the fundamental economic indicators. The countries suffering from those situations is not expected to take advantage of natural resource wealth because of the inverse indirect effects. Since the Resource Curse cannot be easily explained unilaterally from the economic perspective, rather than GDP, several economic and political, as well as social measures emerged as critical aspects to explain the causes of Resource Curse and to measure natural resource abundance.

Considering these facts, this thesis utilizes a comprehensive approach to construct a systematic index; since, after analyzing the recent researches and empirical studies, it seemed that there exists a gap in the literature to measure, rank and analyze the performance of the resource-abundant countries in terms of five most frequently mentioned indicators derived from the comprehensive literature review, namely Oil Rent, GDP, Manufactures Exports, Control of Corruption, Political Stability and Absence of Violence/Terrorism. Moreover, the data for oil-proved reserves have also been utilized to specify the most suitable set of countries for the index. After that, using Principal Component Analysis (PCA), a widespread and well-established multivariate statistical technique, the study constructed the Oil Curse Index (OCI). This study is unique in terms of being the first quantitative study measuring the Oil Curse Tendency of the selected countries in academia. Covering a time period from 2002 to 2015, OCI utilizes a dispersed sample of a total of 41 countries from different geographical regions.

The main finding of this thesis in terms of the constructed OCI is that the performance of the developing economies seemed to be weaker than the developed ones such as the United Kingdom and the United States. Indeed, it is worthwhile to note that the OCI highlights some exceptional countries such as United Arab Emirates, Egypt, and Trinidad and Tobago performing better compared to other countries sharing the same geographical region and development levels, due to their decreasing levels of corruption and lack of rent-seeking behavior, as well as increasing political stability and institutional quality.

Moreover, the main motivation behind the Oil Curse Tendency seemed to be experiencing the Dutch Disease Phenomenon by numerous countries due to the lack of economic diversification. In the OCI, Russian Federation and Saudi Arabia have discoursed as the two major countries suffering from heavy dependence on natural resources in terms of national revenues since they are more vulnerable to the price volatilities of the natural resources in the world markets.

The results also highlight that the rentier states, such as Angola, are more prone to Oil Curse since it increases the risks for increasing income inequality, and corruption, as well as diminishing transparency and accountability. Moreover, the risk for the violence/terrorism/conflict in terms of controlling the oil resources, led the countries such as Nigeria, Sudan, Iraq, Iran more prone to Oil Curse. Similarly, the substantial impact of the Arab Spring on the regions of the Middle East and North Africa (MENA) emphasizes the need to deliberate such political and social features of the Oil Curse (e.g., Syria, Libya, and Yemen).

Besides, the OCI brackets the countries from the Association of Southeast Asian Nations (ASEAN), namely Indonesia, Malaysia, and Thailand, and also India, and underlines the impacts of the Resource Curse in the developing countries. The results ranked these aforementioned countries as being moderate in terms of Oil Curse performance, considering the sub-indicators of corruption, economic diversification, and political stability, as well as the risk of armed and ethnic conflict.

As a conclusion for the first part of this thesis, the constructed OCI offers an econometric measurement for the Oil Curse and also delivers policy suggestions to the decision-makers of the countries related to the remedies to overcome the Resource Curse and develop sustainable growth strategies. Accordingly, it is inferred from the analysis that resource-dependent economies need to construct a set of policies through anti-corruption policies, better resource and revenue management, as well as better institutional quality and political stability to guarantee a sustainable path of growth, as well as economic, social, and political development.

The second part of the thesis adopted an economic growth perspective to validate and verify the constructed OCI. To do so, the OCI has been utilized in a modified and extended Neoclassical Growth Model conducted by Mankiw-Romer-Weil (1992). Using the same sample of countries in the model, the results validate the negative relationship between OCI and economic growth variables, which were also evidenced in the vast majority of the Resource Curse literature. Further analysis also approves the presence of the oil curse through an economic growth model perspective, but the results are not seemed to be robust. So, there is still potential for future works.

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