



T.C.

ANKARA YILDIRIM BEYAZIT UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES

**THE IMPACT OF CRUDE OIL EXPORTS ON ECONOMIC
GROWTH IN GCC COUNTRIES**

MASTER'S THESIS

HOSAM AHMED ALI SENAN ALSAEEDI

DEPARTMENT OF ECONOMICS

ANKARA 2020

T.C.
ANKARA YILDIRIM BEYAZIT UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES

**THE IMPACT OF CRUDE OIL EXPORTS ON ECONOMIC
GROWTH IN GCC COUNTRIES**

MASTER'S THESIS

HOSAM AHMED ALI SENAN ALSAEEDI

DEPARTMENT OF ECONOMICS

SUPERVISOR
PROF.DR. ERDAL TANAS KARAGÖL

ANKARA 2020

ONAY SAYFASI

Hosam Ahmed Ali Senan ALSAEEDI tarafından hazırlanan “The Impact Of Crude Oil Exports On Economic Growth in GCC Countries” adlı tez çalışması aşağıdaki jüri tarafından oy birliği/oy çokluğu ile Ankara Yıldırım Beyazıt Üniversitesi Sosyal Bilimler Enstitüsü İktisat Anabilim Dalı’nda Yüksek Lisans tezi olarak kabul edilmiştir.

Unvan Adı Soyadı	Kurumu	İmza
Prof. Dr. Erdal Tanas KARAGÖL	AYBU/ Siyasal Bilgiler Fakültesi/ İktisat	
Doç.Dr. Abdulkadir DEVELİ	AYBU/ Siyasal Bilgiler Fakültesi/ İktisat	
Prof. Dr. Murat ATAN	AHBV/ İktisadi ve İdari Bilimler Fakültesi/ Ekonometri	
Jüri Üyesi		
Jüri Üyesi		

Tez Savunma Tarihi: 29/12/2020

Ankara Yıldırım Beyazıt Üniversitesi Sosyal Bilimler Enstitüsü İktisat Anabilim Dalı’nda Yüksek Lisans tezi olması için şartları yerine getirdiğini onaylıyorum.

Sosyal Bilimler Enstitüsü Müdürü

Doç. Dr. Seyfullah YILDIRIM

PLAGIARISM PAGE

I hereby declare that all information in this thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work; otherwise, I accept all legal responsibility. Date 31.12.2020

Name, Last name : Hosam Ahmed Ali Senan Alsaedi

Signature :

A large, faint, stylized watermark signature in the background of the page, consisting of several overlapping, slanted lines that form a complex, abstract shape.



To My Family

ACKNOWLEDGMENTS

I would like to extend my sincere thanks and gratitude to;

My thesis advisor Prof. Dr. Erdal Tanas KARAGÖL for his persistent support, valuable advice, encouragement, and Suggestions to me during writing my thesis.

the examining committee members Prof. Dr. Erdal Tanas KARAGÖL, Prof. Dr. Murat ATAN and Doç. Dr. Abdulkadir DEVELİ for their priceless contributions and guidance.

to the Presidency for Turks Abroad and Related Communities (Turkey Scholarship) that funded my master's program.

to all professors, academics and the employees in the Department of Economics and the Institute of Social Sciences at Ankara Yıldırım Beyazıt University.

I extend my thanks and gratitude to my dear parents and all members of my family for their patience and constant support for me throughout my study. and to all my friends who support me.

I also thank my beloved wife for her patience and continuous support.

ÖZET

Petrolün Körfez İşbirliği Konseyi (KİK) ülkelerinde bulunması, özellikle Ortadoğu'da ve genel olarak dünyada stratejik ve ekonomik önemini artırmıştır. KİK ülkeleri, petrol gelirlerinin faydalarını görerek onları dünyanın zengin ülkelerinden biri haline getirmiştir. Bu nedenle, ham petrol ihracatı, hükümet harcamalarının ve kalkınma planlarının finansmanına büyük ölçüde katılmaktadır. Buradan yola çıkarak ham petrol ihracatı ile ekonomik büyüme arasındaki ilişkinin incelenmesi, özellikle petrol piyasalarında meydana gelen farklılıklar nedeniyle günümüzde önem arz etmektedir. Bu çalışma, dengeli bir panel veri seti kullanarak 1970-2018 dönemlerinde ham petrol ihracatının KİK ülkelerindeki ekonomik büyüme üzerindeki etkisini değerlendirmeyi amaçlamaktadır. İlk olarak, serilerdeki kesitler (ülkeler) arasındaki bağımlılık ve hatalardaki kesitler bağımlılığı ve eğim heterojenliğini onaylanmıştır. Ayrıca, hem yatay kesit bağımlılığın hem de yapısal kırılmaların varlığında değişkenlerin durağanlığını incelemek için 2. nesil Panel birim kök testleri kullanılmıştır. Sonrasında, kesit bağımlılığı, yapısal kırılmalar ve gözlenmeyen faktörleri dikkate alan 2. nesil panel eşbütünleşme testleri eşbütünleşme ilişkisini onaylamıştır ve buna göre kırılmalar tahmin edilmiştir. Bundan sonra, uzun vadeli esneklikler birkaç tahmin edici (yani AMG, CS-ARDL ve CS-DL) kullanılarak tahmin edilmiştir. Son olarak, 10000 tekrarlı önyükleme paneli nedenselliği, KİK ülkelerinin çoğunda ham petrol ihracattan ekonomik büyümesine doğru bir nedensellik ilişkisi bulunurken bazı ülkelerde ekonomik büyümesinden ham petrol ihracatına doğru nedensellik ilişkisinin varlığı tespit edilmiştir. Ancak, havuzlanmış nedensellik testi neticesinde çift yönlü nedensellik ilişkisi mevcuttur. Elde edilen sonuçlar, ham petrol ihracatının ekonomik büyüme üzerinde kısa ve uzun dönemde pozitif bir etkiye sahip olduğunu göstermektedir. Sonuçlar, kaynak bolluğu laneti hipoteziyle çelişmekte olup KİK ülkelerinde petrol ihracatı kaynaklı büyüme hipotezini desteklemektedir.

Anahtar Kelimeler: KİK, Ham Petrol İhracatı, Ekonomik Büyüme, Kesitsel Bağımlılık, Heterojen Paneller, Dinamik Paneller, AMG, CS-ARDL, CS-DL.

ABSTRACT

The discovery of the oil in the Gulf Cooperation Council (GCC) countries increased their strategic and economic significance in the Middle East, specifically, and the world, generally. The GCC countries have reaped the benefits of the oil revenues making them one of the affluent countries in the globe. Therefore, the crude oil exports massively participate in financing the governmental spending and development plans. Accordingly, studying the relationship between crude oil exports and economic growth shows significance nowadays, especially because of the variations occurring in the oil markets. This study aimed to assess the impact of the crude oil exports on the economic growth in GCC countries during the periods from 1970 to 2018 using a balanced panel data set. First, cross-sectional dependence in series and errors and the slope heterogeneity of the cross sections were approved. Furthermore, Panel unit root tests from 2nd generations were used to examine the stationarity of the variables in the presence of both the cross-sectional dependency and the structural breaks. Then, the panel cointegration tests from 2nd generations that taking account for cross-section dependency, structural breaks and unobserved factors approved the cointegration relationship, and accordingly the breaks were estimated. After that, the long-run elasticities were estimated using several estimators (i.e. AMG, CS-ARDL and CS-DL). Finally, the bootstrap panel causality with 10000 replications supported the causality direction from the crude oil exports to the economic growth in most of GCC countries, and the inverse case was also detected in some countries. However, the pooled causality supported the bidirectional causal linkages. The outcomes illustrate that crude oil exports positively affect the economic growth in the short and long term. This contradicts the hypothesis of the curse of resource abundance and provide evidences that support the hypothesis of oil exports-led growth, in the GCC countries.

Keywords: GCC, Crude Oil Exports, Economic Growth, Cross-Sectional Dependence, Heterogenous Panels, Dynamic Panels, AMG, CS-ARDL, CS-DL.

TABLE OF CONTENTS

ÖZET	i
ABSTRACT	ii
TABLE OF CONTENTS	iii
LIST OF ABBREVIATIONS	v
LIST OF FIGURES	vi
LIST OF TABLES	vii
1. INTRODUCTION	1
1.1. Introduction.....	1
1.2. Problem Statement and Objectives	3
1.3. The Outline of the Study.....	3
2. OIL SECTOR AND ECONOMIC GROWTH IN GCC COUNTRIES	4
2.1. Oil Sector in GCC Countries	4
2.1.1. Production and Proven Reserves of Crude Oil.	5
2.1.2. Crude Oil Prices and Fluctuations of Productions.	9
2.1.3. Refining Capabilities, Oil products and Energy Consumption.....	15
2.1.4. Imports and Exports of crude oil.....	20
2.1.4.1. Crude Oil Exports in GCC Countries.....	22
2.1.5. Natural Gas and Renewable energy	25
2.2. Economic Growth and Oil Revenues.....	27
2.2.1. Oil GDP and Exports	31
3. LITERATURE REVIEW	34
3.1. The Resource Curse Hypothesis	34
3.2. Export-Led Growth Hypothesis.....	35
3.3. Previous Literature Related to GCC Countries.....	37
4. METHODOLOGY AND EMPIRICAL FINDINGS	42
4.1. Data Set.....	42

4.2. Methodology	43
4.2.1. Cross-Section Dependence	45
4.2.2. Panel Unit Root Tests	46
4.2.3. Panel Cointegration Tests	48
4.2.4. Slope Heterogeneity Test	51
4.2.5. Long-Run Estimators	52
4.2.5.1. The Augmented Mean Group (AMG) Estimator	52
4.2.5.2. The Cross-Sectionally Augmented ARDL (CS-ARDL)	53
4.2.5.3. The Cross-Sectionally Augmented Distributed Lag (CS-DL)	54
4.2.6. Bootstrap Panel Causality	55
4.3. Empirical Results	56
4.3.1. Testing for Cross- Section Dependence	57
4.3.2. Testing for Panel Unit Root	58
4.3.3. Testing for Panel Cointegration	59
4.3.4. Testing for Slope Heterogeneity	62
4.3.5. Long-run Estimations	62
4.3.5.1. The Augmented Mean Group (AMG) Estimator	62
4.3.5.2. The Cross-Sectionally Augmented ARDL (CS-ARDL)	63
4.3.5.3. The Cross-Sectionally Augmented Distributed Lag (CS-DL)	63
4.3.6. Bootstrap Panel Causality	64
5. CONCLUSION AND POLICY IMPLICATIONS	66
6. REFERENCES	68
CURRICULUM VITAE	78

LIST OF ABBREVIATIONS

\$/b	USD Dollar for Barrell
1000 b/d	Thousands Per Day
1000 b/Year	Thousands Per Year
ADF	Augmented Dickey–Fuller Test
AIK	Akaike Information Criterion
AMG	Augmented Mean Group Estimator
ARDL	Autoregressive Distributed Lag Approach
b / d	Barrel Per Day
BAPCO	Bahrain Petroleum Company
COE	Crude Oil Exports
CCEMG	Common Correlated Effects Mean Group
CS	Cross-Sections
CD	Cross-Sections Dependence
CS-ARDL	The Cross-Sectionally Augmented ARDL
CS-DL	The Cross-Sectionally Augmented Distributed Lag
DOLS	Dynamic OLS
DFE	Dynamic Fixed Effects Estimator
ECT	Error Correction Term
EIA	U.S. Energy Information Administration
FMOLS	Fully Modified OLS
FOB	Free On Board
GCC	Gulf Cooperation Council
GDP	Gross Domestic Products
IMF	International Monetary Fund
Kt	Kilotons
MENA	Middle East and North Africa
MG	Mean Group Estimator
NA	Not Available
OAPEC	The Organization of Arab Petroleum Exporting Countries
OLS	Ordinary Least Squares
OPEC	The Organization of Petroleum Exporting Countries
PMG	Pooled Mean Group Estimator
PPP	The Purchasing Power Parity
UAE	United Arab Emirates
UNCTAD	United Nations Conference on Trade and Development

LIST OF FIGURES

Figure 2.1. GCC, OPEC, and World Crude Oil Production 1,000 b/d.....	5
Figure 2.2. GCC Crude Oil Production 1,000 barrels per annum	6
Figure 2.3. GCC proven crude oil reserves	8
Figure 2.4. Selected spot Crude oil prices \$ / b.....	11
Figure 2.5. Selected GCC Crude oil spot prices \$ / b.....	12
Figure 2.6. Saudi Arabia Crude Oil Production and OPEC Reference Basket in Nominal Term.....	13
Figure 2.7. Cushing, OK WTI Spot Price FOB and Future Contract 1 and Contract 4 Prices.....	14
Figure 2.8. Total GCC Crude Oil Production and OPEC Reference Basket in Nominal Term.....	15
Figure 2.9. GCC Installed Refining Capacity 1,000 b/d	16
Figure 2.10. GCC Countries Output of Petroleum Products 1000 b/d.....	18
Figure 2.11. Selected Petroleum products indicators in GCC countries Thousand Barrels	18
Figure 2.12. GCC Energy Consumption by selected energy sources in 2017	19
Figure 2.13. World and selected countries Crude Oil Exports 1,000 b/d.....	22
Figure 2.14. GCC Crude oil exports 1000 b/ Year.....	23
Figure 2.15. GCC Oil Products Exports 1,000 b/d.....	25
Figure 2.16. GCC CO2 Emissions kt	27
Figure 2.17. GCC GDP at Current Prices.....	28
Figure 2.18. GCC Growth Rates in Both Real and Current Prices	29
Figure 2.19. GDP Per Capita at Current Prices of GCC Countries thousands \$.....	31
Figure 2.20. GCC Oil Exports and GDP in Current Prices m\$.....	33
Figure 2.21. GCC Government Primary Balance as GDP %	33
Figure 4.1. GDP Per Capita In Constant Prices (2015) of GCC Countries.....	42

LIST OF TABLES

Table 2.1. GCC Crude Oil Production 1,000 barrels per annum	7
Table 2.2. Refineries in GCC countries with operating companies	17
Table 2.3. GCC Consumed Electric Energy Gigawatt per hour.....	20
Table 2.4. GCC Oil Products Imports 1,000 b/d	21
Table 2.5. GCC Crude oil exports 1000 b/ Year	24
Table 2.6. Selected Indicators of GCC Countries in 2018	30
Table 2.7. Oil and Non-Oil GCC Exports	32
Table 4.1. List of Sampled Countries	56
Table 4.2. The Descriptive Statistics of Variables	57
Table 4.3. Cross Section Dependency in the Series	57
Table 4.4. Errors Cross- Sectional Dependency results.	57
Table 4.5. CIPS and CADF Results	58
Table 4.6. Bai & Carrion-I-Silvestre (2009) Unit Root Test Results	59
Table 4.7. Westerlund and Edgerton (2008) Panel Cointegration Test.....	59
Table 4.8. Estimated Breaks by Westerlund and Edgerton (2008)	60
Table 4.9. Banerjee and Carrion-i-Silvestre (2017) Panel Cointegration Test.....	61
Table 4.10. Slope Heterogeneity Test (Pesaran & Yamagata, 2008).....	62
Table 4.11. AMG Estimator Results	62
Table 4.12. CS-ARDL Approach Estimates.....	63
Table 4.13. Long-run Estimates Based on CS-DL Approach	64
Table 4.14. Emirmahmutoglu & Kose (2011) causality test results.....	64
Table 4.15. Kónya (2006) causality test results	65

1. INTRODUCTION

1.1. Introduction

The Gulf Cooperation Council (GCC) countries have an important geopolitical position in the Middle East, especially in the last century, where the discovery of oil increased their strategic and economic importance in the region and the world. Historically, Pearl trade has been a source of income for many of the citizens of those countries in addition to animal grazing. The Islamic sanctuaries found in Saudi Arabia have been created some commercial momentum, and still a source of income for Saudi Arabia through the revenues of the Pilgrimage and religion tourism until now. After the discovery of oil, the Gulf countries entered an unprecedented era of development, especially in the last decades, and perhaps the most prominent features of this stage were the development of infrastructure and construction sector, in addition to the rapid increase in per capita GDP, and welfare rates. Generally, The GCC countries have reaped huge surpluses of oil revenues to become in the list of the wealthiest countries in the whole world.

The total area of the GCC countries is about 2.4 million square kilometers, and the resident population was 56 million in 2018, where Saudi Arabia is the most enormous Gulf country in terms of area and population, while Bahrain comes in the last. In order to enhance economic integration, trade, political and military cooperation, the Gulf countries established the Gulf Cooperation Council in 1981, where they achieved high coordination and economic integration. For example, GCC countries established a free trade economic zone between them after signing the unified economic agreement in November 1981, and the customs union between the GCC states was established in Jan. 2003. Thus, the GCC countries became a one customs unit in front of the outside world with a transitional period from 2003 to 2009. Additionally, they have agreements and cooperation in the fields of culture, sports, foreign policy, media, security etc. Despite the existence of some differences between the GCC states, especially about foreign policy, the Council remains coherent. On the other hand, some of the GCC countries were considered as among the founders of the Organization of Petroleum Exporting Countries (OPEC), and so far, Saudi Arabia, Kuwait, and the UAE are still having the membership of the organization, while Qatar recently withdrew.

The GCC countries are classified as rentier countries that rely heavily on oil revenues; thus, they have generated large financial surpluses, especially when oil prices were raised in different time periods. However, the six countries seek to diversify their economies and develop non-oil sectors, and the most progress has been made in Bahrain and the UAE, which concentrated on the financial sector, tourism, and foreign direct investment flows. But in general, the whole countries still depend on oil and other natural resources significantly.

The GCC countries are ranked twelfth globally in terms of GDP, which amounted to 1.7 trillion USD at current prices in 2018. Furthermore, the GCC countries achieved a high rate of growth of 13.2% in 2018 compared to the global growth rate, which was 3%, and per capita GDP at current prices was 29,478 \$ in 2018. Also, GCC countries collectively have the largest proven oil reserves in the world, which amounted to 497 billion barrels as an annual average in 2018. Besides, they were ranked as the first in global oil production, as their average daily production in 2018 reached 17.5 million barrels. Whilst, they were ranked as the second globally in natural gas reserves by 41.8 trillion cubic meters in 2018 and as the third in the production of marketed natural gas by 414 billion cubic meters.

The oil sector contributed by 48% of the GDP of the GCC states in 2010, while it was 22% in 2016 affected by changes in oil prices. Meanwhile, petroleum exports (oil and gas) have a high relative ratio to total exports with 77% in 2010, and 61% in 2016. Additionally, GCC countries depend heavily on oil revenues to finance their expenditures, as the oil revenues equalized 84% of the total revenues of the council's governments in 2010 despite the decrease in the percentage to 60% due to oil prices variations in 2016. However, oil revenues still a decisive factor for GCC economies. As crude oil exports are crucial for GCC countries. So, the effects of crude oil exports on economic growth should be studied empirically.

The nexus between natural resources and economic growth has well studied in the literature, where the hypotheses of the negative relevance between the abundance of resources and economic growth were introduced. Still, it is considered controversial issues up today. Nonetheless, the hypothesis of Exports-led growth was introduced to the literature, which suggests that exports leads the economic growth. More discussion on that topic and related work will be presented in details in the third chapter of this work.

1.2. Problem Statement and Objectives

The discovery of oil in the GCC countries was the beginning of a new economic phase, where the GCC countries witnessed a remarkable development in infrastructure and urbanization. In addition, they achieved high economic growth rates, especially since the seventies of the last century. Exports of crude oil were the main source for financing government spending and development plans. Therefore, analyzing the rapport between crude oil exports and economic growth has become more important than before due to the fluctuations in global oil markets and the orientation of these countries towards the diversification of their economies. Consequently, this study mainly aimed to investigate the impact of oil exports on economic growth in the GCC countries by analyzing the relationship between them in the short and long-run and provide new evidences to the literature using recent econometric techniques.

Since the GCC countries are crude oil-rich countries, the study also aims to examine the natural resource curse hypothesis and the oil exports-led growth hypothesis in GCC countries. Furthermore, the study aims to analyze the oil sector and economic growth and clarify the nexus between them during the past decades. Eventually, the study aimed to provide policy implications that may benefit policymakers in the GCC countries.

1.3. The Outline of the Study

The thesis was splatted to five chapters and organized as follows:

- **First Chapter: The introduction:**

This chapter starts with a brief introduction, and then the problem statement and objectives of the study are discussed.

- **Second Chapter: Oil Sector and Economic Growth in GCC Countries**

The reserves of crude oil, production of oil, crude oil prices, and exports of crude oil are discussed in details. Additionally, the economic growth and relationship with crude oil exports in GCC countries are discussed as well.

- **Third Chapter: Literature Review.**

The theoretical background and related literature is reviewed in this chapter.

- **Forth Chapter: Methodology and Empirical Findings.**

This chapter covers the methodology and model specification, data, and empirical results.

- **Fifth Chapter: Conclusion and Policy Implications.**

2. OIL SECTOR AND ECONOMIC GROWTH IN GCC COUNTRIES

2.1. Oil Sector in GCC Countries

The detection of oil in the Arab/ Persian Gulf was the beginning of a new economic and social era for the region, especially for the Gulf countries named Saudi Arabia, UAE, Qatar, Kuwait, Oman, and Bahrain that recently has been known as the Gulf Cooperation Council countries. After suffering from poverty for many decades, these countries have achieved high economic bloom and Significant financial surpluses. The structure of the economy in these countries has changed from the primitive economy depends on Pearl trade to the rentier economy where oil is the cornerstone of the economy. This transformation also led to the emergence of modern government administration. Meanwhile, the urbanization era has been started in these countries clearly in conjunction with oil bloom. The first crude oil discovery was in Bahrain in 1932 by BAPCO (Bahrain Petroleum Company) that was founded by Standard Oil Company of California in 1929 and lately, has been owned completely by the government of Bahrain. The first shipment of oil was exported in 1934. Also, the first oil refinery was established in Bahrain in 1934 with a production capacity of 10,000 b/d, which was then expanded to 260,000 b/d (NOGA, 2012).

Despite the disclosure of oil in South West Persia (Iran now) in 1908, the detection of oil in Bahrain was the main driver for the rest of the Gulf countries to explore oil. Saudi Arabia discovered oil in 1933 and the production process began in the same year, oil also was discovered in the UAE, the State of Kuwait and Qatar during the years 1953, 1938 and 1940 respectively, and production started during the years 1965, 1946 and 1940 respectively (OAPEC, 2019). While production started in Oman in 1962 with commercial quantities. However, the exports started 1967 after many attempts to explore commercial quantities of oil (PDO, 2019).

In this chapter, the listed subjects bellow will be discussed:

- Production and proven reserves of crude oil,
- Crude oil prices and fluctuations of productions,
- Refining capabilities, oil products, and energy consumption,

- Imports and exports of crude oil, and
- Natural gas and renewable energy
- Economic Growth and Oil Revenues.

2.1.1. Production and Proven Reserves of Crude Oil.

The GCC countries are among the most oil-producing countries in the whole world. Where the oil production of these countries combined ranged between 15 to 27% of the global production of crude oil during the past thirty years (figure 2.1). The data indicate that the Gulf countries produced 27% in the year 1980 of the world oil production, and contributed by 26% of the global production of crude oil in 2015. Additionally, the production of the Gulf Cooperation Council countries combined ranges between 50% and 60% compared to the production of OPEC countries combined. Nevertheless, OPEC oil production is between 35% and 45% of the global production.

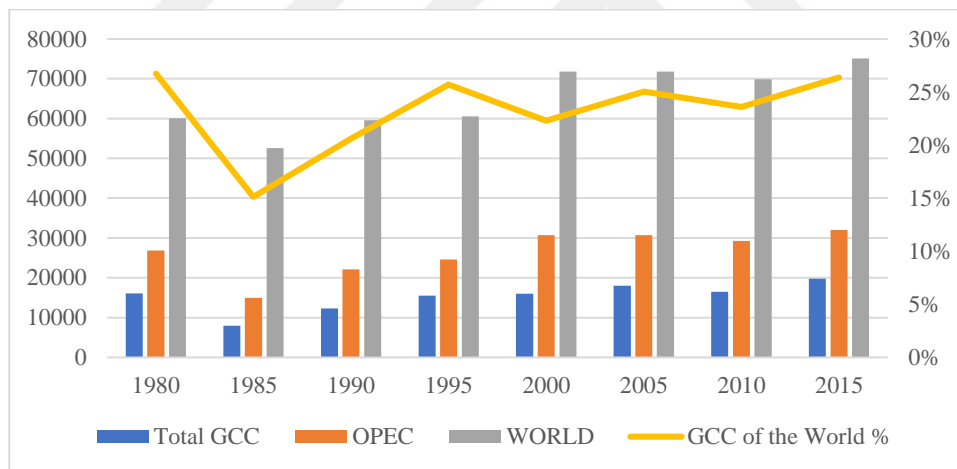


Figure 2.1. GCC, OPEC, and World Crude Oil Production 1,000 b/d

Source: OAPEC, (2020), OPEC, (2016) and OPEC, (2008)

Some of the Gulf countries has a significance role in OPEC due to its large production capacity such as Saudi Arabia that has been considered as the second biggest producer of oil globally (IRENA, 2016). The production of crude oil in the GCC countries reached 6,586,774.95 thousand barrels in 2018 (IMF, 2019). Plus, GCC countries collectively have huge oil reserves which amounted to 44% of global crude oil reserves in 2000 and 33% during the 2011-2017 period.

The oil was discovered in Saudi Arabia in the mid-1930s. Then, the quantities of produced crude oil accelerated considerably making her at the forefront of the oil-producing countries. The cumulative production of crude oil from 1938 to 2017 reached 147,606,013 thousand barrels. The Production of oil raised from 511 thousand barrels in 1938 to 3,708,911 thousand barrels in 2018. Saudi Arabia achieved the highest production ever in 2016 by producing 3,817,973 thousand barrels when the oil prices were declined to 40.76 dollars a barrel for OPEC basket crudes. After 2016 the production of Saudi Arabia decreased as a result for oil producers' arrangement that aimed to improve the oil prices. In general, the oil production of Saudi Arabia has taken an increasing trend over the years making Saudi Arabia the greatest oil producer among the countries of the GCC as the Saudi production rate has a position between 55-70% of the total production volume of the GCC countries during the period from 1980 to 2018 as shown in Figure 2.2. below.

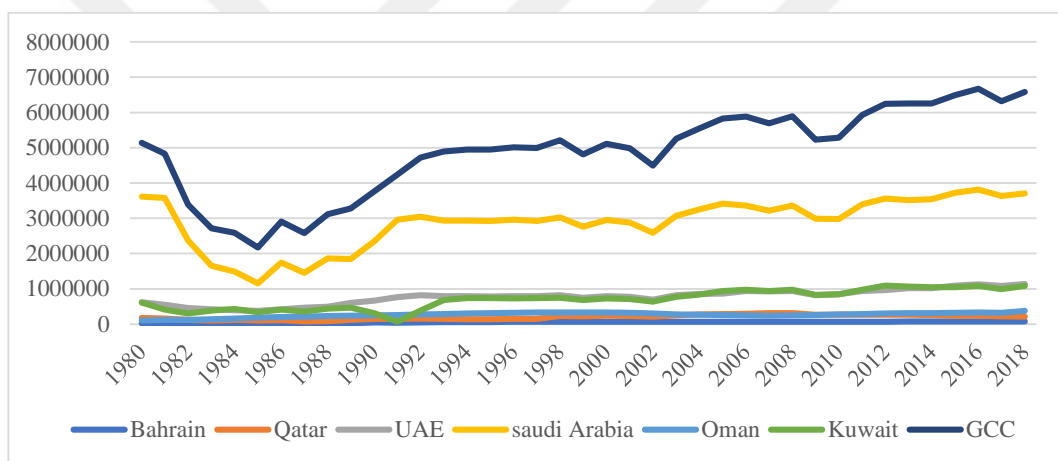


Figure 2.2. GCC Crude Oil Production 1,000 barrels per annum

Source: OAPEC, (2020), Data of 2018 has taken from IMF, (2019)

At the global level, Saudi Arabia takes a large weighted position by producing 14% and 13% of the total global crude oil production for 2016 and 2017, respectively. In the other side, Saudi Arabia has one of the biggest oil reserves in the world, as its oil reserves amounted to 266,455 266,208 and 266,260 million barrels for the years 2015, 2016, 2017 respectively, achieving the second position after Venezuela, which has the biggest oil reserves in the world until 2017 which was 302 809 million barrels (OPEC,2018). Saudi oil reserves represented 54% of the total oil reserves of the GCC countries in 2017, and 18% of the global crude oil reserves. Moreover, the number of oil-producing wells in Saudi Arabia amounted to 3,555 3,648 and 3,489 wells for the years 2015, 2016 and 2017 respectively, and the number of completed wells reached 600, 622 and 616 well for the same years in a

row. knowing that the data includes the area divided between Kuwait and Saudi Arabia which was agreed to share it equally between the two countries in 1965 (Onorato, 1985).

Kuwait has a high crude oil production proportion among GCC countries where oil production began in the 1940s, and cumulative production of crude oil from 1946 to 2018 reached 48,917,744 thousand barrels with a growth rate ranging between 2 and 3% since 1994 until 2018. The average annual production reached 5 913 thousand barrels in 1946, and the production volume reached 607,250.5 843,916.5, and 1,083,831 thousand barrels for the years 1980, 2010, 2018, respectively.

Table 2.1. GCC Crude Oil Production 1,000 barrels per annum

Year/ Country	Bahrain	Qatar	UAE	Saudi Arabia	Oman	Kuwait	GCC
1980	17,520	172,061	621,193.5	3,613,682.5	103,419.1	607,250.5	5,137,106.6
1985	15,330	105,448.5	369,599	1,158,875	181,854	341,749.5	2,174,840.9
1990	42,989.7	148,044	663,752.5	2,340,562.5	250,134.5	312,622.5	3,760,095.7
1995	53,071	142,277	784,020	2,928,541	309,556.5	732,409	4,951,869.5
2000	65,882.5	236,593	793,765.5	2,954,492.5	328,025.5	728,576.5	5,109,335.5
2005	68,072.5	279,553.5	867,970	3,413,954.5	259,259.5	939,291	5,830,106
2010	66,357	267,691	848,187	2,980,444	276,779.5	843,916.5	5,285,385
2015	73,949	239,440	1,090,949	3,720,299	323,098	1,043,426	6,493,175
2018	73,375.95	213,014	1,133,471	3,708,911	372,154	1,083,831	6,586,774.9

Source: OAPEC, (2020); Data of 2018 was obtained from IMF, (2019)

Kuwait's crude oil production ranged between 14-16% of the total oil production of the GCC countries during the twentieth Last years until 2018, while the percentage of crude oil production in Kuwait was 4% of world production during the period 2015-2017. In term of reserves of crude oil, Kuwait owned 20% of the total oil reserves of the Gulf states in 2017 and 7% of the volume of global reserves for the similar year while the data of divided area with Saudi Arabia was included. Further, the oil-producing wells were 1,731 1,780 and 1,689 for 2015, 2016 and 2017 respectively. However, the data of crude oil are close to those of the United Arab Emirates, as the percentage of crude oil production ranged between 15-17% of the total oil production of the GCC countries during the past twenty years until 2018. The production of crude oil in UAE was 4% of the total global oil production during 2015-2017 years. Meanwhile, the production was 11,272,230 1,082,773 and 1,133,471 thousand

barrels for 2016, 2017, 2018 respectively. Additionally, the cumulative production of oil since 1962 was 36,650,774 thousand barrels until 2018 where the production in 1962 was 5,183 thousand barrels (OPEC, 2005). Furthermore, the reserves of the United Arab Emirates reached 97,800 Million barrels in 2017, which is 20% of the total reserves of the GCC countries, and 7% of the global reserves of crude oil, and the number of producing- wells in 2017 was 1,795 wells.

The State of Qatar is one of the most affluent countries in the world with natural gas. But that is not the case for crude oil where Qatar produces relatively few quantities of oil compared to the rest of GCC countries. Qatar was one of the OPEC members until concluding its membership on 01 Jan 2019 (OPEC, 2020). Qatar's cumulative production of crude oil reached 10,687,979 thousand barrels since 1949 until 2018 as well as the production of crude oil in 1949 was 730 thousand barrels. The production oil amounted to 237,797.5 219,000 and 213,014 thousand barrels during 2016, 2017 and 2018 respectively. The ratio of Qatar's crude oil production ranged between 3% and 5% of the total production for the Gulf countries during the past twenty years until 2018 with almost 425 produced wells, while the ratio to global Crude oil output is about 1%.

Qatar's reserves of crude oil reached 5,373 million barrels in 2017, which represents 5% of reserves in the Gulf states, and nearly 2% of global proven reserves.

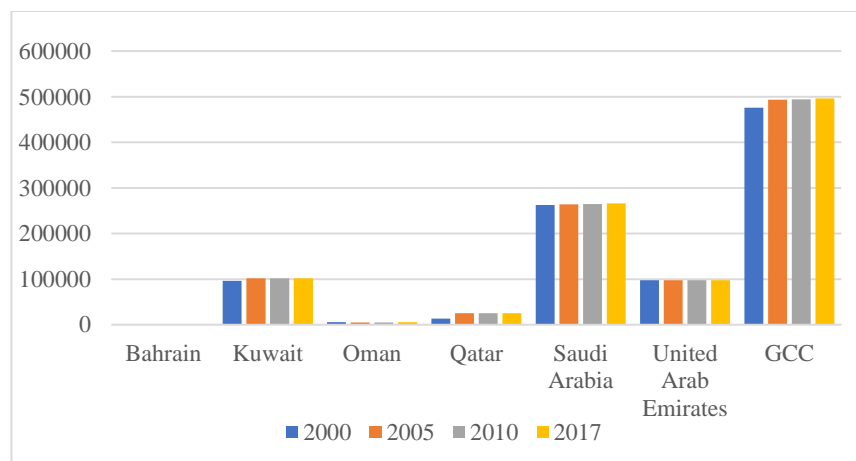


Figure 2.3. GCC proven crude oil reserves

Source: OAPEC, (2020)

Oil was discovered in the State of Bahrain before its counterparts in the Gulf countries; nevertheless, it has a scarcity of crude oil in which the production reached 71,138.5 and 73,375.95 thousand barrels in 2017 and 2018, respectively. The percentage of crude oil

production in Bahrain was 1% of the total oil production in the GCC countries during the past twenty years up to 2018, and 0.0026% of global production in 2017. this reflects the lack of oil in Bahrain. At the same time, the reserves amounted to 120 and 80 million barrels in 2016 and 2017, respectively. Bahrain has the lowest rate of production and reserves between the Gulf countries this makes Bahrain's situation unique in term of crude oil compared to the neighboring countries.

The State of Oman has a better situation than Bahrain where the crude oil production reached 323,098 331,675.5 322,623.5 and 372,154 thousand barrels for the years 2015, 2016, 2017, 2018 respectively. Besides, the ratio of Omani crude oil production relative to crude oil production in the other GCC countries ranged between 4 and 6.85 through the years from 1990-2018 and about 1% of global production in 2017. in terms of reserves, Oman's crude oil reserves were 5,373 million barrels in 2017 which represented 1% of the GCC reserves, and for the same year it was 0.0036% of the total global reserves.

2.1.2. Crude Oil Prices and Fluctuations of Productions.

Many factors interfere in the energy and oil pricing process besides the economic factors, leaving a failure in the market mechanism. So, the pricing of crude oil is a complex and difficult process. The most important factor is the government interventions associated with geopolitical interests and mutual international influence. In addition to the presence of monopolies because of the high costs of exploration, production, and distribution to the hand of the consumer. Given that oil and its derivatives are a final and intermediate commodity at the same time, therefore, the pressure on the pricing mechanism is usually higher.

After the discovery of oil in the United States during the period 1859-1870, prices have been constantly changing. Then, major companies in the United States and other countries have started appearing such as Standard Oil Company that Founded in 1870 and Texas Oil Company. These companies had a major role in exploring and pricing oil at the local American and international levels. In that era, the United States was the largest oil exporter globally. Then, the oil was found in many other countries such as Mexico and Russia. Until 1928, oil had become a global commodity and giant companies have been appeared, such as Anglo-Persian Oil Company which became British Petroleum nowadays and the British government owned a large share of it. the government property usually facilitates interfering the oil trade for political and non-political reasons (Bhattacharyya, 2019).

During this stage, the oil was discovered in the Middle East, which was also an important event in the global oil trade as a result of the relatively low production costs and large reserves that were discovered. Hence, two oil pricing systems have been applied. The first was the price system based on one base point (The Gulf-plus pricing scheme) in which the price is calculated according to FOB price from the United States coast of Gulf of Mexico as a basis point in addition to the transportation costs that are calculated based on transportation costs between the Gulf of Mexico and the importing country rather than the transportation costs between exporting country and the importing country. This scheme was a result of an agreement between three major companies named Standard Oil of New Jersey, Royal Dutch/Shell and Anglo-Persian to reduce the rivalry, that is, an agreement between large monopolistic powers. Mostly, this mechanism was at the service of the American market and importing countries. The increased production of oil in the Middle East caused adjustments to this price scheme and another basis was included which is the double basis point pricing system that produced more basis for assessing costs alongside the Gulf of Mexico. After that, the Seven Sisters which are giant oil companies such as Standard Oil of New Jersey (ExxonMobil) and Royal Dutch Shell were controlling almost the whole oil industry around the world during the period 1928-1960. These companies have adopted a new price system which is the Posted Price system. This system created the buyer-set prices where the refineries were determining the price (Bhattacharyya, 2019). Furthermore, until 1960 many new variables emerged such as the transformation of the United States into an oil importer and the liberation of some oil-producing countries from the colonialism, and the foundation of OPEC which founded in September 1960 in Iraq with a membership of 5 countries named Iraq, Saudi Arabia, Kuwait, Venezuela, and Iran. OPEC later was expanded to include 14 countries and currently consists of 13 countries as follows: Algeria, Angola, Congo Equatorial, Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, United Arab Emirates, and Venezuela (OPEC, 2020).

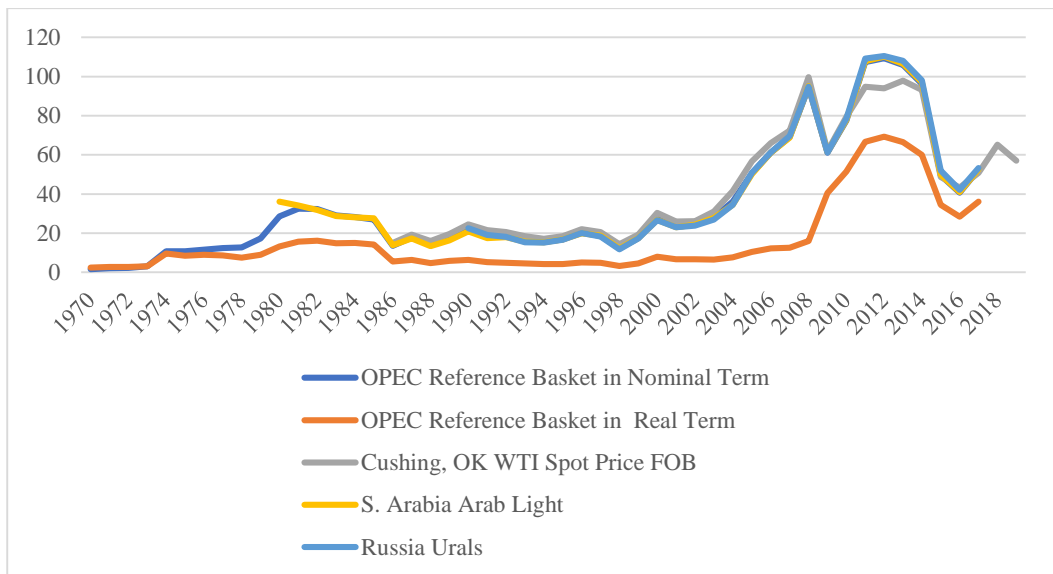


Figure 2.4. Selected spot Crude oil prices \$ / b

Source: OPEC Annual Statistical Bulletin: several issues, OAPEC, (2020), and EIA, (2020)

In 1973, the tendency by OPEC countries was localizing the production concessions, changing the tax system (i.e., raising taxes, and controlling the production of oil) and setting annual rates of increase to confront inflation. Moreover, some oil-producing countries have moved toward nationalizing oil industry such as Algeria. However, the decisive change was through the war of October 1973 as Arab-oil exporting countries announced the ban on the export of Arab oil to the United States and other countries for political considerations related to the position on the war in addition to production cut by 25%. This ended the posted price system and OPEC countries have adopted a new method of pricing (Bhattacharyya, 2019). During the period 1970- 2010 about 12 Geopolitical events affected the oil prices were happened like the Iranian revolution (1979) and the Iraq-Iran war (1980), the September 11 attacks (2001), the 2009 global financial crisis, and the sanctions on some countries like Iraq and Iran. In addition to the Geopolitical factors, there are other factors have effects on the oil pricing such as the impact of oil futures contracts, production flexibility, production-cut decisions, the emergence of shale oil in the United States, and the fluctuations of the global demand.

GCC countries produce several types of crude oil, and the type of oil varies based on the carbon content and the specific density ratio (the density of crude oil relative to the density of water) according to the criteria of the American Petroleum Institute, Figure 2.5. shows the prices of the most important types of oil that were produced by the GCC states

corresponding to the OPEC basket spot prices. However, the oil production process of the Gulf countries is characterized by the difficulty of rapid response to changes in prices where the wells are traditional despite the lower production costs compared to shale oil which wells can be prepared in less time; therefore, it is difficult to equip wells quickly and respond to changes in the demand side (Devarajan & Mottaghi, 2016).

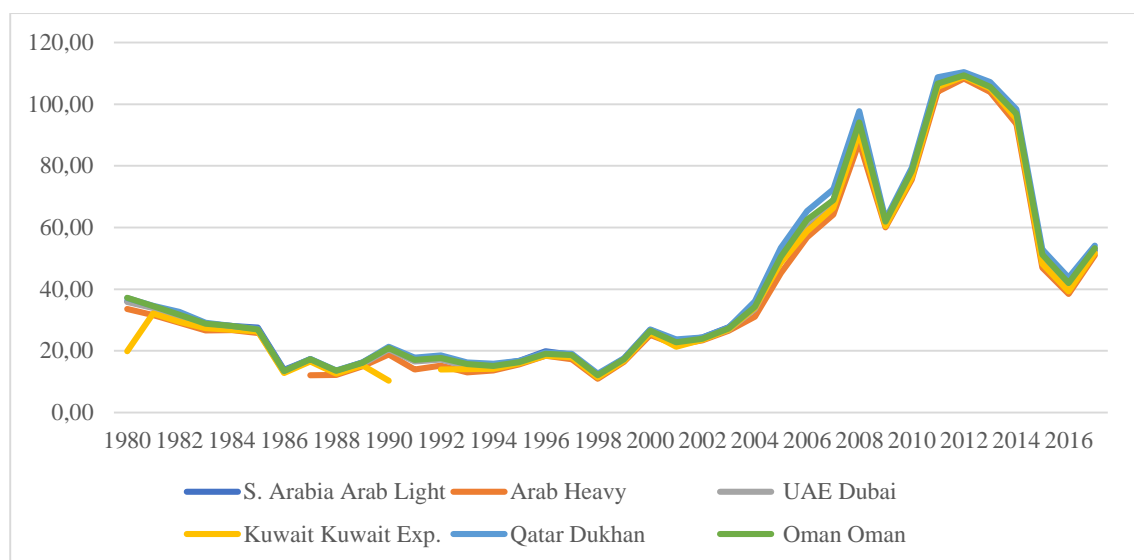


Figure 2.5. Selected GCC Crude oil spot prices \$ / b

Source: OAPEC, (2020)

Crude oil prices have witnessed a noticeable increase in prices since the beginning of the 1970s, as the prices of the OPEC basket increased from 3.05 in 1973 to 10.73 \$/b in 1974 because of the oil embargo made by some Arabian countries, and by a rate of 252%, this was accompanied by a reduction in production in OPEC countries headed by Saudi Arabia. The price continued to rise until 28.64 \$/ barrel in 1980 influenced by the Iranian revolution and the warfare between Iran and Iraq where the spot price of OPEC basket for example increased by 66%. But, by 1986 prices had decreased by 50%, and during this period Saudi Arabia abandoned its role as a weighted producer, and Saudi oil production recorded a decrease of 22% in 1985, but it rose again by 51% in 1986, then, it was reduced by 17% in 1987 while the price was increased by 31%.

Saudi Arabia in the last two decades has abandoned its policy of driving prices as Saudi Arabia was often maintaining its share of production in the oil markets rather than trying to influence the global price by reducing or increasing production (Figure 2.6.). Additionally, in the early nineties the prices increased due to the Iraqi invasion of Kuwait

and then the prices remained fluctuating until 1998, when prices decreased 34% (say OPEC basket prices). After that, many of economic and political events also occurred, like the financial crisis in 2009 where the prices decreased by 39%, and by 2011 prices rose again and unprecedentedly supported by the global increase in growth and demand of oil, also OPEC made huge producing-cut, the prices exceed the barrier of 100 \$ a barrel during the period 2011-2013.

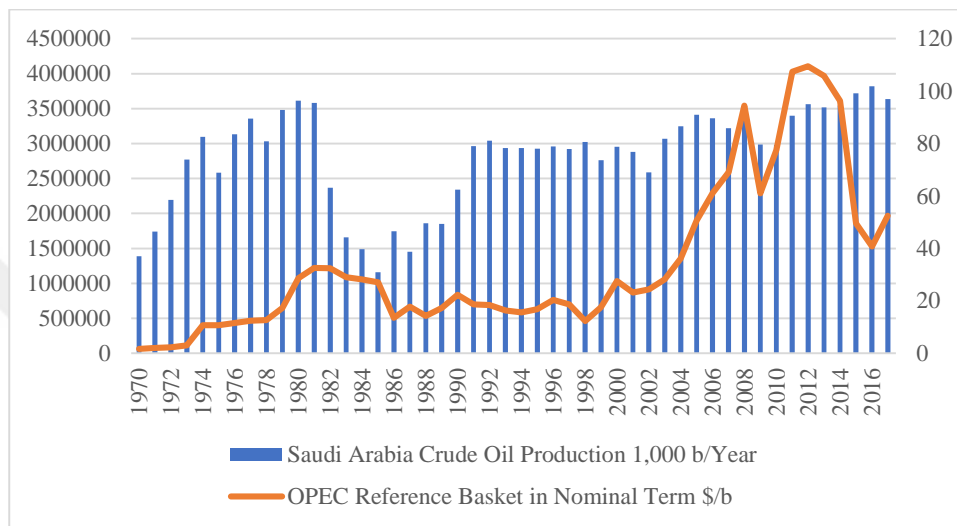


Figure 2.6. Saudi Arabia Crude Oil Production and OPEC Reference Basket in Nominal Term

Source: OPEC Annual Statistical Bulletin: several issues and OAPEC, (2020)

As a result of a set of factors, prices fell significantly during the years 2014-2016 especially in 2015 by 49%. Possibly the most important factor was the slowdown of the global economy and China’s economy particularly, as well as expectations regarding the prices of futures contracts of oil and the amount of reserves in the United states. In general oil prices had many fluctuations during these years. In 2017 there was an increase in the prices when the prices of the OPEC basket was about 52 \$ a barrel. But again, prices sharply declined in the proem of 2020 as a result of the COVID-19 Virus outbreak which led up to a big decrease in the worldwide demand for oil, the prices of WTI - Cushing, Oklahoma crude oil, for instance, was just 19.48\$ a barrel on 23th Mar 2020 (EIA, 2020).

Under the future contract, certain quantities are delivered at a specific time later while the price is specified at the time of the contract. That is the future contract 1 ends on the third working day before the 25th day of the month going before the delivery month, while the contracts 2,4 represent delivery months following the first contract, and so on. The spot

prices of WTI - Cushing, Oklahoma, and futures contract prices (e.g., Contract 1, Contract 2, etc.) are illustrated in Figure 2.7. The differences between the immediate and future prices is small, but the uncertainty about the future price path and the expectations affect the spot prices of the crude oil and the fluctuations of spot prices effect the future prices. Further, the existence of multiple crude oil-producing countries has created difficulties that prevented these countries from taking uniform decisions on the production and export of crude oil, where the decisions are made based on political goals or to achieve the maximum gains and market shares, for example, Iran pumped large quantities of oil after the suspension of sanctions, in which that contributed to the decline of prices in 2014. Selected Crude oil prices are illustrated in Figure 2.4.

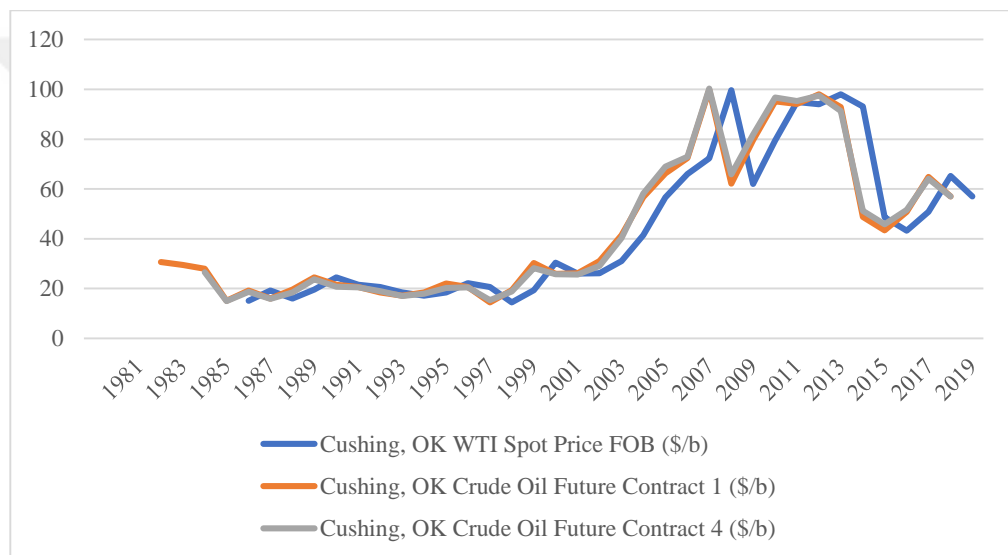


Figure 2.7. Cushing, OK WTI Spot Price FOB and Future Contract 1 and Contract 4 Prices

Source: EIA, (2020)

By comparing Figure 2.6 and 2.8 it can be concluded that the direction of the produced crude oil quantities seems to be the same among GCC countries with a difference in size, which reflects the weighted weight of Saudi Arabia. But this does not mean that some of the GCC countries were not affected individually by the Geopolitical events and other factors. For example, Kuwait was influenced by the Iraqi invasion significantly, as the percentage of Kuwait's production in 1991 of the total production of the Gulf states decreased to 1.64% whilst it was 14,19 % in 1989.

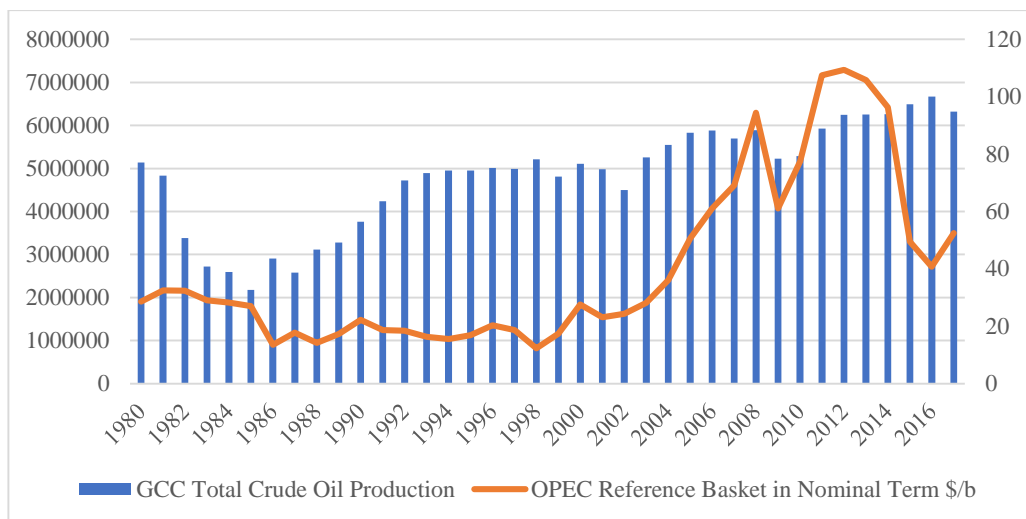


Figure 2.8. Total GCC Crude Oil Production and OPEC Reference Basket in Nominal Term

Source: OPEC Annual Statistical Bulletin: several issues and OAPEC, (2020)

2.1.3. Refining Capabilities, Oil products and Energy Consumption.

The GCC countries possess a group of refineries that are used for the purpose of producing Crude oil derivatives for consumption locally or for exports. the most petroleum products produced by GCC countries are gasoline, kerosene, jet fuel, and diesel. although the GCC countries produce 26% of the crude oil produced worldwide, their installed capacity of refining oil did not exceed 6% in 2017. The installed capacity increased from 2% in 1980 to 4% in 2000 and then to 6% in 2015, as it was 1,726.66 thousand barrels a day in 1980 in the GCC countries combined except Oman, and then it had increased steadily to 2,740.15 in 1985 and 3,358.52 in 1990, in 1991 the installed capacity had declined to 2,579 thousand barrels per day due to the Iraqi war on Kuwait. But again, the installed capacity of refineries had been increased in 2005 up to 4,167 and 5,634 in 2018.

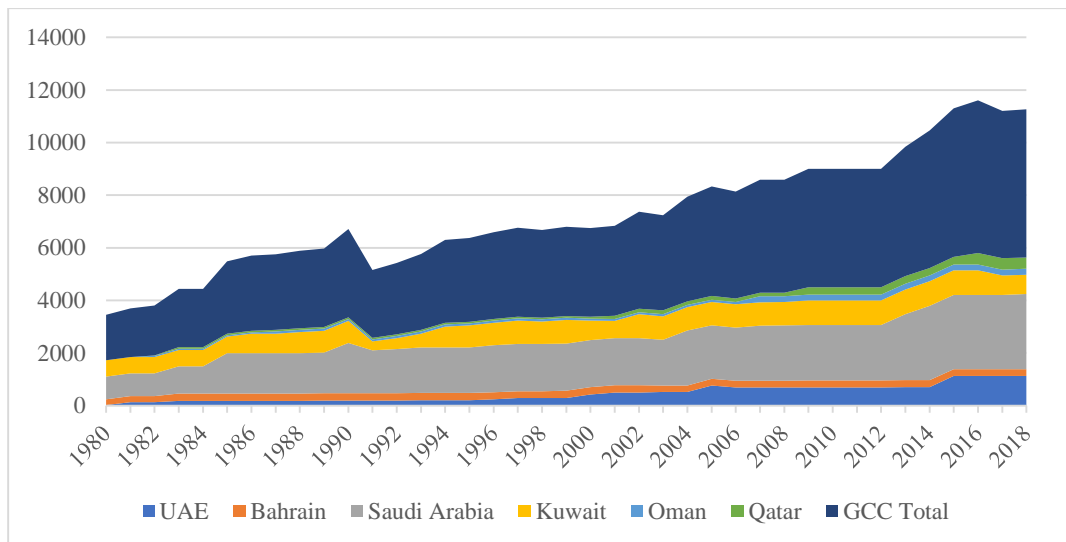


Figure 2.9. GCC Installed Refining Capacity 1,000 b/d

Source: OAPEC, (2019) and OAPEC, (2020)

During the period from 1980 to 2018 Saudi Arabia acquired the largest share of the installed capacity of the refineries where the percentage ranged between 46 and 63% compared with the rest of the GCC countries. In 2018 Saudi Arabia ratio was 51% for followed by the UAE with a percentage of 20%, then the State of Kuwait, at 13%, then the State of Qatar at 8% and Bahrain at 5%. lastly, the State of Oman at 4%.

GCC countries have about 22 refineries (Table 2.2) the first oil refining station was in the Kingdom of Bahrain in 1936, now Saudi Arabia has the largest number of refineries, followed by the UAE with 4, then Qatar with 3 refineries.

Table 2.2. Refineries in GCC countries with operating companies

Country	Company	Refinery
Bahrain	BABCO	The Bahrain Refinery
Kuwait	KNPC	Mina Al-Ahmadi
		Mina Abdullah
		Shuaiba
Oman	Oman Refineries and Petrochemical Company	Al-Fahal port refinery
		Sohar refinery
Qatar	Qatar Petroleum	Ras Laffan condensate
	Takreer	Mesaieed refinery & condensate
Saudi Arabia	Saudi Aramco	Ras Tanura
		Yanbu
		Riyadh
		Jeddah
		Yasref
	Saudi Aramco & Mobil	Samrif
	Saudi Aramco & Petrola	Rabigh
	Saudi Aramco & Total	Satorp
Saudi Aramco & Shell	Sasref	
UAE	ADNOC	Al-Ruwais
		Umm Al-Narr
	Emirate Oil	Jebel Ali
	METRO Oil	Fujairah

Source: OPEC Annual Statistical Bulletin: several issues, NOGA, (2012) and, NCSI, (2016)

The production of petroleum products of GCC countries ranged between 5 and 6% compared to global production during the period from 2010 to 2017. as Saudi Arabia has the biggest share of refining capacity, its production of petroleum products reached about 45-51% relative to the rest GCC countries during the period from 2010 to 2017, and it was followed by the UAE with 18% in 2017, then Kuwait by 13%, and Qatar by 7%. Further, the total production of the GCC countries through the year 2010 reached 4,208.1 thousand barrels b/d. Likewise, the total production of petroleum products was 5,095.9 and 5 533.3 thousand barrels per day in 2015 and 2018 respectively, While the production of the United States in 2017was 20,311, and Russia's production for the same year was 6,349 thousand barrels of oil products, China also has a big share of oil derivatives production globally with 12,085 thousand barrels per day in 2017.

Saudi production was 1,893.4 thousand barrels per day in 2010, and 2,873.7 in 2017, for Kuwait, was 1,008.9 in 2010 and its production declined to 721 in 2017. Contrarily, the

production of UAE increased from 589.2 in 2010 to 1,042.6 in 2017. Nevertheless, the production of the rest member states of GCC increased slightly, as the production of Qatar, Oman, and Bahrain were 271 173 and 272.5 thousand barrels per day in 2010 and 360.8, 251.2 and 271.2 in 2017 respectively.

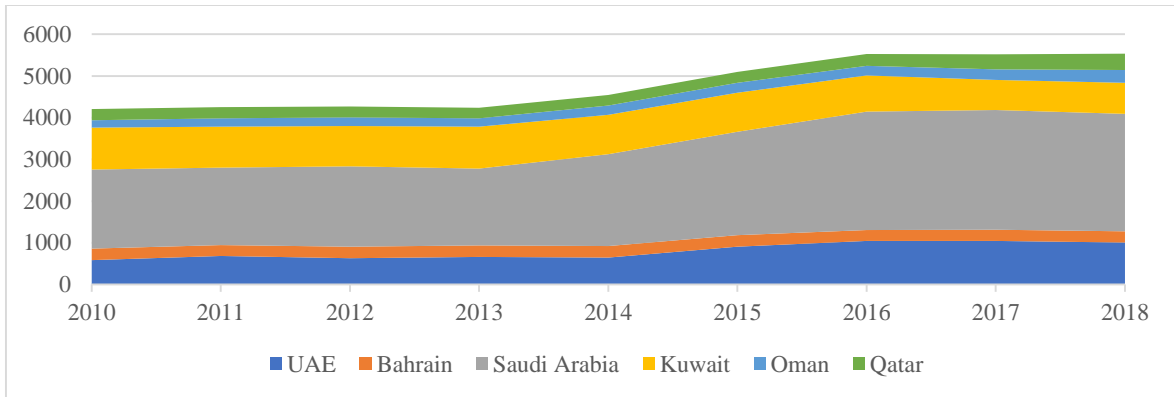


Figure 2.10. GCC Countries Output of Petroleum Products 1000 b/d

Source: (OAPEC, 2019) and (OAPEC, 2020)

On the other hand, diesel was the most productive oil material by the GCC states (Figure 2.11) as the production of the six countries combined reached 614,844 thousand barrels in 2017, Gasoline was the second, then kerosene and aircraft fuel where gasoline production in 2017 reached 329,299 thousand barrels, Kerosene and aviation fuel production reached 307,124,000 barrels in 2017 too. Once again, Saudi Arabia exceeded the rest of the countries in the production of oil derivatives, except kerosene and aviation fuel as the UAE produced more (OPEC,2019) The UAE production was 269 thousand barrels per day in 2017, while Saudi production was 247.9 for the same year.

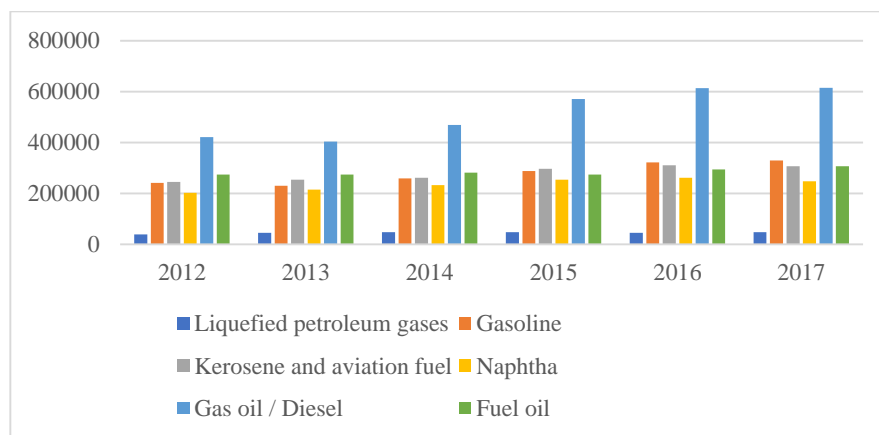


Figure 2.11. Selected Petroleum products indicators in GCC countries Thousand Barrels

Source: (GCC-STAT, 2017)

Energy Consumption

Energy Consumption in the GCC countries is approximately a third of the produced energy, where the aggregate energy consumption in the Gulf countries combined reached 8,790.9 8,508.3 and 8,703 thousand equivalent barrels per day during the years 2016, 2017, 2018 respectively, and that represents 29 to 30% of the total energy produced in the six countries combined during the same three years which amounting to 29,584.7 28,159.4 and 28,955.6 thousand equivalent barrels per day. The Kingdom of Saudi Arabia consumed energy by 49, 51, 50% during the period 2016-2018, ranking first among the GCC countries, followed by the UAE at 20%, Qatar by 11%, then Kuwait by 8%, finally, Oman and Bahrain by 8%, And 3%, respectively. On the other hand, the ratio of local consumed energy to the local energy production in Bahrain was the highest among the rest GCC countries in which were 61, 62 and 62% during 2016, 2017 and 2018 respectively, followed by Oman, with a percentage ranging between 39-42 %, Then the UEA, with a percentage ranging between 33-35%, then Saudi Arabia with 31-32%, and finally Kuwait and Qatar with rates of 19-22% and 19-20% respectively. Accordingly, it can be observed that the ratio of state-consumption to total production in GCC differs from that in the individual state cases, due to the large total production in all countries together. However, Saudi Arabia consumes a vast amount of the gross produced energy in the region.

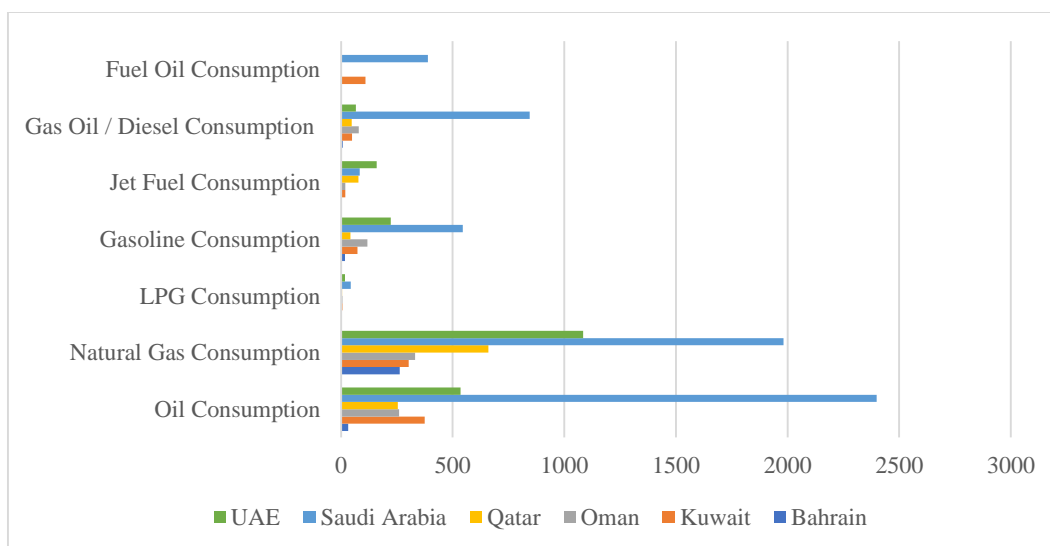


Figure 2.12. GCC Energy Consumption by selected energy sources in 2017

Source: (OAPEC, 2019)

Note: Natural Gaz and Oil are in thousand equivalent barrels while the rest resources are in thousands of barrels.

Besides, the GCC oil consumption reached 3 837.50, 3 856.10, 3 808.20 thousand barrels of oil equivalent per day during the years 2016, 2017, 2018 respectively, with a percentage ranging between 43-45% of the total energy consumed. This reflects the relatively weighted role of oil in the GCC countries in terms of energy consumption. Saudi Arabia consumed 53-56% of oil as a proportion of energy consumption during the period 2016-2018, followed by Kuwait at a rate between 52-55% and Oman at 41- 44%, then the UAE, with a percentage ranging between 26-32%, then Qatar and Bahrain, with rates ranging between 24-26% and 10%, respectively, during the same period. Additionally, Saudi Arabia's share of world oil demanded was 3.34% in 2017 and had consumed a third of locally produced oil in 2014, making it the seventh most massive oil consumer in the world and the greatest oil consumer in the region (IRENA, 2016).

Table 2.3. GCC Consumed Electric Energy Gigawatt per hour

Year/ Country	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC
1980	1,327	7,965	763	2,416	17,437	4,809	34,717
1985	2,392	13,159	2,541	3,949	41,904	9,293	73,238
1990	3,216	15,519	4,253	4,350	58,972	13,377	99,687
1995	4,303	20,519	5,486	4,352	85,908	17,228	137,796
2000	5,515	27,374	6,698	8,765	114,161	37,866	200,379
2005	7,898	35,000	8,800	10,700	153,284	53,874	269,556
2010	10,994	49,304	11,448	23,292	211,078	79,346	385,462
2015	16,553	58,189	25,174	38,853	286,038	111,685	536,492

Source: (OAPEC, 2020)

Saudi Arabia was at the top of GCC electricity consumer followed by UAE and Kuwait (Table 2.3) However, the sources and proportions of each source differ among GCC countries, and some energy sources such as coal have been using in some countries only.

2.1.4. Imports and Exports of crude oil

GCC countries are classified as oil producing and exporting countries except Bahrain which in a unique, Bahrain imports large quantities of Saudi crude oil for the probes of refining where the installed capacity of oil refineries exceeds the produced crude oil. But Bahrain still exports the crude oil in semi-stable quantities since 2000, in 1980 Saudi crude

oil imported by Bahrain was 195 thousand barrels per day, and it was 210 and 220 thousand barrels per day in 2017 and 2018 respectively (OAPEC, 2019). and often Bahrain exports large quantities of crude oil produced from the Abu Sa'fah field which is jointly shared field by Saudi Arabia and Bahrain, while oil extracted from the Bahrain field is often pumped to refineries (NOGA, 2006).

Table 2.4. GCC Oil Products Imports 1,000 b/d

Year/ Country	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
2015	2.2	NA	4.6	9.2	588	230.4
2016	2	19.6	0.8	11	591.1	209.2
2017	2	13.9	6.9	4.1	486.8	209.2
2018	3.3	30.4	16.9	4.3	898.4	259.6

Source: OAPEC, (2019)

Unlike the rest of the GCC countries Bahrain imports a small quantities of oil derivatives, followed by the State of Oman, and Kuwait, which also started importing oil derivatives a few years ago, Saudi Arabia comes at the top of the list of importing countries for oil products among the GCC countries followed by the UAE as shown in Table 2.4.

The imported quantities of Oil derivatives vary according to the demand and the production inside the country. For instance, Saudi Arabia produced 137 million barrels of Gasoline in 2016, while the consumption of Gasoline was 237.7 million barrels, and as shown previously that Diesel is being produced by a high rate in Saudi Arabia with 384.6 million barrels in 2016, Diesel consumption was 256.5 million barrels in 2017, and in Oman, production of fuel oil reached 2.5 million barrels in 2015, while consumption reached 16 million barrels for the same year, and for Qatar where the production of Diesel reached 14.6 million barrels in 2016, while Consumption was 18 million barrels for the same year. In the UAE, Gasoline production reached 49.8 million barrels in 2016, while consumption reached 63.5 million barrels for the same year, and generally, oil products consumption differs according to the locally produced as well as according to the oil demand which is also determined by the structure and size of the economy.

2.1.4.1. Crude Oil Exports in GCC Countries

Crude oil exports are the most important economic resource for the GCC countries except Bahrain which depends on Petroleum products exports more. The six GCC countries collectively represent 30% of the global crude oil exports (Figure 2.13) and Saudi Arabia is the largest country that exports oil among them, where the crude oil exports of Saudi Arabia were between 15-18% of the world crude oil exports during the period from 2010 to 2017, followed by the UAE at a rate ranging between 5-6%, then Kuwait at 3-5%, while the rest of GCC countries export low global rates.

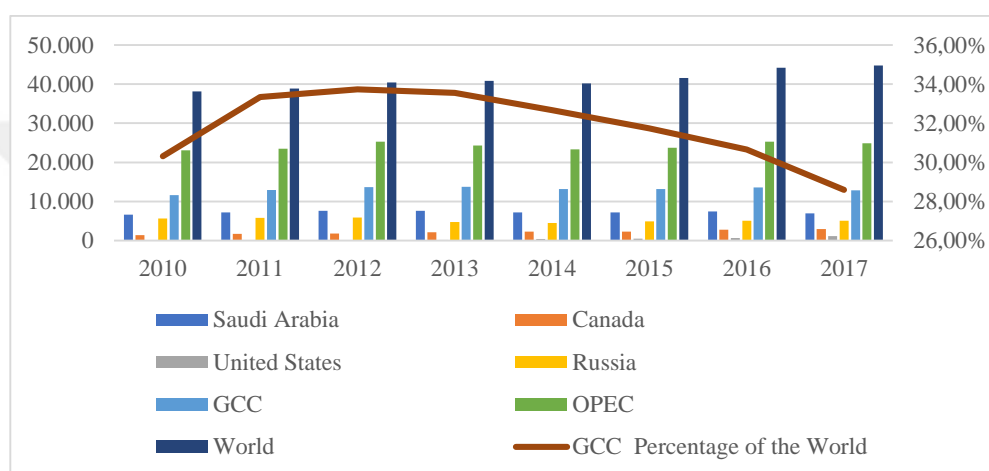


Figure 2.13. World and selected countries Crude Oil Exports 1,000 b/d

Source: OPEC Annual Statistical Bulletin: several issues and OAPEC, (2020)

Saudi Arabia exported more than 55% of total GCC crude oil exports during the past twenty years, followed by the United Arab Emirates at a rate ranging between 17-19%, then the State of Kuwait at 12-15%, then Oman by almost 6%, followed by the State of Qatar with 4-5%, and finally, Bahrain with no more than 1% in many years.

The GCC crude oil supply was affected by many factors such as political and economic crises and geopolitical events, which was clear by observing the series of exports of the GCC countries. For example, the rate of export growth decreased by 12 percentage points in 1974, and negative growth was recorded at -14% in 1975. In the early 1980s of the 20th century, the crude oil exports of the GCC countries recorded a negative growth rate as a result of the political crises and wars in the region, and price fluctuations, where the crude oil exports growth breakdown by -34% in 1982, and -25% in 1985. Oil exports decreased by 15 percentage points in the early 1990s because of Iraq's invasion of Kuwait, which led to a

decline in Kuwaiti exports by -24% and -86% in 1990 and 1991 respectively, and in 2009 the GCC crude oil exports decreased by 13% compared to 2008 due to world financial crises. Moreover, during the period 2016-2018, Saudi exports of crude oil reached 7,483 6,968 and 7,371.6 thousand barrels per day respectively, while that of the UAE was 2,407.8 2,378.7 and 2,296.5 thousand barrels per day, similarly, the crude oil exports of Kuwait reached 2,128.19 2,025.53 and 2,050 thousand barrels per day during the same period, followed by the Sultanate of Oman by 881.917 806.028 and 792.5 thousand barrels per day, then the State of Qatar at 508.79 466.33 and 536.2 thousand barrels per day, finally, Bahrain with 155 152 and, 153 thousand barrels per day during the same years in a row, while the exports of the GCC countries combined for the same period were 13,564.6 12,797.02 and 13,199.71 thousand barrels per day as shown in Figure 2.14 and Table 2.5.

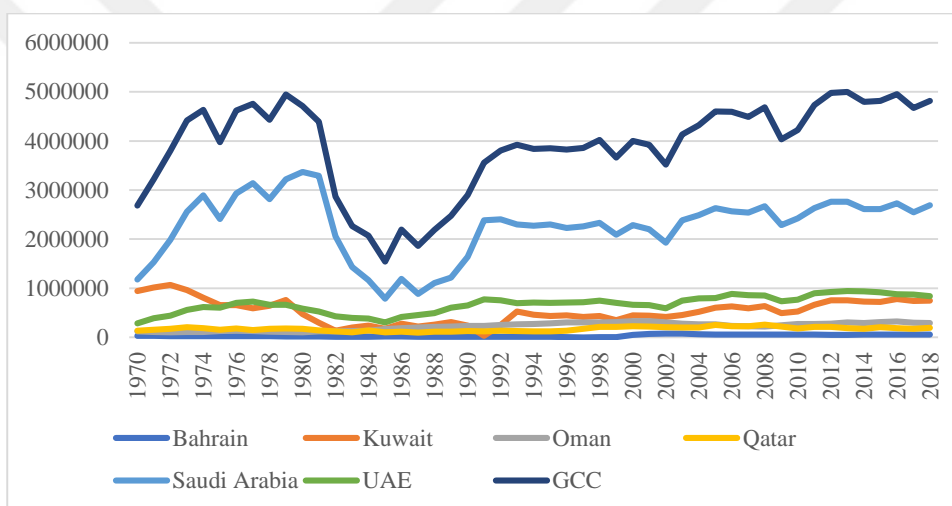


Figure 2.14. GCC Crude oil exports 1000 b/ Year

Source: OAPEEC, (2019), OAPEEC, (2020), IMF, (2019) and EIA, (2020)

Note: Data of Bahrain for years 1996, 1997 and 1998 includes the Lease condensate

The GCC countries export mainly crude oil to Asian countries, led by China, Japan and South Korea, in addition to other countries in the Middle East and Africa.

Table 2.5. GCC Crude oil exports 1000 b/ Year

Year/ Country	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC
1970	28,105	941,663.5	121,001.2	132,422	1,174,169	283,605	2,680,965
1975	22,265	65,8241	124,647.5	156,329.5	2,409,402	606,411	3,977,296
1980	14,965	473,222.5	101,798.5	169,980.5	3,366,468	585,825	4,712,260
1985	13,505	173,703.5	164,615	102,200	7,850,055	303,680	1,542,709
1990	11,315	235,425	229,293	126,947	1,642,427	651,525	2,896,932
1995	10,950	433,036	286,525	121,545	2,296,142	702,990	3,851,188
2000	52,179.69	449,315	326,675	225,570	2,282,345	662,475	3,998,560
2005	54,869	602,615	261,099.8	249,831.9	2,631,285	801,175	4,600,876
2010	55,078	52,4471.1	271,801.3	179,470.5	2,423,488	767,635.2	4,221,944
2015	54,556	718,159.4	308,099.4	205,038.8	2,614,495	913,034	4,813,383
2018	55,813	748,250	289,262.5	195,713	2,690,634	838,222.5	4,817,895

Source: OAPEC, (2019), OAPEC, (2020) and IMF, (2019)

In terms of petroleum products, Saudi Arabia also holds the lead by 35% in 2010 and 44% in 2018 from the total GCC petroleum products exports, and Kuwait was the second during the period 2010-2012 by 27-27%, then the UAE became the second after Saudi Arabia with 17% in 2018, While the share of Kuwait declined to 13% in the same year, Qatar ranked third in 2017 and 2018 respectively with 16%. Bahrain exports semi-stable quantities. But, its percentage among the GCC countries has declined from 8% in 2010 to 5% in 2018 due to the increase in exports from the rest of the GCC countries, especially Saudi Arabia, Oman came last at a rate of 2% in 2018. Additionally, total petroleum products exports of the GCC countries was 3 736.2, 4 122.7 and, 4391.1 thousand barrels per day in 2016, 2017 and 2018 respectively as shown below.

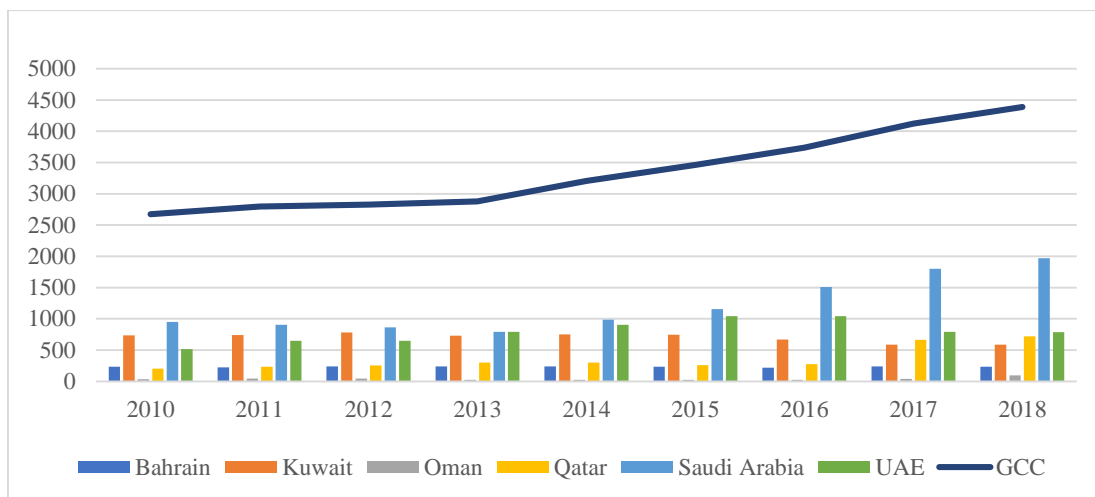


Figure 2.15. GCC Oil Products Exports 1,000 b/d

Source: OAPEC, (2015) and OAPEC, (2019)

2.1.5. Natural Gas and Renewable energy

Natural Gas

The countries of the Gulf Cooperation Council are rich in natural gas, as they possess approximately 20% of the global gas reserves, and the State of Qatar comes at the top of the countries of the Council where it has more Natural Gas than Crude oil, as Qatar possessed 58-60% of the total proven natural gas reserves in the Arab Gulf region during the period from 2010 to 2018, in addition to 11% of world proven natural gas reserves with 23861 billion cubic meters estimated in 2018, followed by Saudi Arabia with a proportion ranging between 19-21% during the period from 2010 to 2018, and confirmed natural gas reserves in 2018 was 9 069 billion cubic meters, and the United Arab Emirates was the third in terms of natural gas reserves by 14% and 6 091 billion cubic meters in 2018 as a proven reserves, then Kuwait with 11% of GCC proven natural gas reserves and 1 784 billion cubic meters at the end of 2018, followed by Oman and Bahrain, with reserves of 193 and 707 billion cubic meters respectively at the end of 2018 too.

GCC countries produce marketed gas at a rate of 10-11% of the global production volume, and Qatar was the first among the six-country with 42% in 2018 and an amount of 170.3 billion cubic meters, followed by Saudi Arabia with 29% and 118 billion cubic meters for the same year, then the UAE by 13%, Then Oman 8%, and finally, Bahrain and Kuwait, respectively. Also, Qatar ranks first among the Gulf countries in terms of exporting the

natural gas where Qatar exported 118 billion cubic meters in 2018, and by 86% of the GCC countries that export gas (e.g., UAE). However, UAE and Kuwait import natural gas due to the increasing demand, as well as regarding the obligations related to long-term contracts (IRENA, 2016), in 2017 UAE had imported 79% of GCC total imported Natural Gas and ranked first, followed by Kuwait with 14%. Certainly, Natural gas is a promising sector for the GCC countries which are an important source of energy generated through natural gas in the world.

Renewable Energy

Energy demand is increasing rapidly in GCC countries as well as Global Warming and climate change. Hence, these challenges press for diversification of the economies and energy sources, besides, to minimize the consumption of carbon and fossil fuels. So, the cornerstone is the renewable energy sources, especially Solar which is the most preferable in GCC countries owing to the relative priority to generate energy through the sun in GCC countries which located in the solar belt, and because of the low costs of solar energy production compared to some other clean sources (IRENA, 2016).

Carbon dioxide emissions in the GCC countries have increased in recent decades as energy demand has increased dramatically to coincide with the economic boom and continuous urbanization in the GCC countries. Saudi Arabia is the biggest source of carbon dioxide emissions in the GCC countries by 54%, followed by the UAE with 14%. Then Qatar by 9% and finally Kuwait by 8%. Conversely, in terms of emissions per capita, Qatar ranked first with 29%, followed by Kuwait, Bahrain, Emirates, and lastly Saudi Arabia.

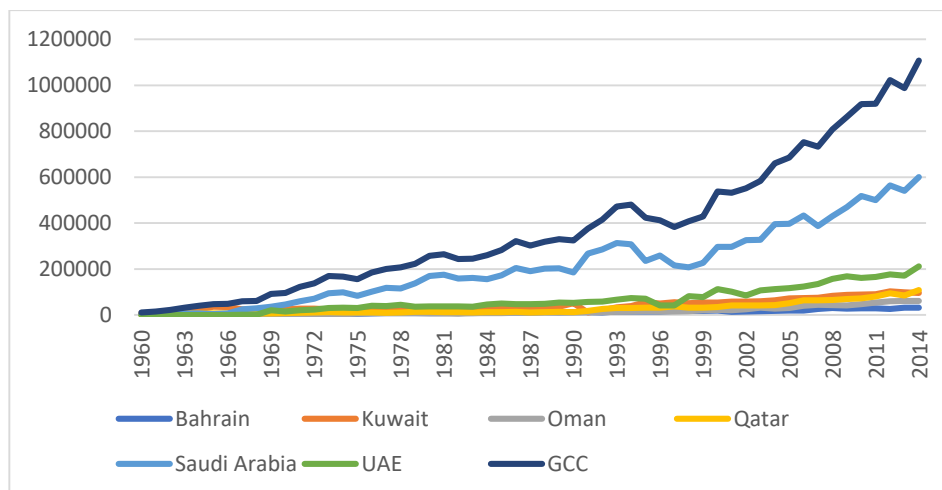


Figure 2.16. GCC CO2 Emissions kt

Source: World Bank, (2014)

The Gulf states aim to reduce the reliance on fossil fuels and to shift towards renewable energy sources in the future, for instance, Saudi Arabia plans to produce 30% of needed energy from renewable and nuclear energy sources by 2030. Oman also aims to produce 10% of electricity from renewable energy sources. In the case of Kuwait, the target is to produce 15% of electricity from clean energy sources also by 2030, similarly, Bahrain plans to produce 10% of electricity in 2030 as well, furthermore, UAE aims to increase the capacity of clean sources to 44% in 2050, finally, Qatar plans to produce about 200-500 MW of energy Through the sun (Solar). GCC countries planning to reduce carbon emissions levels (IRENA, 2019).

2.2. Economic Growth and Oil Revenues

The countries of the GCC have achieved steady growth during the past few decades. Especially, when the prices of oil increased continuously in the 1970s pushing oil supply up and subsequently the Oil revenues. The GDP has increased at the instant prices of the six countries combined from 10 546 million dollars in 1970 to 1 659 710 million dollars in 2018. Saudi Arabia has the greatest share of GDP among the rest countries where the Saudi GDP represented a 50% of the total GCC GDP in 1970, and the percentage was 47% in 2018, followed by the UAE by 24% in 2018, then Qatar by 11%, Kuwait, Oman, and Bahrain by 8%, 5%, and 2%, respectively for the same year. GCC countries ranked the 7th globally in GDP according to the purchasing power parity (PPP), with a total of 3,302.8 billion dollars,

while they occupy the 12th position according to the GDP at current prices with 1,354.8 billion dollars (GCC-STAT, 2018a).

The GDP of the GCC countries was affected by fluctuations in oil prices. The economic growth rate at current prices increased by 32% in 1971, and it was 173% in 1974 affected by the rise in oil prices after the Arab embargo. many geopolitical events played an remarkable role in affecting the GDP of the GCC states, such as Iraq’s invasion of Kuwait, which led to a decline in the GDP of Kuwait by 24% in 1990 and then 40% in 1991, and the growth rate of all GCC countries had decreased as well from 16% in 1990 to 3% in 1991. Likewise, in 2009 the global financial crisis occurred and the GDP of GCC countries at current prices decreased to -19% in 2009 compared to 27% in 2008. Similarly, in 2015 the growth rate decreased to -15%. But the GDP increased to 26% when the Oil prices increased in 2011 as shown in figure 2.17 bellow.

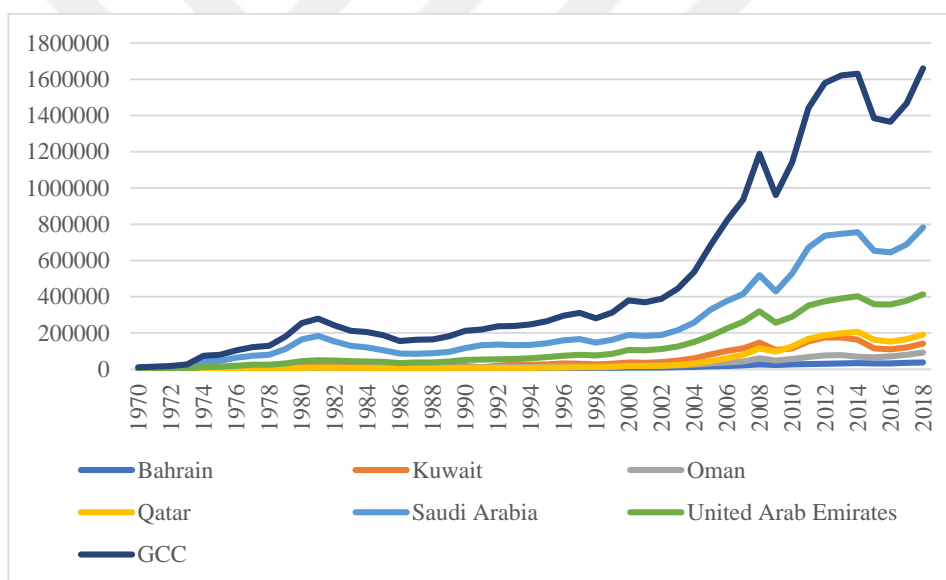


Figure 2.17. GCC GDP at Current Prices

Source: UNCTAD, (2020)

In term of economic growth, the GCC countries achieved the highest rate of growth during the period from 1971 to 2018 at current prices in 1974, where the growth rate was 173% affected by price increases, and the lowest growth rate was in 2009, where the nominal growth rate reached -19%, and it can be observed increase in the growth rates at the current prices in the years when there was an increase in oil prices and vice versa. For example, the growth rate increased in the early 1970s, 2004, 2010, and 2011, while the growth rate decreased in 1986, 2009, and 2015. Furthermore, in the real term, GCC countries achieved

real GDP growth in the early seventies, but the growth in 1974 was only 10% in real term compared to 173% at current prices. GCC recorded the highest growth rate in 1972 when it was 16%, and the lowest growth rate was -16% in 1982; generally, despite the large fluctuations in the rate of growth of GDP at current prices, the rate of growth at constant prices seems to be more stable with small fluctuations related to oil prices at most (figure 2.18).

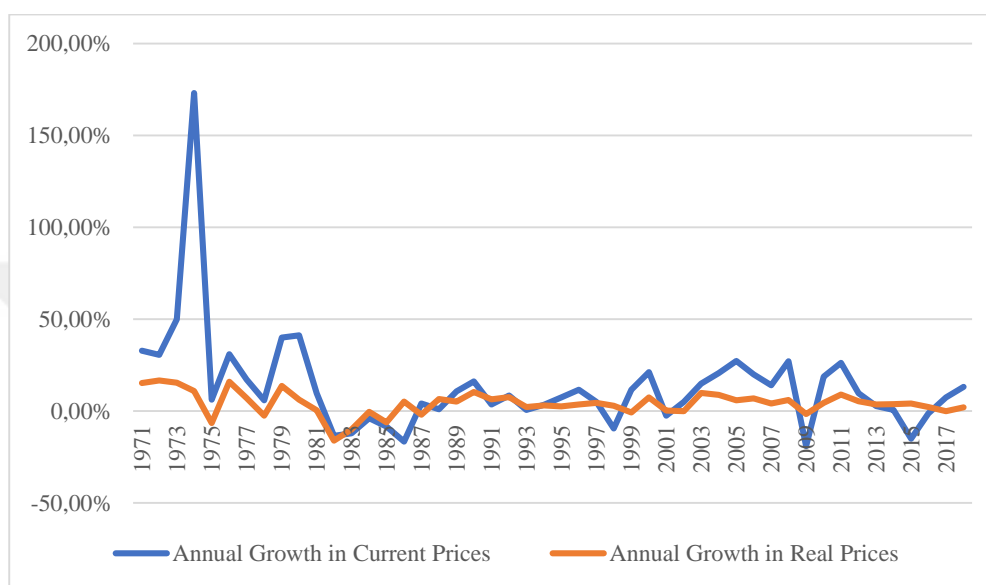


Figure 2.18. GCC Growth Rates in Both Real and Current Prices

Source: UNCTAD, (2020)

At the level of countries, during the period from 1971 to 2018 Saudi Arabia has achieved the highest growth rate at current prices in 1974, where the nominal growth rate of the GDP was 203%; Saudi Arabia also achieved high nominal growth rates in 1980 and 2005 by 47% and 26% respectively. The largest decline in the GDP growth rate of Saudi Arabia was -17% and has been recorded in 2009. In 2015 GDP growth was -13%. For the GDP in real prices, Saudi Arabia recorded the highest growth rate in 1973, which reached 24%, also recorded a growth rate of 17%, 9% in 1986 and 2011. Also, the GDP in real term has decreased in different years; but the largest was in 1982 by -20%. However, the oil prices and the global demand affected the GDP of Saudi Arabia; the decisions to control oil production affect the GDP as well.

The fluctuation in GDP growth is a common feature of the GCC countries. This can be noticed by monitoring the GDP in all the countries; Oman, UAE, and Kuwait achieved a nominal growth rate of 240%, 175%, and 140% respectively in 1974, while Qatar and

Bahrain achieved 28% and 42% respectively; another geopolitical event was happened and affect the Growth rates in GCC countries negatively which was the invasion of Iraq to Kuwait; Therefore, Kuwait recorded a fall in growth rate in 1990 and 1991 where the growth rate was -24% and -40%, respectively. when the global financial crises occurred all the GCC countries were affected deeply as shown above for Saudi Arabia; the rest GCC countries namely UAE, Kuwait, and Oman have witnessed a decreased growth rates -19%, -28%, and -20% respectively in 2009, while the growth rate of Qatar and Bahrain was -15% and -10% respectively for the underlying year. The real growth of GCC countries was 1.9% in 2018, and 2.53%, 1.24%, 2.09%, 1.49%, 2.21%, 1.73% for Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE respectively. However, it can be concluded that the economic growth rate was affected negatively and positively in the years that witnessed fluctuations in oil production and prices especially in 1974, 1982, 2000, 2009, 2011, and 2015 (figure 2.18).

Table 2.6. Selected Indicators of GCC Countries in 2018

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC
GDP at current prices m\$	37,876	141,698	92,111	191,362	782,483	414,178	1,659,710
GDP at constant prices m\$	34,277.13	115,244.3	68,261.31	170,302.6	674,892.6	377,312.4	1,440,290
Per capita GDP at current prices	24,133.64	34,248.83	19,072.77	68,793.66	23,217.19	43,004.92	25,346.5*
Per capita GDP at constant prices thousands \$	21,840.36	27,854.85	14,134.31	61,222.88	20,024.85	39,177	NA
Growth rate at current prices thousands \$	6.90%	18.54%	16.19%	14.64%	13.64%	9.66%	13.10%
Growth rate at constant prices	2.53%	1.24%	2.09%	1.49%	2.21%	1.73%	1.92%

*2016

Source: GCC-STAT, (2018b)

In term of GDP per capita in current prices Qatar ranked first among the GCC countries in 2018 with 68,793 \$ per capita followed by the UAE with 43,000 dollars, then Kuwait, Bahrain, and Saudi Arabia with 34,200 24,133 and 23,300 \$ per capita respectively, and finally the State of Oman with approximately 19,100 \$ per capita.

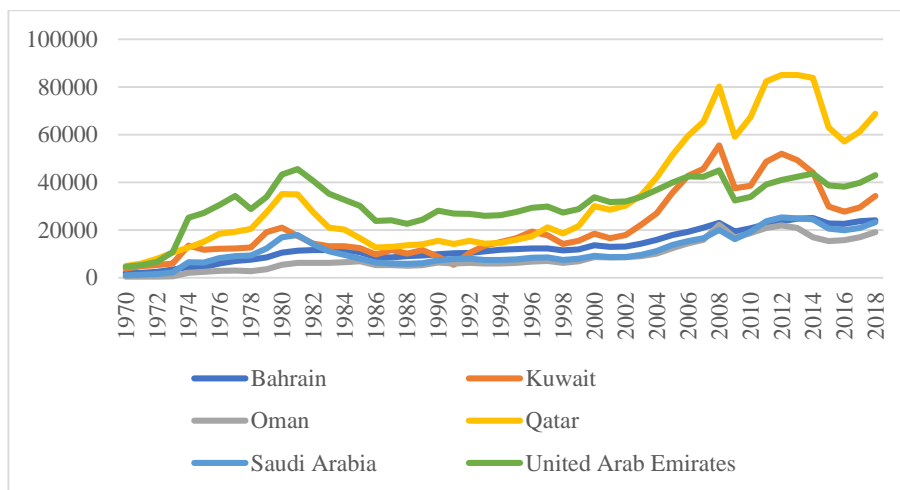


Figure 2.19. GDP Per Capita at Current Prices of GCC Countries thousands \$

Source: UNCTAD, (2020)

In term of fixed prices per capita GDP, Qatar has also achieved the highest per capita GDP of 61 200\$ followed by the UAE with 39,200 and Kuwait 27,800, in the last three ranking Bahrain, Saudi Arabia, Oman has taken a place with 21,800 20,000 and 14,100 \$ respectively in 2018.

2.2.1. Oil GDP and Exports

Oil sector plays an important role in the gross domestic product as the percentage of oil and gas was 48% of the total GDP of the GCC countries at current prices in 2012, but the rate has declined recently to 26.4 in 2017 due to the decline in oil prices mainly, the percentage of oil GDP was decreasing significantly during the years following 2012 and was 45.6% and 41.9%, 26% and 23% in 2013, 2014, 2015 and 2016 respectively. The highest percentage of oil GDP out of total GDP was in the State of Kuwait where it reached 64.4%, 63.5%, 60.8% and 42% in 2012, 2013, 2014 and 2017 respectively, and it was 58% in the State of Qatar in 2012 and 32.3% in 2017; for Oman, the oil GDP represented 52.5% in 2012 and 29% in 2017. in Saudi Arabia, oil GDP represented 47.2%, 43.7%, and 25% in 2012, 2013 and 2017 and it was 39%, 36%, and 22% in the UAE, for Bahrain oil GDP was 24.9%, 25.4% and 12.4% for the same years. However, Bahrain is ranked last in the oil GDP share of total GDP among other GCC countries.

The majority of GCC countries depend on oil exports which oil and gas exports represented the largest part of the total exports of GCC countries as it was 67.7% in 2010

and then increased to 80% in 2011 due to the increase in oil prices. But, in conjunction with the decreasing oil prices started in 2013 the share of oil and gaz exports of total exports has declined to 78.7% and then to 61.5% in 2017. Nonetheless, non-oil exports have increased significantly in the few last years.

Table 2.7. Oil and Non-Oil GCC Exports

Indictor	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC	Relative Year
Oil exports	70	95	70	88	87	53	78.7	2012
Non-oil exports	25	4	18	11	11	21	NA	
Oil exports	69.9	95.4	76	90.9	85.1	75.6	84.6	2014
Non-oil exports	30.1	4.6	24	9.1	14.9	24.4	15.4	
Oil exports	60.3	92.1	72.3	86.4	78.8	59.2	76.1	2015
Non-oil exports	39.7	7.9	27.7	13.6	21.2	40.8	23.9	

Source: GCC -STAT, (2012), (2014), (2015)

On the country level, the oil-exports share of total domestic exports was in the State of Kuwait where it was 95.4% in 2014, and it was 95% in 2012 and by 2015, the ratio decreased to 92.1%. Qatar ranked second where oil and gas exports were 90.9% in 2014 compared to 88% in 2012 and 86.4% in 2015. Saudi Arabia ranked third where oil- exports represented 87%, 85%, and 78% of oil total domestic exports in 2012, 2014 and 2015 respectively; while the share of oil exports was 78.7%, 84.6% and 76.1% in the same years for the United Arab Emirates. In the case of Oman, the oil- exports share of total exports was 70%, 76% and 72.3% in 2012, 2014, 2015, and Bahrain ranked last by 60.3% in 2015 compared to 70% in 2012 as shown in Table 2.7. This reveals the oil-export significance role in the economics of GCC countries, which a huge part of revenues and foreign capital flows depend on oil. Thus, the risk that GCC countries faced is high. Therefore, GCC countries are opened to global crises and vacillations. It seems that GCC countries are suffering from a risk cycle that is complicated. As the GDP of GCC relay on the exports, the exports depend on oil-exports; But oil demand and trade are controlled by external factors. Economic diversification is a crucial issue for GCC countries especially with the highly competitive oil markets and the new energy sources that became more available than before.

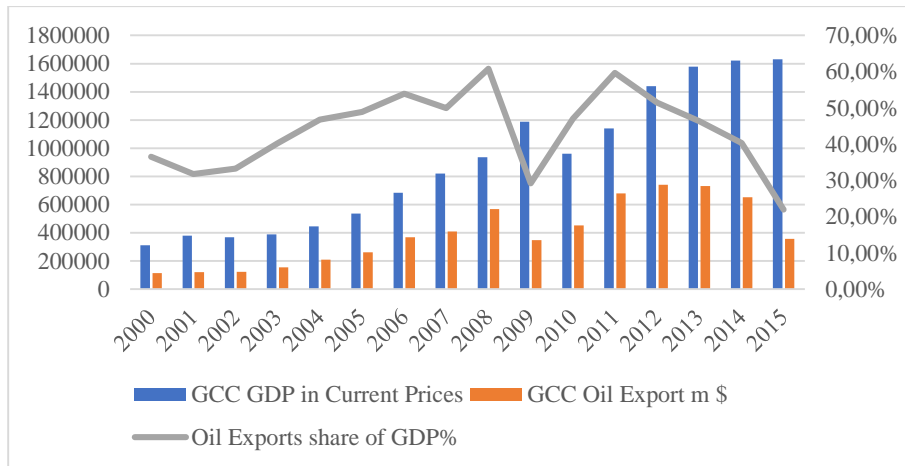


Figure 2.20. GCC Oil Exports and GDP in Current Prices m\$

Source: UNCTAD, (2020) and GCC- STAT, (2015)

The value of oil and gas exports, GDP at current prices, and the ratio of oil and gas exports to GDP during the period from 2000-2015 is shown above in Figure 2.20. The export rate was 36.5% of the GDP in 2000 and achieved a steady increase during the years 2003-2008, and as a result of the 2009 global financial crisis, oil exports were affected and has decreased to 29% and the lowest share over the period 2000-2015 was in 2015.

Oil revenues are the cornerstone of the governments of GCC countries which represented 81% in 2013 and 62% in 2017. The fluctuations in the oil market led to a budget deficit and affect the expenditures plans of government which usually resort to borrowing or withdrawing from its sovereign funds. The government balance as a percent of GDP is illustrated below in figure 2.21.

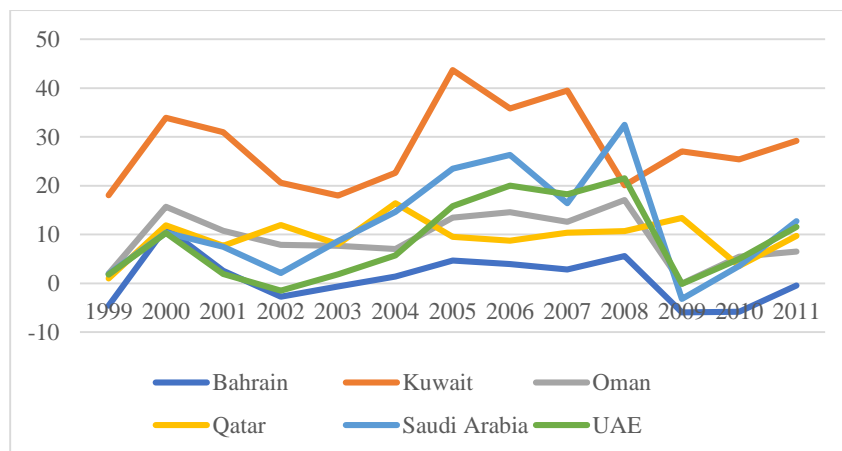


Figure 2.21. GCC Government Primary Balance as GDP %

Source: IMF, (2020)

3. LITERATURE REVIEW

The relation between economic growth and natural resource is nothing new in the literature, many studies investigated this relation, crude oil as a natural resource attracted considerably studies as well. Additionally, economic growth and aggregate exports relationship has been studied well in the literature. In this chapter, two hypotheses are going to be discussed the first is The Resource Curse Hypothesis and the second is the Export-led Growth hypothesis. In this path, the literature relevant to GCC countries will be reviewed.

3.1. The Resource Curse Hypothesis

The growth models that appeared in the mid-twenties of the 20th century as well as neo-classical growth models that also dominated from the mid-fifties until the mid-eighties neglected the impact of inbred resources that effects economic growth (Auty, 2007). while the work of Sachs and Warner (1995) drew attention to the role of the abundance of economic resources in explaining the difference in economic performance among countries. The study concluded that the natural resources- wealthy countries head for growing less than the poor countries in term of natural resources, in other words, the results of the study found that there is a negative relationship between the resources abundance and economic growth; These findings have sparked a controversy over the resources and how they affect the growth.

Other studies have corroborated these results such as the work of Auty (2001) which concluded that the abundance of resources has contributed to achieving disappointing development, and the resource-rich countries have achieved a weak performance compared to the poor countries in terms of natural resources since the 1860s. Furthermore, the study concluded that resource-poor countries achieved faster growth by two to three times than the rich countries in GDP per capita from 1960-1990. Similarly, the paper of Sachs, & Warner (1999) concluded that the prosperity in natural resources may lead up to reducing per capita GDP in seven countries of Latin America.

The paper of Papyrakis, & Gerlagh (2007) found an inverse relationship between resource abundance and economic growth in the United States. They concluded that, the abundance of resources reduces Investment, Schooling, Openness, Research, and Development expenditures on the one hand and increases Corruption on the other. Hence,

they indicated that these effects explain the negative influence on economic growth. Ahmed et al. (2016) showed that the abundance of resources impedes economic growth in Iran by using data for the period 1965-2011 and the cointegration and causal relationship tests were used, the results revealed a cointegration relationship between economic growth and the other variables, say the abundance of resources, capital, exports, and work. Also, the feedback causal relationship was found from economic growth to the abundance of resources. Using A panel data set for 100 countries through the period 1970-2009 the paper of Butkiewicz & Yanikkaya (2010) found that only in developing countries with weak institutions the Mineral resource curse can exist, While the study did not find a similar effect for the rest of the natural resources (fuel, agricultural products, food). However, the study noticed the sensitivity of the results to the used statistical method.

Nevertheless, the previous studies and findings faced some criticizes, Stijns (2005) argued that the method used to measure the abundance of resources and applied Growth models affect the results, and therefore he found that there are limitations to the study of Sachs & Warner (1995). Stijns (2005) concluded that although the Land may adversely affect economic growth, that is not the case for fuel, oil, and minerals. The study indicated that fuel and mineral reserves are not a structural determinant of economic growth during the period 1970-1989. Further, the results showed that the effects of resources on the growth may be negative or positive. De Ferranti et al. (2002) argued that it is impossible to say that some developed countries such as "The United States of America, Canada, and Australia" did not start the development by investing their natural resources. In contrary to the finding of Sachs & Warner (1995), Brunnschweiler (2008) reexamined the relationship between natural resources measured by a new measure "Institutional quality" and growth. The study concluded that a positive relationship between resource richness and growth was existed.

3.2. Export-Led Growth Hypothesis

Emery (1967) argued that there are logical and applied fundamentals support the hypothesis that exports contribute to growth, and export growth has ways to directly influence economic growth where exports raises the efficiency of industry, and urge countries to invest in more efficient sectors. Additionally, exports enhance countries to get more benefits from the economies of scale, and improve the quality of goods. In the same way, Balassa (1978) contended that export-focused on policies raise the utilization of

economies of scale, contribute to technology development and upsurge employment. Marin (1992) claimed that Exports affect the whole economy. especially, in terms of importing and disseminating technology into the local economy, as well as through externalities. Marin argued that exports improve the knowledge and human resource in addition to encouraging the innovation in the local economy; He also argued that a framework can be found for the export-led growth hypothesis similar to the Romer (1986) model in which the effect of economies of scale was introduced to neo-classical growth models; according to Marin (1992) Romer has introduced the stock of capital in the whole economy as an externality factor besides the capital stock of the company and both of them affects the output of the company, and the same idea could be applied by replacing the stock of capital in whole economy with exports.

Several empirical studies have examined the exports and growth relationship early in the literature, but many of the early studies that used the correlation coefficient and the non-advanced regression have faced criticism about their results such as mentioned above Emery (1967) study which aimed to examine the exports- growth nexus in 50 countries through the period 1953-1963 using cross-sectional and time-series data. The OLS regression has been applied and the results showed that high exports growth rates lead to high growth rates and vice versa. Also, the paper of Tyler (1981) which used Pearson and Spearman correlation coefficients and the regression models to analyze the exports and growth relationship in developing countries and concluded that countries which implement exports- neglecting policies might achieve slow growth. Feder (1983) supported the positive growth - exports relationship in six Asian countries, and that the export sector affects the non-export sector.

Recently, new studies have used more advanced Econometrics approaches such as cointegrations models and causal tests to examine export-led growth such as Awokuse (2003) paper which aimed to re-examine the relationship amongst the exports and growth and to investigate the existence of export-led growth hypothesis in Canada using VECM model and causality teste. The results showed that unidirectional causality from exports to economic growth existed. Konstantakopoulou (2016) used the bound-testing approach developed in Pesaran, Shin, and Smith (2001) and causality tests proposed by Toda and Yamamoto (1995) to inspect the exports- economic growth nexus in the Southern Euro-zone countries over the period 1960-2014. the results supported the presence of the long-run relationship in Spain, Portugal, and Greece. Moreover, the causality tests showed different results, while there was no causality relation found in Italy, the bidirectional Granger

causality was existed in Greece and Spain, and unidirectional causal relationship was found in Portugal.

Novak (2019) aimed to analyze the long-term and causal relation between exports and growth in Hungary using quarterly data through the duration of 1996Q1-2016Q4. The non-linear threshold cointegrating approach was applied. The results found a long-run relationship and supported the export-led Growth. Hosseini et al. (2014) investigated the effects of oil and non-oil exports on the Iranian economic growth from 1970 to 2008. The study confirmed the integration of underlying variables and the unidirectional causal relationship from oil and non-oil exports to the growth. However, the oil exports' effect on growth was negative.

Kubalu et al. (2016) aimed to explore the effects of crude oil exports and Corruption on economic growth in Nigeria using data covered the period from 1996 to 2015. The ARDL approach was applied and the results revealed a long-run relationship between corruption, crude oil exports and growth. Furthermore, the study found a negative relationship of corruption on the growth in the short and long-run. Additionally, crude oil exports affect the growth positively in the short- run and negatively in the long-run. The purpose of Fapetu & Owoye (2017) work was to examine the exports-led growth hypothesis in oil-rich country of Nigeria using time series for the time period from 1981 to 2014. The results confirmed the existence of the hypothesis in Nigeria with a greater impact of non-oil exports on growth than the effects of both oil exports and imports. Finally, the work of Ee (2016) intended to investigate the existence of export-led growth hypothesis in some Sub-Saharan African countries by using Panel data set through the 1985-2014 period. The Cointegration tests and FMOLS and DOLS models were applied. The results confirmed the long-run relationship among the growth, Exports, Investment, and Government expenditure.

3.3. Previous Literature Related to GCC Countries

Considering that the GCC countries are oil-rich and their economics depend intensely on oil, the relationship between oil production, exports, oil revenues and growth in the GCC countries have received many studies. and in this section, some of those studies will be covered.

Early in the literature the study of Metwally & Tamaschke (1980) aimed to investigate the economic growth relationship with oil exports in MENA, the research concluded that, the investment is very sensitive to growth in oil exports, especially in Iraq and Iran, and the study also denied the impact of oil exports on the economy in Libya and Kuwait, which means, according to the study, the non-oil sector does not respond to changes in exports of oil. Likewise, the study found that there is a short-run oil export's effect on growth in Iraq and Saudi Arabia.

The paper of Saddam & Kari (2014) aimed to analyze the long-run relationship between FDI, oil exports and economic growth in the GCC countries based on classic economic growth theories that provide a major role for the FDI in promoting the growth, and the endogenous growth theories that give a role to open trade policies in enhancing the investment in sectors and then economic growth. The study used annual series data through the period 1998-2008 and the VECM model and the impulse response function, as well as, variance decomposition of the said variables. The study concluded that, the shocks of foreign direct investment have a significant negative impact on crude oil exports and growth at the same time. Further, the foreign direct investment flows are more related to economic growth than crude oil exports. However, the study showed that growth is closely related to the exports of crude oil. The findings showed that crude oil exports are closely related to its shocks, and this suggests that it is not linked to the changes in the local economy, but rather to other external variables such as fluctuations in global markets and shocks in oil prices.

Abdalla & Abdelbaki (2014) aimed to reveal the determinants of growth in the GCC countries using Cointegration tests. The study divided the sectors in the Gulf states into 5 sectors; specifically, oil sectors, non-oil sectors, private sectors that include hotel, trade, restaurants, the financial and banking sector, and government sectors which include services provided by the government such as water and electricity, the period of study was from 1973 to 2012 and was divided into four phases in a 10-year horizon. the dependent variable was the economic growth while the independent study variables were as follows: exports, foreign direct investment, gross capital formation, and all of them were a percentage of GDP. The study concluded that exports and gross capital formation are the main determinants of growth in Kuwait, Qatar, and Saudi Arabia, while exports and foreign direct investment represented the main determinants of growth in the UAE. For Bahrain, the determinants of economic growth were FDI and gross capital formation. the results did not indicate any causal relationship to the three determinants tested as independent variables on growth in

the State of Oman. Finally, the study found that the share of exports contributing in shocks to economic growth was 9.55%, 1.33%, 6.85%, 10.38%, and 20.9% in Bahrain, Kuwait, Qatar, Saudi Arabia, and the UAE respectively.

Alkhathlan (2013) investigated the oil production and growth relationship in the Kingdom of Saudi Arabia, using the ARDL approach. Oil production was divided into two parts, the first was the export revenue of crude oil, and the second was the domestically consumed oil in the industrial sector. The obtained data covered the period from 1971 to 2010. The results showed that a significant positive relationship between the revenues of crude oil exports and growth in both the short and long term, also negative relationship between domestic consumption and the growth was confirmed by the results. Nevertheless, the study concluded that Saudi Arabia is still far from a sustainable growth rate. Hamdi & Sbia (2013) concluded that oil revenues are a main origin of growth and government spending in Bahrain using annual data for 1960–2010 period. Further, the study used oil and gas revenues at real prices to express oil revenues, as well as the total government spending at current prices, which includes current expenditures, capital spending, and debt interest, while GDP was a proxy variable for the growth. The results confirmed the statistical significance in the long-run for both oil revenues and government spending, but that was only the case for oil revenues in the short run. Plus, the results revealed a unidirectional causal relationship from oil revenues towards GDP.

The work of Ahmad & Masan (2015) found positive relation in the long term between economic growth (real GDP), government spending, and oil revenues in real prices in the State of Oman. In general, the results have shown that government spending plays a pivotal role in influencing growth. but the fluctuations in government spending was affected by oil revenues only in the short term. The paper used annual data covered the period 1971-2013 and applied the cointegration tests, Variance Decomposition, and Impulse response functions. The study of Merza (2007) aimed to examine the hypothesis of exports-led growth using data in real term of GDP, as a proxy of growth, oil exports, and non-oil exports through the period from 1970 to 2004 in the State of Kuwait. the results revealed the fulfillment of the hypothesis in the State of Kuwait, where the long-run relationship among the three variables, and causality tests showed the bidirectional relationship from exports to growth and vice versa; While unidirectional relationship from non-oil exports to the growth was existed.

Faisal et al. (2017) examined Exports-led growth in Saudi Arabia using up time series through the period 1968 -2014 for economic growth, total exports, and imports as a percentage of GDP, ARDL approach was applied. The results revealed a long-run growth - exports relationship, and the exports effects on growth were positives effects. Which means the validation of the hypothesis, contrary to that there was no long-run relationship between the imports and the growth. The results of Granger's causality test concluded with confirming the unidirectional causal relationship from exports to growth, and unidirectional relation from imports to exports. This was interpreted as the Saudi economy is susceptible to external shocks, as oil exports are a large part of total exports.

The study of Maalel & Mahmood (2018) aimed to show the effect of Oil dependency expressed in both the dependence of exports on Oil and the dependence of GDP on oil, on the economic performance expressed in economic growth in GCC countries by employing a data covered the 1980-2016 period. the study applied a non-linear ARDL methodology and concluded that there are evidences of a strong cointegration relation found in all GCC countries. Furthermore, the increase in the Oil-GDP dependency leads to an inverse relationship to growth in Bahrain, and positive for both Qatar and the UAE. and the decrease in Oil-GDP dependency leads to a frustrating impact on growth in Oman and Qatar. Generally, Oil-GDP dependence has a positive effect on the GCC states asymmetrically. For Oil- exports dependence, which is the other representative of petroleum dependency, the increasing Oil- exports dependency leads to the negative impact on the growth of Kuwait, Saudi Arabia, and the UAE. and reducing the oil- exports dependency leads to increasing the growth of Saudi Arabia, Kuwait, and Oman, and reducing the growth in the UAE and Bahrain. Briefly, reducing Oil- exports dependency leads to achieving better growth in most of the GCC countries, with asymmetric effects for the UAE, Bahrain, Saudi Arabia, and Oman in terms of increasing or decreasing dependency in exports. The study recommended Bahrain to reduce dependence on oil in its GDP, and the UAE, Saudi Arabia, and Kuwait to reduce dependence on exports to improve economic growth.

Harb (2009) mainly aimed to explore the impacts of the natural resource's exports on economic performance in the countries of the GCC countries except for Bahrain, because it is a small oil exporter. the study used five variables: oil exports, non-oil GDP at current prices, productivity at current prices, and gross capital formation as a representative of investment and the per worker investment. The study concluded that there is a cross-sectional correlation in oil exports, which means that there is a common factor among the

five countries. Likewise, the study concluded that there is no positive or negative relationship among the oil exports and economic variables in the long-run, and this was explained as contrary to resource abundance curse hypothesis, while the impact in the short term depends on local policies. the study showed that education may play a role in the impact of oil exports on economic performance. this means that oil exports can play a better role in economic performance in countries that depend on their qualified workers.

Albassam (2015) analyzed the economic diversification of Saudi Arabia during a period covering nine economic plans over the period 1970- 2013. The study concluded that oil is still the main driver of the Saudi economy. Sultan & Haque (2018) investigated the validation of a long-run growth relationship with oil exports, government consumption expenditure and imports in Saudi Arabia; using Johansen cointegration methodology and VECM model for the period from 1984 to 2015. The study found the long-run positive relationship among the growth, oil exports and consumption of government spending, and a negative import – growth relationship in the short and long-run. Besides, oil exports have a positive impact on growth in the short term.

4. METHODOLOGY AND EMPIRICAL FINDINGS

In this chapter; Data set and the methodology will be discussed as well as the empirical findings of used econometric models.

4.1. Data Set

The data set covered the period 1970-2018 for all the GCC countries which made it a powerfully balanced panel data set, Incoe represents the crude oil exports (annual 1,000 thousand Barrels) which is the independent variable and lngdp represents the GDP per capita (thousands per annum) in the constant prices (2015) as a proxy variable for the economic growth which is the dependent variable. and the data of both Incoe and lngdp was transformed into logarithm.

The Incoe data for the period from 1970 to 2018 has obtained from OAPEC organization data base (OAPEC, 2020) except for Bahrain due to presence of missing values of some years in the OAPEC data, the data of 1996, 1997, 1998, and 2006 of Bahrain were taken from Energy Information Administration (EIA, 2020) which includes the Lease condensate exports. the data of lngdp was obtained from UNCTAD data base (UNCTAD, 2020). Incoe data set was illustrated previously in Figure 2.14. and the data of lngdp is shown in figure 4.1 bellow.

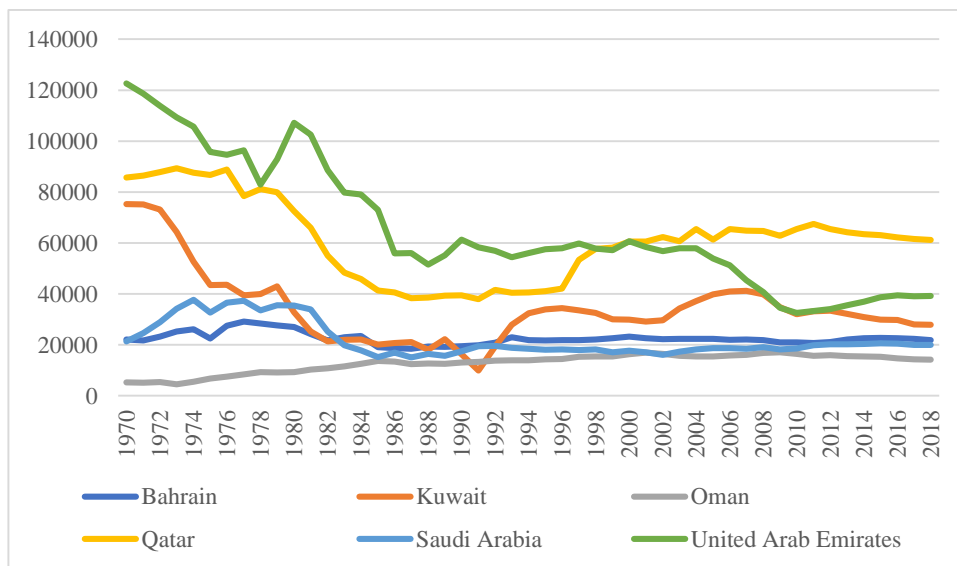


Figure 4.1. GDP Per Capita In Constant Prices (2015) of GCC Countries

Source: UNCTAD, (2020)

4.2. Methodology

The usage of the Panel data provides more opportunities to study the changes that occur between economic variables during different periods and between different cross-sectional units, and thus it raised the ability to understand the economic phenomena, and increases the ability to interpret them more accurately. Furthermore, the presence of more than onetime period and more than one cross-sectional unit rise the degree of freedom and reduces the problem of multicollinearity between the variables. Likewise, panel data provide better bulk for studying the subjects related to human behavior than time-series or cross-sectional data. Also, panel data capturing for the individual heterogeneity, see (Hsiao, 2007) and (Pesaran, 2015a). However, the availability of data led to a booming of Panel data models especially in Macroeconomics filed.

In literature, three panel data groups can be defined according to the relative time periods to cross-section units. The first accrued when time periods (T) are greater than cross-section units (N), the second represents the inverse case (i.e., where the time periods are less than the cross-section units) and the third represented the large time periods and large cross-section units.

In this study, the model under consideration is simply identified as follows

$$\ln \text{gdp}_{i,t} = f(\ln \text{coe}_{i,t}) \quad (1)$$

where t represents the time dimension $t = 1, 2, \dots, T$ and I is the cross units $i = 1, 2, \dots, N$

and the first step is to examine the cross-sectional dependence in the series and residuals since neglecting the CD dependence can conclude with misleading results or inconsistent estimates sometimes Chudik et al. (2016) and to avoid such problem which the traditional panel approaches do not take it into account; the cross-sectional dependence test such as Pesaran CD test introduced by Pesaran (2004) and LM test developed by Breusch and Pagan (1980) . To test for the CD in the residuals Pesaran (2004) and the bias-adjusted LM test developed by Pesaran et al. (2008) will be applied. If the CD exists in the series then the 2nd generation panel unit root tests will be used since the 1st generation of panel unit root tests such as LLC test that developed in Levin et al. (2002) and IPS test introduced by Im et al. (2003) do take the problem of CD into account. Likewise, Pesaran et al. (2008) will be

used to examine the residual's CD, if the CD exists in the residuals then the 2nd cointegration test will be used rather than the 1st generation tests. See Gorus & Aslan (2019).

The 2nd generation unit root test such as CIPS and CADF (Pesaran, 2007) that capturing for the cross-sectional dependence error will be used. Further, the 3rd generation of panel data root tests that allow for the problem of CD, structural breaks and unobserved common factor will be used, because these three problems can cause misleading results of the stationarity and the integration's order of the time series (Bai & Carrion-I-Silvestre, 2009). Therefore, Bai & Carrion-I-Silvestre (2009) interduced a unit root test to examine the stationarity of the panel data where the multiple structural breaks and unobsorved commen factores are considered, this test will be used to obtain more realistic findings.

The slope homogeneity test that proposed by Pesaran and Yamagata (2008) will be used to check the heterogeneity of the slope coefficients in the data before estimating the long-run etimates and casultiy direction in order to use the estimators and the causality test that allow for the slope homogeneity. To estimate the long-run relationship, the cointegration tests should be used to determine the existance of the long-run relationship and there are many tests and generations of cointegration tests in the litrature from differnt generations like Pedroni (2004) from the 1st generation that does not take the CD error and the structural breaks into account. However, this study will use the second generation of the cointegration tests such as Westerlund and Edgerton (2008) and Banerjee and Carrion-i-Silvestre (2017) that can manage the CD and structural breaks.

Long-run estimators such as Mean Group (MG) estimator suggested by (Pesaran & Smith, 1995), and Pooled Mean Group (PMG) estimator developed by Pesaran et al. (1999) allow for the heterogeneity but they are not robust to the presence of the correlation across units. So, the new generation long-run estimators will be used such as Augmented Mean Group estimator (AMG) developed by Eberhardt & Bond (2009) and Eberhardt & Teal (2010). Furthermore, The cross-sectionally augmented ARDL (CS-ARDL) introduced by Chudik & Pesaran (2013a) which is an extension for Pesran CCEMG estimator with lagged dependent variable and/or weakly exogenous regressors will be applied to estimate the estimates of long-run. Additionally, the cross-sectionally augmented distributed lag (CS-DL) approach developed in Chudik et al. (2013) to estimate the coefficients of long-run in the large panels with CD error. Also, CS-DL considers the dynamics and panel heterogeneity. After the estimation of the long-run coefficients Emirmahmutoglu & Kose

(2011), and Kónya (2006) panel causality tests will be used to examine the existence and direction of causality relations between the variables. More details about used tests are presented below.

4.2.1. Cross-Section Dependence

Cross-Section Dependence can be a result of non-considered residual interdependence or can appear due to some unobserved common factors (Bildirici, 2014). To reveal the presence of the CD in the series Pesaran (2004) test will be used, CD test can be used even if the multiple breaks or unit root are existing in the panels, and for balanced or unbalanced panel data as mentioned by Pesaran (2004), additionally, CD Pesaran can be used for non-linear panel data under specific conditions. The CD test was developed based on pair-wise correlation parameters that obtained of the OLS residuals of the individual regressions. CD test can be obtained from the bellow equation provided by Pesaran (2004).

$$D = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \right) \quad (2)$$

Where

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t=1}^T e_{it} e_{jt}}{\left(\sum_{t=1}^T e_{it}^2 \right)^{1/2} \left(\sum_{t=1}^T e_{jt}^2 \right)^{1/2}} \quad (3)$$

Where

$$e_{it} = \hat{y}_{it} - \hat{\beta}_i' x_{it} \quad (4)$$

The test examines the CS independence null hypothesis and the rejection of the null means that the CD is existed. Pesaran, (2015b) introduced a new test to reveal the cross-sectional independence under the assumption of weakly CD errors in the panels and where T and N are large. The test is an extenuation of Pesaran, (2004) CD test, see Chudik, & Pesaran (2013b).

LM test developed by Breusch, & Pagan (1980) was widely used to examine the null of no cross-equation error correlations and can examine for the CD using the following scaled equation: (Pesaran, 2015b). the null hypothesis is no cross-sectional dependence.

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N (T \hat{\rho}_{ij}^2 - 1)} \quad (5)$$

Where $\hat{\rho}_{ji}$ and e_{it} as defined above in (9) and (10).

After testing for the CD in the series, the CD in the residuals should be examined. that is a pre-condition to choose the suitable cointegration test, for this purpose the errors CD will be examined using both Pesaran (2004) test and Pesaran et al. (2008) bias-adjusted LM test. Pesaran et al. (2008) adjusted the Breusch, & Pagan (1980) LM test for small size panels with accurately exogenous regressors as well as the normal disturbances. The simulation showed that the test controls for small size significantly. Adjusted LM statistic can be defined as follows:

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \frac{(T-K) \hat{\rho}_{ij}^2 - \nu T_{ij}}{\nu T_{ij}}} \quad (6)$$

4.2.2. Panel Unit Root Tests

The 2nd generation of the panel unit root tests are accounting for the CD error, and many tests have been developed to overcome this error where the first-generation tests fail to deal with this error. Pesaran, (2007) introduced the cross-sectionally augmented Dickey-Fuller (CADF) and the cross-sectionally augmented Im-Pesaran-Shin (CIPS). Pesaran (2007) argued that CIPS test provides a robust result even if both T and N are small, say N=T=10 and if T is more than 30 and if the linear trend was included the robustness of the test would raise.

The CADF can be calculated as follows: see (Le& Bao, 2020).

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \lambda_i \bar{y}_{t-1} + \delta_i \Delta \bar{y}_{i,t} + \varepsilon_{it} \quad (7)$$

Where \bar{y}_{t-1} is the CS averages of lagged levels of individual series and can be obtained as:

$$\bar{y}_{t-1} = N^{-1} \sum_{i=1}^N y_{i,t-1} \quad (8)$$

and,

$\Delta\bar{y}_{i,t}$ is the CS averages of individual series and can be calculated as

$$\Delta\bar{y}_{i,t} = N^{-1} \sum_{i=1}^N \Delta y_{i,t} \quad (9)$$

The CADF statistic can be used to calculate the adjusted statistic of the t-bar test proposed by Im et al. (IPS) according to Pesaran (2007) which yield the CD augmented IPS (CIPS) test which be defined as follows:

$$CIPS(N, T) = N^{-1} \sum_{i=1}^N ti(N, T) \quad (10)$$

where $ti(N, T)$ are the t statistics of the coefficients in the CS augmented Dickey–Fuller regression (Hashmi & Alam, 2019), or simply as

$$CIPS = N^{-1} \sum_{i=1}^N CADF_i \quad (11)$$

The 3rd generation of panel unit root tests such as Bai & Carrion-I-Silvestre (2009) unit root test examined the stationarity in the presence of the multiple structural breaks and Common dynamic factors, Bai & Carrion-I-Silvestre (2009) test pools adjusted Sargan-Bhargava (MSB) tests for singular series by introducing the influence of structural breaks in the level, slope or both and common dynamic factors, the statistics of the test can be defined as follows:

$$Z = \sqrt{N} \frac{\overline{MSB(\lambda)} - \bar{\xi}}{\bar{\zeta}} \rightarrow N(0,1) \quad (12) \text{ where}$$

$$\overline{MSB(\lambda)} = N^{-1} \sum_{i=1}^N MSB_i(y_i) \quad \bar{\xi} = N^{-1} \sum_{i=1}^N \xi_i \quad \text{and} \quad \bar{\zeta} = N^{-1} \sum_{i=1}^N \zeta_i^2$$

$\bar{\xi}$ and $\bar{\zeta}^2$ are the average and the variance of the individual modified MSBi(λ) statistic, respectively (Dobnik, 2011).

$$P = -2 \sum_{i=1}^N \ln \rho_i \rightarrow X^2_{2N} \quad (13)$$

$$P_m = \frac{-2 \sum_{i=1}^N \ln \rho_i - 2N}{\sqrt{4N}} \rightarrow N(0,1) \quad (14)$$

Bai and Carrion-i-Silvestre (2009) also developed another approach based on simplified test statistics. simplified test statistics were denoted as Z^* , P^* and P_m^* .

4.2.3. Panel Cointegration Tests

The economists have focused attention on the long-run equilibrium following the economic theory that concerned about the long-run relationship among the economic variables. the econometrics of cointegration in panel data has become more popular recently especially, with the appearance of many tests in the literature. In this study the 2nd generation of the cointegration tests such as Westerlund and Edgerton (2008) and Banerjee and Carrion-i-Silvestre (2017) that allow for the CD and structural breaks well be used to investigate the cointegration relationship. The 2nd generation of cointegration tests allow for heterogeneity, CD, and recently for the structural breaks, Westerlund and Edgerton (2008) developed unpretentious test for panel cointegration with two versions to examine no cointegration null hypothesis. The test takes account for heterogeneity, cross sectional dependency and unknown structural breaks. further, the test allows for the heteroskedastic and error's serial correlation. the performance of the test with small samples was investigated and found that

the tests perform well and has good power even in small samples according to Westerlund and Edgerton (2008). The model under consideration is

$$y_{it} = \alpha_i + \eta_{it} + \delta_i D_{it} + \chi_{it}' \beta_i + (D_{it} \chi_{it})' \gamma_i + z_{it} \quad (15)$$

$$\chi_{it} = \chi_{it-1} + \omega_{it} \quad (16)$$

Where $t=1, \dots, T$ and $i=1, \dots, N$ represent the time series and units respectively.

χ_{it} is the vector with K dimension, δ_i represents the intercept of the break while β_i represents the slope of the break and D_{it} variable is a break dummy. z_{it} represents the disturbance and permits the cross- sections dependence by using the unobserved common factors as follows:

$$z_{it} = \lambda_i' F_t + v_{it} \quad (17)$$

$$F_{jt} = \rho_j F_{jt-1} + \mu_{jt}, j = 1, \dots, k \quad (18)$$

$$\phi_i(L) v_{it} = \phi_i v_{it-1} + e_{it} \quad (19)$$

$$\text{Where } \phi_i(L) = 1 - \sum_{j=1}^{P_i} \phi_{ij} L^j \quad (20)$$

The null is no cointegration while the alternative is that one unit is cointegrated at least. The break point estimator is defined as

$$\hat{\tau}_i = \arg \min_{0 < \tau_i < 1} \frac{1}{T-1} \sum_{t=2}^T (\Delta \hat{z}_{it})^2 \quad (21)$$

Banerjee and Carrion-i-Silvestre (2017) developed cointegration test based on the CCE estimator introduced by Pesaran(2006) allowing for both weak and strong CD, the main idea of Banerjee and Carrion-i-Silvestre (2017) was to control for the CD by using the averages of the cross sections following the CCE approach and build a test for the cointegration on the light of this results. Moreover, the test allows for the structural breaks.

The null of no cointegration can be tested as follows:

$$\text{Let } y_{i,t} = D_{i,t} + x'_{i,t} \beta_i + \zeta_{i,t} \quad (22)$$

is a date generating process (DGP)

$$\text{Where } \zeta_{i,t} = \theta_i \zeta_{i,t-1} + f'_t \lambda_i + \varepsilon_{i,t} \quad (23)$$

and,

$D_{i,t}$ denotes the deterministic side of the model, the order of integration for all common factors and it is the same for all of them and spurious regression for all units were assumed. and Pesaran CCE estimated parameters were used to define

$$\tilde{y}_{i,t} \text{ as } \tilde{y}_{i,t} = y_{i,t} - x'_{i,t} \hat{\beta}_{PCCE} \quad (24)$$

and,

$$\tilde{y}_{i,t} = D_{i,t} + v_{i,t} \quad (25)$$

by using the cross section augmented Dickey–Fuller (CADF) statistics to analyze the set of integration of $\hat{v}_{i,t}$

$$CADF_p = N^{-1} \sum_{i=1}^N t_{\hat{\alpha}_{i,0}} \quad (26)$$

Where $t_{\hat{\alpha}_{i,0}}$ is the pseudo t-ratio of the estimated $\alpha_{i,0}$ parameter in the following equation

$$\Delta \hat{v}_{i,t} = \alpha_{i,0} \hat{v}_{i,t-1} + \sum_{j=1}^p \alpha_{i,j} \Delta \hat{v}_{i,t-j} + \varphi_i \bar{\hat{v}}_{i,t-1} + \sum_{j=0}^p k_{i,j} \Delta \hat{v}_{i,t-j} + v_{i,t} \quad (27)$$

With one joint factor and,

$$\Delta \hat{v}_{i,t} = \alpha_{i,0} \hat{v}_{i,t-1} + \sum_{j=1}^p \alpha_{i,j} \Delta \hat{v}_{i,t-j} + \varphi_i' \bar{A}_{t-1} + \sum_{j=0}^p k_{i,j}' \Delta \bar{A}_{t-j} + v_{i,t} \quad (28)$$

Where $\bar{A}_t = (\bar{v}_t, \bar{x}_{1,t}, \dots, \bar{x}_{k,t})'$ is the vector of CS averages augmentation terms for the 1+k multiple common factors case, assuming the one common factor represents the extreme case of the test according to Banerjee and Carrion-i-Silvestre (2017).

4.2.4. Slope Heterogeneity Test

For large unites (N) and small-time dimensions (T) panel data was assumed usually the homogeneity of the slope coefficients but this assumption was not true all the time especially when the T is getting longer and this assumption was quite often rejected (Baltagi, 2008). In their work Robertson & Symons (1992) concluded that the biases raise when the homogeneity is assumed in estimation although the parameters are varying across unites. While Pesaran & Smith (1995) found that pooling and agregating yiled inconsistent and misleading estimates where the coefitientes vary across cross section units in the dynamic case. Swamy (1970) has developed a test to examine the slope homogeneity where N is smaller than T and the statistics of the test can be written as follow: (Pesaran & Yamagata, 2008)

$$\hat{S} = \sum_{i=1}^N (\hat{\beta}_i - \hat{\beta}_{WFE})' \frac{X_i' M_\tau X_i}{\hat{\sigma}_i^2} (\hat{\beta}_i - \hat{\beta}_{WFE}) \quad (29)$$

Where
$$\hat{\sigma}_i^2 = \frac{(y_i - X_i \hat{\beta}_i)' M_\tau (y_i - X_i \hat{\beta}_i)}{(T - K - 1)} \quad (30)$$

and $\hat{\beta}_{WFE}$ is the weighted pooled estimator of slope parameters and defined as

$$\hat{\beta}_{WFE} = \left(\sum_{i=1}^N \frac{X_i' M_\tau X_i}{\hat{\sigma}_i^2} \right)^{-1} \sum_{i=1}^N \frac{X_i' M_\tau y_i}{\hat{\sigma}_i^2} \quad (31)$$

The null hypothesis is $H_0: \beta_i = \beta$ for all i

Pesaran & Yamagata (2008) developed slope homogeneity tests based on Swamy (1970) with standardized version of Swamy's test (the $\tilde{\Delta}$ test):

$$\tilde{S} = \sum_{i=1}^N (\hat{\beta}_i - \tilde{\beta}_{WFE})' \frac{x_i' M_{\tau} x_i}{\tilde{\sigma}_i^2} (\hat{\beta}_i - \tilde{\beta}_{WFE}) \quad (32)$$

Where $\hat{\beta}_i$ is the pooled OLS estimator, The standardized dispersion statistic is defined as:

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - k}{\sqrt{2k}} \right) \quad (33)$$

For the small sample the statistic can be adjusted as:

$$\tilde{\Delta}_{adj} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - E(\tilde{Z}_{it})}{\sqrt{\text{var}(\tilde{Z}_{it})}} \right) \quad (34)$$

(Chou, 2013)

4.2.5. Long-Run Estimators

4.2.5.1. The Augmented Mean Group (AMG) Estimator

Eberhardt & Bond (2009) and Eberhardt & Teal (2010) provided the AMG estimator that is somewhat similar to CCE estimator developed by Pesaran (2006). AMG accounts for CD by implication of common dynamic effect. They have assumed the following model:

$$y_{it} = \beta_i x_{it} + u_{it} \quad (35)$$

Where $u_{it} = \alpha_{1i} + \lambda_i f_t + \varepsilon_{it}$ (36)

$$x_{it} \alpha_{2i} + \lambda_i f_t + \gamma_i g_t + e_{it} \quad (37)$$

Where f represents the unobserved common factor and was extracted from the year dummy parameters of a pooled regression in 1st differences. The estimator has two stages as follows:

The 1st stage (38)

$$\Delta y_{it} = b' \Delta x_{it} + \sum_{t=2}^T c_t \Delta D_t + e_{it}$$

Where $\hat{c}_t \equiv \hat{\mu}_t^*$

The 2nd stage (39)

$$y_{it} = \alpha_i + b_i' x_{it} + c_i t + d_i \hat{\mu}_t^* + e_{it}$$

and (40)

$$\hat{b}_{AMG} = \frac{1}{N} \sum_i \hat{b}_i$$

4.2.5.2. The Cross-Sectionally Augmented ARDL (CS-ARDL)

The main objective of the CS-ARDL developed in Chudik & Pesaran (2013a) is to account for the unobserved common factors which if existed can conclude with inconsistent estimates especially if the factors are serially correlated with the independent variables. The only problem with CS-ARDL is requiring a large T where the lagged dependent variable be added to the regressors, see Chudik et al. (2013).

Following Chudik et al. (2013) the CS-ARDL cannot estimate the long-run estimates directly, but firstly estimating the short-run parameters and then calculate the long-run coefficients. And this can be done as follow:

Consider the following ARDL form

$$\Delta \ln gdp_{it} = c_i + \sum_{\tau=1}^p \alpha_{i\tau} \Delta \ln gdp_{i,t-\tau} + \sum_{\tau=0}^p \beta'_{i\tau} \ln coe_{i,t-\tau} + \mu_{it} \quad (41)$$

CS-ARDL can be given by

$$\Delta \ln gdp_{it} = c_i + \sum_{\tau=1}^p \alpha_{i\tau} \Delta \ln gdp_{i,t-\tau} + \sum_{\tau=0}^p \beta'_{i\tau} \ln coe_{i,t-\tau} + \sum_{\tau=0}^3 \phi'_{i\tau} \bar{z}_{t-\tau} + \mu_{it} \quad (42)$$

Where the $\bar{z}_t = (\bar{\Delta \ln gdp}_t, \bar{x}'_t)'$ and,

$$\hat{\theta}_{CS-ARDL,i} = \frac{\sum_{l=0}^p \hat{\beta}_{1,i}^{p \ln coe}}{1 - \sum_{l=1}^p \hat{\alpha}_{1,i}^{p \ln gdp}} \quad \text{See (Ditzen, 2019)} \quad (43)$$

4.2.5.3. The Cross-Sectionally Augmented Distributed Lag (CS-DL)

The CS-DL approach accounts for the Dynamic, heterogeneous, and cross-sectionally dependence. Chudik et al. (2013) argued that the CS-DL approach showed better performance in a small sample (i.e., when T is moderate, say between 30 and 100) than other estimators such as ARDL. Additionally, they supposed that when T is moderate the estimate of long-run parameters can improve those of the short-term. However, the main problem is that when there are inverse effects come from the dependent variable toward the independence variables, which can produce inconsistent estimates and biased results. CS-DL approach calculates the long-run coefficients straightway and shows robust performance even in the presence of the breaks in the error processes of units.

$$\Delta \ln gdp_{it} = c_i + \theta'_i \ln coe_{it} + \sum_{\tau=0}^{p-1} \delta'_{i\tau} \Delta \ln coe_{i,t-\tau} + \omega_{i \ln gdp} \bar{\Delta \ln gdp} + \sum_{\tau=0}^3 \omega'_{i, \ln coe \tau} \bar{\ln coe}_{t-\tau} + e_{it} \quad (44)$$

4.2.6. Bootstrap Panel Causality

After the estimation of the long-run estimates its important to test for the causal relationship and to check for the direction of the causality. Tow bootstrapping panel causality will be used namely Emirmahmutoglu & Kose (2011) and Kónya (2006) test.

Emirmahmutoglu & Kose (2011) test was developed based on Meta-analysis in heterogeneous mixed panels with LA-VAR process. The test allows for the heterogeneity and unit correlation or unit independence. Furthermore, the test considers the cointegrated or non-cointegrated series. The test's performance with small size of the units and time dimension was found powerful using the Monte Carlo simulation. Emirmahmutoglu & Kose (2011) assumed the following heterogenous model:

$$z_{i,t} = \mu_i + A_{i1} z_{i,t-1} + \dots + A_{iki} z_{ki} + \mu_{i,t} \quad (45)$$

And they used the Fisher statistics provided by Fisher (1932) and for testing the null hypothesis of x does not granger cause y the following equation was used:

$$y_{i,t} = \mu_i^y + \sum_{j=1}^{k_i+d \max_i} A_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i+d \max_i} A_{22,ij} y_{i,t-j} + \mu_{i,t}^y \quad (46)$$

And the inverse case can be expressed as follows:

$$x_{i,t} = \mu_i^x + \sum_{j=1}^{k_i+d \max_i} A_{11,ij} x_{i,t-j} + \sum_{j=1}^{k_i+d \max_i} A_{12,ij} y_{i,t-j} + \mu_{i,t}^x \quad (47)$$

Weher $d \max$ is the number of the integration in the LA-VAR system. For bootstrap sample they used the following specification:

$$y^*_{i,t} = \hat{\mu}_i^y + \sum_{j=1}^{k_i+d \max_i} \hat{A}_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i+d \max_i} \hat{A}_{22,ij} y^*_{i,t-j} + \tilde{\mu}_{i,t}^* \quad (48)$$

Kónya (2006) developed the bootstrap causality test that considering the heterogeneity and CS dependence based on the seemingly unrelated regression (SURE) model. The variables can be examined by the level series. Further, this test does not need any pre-conditions such as testing tor unit root or cointegration. However, the test is powerful to the

features of unit root and cointegration process. see Menyah et al. (2014). The following system equations will be estimated.

$$\ln gdp_{1t} = \alpha_{11} + \sum_{J=1}^{p_1} \beta_{11J} \ln gdp_{1t-1} + \sum_{J=1}^{p_1} \delta_{11J} \ln coe_{Nt-1} + \varepsilon_{11t}$$

:

$$\ln gdp_{Nt} = \alpha_{1N} + \sum_{J=1}^{p_1} \beta_{1NJ} \ln gdp_{Nt-1} + \sum_{J=1}^{p_1} \delta_{1NJ} \ln coe_{Nt-1} + \varepsilon_{1Nt} \quad (49)$$

$$\ln coe_{1t} = \alpha_{21} + \sum_{J=1}^{p_2} \beta_{21J} \ln gdp_{1t-1} + \sum_{J=1}^{p_2} \delta_{21J} \ln coe_{Nt-1} + \varepsilon_{21t}$$

$$\ln coe_{Nt} = \alpha_{2N} + \sum_{J=1}^{p_2} \beta_{2NJ} \ln gdp_{Nt-1} + \sum_{J=1}^{p_2} \delta_{2NJ} \ln coe_{Nt-1} + \varepsilon_{2Nt} \quad (50)$$

4.3. Empirical Results

In this section the experiential results will be discussed following the methodology clarified in the previous section. The sampled countries are arranged literally and has been entered to the used software as illustrated in (Table 4.1).

Table 4.1. List of Sampled Countries

Country Code	Country Name
1	Bahrin
2	Kuwait
3	Oman
4	Qatar
5	Saudi Arabia
6	United Arap Emarites

The data is a balanced panel data with 294 observations transformed into logarithm for both lngdp and lncoe. The descriptive statistics of variables are illustrated in Table 4.2 bellow.

Table 4.2. The Descriptive Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Incoe	294	10.29239	.6532732	8.415263	11
Lngdp	294	12.50964	1.652092	1.631199	15

4.3.1. Testing for Cross- Section Dependence

The results of both Pesaran, (2004) CD test and Breusch, & Pagan (1980) CD_{LM} test strongly rejected the null of no CD in the series. this was expected due to the presence of many common economic features among the GCC countries such as the free trade economic zone, Oil resources, and the integration in many fields. The results are shown in Table 4.3. as follows:

Table 4.3. Cross Section Dependency in the Series

Variable	LM Breusch and Pagan (1980)	CD Pesaran (2004)
lngdp	250.5***	5.655***
Incoe	119.1***	3.822***

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Once the CD in the series was confirmed in the series, the 2nd generation panel unit root tests will be applied to check for non-stationarity. Additionally, Pesaran et al. (2008) and Pesaran (2004) results are illustrated in Table 4.4 and confirmed the presence of the CD in the residuals that obtained from CCEMG approach. These results enhance using the 2nd generation of cointegration. Later in this section the slope heterogeneity will be examined since the new generations of cointegration tests and long-run estimators assumed the slope heterogeneity.

Table 4.4. Errors Cross- Sectional Dependency results.

Residuals based on CCE estimator	CD Pesaran (2004)	CD Pesaran, Ullah and Yamagata (2008)
	-2.06**	125.9***

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

4.3.2. Testing for Panel Unit Root

The first-generation tests do not take the error of CD into account. Therefore, the next step is to use the new generations of panel unit root tests to check whether the unit root exists in the data or not, this will be done using three tests namely CIPS and CADF (Pesaran, 2007) from the 2nd generation tests and Bai & Carrion-I-Silvestre (2009) from the third-generation. The trend was included and the results confirmed the findings of the first-generation tests as follows:

Table 4.5. CIPS and CADF Results

Level				
CIPS		CADF		
Variable	CIPS	Variable	t-bar	P-value
Incoe	-2.646	Incoe	-2.708	0.153
lngdp	-2.402	lngdp	-2.752	0.126
First Difference				
Incoe	-5.855***	Incoe	-4.600***	0.000
lngdp	-5.710***	lngdp	-4.574***	0.000

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

The CIPS tested null hypothesis was rejected at the first difference with 1% significance level, CADF also confirmed the stationarity of the letter variables at the 1st difference with 1% significance level. Thus, both lngdp and Incoe are integrated at the 1st order I(1). Bai & Carrion-I-Silvestre (2009) test examined the stationarity in the presence of the various structural breaks and Common dynamic factors and allows for the cross-sectional dependency as well, the test was performed using GAUSS code which is available freely by (Carrion-I-Silvestre, 2020). The results showed that both lngdp and Incoe are I(1) integrated series where the null of no unit root was rejected at first different (Table 4.6). As known before, the tests examined the unit root even in the existence of the breaks at level or slope in different countries at different time, the breaks were found at level in lngdp for Oman at 1985 and for Qatar at 1987 and no breaks were estimated regarding to Incoe.

Table 4.6. Bai & Carrion-I-Silvestre (2009) Unit Root Test Results

At ALevel			
Statistics	Z	Pm	P
Incoe	-1.318	1.055	17.169
lngdp	0.176	-1.306	5.597
At First Difference			
Incoe	-2.330***	14.34***	82.26***
lngdp	-2.28**	9.76***	59.82*

The 1%, 5% and 10% critical values for the Z and Pm statistics are 2.326, 1.645 and 1.282. Meanwhile, the critical values for the P statistic are 71.201, 62.830 and 58.641, respectively. See (Dobnik, 2011) and Khan et al. (2020).

4.3.3. Testing for Panel Cointegration

The Panel Cointegration test introduced by Westerlund and Edgerton (2008) allows for CD error and structural breaks with no cointegration null hypothesis against the alternate of at least one unit is cointegrated. Further, the test allows for heteroskedastic and serially correlated errors (Dobnik, 2011). The test was performed using GAUSS code provided by (Westerlund, 2020) and the results are shown in Table 4.7.

Table 4.7. Westerlund and Edgerton (2008) Panel Cointegration Test

Test statistic	No shift		Level shift		Regime shift	
	Statistic	P-value	Statistic	P-value	Statistic	P-value
tau_n	-2.760***	0.003	-3.995***	0.000	-3.752***	0.000
phi_n	-1.816**	0.035	0.-1.518*	0.064	-1.397*	0.081

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Estimated no of factors =2.

The results above indicated the presence of the cointegration relation between crude oil exports(Incoe) and economic growth (lngdp). phi_n statistics for level and regime shift confirmed the cointegration relation at %10. Westerlund and Edgerton (2008) estimated some structure breaks in the data and most of the breaks concentrated on the 1980s. For Bahrain in the case of level shift and regime shift the break was the same and was detected in 1984 while the prices of oil were shifting down. Regarding Kuwait, the level shift break

was in 1993 and reflected the recovery of the economy after Iraq's invasion. In the case of the regime shift the estimated break was in 1981 which reflected the effects of the Iran-Iraq war that caused rapidly oil prices increasing. OPEC reference basket in nominal term for example increased from 17 \$ in 1979 to 28\$ in 1980. Despite the decline in crude oil exports, the nominal GDP of the GCC countries increased by 41% in 1980 compared to the prior year. But that was not the case from 1983 to 1986 where the oil prices shifted down sharply, especially when Saudi Arabia let the swing producer role down. This was clearly reflected in the estimated breaks as they were in 1985 and 1983 for the level shift and regime shift respectively in Saudi Arabia. For UAE the estimated breaks were in 1958 for both level and regime shift. Kuwait, UAE, and Saudi Arabia are the biggest three crude oil exporters in the Gulf region. For Qatar which is the largest Gaz producer and exporter country in the GCC, the estimated breaks were in 1996 where Qatar started exporting the gaz which caused a rise in the GDP and the gdp per capita. Oman has no big crude oil exports compared to the rest of the GCC countries. However, the estimated breaks were in 1974 which reflected the 1993 crises of the Arab embargo that caused a huge increase in the oil prices.

Table 4.8. Estimated Breaks by Westerlund and Edgerton (2008)

Country	Level shift	Regime shift
Bahrain	1984	1984
Kuwait	1993	1981
Oman	1974	1974
Qatar	1996	1996
Saudi Arabia	1985	1983
UAE	1985	1985

Banerjee and Carrion-i-Silvestre (2017) developed cointegration test based on the CCE estimator introduced by Pesaran(2006) deals with the heterogeneity, weak and strong cross-sectional dependency, structural breaks and non-stationary panels. The results of the test were obtained using GAUSS software code provided freely by (Carrion-I-Silvestre, 2020) and the finding confirmed the cointegration relation between lngdp and lncoe with 95% statistical confidence level. The results supported the results obtained by Westerlund and Edgerton (2008) test. The results were computed in three models by letting the autoregressive correction's order to vary from 0 to 2 and the results in the three cases confirmed the cointegration relation between the lngdp and lncoe.

Table 4.9. Banerjee and Carrion-i-Silvestre (2017) Panel Cointegration Test

P (Order of the autoregressive correction) = 0			
Countries	Non-deterministics specification	With Constant	With Trend
All Countries	-8.893**	-8.628**	-8.550**
Bahrain	-12.154**	-11.571**	11.370 **
Kuwait	-9.128**	-8.711**	-8.701**
Oman	-6.253**	-6.331**	-6.293**
Qatar	-7.923**	-7.742**	-7.637**
Saudi Arabia	-8.013**	-8.012**	-7.879**
UAE	-9.889**	-9.400**	-9.422**
P (Order of the autoregressive correction) = 1			
All Countries	-5.059**	-5.008**	-5.023**
Bahrain	-5.823**	-5.703**	-5.570**
Kuwait	-5.255**	-5.041**	-5.213**
Oman	-4.155**	-4.303**	-4.350**
Qatar	-4.755**	-4.694**	-4.620**
Saudi Arabia	-5.253**	-5.498**	-5.449**
UAE	-5.117**	-4.810**	-4.935**
P (Order of the autoregressive correction) = 2			
All Countries	-4.219**	-4.210**	-4.134**
Bahrain	-4.929**	-4.960**	-4.636**
Kuwait	-4.323**	-4.094**	-4.167**
Oman	-3.348**	-3.568**	-3.505**
Qatar	-3.405**	-3.316**	-3.214**
Saudi Arabia	-4.204**	-4.605**	-4.606**
UAE	-5.104**	-4.719 **	-4.676**

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

4.3.4. Testing for Slope Heterogeneity

As shown above the slope heterogeneity became an essential test in the sequence of the panel data analyzing since the time dimension has been available more than before. The finding of (Pesaran & Yamagata, 2008) test confirmed strongly the slope heterogeneity in the involved data as shown in Table 4.10.

Table 4.10. Slope Heterogeneity Test (Pesaran & Yamagata, 2008)

Statistics	Test value	P-Value
Delta	3.138***	0.002
Delta tilde Adjusted	3.301***	0.001

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

4.3.5. Long-run Estimations

Once the slope heterogeneity and CD were confirmed, and the cointegration tests proved the long-run relation presences, the next step is to carry out the long-run estimators to estimate the elasticities of the model under consideration.

4.3.5.1. The Augmented Mean Group (AMG) Estimator

The results of the AMG estimator proposed by Eberhardt & Bond (2009) and Eberhardt & Teal (2010) is shown in Table 4.11.

Table 4.11. AMG Estimator Results

Coefficient	.2202925 **	Wald chi2	4.60
P> z	0.032**	Prob > chi2	0.0319**
Country-specific coefficients			
Country	Coefficient	P> z	
Bahrin	.0034951	0.507	
Kuwait	.4092854***	0.000	
Oman	.2875541**	0.028	
Qatar	.3160824***	0.006	
Saudi Arabia	.4773148***	0.000	
UAE	-.171977**	0.029	

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

AMG estimator coefficient is positive and statistically significant, while all the Country-specific coefficients are statistically significant except for Bahrain which the p-value greater than %5. And all the coefficients are positive except for UAE. Also, the common dynamic process was significant at all the countries.

4.3.5.2. The Cross-Sectionally Augmented ARDL (CS-ARDL)

Chudik & Pesaran (2013a) extended CCE estimator to model heterogenous panels with lagged dependent variable and different exogeneity level for the regressors. And therefore, they developed Common correlated effects estimator or CS-ADRL that as explained before, assumed the dynamic, heterogenous and cross-sectional dependence error. To estimate the long-run estimates using CS-ARDL approach the short-run coefficients should be estimated firstly and then calculate the long-run estimates (Table 4.12).

Table 4.12. CS-ARDL Approach Estimates

CS-ARDL (1 lag)		CS-ARDL (2 lags)		CS-ARDL (3 lags)	
Short-run Coefficient	.1539593**	Short-run Coefficient	.1612191**	Short-run Coefficient	.1767194***
Long-run Coefficient	.1673485 **	Long-run Coefficient	.1913105***	Long-run Coefficient	.1998642***
CD statistic	-3.32***	CD statistic	-3.22***	CD statistic	-3.13***

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

The results found that the crude oil exports (Incoe) have a positive influence on the growth (Ingdp) in long and short-run. CD is the cross-sectional test proposed by Pesaran (2004) and the results confirmed the CD with 1, 2 or 3 lags.

4.3.5.3. The Cross-Sectionally Augmented Distributed Lag (CS-DL)

Compared to the CS-ARDL approach CS-DL can produce better performance in the small sample as Chudik et al. (2013) argued, further, CS-DL can directly estimate the long-run estimates.

Table 4.13. Long-run Estimates Based on CS-DL Approach

CS-DL (1 lag)		CS-DL (2 lags)		CS-DL (3 lags)	
Long-run Coefficient	.1877336***	Long-run Coefficient	.2033723**	Long-run Coefficient	.2018899**
CD statistic	0.0009	CD statistic	-3.00***	CD statistic	-2.76***

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

The results obtained by CS-DL approach confirmed the long-run positive relationship between the crude oil exports and growth in GCC countries, and the coefficients (elasticities) were 0.1877336, 0.2033723 and 0.2018899 in the model with 1 lag, 2 lags and 3 lags respectively. CD test according to (Pesaran, 2015b) rejected the null of cross-sectional independence. The presence of long-run relationship between the said variables does not necessarily mean causation. the direction of the causal relationship must be tested to find out whether the relationship is heading from crude oil exports to economic growth or vice versa.

4.3.6. Bootstrap Panel Causality

After the estimation of the long-term elasticities, the direction of the causality should be examined to determine the source of the causality. Therefore, Emirmahmutoglu & Kose (2011) test, and Kónya (2006) test will be used to reveal the orientation of the causal linkages between the crude oil exports (lncoe) and growth (lngdp) in GCC countries. Emirmahmutoglu & Kose (2011) results are shown in Table 4.14.

Table 4.14. Emirmahmutoglu & Kose (2011) causality test results

Country	lncoe does not cause lngdp		lngdp does not cause lncoe	
	Wald statistic	P-value	Wald statistic	P-value
Bahrin	0.028	0.866	0.005	0.941
Kuwait	7.506***	0.006	11.124***	0.001
Oman	0.011	0.918	1.221	0.269
Qatar	0.009	0.923	10.254***	0.001
Saudi Arabia	3.323*	0.068	5.101**	0.024
UAE	3.171*	0.075	0.419	0.518
Calculated Fisher Test Statistic	21.351**+	0.045	38.861***	0.000++

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. ++ and + indicate to the significance at the 5% and 10% levels using 10000 bootstrap replications critical values.

The results provided evidences supported the bidirectional causality between lngdp and Incoe where the calculated fisher statistic is statistically significant at %5. For country specific Wald statistics, the causality from Incoe to lngdp was found out in Kuwait, Saudi Arabia, and UAE and the inverse case was found in Kuwait, Qatar, and Saudi Arabia. Further, no causality relation was found in Bahrain and Oman.

Kónya (2006) causality test with 10000 bootstrap replications results provide mixed causality directions as shown below.

Table 4.15. Kónya (2006) causality test results

Country	Incoe does not cause lngdp				lngdp does not cause Incoe			
	Wald statistic	Bootstrap CVs			Wald statistic	Bootstrap CVs		
		1%	5%	10%		1%	5%	10%
Bahrin	0.015	1.151	0.596	0.414	0.026	4.718	2.670	1.915
Kuwait	3.495***	2.144	1.395	1.045	3.040***	2.692	1.512	1.100
Oman	0.004	1.325	0.739	0.526	3.264*	4.958	3.341	2.680
Qatar	2.130***	1.197	0.709	0.534	0.046	4.732	2.682	1.929
Saudi Arabia	1.969**	3.354	1.837	1.300	0.560	6.910	3.931	2.801
UAE	1.441**	1.541	0.748	0.479	8.701***	2.891	1.722	1.278

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

The results supported the direction from Incoe to lngdp in Kuwait, Qatar, Saudi Arabia and UAE, and causality from the lngdp to Incoe in Kuwait, Oman, and UAE. For Bahrain no causality relation was found. According to Emirmahmutoglu & Kose (2011) the bidirectional causality was detected in Kuwait And Saudi Arabia. And only it was the case of Kuwait according to Kónya (2006). The overall results provide evidences support the positive impact from Incoe to lngdp.

5. CONCLUSION AND POLICY IMPLICATIONS

This study aimed to examine the impact of crude oil exports on the economic growth in the GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE during the periods from 1970 to 2018. The oil sector in the GCC countries was widely discussed and the important indicators of crude oil in GCC countries such as crude oil production, crude oil reserves, and oil derivatives were analyzed. The crude oil exports and the oil pricing systems were debated to provide an inclusive picture about the crude oil exports in the GCC countries and to understand the interrelationships between the crude oil exports and the variations in the crude oil production and global demand. Economic growth and Oil GDP of the GCC countries were analyzed. Additionally, the previous literature and hypotheses that studied the relation between the economic growth with both the abundance of resources and the exports were reviewed.

The CD problem was examined and the results emphasized the presence of the CD in the series and residuals. It can be caused by some factors such as geographical neighboring, the structure of GCC economies which are oil-rich economies, in addition to other factors that may be unobserved. Then, panel unit root tests from different generations were used and confirmed that both $\ln coe$ and $\ln gdp$ are non-stationary level-wise; however, they are stationary at the first difference, this was confirmed even in the case of cross-sectional dependency and structural breaks. Next, the cointegration relationship also was investigated using different approaches from different generations with taking the CD error, heterogeneity, and structural breaks into account. The tests stated the presence of the long-run relationship and many breaks were detected. The slope heterogeneity test was carried out and strongly confirmed the heterogeneity in the units. Therefore, the long and short-term elasticities were estimated and affirmed the positive relationship. After that, the direction of causality was examined and the pooled results revealed the bidirectional causality from the exports of crude oil to the growth. However, the country-specific causal linkages indicated to causal direction from crude oil exports to economic growth for the countries that produce oil largely such Kuwait, Saudi Arabia, and UAE. Meanwhile, the causal direction from economic growth to crude oil exports are found out in the less-producing countries like Oman or that following diversification policies such as UAE. And no causal relations were found in Bahrain which is small oil-producer. The results illustrate the importance of the role that oil sector plays in the GCC countries mainly on economic growth and consequently

on economic development. Expectedly, the curse of resources hypothesis was rejected in the GCC countries as the study concluded that oil exports positively affect economic growth. On the contrary, there are reasonable evidences that supported the hypothesis of exports-led growth. Considering that GCC countries are oil-rich countries and according to the results obtained here, it can be said that oil exports are driving growth in the most of GCC countries, which we can arguably refer to as oil exports-led growth.

To conclude, the study findings can inspire policymakers in the GCC countries to enact crude oil export policies that support economic growth, and reinforce the positive impact of crude oil exports on the economic growth in the short and long-terms. On the other hand, since the economic growth is influenced by the crude oil exports, the negative impact of the fluctuations in oil markets, which are usually subject to the conditions of the global market, may harm the local economies of the GCC countries in both the short and long-runs. Hence, economic policies must be imposed in the way that limiting the effects of variations in the global oil markets, especially on the growth of local economies in the long-run. The reason of that is the variations taking place in short-runs are inevitable; however, the negative effects that extend for a long-run can disturb the structure of the economy. Generally, the study recommends policymakers to make policies that guarantee as much as possible the permanence of exporting crude oil in a way that contributes to promoting growth and economic development. But, the diversification of the economy by developing non-oil GDP is important to reduce the negative effects that the global oil market may bring to local economies. Economic diversity is necessary to create sustainable development as oil is ultimately an exhaustible commodity, and the renewable energy sources are blooming recently.

For future directions, we argue that since the numbers of the cross-sections $N=6$ is relatively small, this may be a drawback of the study. Moreover, the impact of crude oil exports on economic growth in GCC countries can be re-examined with a larger group, where statistical tests can provide more accurate results with an increase in the volume of data. Furthermore, this study can be extended in the future to include the global or regional crude oil exporter countries. Further, an empirical study is needed to examine the relationship of oil and non-oil exports to economic growth, to determine which affect growth the most.

6. REFERENCES

- Abdalla, M., & Abdelbaki, H. H. (2014). Determinants of economic growth in GCC economies. *Asian Journal of Research in Business Economics and Management*, 4(11), 46-62.
- Ahmad, A. H., & Masan, S. (2015). Dynamic relationships between oil revenue, government spending and economic growth in Oman. *International Journal of Business and Economic Development (IJBED)*, 3(2).
- Ahmed, K., Mahalik, M. K., & Shahbaz, M. (2016). Dynamics between economic growth, labor, capital, and natural resource abundance in Iran: An application of the combined cointegration approach. *Resources Policy*, 49, 213-221.
- Ahmed, W. M. (2020). Stock market reactions to domestic sentiment: Panel CS-ARDL evidence. *Research in International Business and Finance*, 101240.
- Albassam, B. A. (2015). Economic diversification in Saudi Arabia: Myth or reality? *Resources Policy*, 44, 112-117.
- Alkhatlan, K. A. (2013). Contribution of oil in economic growth of Saudi Arabia. *Applied Economics Letters*, 20(4), 343-348.
- Auty, R. M. (2007). Natural resources, capital accumulation and the resource curse. *Ecological economics*, 61(4), 627-634.)
- Auty, R. M. (Ed.). (2001). *Resource abundance and economic development*. Oxford University Press.
- Awokuse, T. O. (2003). Is the export-led growth hypothesis valid for Canada? *Canadian Journal of Economics/Revue canadienne d'économique*, 36(1), 126-136.
- Bai, J., & Carrion-I-Silvestre, J. L. (2009). Structural changes, common stochastic trends, and unit roots in panel data. *The Review of Economic Studies*, 76(2), 471-501.
- Balassa, B. (1978). Exports and economic growth: further evidence. *Journal of development Economics*, 5(2), 181-189.

- Baltagi, B. (2008). *Econometric analysis of panel data*. John Wiley & Sons, third edition.
- Banerjee, A., & Carrion-i-Silvestre, J. L. (2017). Testing for panel cointegration using common correlated effects estimators. *Journal of Time Series Analysis*, 38(4), 610-636.
- Bhattacharyya, S. C. (2019). *Energy economics: concepts, issues, markets, and governance*. Springer Nature.
- Bildirici, M. E. (2014). Relationship between biomass energy and economic growth in transition countries: panel ARDL approach. *Gcb Bioenergy*, 6(6), 717-726.
- Breitung, J., & Pesaran, M. H. (2008). Unit roots and cointegration in panels. In *The econometrics of panel data* (pp. 279-322). Springer, Berlin, Heidelberg.
- Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The review of economic studies*, 47(1), 239-253.
- Brunnschweiler, C. N. (2008). Cursing the blessings? Natural resource abundance, institutions, and economic growth. *World development*, 36(3), 399-419.
- Butkiewicz, J. L., & Yanikkaya, H. (2010). Minerals, institutions, openness, and growth: an empirical analysis. *Land Economics*, 86(2), 313-328.
- Carrion-I-Silvestre, J. L. (2020), GAUSS Program codes, retrieved from: https://webgrec.ub.edu/webpages/personal/ang/000698_carrion.ub.edu.html, accessed on 11th Oct 2020.
- Chou, M. C. (2013). Does tourism development promote economic growth in transition countries? A panel data analysis. *Economic Modelling*, 33, 226-232.
- Chudik, A. and Pesaran, M. H. (2013a). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors. CESifo Working Paper No.4232.
- Chudik, A., & Pesaran, M. H. (2013b). Large panel data models with cross-sectional dependence: a survey. *CAFE Research Paper*, (13.15).

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2013). Debt, inflation, and growth: robust estimation of long-run effects in dynamic panel data models. *Cafe research paper*, (13.23).

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2016). Long-run effects in large heterogeneous panel data models with cross-sectionally correlated errors. Emerald Group Publishing Limited.

De Ferranti, D., Perry, G. E., Lederman, D., & Maloney, W. E. (2002). From natural resources to the knowledge economy: trade and job quality. The World Bank.

Devarajan, S., & Mottaghi, L. (2016). Whither Oil Prices? MENA Quarterly Economic Brief, Washington, DC: World Bank, July.

Ditzen, J. (2019). Estimating long-run coefficients and bootstrapping standard errors in large panels with cross-sectional dependence. In London Stata Conference 2019 (No. 13). Stata Users Group.

Dobnik, F. (2011). Energy consumption and economic growth revisited: structural breaks and cross-section dependence. Available at SSRN 1981869.

Eberhardt, M., & Teal, F. (2010). Productivity Analysis in Global Manufacturing Production, University of Oxford Department of Economics Discussion Paper Series Number 515.

Eberhardt, M., and S. Bond. 2009. Cross-section dependence in nonstationary panel models: A novel estimator. MPRA Paper 17692, University Library of Munich. [http://mpra.ub.uni-muenchen.de/17692/1/MPRA paper 17692.pdf](http://mpra.ub.uni-muenchen.de/17692/1/MPRA_paper_17692.pdf).

Ee, C. Y. (2016). Export-led growth hypothesis: empirical evidence from selected Sub-Saharan African countries. *Procedia Economics and Finance*, 35(2), 232-240.

EIA, (2020), U.S. Department of Energy, Energy Information Administration, Independent Statistics & Analysis, retrieved from: <https://www.eia.gov/petroleum/data.php>, accessed on 25th Mar 2020.

Emery, R. F. (1967). The relation of exports and economic growth. *Kyklos*, 20(4), 470-486.

Emirmahmutoglu, F., & Kose, N. (2011). Testing for Granger causality in heterogeneous mixed panels. *Economic Modelling*, 28(3), 870-876.

Faisal, F., Tursoy, T., & Resatoglu, N. G. (2017). Is export-led growth hypothesis exist in Saudi Arabia? Evidence from an ARDL bounds testing approach. *Asian Journal of Economic Modelling*, 5(1), 110-117.

Fapetu, O., & Owoeye, S. D. (2017). Testing the validity of the export-led growth hypothesis in Nigeria: Evidence from non-oil and oil exports. *Computational Methods in Social Sciences*, 5(2), 41-48.

Feder, G. (1983). On exports and economic growth. *Journal of development economics*, 12(1-2), 59-73.

Fisher, R.A., 1932. *Statistical Methods for Research Workers*, 4th edition. Oliver and Boyd, Edinburgh

GCC-STAT, (2012), GCC Statistical Center, GCC foreign Trade Indicators 2011 – 2012, Muscat.

GCC-STAT, (2014), GCC Statistical Center, GCC foreign Trade Indicators 2014, Muscat.

GCC-STAT, (2015), GCC Statistical Center, GCC foreign Trade Indicators 2015, Muscat.

GCC-STAT, (2017), GCC Statistical Center, GCC Energy Statistics Report 2017, Muscat.

GCC-STAT, (2018a), GCC Statistical Center, Annual Report, GCC National Accounts for the year 2016, Muscat.

GCC-STAT, (2018b), GCC Statistical Center, Economic Performance, and outlook For the Gulf Corporation Council (GCC). Muscat.

Gorus, M. S., & Aslan, M. (2019). Impacts of economic indicators on environmental degradation: evidence from MENA countries. *Renewable and Sustainable Energy Reviews*, 103, 259-268.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica: journal of the Econometric Society*, 424-438.

- Hamdi, H., & Sbia, R. (2013). Dynamic relationships between oil revenues, government spending and economic growth in an oil-dependent economy. *Economic Modelling*, 35, 118-125.
- Harb, N. (2009). Oil exports, non-oil GDP, and investment in the GCC Countries. *Review of Development Economics*, 13(4), 695-708.
- Hashmi, R., & Alam, K. (2019). Dynamic relationship among environmental regulation, innovation, CO2 emissions, population, and economic growth in OECD countries: A panel investigation. *Journal of cleaner production*, 231, 1100-1109.
- Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the econometric society*, 1251-1271.
- Hosseini, P., Mehrshad, S., & Tang, C. F. (2014). The effects of oil and non-oil exports on economic growth: a case study of the Iranian economy. *Economic research-Ekonomska istraživanja*, 27(1), 427-441.
- Hsiao, C. (2007). Panel data analysis—advantages and challenges. *Test*, 16(1), 1-22.
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of econometrics*, 115(1), 53-74.
- IMF, (2019), International Monetary Fund, Direction of Trade Statistics, available in: <http://data.imf.org/?sk=388DFA60-1D26-4ADE-B505-A05A558D9A42>, accessed on 10th Dec 2019.
- IMF, (2020), International Monetary Fund, IMF Data Mapper, Available in: <https://www.imf.org/external/datamapper/pb@FPP/USA/FRA/JPN/GBR/SWE/ESP/ITA/ZAF/IND/BHR/SAU>, accessed on 20th Jun 2020.
- IRENA, (2016), Renewable Energy Market Analysis: The GCC Region, Abu Dhabi.
- IRENA, (2019), Renewable Energy Market Analysis: The GCC Region, Abu Dhabi.
- Khan, Z., Ali, M., Jinyu, L., Shahbaz, M., & Siqun, Y. (2020). Consumption-based carbon emissions and trade nexus: Evidence from nine oil exporting countries. *Energy Economics*, 104806.

- Konstantakopoulou, I. (2016). New evidence on the Export-led-growth hypothesis in the Southern Euro-zone countries (1960-2014). *Economics Bulletin*, 36(1), 429-439.
- Kónya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, 23(6), 978-992.
- Kubalu, A. I., Mustpha, A. M., & Muhammad, K. (2016). Impact of Crude Oil Exports and Courruption on Economic Growth in Nigeria: Using ARDL Bound Test. *Journal of Edicational Policy and Entrepreneurial Research*, 3(7), 139-156.
- Le, H. P., & Bao, H. H. G. (2020). Renewable and nonrenewable energy consumption, government expenditure, institution quality, financial development, trade openness, and sustainable development in Latin America and Caribbean emerging Market and developing economies. *International Journal of Energy Economics and Policy*, 10(1), 242.
- Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of econometrics*, 108(1), 1-24.
- Maalel, N., & Mahmood, H. (2018). Oil-abundance and Macroeconomic Performance in the GCC Countries. *International Journal of Energy Economics and Policy*, 8(2), 182-187.
- Marin, D. (1992). Is the export-led growth hypothesis valid for industrialized countries? *The Review of Economics and Statistics*, 678-688.
- Menyah, K., Nazlioglu, S., & Wolde-Rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling*, 37, 386-394.
- Merza, E. (2007). Oil exports, non-oil exports and economic growth: Time series analysis for Kuwait (1970-2004) (Doctoral dissertation, Kansas State University).
- Metwally, M. M., & Tamaschke, H. U. (1980). Oil exports and economic growth in the Middle East. *Kyklos*, 33(3), 499-522.
- NCSI, (2016), National Centre for Statistics and Information, the Statistical Year Book 2016, Muscat.

NOGA (2012), Oil & Gas Facts and Figures, National Oil and Gas Authority – Kingdom of Bahrain- available in: http://www.noga.gov.bh/Publication/Facts_Figures_2012_AR.pdf accessed on 21th Dec 2019.

NOGA, (2006), National Oil and Gas Authority, Annual report, Bahrain. Manama.

Novak, i. (2019). Nonlinear adjustments in the Export-led growth hypothesis: re-examining the Hungarian case. *emc review-časopis za ekonomiju*, 18(2).

OAPEC, O. (2015). Annual Statistical Report 2015. The Organization of Arab Petroleum Exporting Countries, Kuwait.

OAPEC, O. (2019). Annual Statistical Report 2019. The Organization of Arab Petroleum Exporting Countries, Kuwait.

OAPEC, O. (2020). OAPEC Data Bank. The Organization of Arab Petroleum Exporting Countries, Kuwait, available in <http://www.oapecorg.org/Home/DataBank> accessed on 10 Dec 2019.

Onorato, W. T. (1985). A case study in joint development: The Saudia Arabia-Kuwait partitioned neutral zone. *Energy*, 10(3-4), 539-544.

OPEC, O. (1999), Annual Statistical Bulletin 1999, The Organization of Petroleum Exporting Countries, Vienna.

OPEC, O. (2005), Annual Statistical Bulletin 2005, The Organization of Petroleum Exporting Countries, Vienna.

OPEC, O. (2008), Annual Statistical Bulletin 2008, The Organization of Petroleum Exporting Countries, Vienna.

OPEC, O. (2016), Annual Statistical Bulletin 2016, The Organization of Petroleum Exporting Countries, Vienna.

OPEC, O. (2018), Annual Statistical Bulletin 2018, The Organization of Petroleum Exporting Countries, Vienna.

OPEC, O. (2020), The Organization of Petroleum Exporting Countries, Vienna, available in: https://www.opec.org/opec_web/en/about_us/25.htm, accessed on 20th Feb 2020.

OQ, (2020), Oman Refineries and Petrochemical Company, retrieved from: <https://oq.com/about-us.html>, accessed on 2nd Apr 2020.

Papyrakis, E., & Gerlagh, R. (2007). Resource abundance and economic growth in the United States. *European Economic Review*, 51(4), 1011-1039.

PDO, (2019), Petroleum Development Oman, available in: <https://www.pdo.co.om/en/about/Pages/default.aspx>, accessed on 17th Apr 2020.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, 61(S1), 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, 597-625.

Pesaran, H. M. (2004). General diagnostic tests for cross-sectional dependence in panels. University of Cambridge, Cambridge Working Papers in Economics, 435.

Pesaran, M. H. (2006). Estimation and inference in large heterogeneous panels with a multifactor error structure. *Econometrica*, 74(4), 967-1012.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of applied econometrics*, 22(2), 265-312.

Pesaran, M. H. (2015a). *Time series and panel data econometrics*. Oxford University Press.

Pesaran, M. H. (2015b). Testing weak cross-sectional dependence in large panels. *Econometric reviews*, 34(6-10), 1089-1117.

Pesaran, M. H., & Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels. *Journal of econometrics*, 68(1), 79-113.

Pesaran, M. H., & Tosetti, E. (2011). Large panels with common factors and spatial correlation. *Journal of Econometrics*, 161(2), 182-202.

Pesaran, M. H., & Yamagata, T. (2008). Testing slope homogeneity in large panels. *Journal of econometrics*, 142(1), 50-93.

- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3), 289-326.
- Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American statistical Association*, 94(446), 621-634.
- Pesaran, M. H., Ullah, A., & Yamagata, T. (2008). A bias-adjusted LM test of error cross-section independence. *The Econometrics Journal*, 11(1), 105-127.
- Robertson, D., & Symons, J. (1992). Some strange properties of panel data estimators. *Journal of Applied econometrics*, 7(2), 175-189.
- Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of political economy*, 94(5), 1002-1037.
- Sachs, J. D., & Warner, A. M. (1995). Natural resource abundance and economic growth (No. w5398). National Bureau of Economic Research.
- Sachs, J. D., & Warner, A. M. (1999). The big push, natural resource booms and growth. *Journal of development economics*, 59(1), 43-76.
- Saddam, A., & Kari, F. (2014). A long-run dynamic analysis of FDI, growth and oil export in GCC countries: An evidence from VECM model. *Canadian Social Science*, 10(1), 76-82.
- Stijns, J. P. C. (2005). Natural resource abundance and economic growth revisited. *Resources policy*, 30(2), 107-130.
- Sultan, Z. A., & Haque, M. I. (2018). Oil exports and economic growth: An empirical evidence from Saudi Arabia. *International Journal of Energy Economics and Policy*, 8(5), 281.
- Swamy, P. A. (1970). Efficient inference in a random coefficient regression model. *Econometrica: Journal of the Econometric Society*, 311-323.
- Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of econometrics*, 66(1-2), 225-250.
- Tyler, W. G. (1981). Growth and export expansion in developing countries: Some empirical evidence. *Journal of development Economics*, 9(1), 121-130.

UNCTAD, (2020), Data Stat, retrieved from: <https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx>, accessed on 04th Jun 2020.

Westerlund, J., & Edgerton, D. L. (2008). A simple test for cointegration in dependent panels with structural breaks. *Oxford Bulletin of Economics and Statistics*, 70(5), 665-704.

Westerlund, J., (2020), GAUSS code, retrieved from [.https://sites.google.com/site/perjoakimwesterlund/home/gauss-codes](https://sites.google.com/site/perjoakimwesterlund/home/gauss-codes), accessed on 15th Oct 2020

World Bank, (2014), Data Bank, retrieved from: <https://data.worldbank.org/indicator/EN.ATM.CO2E.KT>, accessed on 19th Mar 2020.