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Impact of oil revenue volatility on the real exchange rate and the structure of economy: Empirical evidence of “Dutch disease” in Iraq

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Abstract

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Impact of oil revenue volatility on the real exchange rate and the structure of economy: Empirical evidence of “Dutch disease” in Iraq

Key Words: Dutch Disease, Oil Price, Relative Price, Real Exchange Rate, Tradable Goods, Non-tradable Goods.

This thesis analyses the extent to which a boom in a particular export commodity sector (i.e., oil) affects relative price of non-tradable goods against tradable goods, the real exchange rate and competitiveness in the rest of the economy: This problem has been analysed in the early stage by (Corden and Neary 1982) with the so-called ‘Dutch-disease’. As a result, booming sector (oil Sector) the country’s currency appreciates, thereby reducing the competitiveness of the country’s traditional export sector in international market. This thesis examines whether Dutch Disease is present in Iraq in the light of having not study about Dutch Disease phenomena. It evaluates the impact of growing oil revenues on non-oil sectors of the Iraqi economy. It produces some empirical evidence for the explanation non-tradable goods and contraction of tradable goods sector due to booming oil sector and appreciation real exchange rate and made tradable goods sector become uncompetitive for export. The main findings form this thesis that the Iraqi economy was subject to have the Dutch disease phenomena during the boom. Some of the indications of the disease, remarkably the increase of relative prices, the real exchange rate appreciation, contraction tradable goods

sector and expansion of nontraded goods output were applicable. The study uses annual time series data sourced from home and international agencies from 1970 to 2013. Due to problem with endogeneity, the data are analysed through the use of two stages least square. Finally, the thesis discusses briefly some policy measures that will help avoid the issue of appreciation real exchange rate and changing the structure of economy out of tradable goods to non-tradable goods sector.

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Dedication

This Thesis is dedicated to my parents

and

to my family and my sweet little daughter (**SOLINA**)

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
CPI	Consumer Price Index
DUMS	Dummy Variable to Capture Economic Sanction
DUMW	Dummy Variable to capture Iraq-Iran War
EIA	Energy Information Administration
EPI	Import Price Index
GATT	The General Agreement on Tariffs and Trade
GDP	Goross Dometic Product
GDPD	Gross National Product Deflators
HQC	The Hannan-Quinn Criterion
IFS	International Financial Statistics Yearbook
IMF	International Monetary Fund
IPI	Import Price Index
IWPI	Industrial Countries Wholesale Price Index
MD	Demand for Money
MS	Money Supply
NDP	National Development Plan
NER	Nominal Exchange Rate
NT	Non-Tradable goods
NTGDPD	Non-Tradable Gross Domestic Product Deflator
OECD	Organization for Economic Cooperation and Development
OFFP	Oil For Food Program
OLS	Ordinary Least Square

OPEC	Organization Ptroluoim Ecxporting Countries
OR	Oil Revenue
PO	Price of Oil
PP	Phillips and Perron
PPF	Production Possibility Frontier
PT	Price of Tradable goods
PWT	Penn World Tables (University of Pennsylvania)
RER	Real Exchnage Rate
RP	Relative Price of Non-tradable goods aganist Tradable goods
SDR	Special Drawing Rights
SIC	Schwarz Information Criterion
T	Output Of Tradable goods
TGDPD	Tradable Gross Domestic Product Deflator
TSLS	Two Stages Least Squares
UK	United Kingdom
UN	The United Nations
VIF	Variance Inflation Factor
WB	World bank
WPI	Wholesale Price Index
WWPI	World Wholesale Price Index
y	Real GDP Per-Capita

Chapter One

Introduction

1.1 Diagnosing the problem,

At least since the 16th century, when the influx of gold from her colonies began damaging Spain's industry, rapid infusions of foreign exchange have had troublesome effects on the domestic economy. This phenomenon enjoyed a renewal of interest in the 1970s, as the international oil price increased sharply. The oil price revolution of 1973 rapidly changed the balance of economic power and threw light on the relatively small number of countries that had massive reserves of crude oil–countries that were considered as developing countries. Oil-rich countries suddenly saw themselves, and were seen by others, as having found a shortcut to the golden era and the oil-producing countries themselves welcomed the rapid increase in their material fortunes. Among the OPEC countries that welcomed this rapid increase in crude oil price in their fortune was Iraq. Although the Iraqi government had been producing and exporting oil since the 1920s, the most significant oil exports began from the 1950s. However, the importance of the oil sector in Iraq had not been considered as a main source of government revenue until the increasing international oil prices at the beginning of the 1970s. The question is raised here: What is the problem of increasing oil prices for oil-exporting countries? If there is a problem, why it is problem?

The oil boom increased overall disposable income, improved the balance of payments (a surplus in the balance of payments) and the welfare attained. In addition, a huge petroleum boom represents opportunities for faster development of the local economy (infrastructural development), and increases its GDP compared to pre-oil revenue. During a period of high oil prices, the oil-

exporting countries gain vast amounts of foreign exchange revenues, while this is also a considerable economic opportunity to remove financial barriers. These changes would usually have been considered as a blessing or as a good thing for domestic economy. However, these advantages and benefits from exporting oil and the resulting booming period were very patchy due to some negative consequences of oil revenue. Oil-producing developing countries may suffer from adverse side effects resulting from a booming oil sector. Adverse side effects can take place, especially an asymmetrical impact on reallocation of resources and on distribution of income in the economy. The adverse side effects of the booming sector (oil sector) are identified in the literature as the Dutch disease phenomenon or in some cases, are referred to as de-industrialisation or de-agriculturalisation (Rowthorn and Wells 1987; Singh and Montgomery 1987; Pieper 2000; Arestis et al. 2005). Most oil-exporting countries have suffered from the so-called Dutch disease in one way or another. The differences are in the structural consequences; while we talk about “de-industrialisation” phenomena in developed countries such as the United Kingdom and the Netherlands, it is a case of de-agriculturalisation in developing countries.

For some reasons, however, the effects of a booming oil sector on a developing country can be different compared to developed countries. First, agriculture, rather than manufacturing, is the sector most likely to be negatively affected during a booming period (high oil revenue). This has implications for rural-urban terms of trade, as well as for rural-urban migration. Second, to the extent that the country produces manufacturing goods, they are usually imperfect substitutes for products sold in the international markets. Therefore, consumer demand might not shift completely into the foreign goods as the domestic price increases.

In addition, Maizels (1992) pointed out that the basic problem faced by exporters of oil is that this product, unlike other economic sectors, generally has low supply and demand price elasticities (in absolute value), so that a given shift in one of the curves leads to a much higher change in short-run equilibrium prices, than if the elasticities are greater in absolute value. Furthermore, these price fluctuations tend to have more important impacts on developing countries, because the relative importance of the commodity sector in these countries (developing countries) is much larger than in developed countries. Third, in almost all developing countries the oil sector is an enclave with regard to the rest of the economy (since it uses mostly imported materials, capital and highly skilled labor from developed countries). Thus, the oil boom is caused by the expenditure of oil revenue instead of any resultant demand for materials or labor from the oil sector (Karl 1997: p.52 and Al-Moneef 2006).

The Iraqi oil sector has experienced solid growth in terms of level of production and export values since the early 1970s, accompanied by unstable increases in the Iraqi real exchange rates. However, the experience of other oil-exporting countries proposes that high oil prices (oil boom period) could cause a contraction of the tradable sectors (agriculture and manufacturing sectors) mostly after appreciation RER (Corden and Neary 1982). Sachs et al. (1995) stated that countries abundant in natural resources would witness a slow growth in tradable sectors compared to poorer natural resource countries. The “Dutch disease” refers to a situation where the reversal of positive effects or negative effects of oil booms on countries hampers their economic transformation where they are extracted. This theory conceptually stemmed from the Netherlands in the 1960s due to the exploitation and tapping of the newly found gas reserves

positioned in the North Sea. Revenues denominated in hard currencies were received and the local Dutch Guilder began to appreciate in value sharply. Dutch disease theory predicts that part of the boom revenues is spent on the non-tradable goods which bring about an appreciation of the real exchange rate, and which, in turn, draws resources toward the non-tradable sector from the tradable sector. Furthermore, the increased profitability of a non-tradable sector bids up the prices of factors of production, leading to a reduction of the agriculture and manufacturing sector as a result of the reduction in production factors.

If the Dutch disease hypothesis is confirmed in this study, then the policy makers recognize that this disease is costly for the economy. They can protect the economy from this by implementing suitable policies that have been successfully used in other countries such as Canada and Norway. These strategies and policies include (i) the investment via using of the resource royalties (oil revenue) to keep the growth rate of the tradable sector (agriculture and manufacturing sectors) high, (ii) holding (saving) the oil revenue in a fund and using this saving to invest in abroad (foreign assets), and (iii) limiting increasing real wage particularly recurrent expenditure (salary administration expenditure). However, it is emphasized that this thesis concentrates on whether the Dutch disease exists as a first step, then based on the outcomes of this study, the suitable policy can be discussed and suggested in the conclusion chapter.

1.2 Importance of the study

The issue of dependence of natural resources in some developing countries has been a subject of great interest and discussion among economists for many years. As such, the issues surrounding the oil sector and rentier states are

certainly not new, but they have led to renewed interest in recent years after an increasing international crude oil price since the mid-2000s and a sharp drop in the price three times in 2014. Among the classification of the world's countries, Iraq is considered as a developing country. The Iraq economy is characterized by some features such as: (i) the dominance of the public sector (government intervenes in economic activities) due to the fact that the government owns or manages the oil fields and most of these revenues come from oil exploits to intervene in the domestic economy via public spending; (ii) a high reliance on international trade (exporting oil), since most of the oil is exported to international markets. Iraq is well known as being one of the major oil exporting countries in the world. According to the OPEC (OPEC Report 2016), Iraq's oil production is above 4 million b/d and it is the third largest oil exporter in the world. Iraqi oil reserves are estimated to have the fifth largest proven oil reserves and also the thirteenth largest proven natural gas reserves in the world, in addition to huge potential for further discoveries. In addition, oil exports account for 95% of total government revenues and are equal to more than 70% of GDP in 2013 (Ministry of Finance 2010).

Therefore, oil price and oil exports play a main role in the Iraqi economy, and any fluctuation of oil price may significantly affect macroeconomic variables. This means that the economy has faced a series of external shocks (either positive or negative oil shocks). In this context, the issue of how to deal with the fluctuations of crude oil price is an important topic. More specifically, it can be said that Dutch disease sheds light on the difficulty the government faces in managing fluctuations in oil revenue, which arise from the export boom, without losing consistency with its long-term objective of promoting economic

development via the expansion of non-oil tradable sector (manufacturing and agriculture sectors). Government policies in the face of the oil boom, therefore, are crucial.

Similar to other oil-exporting developing countries, the oil sector has experienced the boom and slumping period during the last five decades because of unforeseen sharp rises in the price of oil and production during that period. For example, from the Arab-Israeli war in 1973 and Iranian revolution in 1979, an oversupply of oil during the 1980s led to a sharp decline in oil price (1982 and 1986), followed by a strong drop in oil revenue due to economic sanctions in 1990s. Sanctions were then removed and increasing international oil prices pushed the oil revenue to increase, with significant change in some macroeconomic levels. Then, there was a drop in oil price in 2014-15 to the lowest level since 2004. This study is important since the Iraq economy faces a severe problem in regard to the structure of the economy, since local producers cannot produce manufacturing and agriculture goods to enable them to be self-sufficient, and almost all industrial products and most agriculture products are imported from abroad. However, before discovering natural resources and increasing oil revenue since 1973, the Iraqi economy mainly depended on the agriculture sector for her growth. Nowadays, Iraq faces a problem of the changing structure of the economic sector from a tradable sector to non-tradable sector.

1.3 The choice of the topic and Its contribution to knowledge

There is plentiful literature on the economic consequences of the influence of the oil export boom on the domestic economy. Most of the theoretical and empirical

studies are built for developed economies, which generally created some assumptions, which are suitable within the structure of these economies. These assumptions might not be suitable for oil-exporting developing countries. For example, it is assumed that in developed countries capital markets available, assuming full employment in their economy, highly developed manufacturing sector, following a flexible exchange rate regime, the private sector has an important role in economic activities rather that public sector. Forsyth and Kay (1980), Corden (1981), Corden and Neary (1982), Eastwood and Venables, (1982), Harberger (1983), Van Wijenvergen (1984), Matsuyama (1992), Ramaswamy and Rowthorn (1998), Anderson and De-Palma (2000), Larsen (2004) and DiJohn (2007), amongst others, are samples of these studies.

The developing countries on the other hand have had relatively less consideration given to them in comparison with developed countries. Examples of these studies that have been carried out on developing countries include Kamas (1986), Warr (1986), Looney (1990), Fardmanesh (1991), Roemer (1994), Mogotsi (2002), Stijns (2003) and Ismail (2010). On the other hand, studies have been conducted in developing countries on how they cope with the influence of a primary agricultural product boom on the changing structure of the economy. It is known that the nature of the agricultural sector is different with the natural resource sector (oil and gas sector), since the agriculture sector has backward and forward linkages with other economic sectors, while the natural resources sector is recognized as being an enclave sector with very small linkages with other economic sectors.

Regarding the novelty of this study, it can be said that, to a large extent, finding studies about the consequences of fluctuating oil prices on the Iraqi economy is

relatively difficult. Although there are some studies about Iraqi oil sectors and its reservation and productions, none of these studies examine the impact of booming oil on the Iraqi economy, particularly on a macroeconomic level. It is worth noting that this study covers a long period during which the oil price passed through a sharp volatility in its price. Apart from that, Iraq as a case study is different to a large extent compared to other oil-exporting developing countries. Iraq has faced certain situations which have not taken place in other oil-exporting developing countries, for instance the Iraq-Iran war during the 1980s, imposing economic sanctions on the oil sector by the UN during the 1990s.

However, it can be said that there are some other oil-exporting developing countries that have had economic sanctions imposed on them, the same as the Iraqi situation, such as Libya and Iran. But, their degree of economic sanction was much softer than the Iraqi situation, since their sanction only restricted these countries to export oil in limited amounts; In the Iraqi case, the exporting oil was completely banned. Iraq was unable to export even one drop of oil for nearly seven years[1]. In addition, this study contains both booming and slumping periods of oil. In other words, this study examines a combination of both high oil revenue and low oil revenue, which is unique among other studies. This will be a significant contribution in the economic.

On the other hand, the Edward's model is employed in this thesis, since it is applied for developing countries like Colombia, the economic characteristics of which are relatively close to the Iraqi economy. Apart from that, the Edwards' model shows the relationship between deficit and money creation, which is very

[1] The period of economic sanction started from 1990 to 2003. From 1990 to 1997 (seven years), the Iraq government was completely banned to export even one drop of oil by UN. From 1997 the oil for food program has been introduced via the agreement between Iraqi Government and United Nations Security Council (under UN Security Council Resolution 986). In both cases, the Iraqi government did not get any revenue from exporting oil.

close to the Iraqi situation when Iraq faced a difficult situation during the decline in the oil price in the 1980s, as well as during the economic sanction (drop in oil revenue) in the 1990s. Therefore, only a few previous studies have followed the Edwards model, since many oil-exporting developing countries such as the six Gulf countries have not created any money to fund the deficit. This is because these countries have massive foreign reservation, and during low oil revenue they use these reserves instead of creating money.

Another important contribution is that this study considers both real factors (spending effects) and monetary factors (money creation and money supply). One can conclude that this thesis provides the first substantial study of its kind on the oil revenue increases, which are linked to real exchange rate and a change to the structure of the Iraqi economy. The source of date is another important issue for every research, since different source of data and type of data may lead to have different conclusion, thus, the next section will be about source of data for this thesis.

1.4 Source of data

Before turning to analyse the variables that will be used in this study, it would be useful to present the period of data, characteristic of data and the main sources of the data involved. The study covers the period 1970–2013, which captures both the boom period and slump period. Both periods (1970-1980 and 2003-2013) are considered as boom periods (high oil revenue). The official and market exchange rates are very close to each other in terms of rates and surplus government budgets. The period 1981-2003, meanwhile, is considered as a slump period, since the economic trend throughout the foreign trade was in deficit, with a relatively big gap between the value of the official exchange rate and severe budget deficit.

The relevant data was obtained from different sources (domestic, regional and international agency publications). Examples of domestic publications, such as the Central Bank of Iraq, are one of the main domestic sources. Other domestic sources, such as Ministry of Planning, the Ministry of Finance, Ministry of Oil, and the National Authority for Information and Documentation, were used as the main sources of data.

The following international publications were used as sources of data for this study: the World Development Indicator issued by the World Bank (WB), the International Financial Statistics Yearbook (IFS) issued by the International Monetary Fund (IMF), Penn World Tables (PWT), OECD Publications, particularly those of the Middle East Oil and Gas Reports on oil prices, production and oil revenues, the World and Industrial Countries' Price Indices, Annual Statistical Bulletin issued by Organisation Petroleum Exporting Countries (OPEC), Energy information Administration (EIA), and the United Nations (UN

data).

These sources are not the only ones used, as other minor sources are cited either below the tables or in the text. The data from these different sources refer to the entire period of 1970 to 2013. Consequently, this study has chosen annual data instead of quarterly data. This study highlights the main limitation regarding the Dutch disease model, limitation about some aspects which related to Iraqi economy, in addition to show some limitation related to this study itself, the next section is about the limitation of this study.

1.5 Limitations of the study

One of the main limitations of this thesis is that it does not include the role of corruption and rent-seeking issues in Iraq as an oil-exporting developing country. These phenomena have recently been considered by some scholars, who viewed them as the main obstacles to oil economies. The concept of “resource curse” has shown that countries rich in natural resources tend to have a slower economic growth than countries that have smaller natural resource endowments (see, for instance, Auty (2001) and Sachs and Warner 2001). The negative impact of natural resources on the economy is more apparent in countries with weak institutions, absence of the rule of law, the lack of enforcement of regulations, non-enforcement of property rights, inadequate policies and a lack of reliable infrastructure. Furthermore, the curse is more severe for point source resources like oil-exporting countries than for more dispersed natural resources, such as farmland (Isham 2002). However, according to some scholars such as Auty (2001), Sachs and Warner (2001), Bhattacharyya and Hodler (2010), Fearon (2005), and Kilian (2009), this is related to rent from natural resources which lead to corruption and rent-seeking. When revenues are controlled by

governments with a limited degree of autonomy, and the absence of the rule of law, the outcome may be a destructive competition between interest groups to gain a share of this income. This thesis has not considered the issue of rent-seeking due to political barriers; as a result, researchers are not able to do proper research under these unsafe environments such as the Iraqi situation. Thus, once the security environment is available, the investigation on rent seeking can be easily carried out in order to diagnose the resource cure in the Iraqi situation. Employing different sources of data for both descriptive and empirical analyses in this thesis is another limitation. This should be mentioned, since using different sources of data, particularly if two types of data come from two different sources and are used in the same figure or equation, may create some potential problems for the outcomes of the analyses. This is because different sources of data may use different methods for collecting data. For instance, the method for collecting data by Iraqi authorities (Ministry of Planning, Ministry of Finance and Economy and Iraqi Central Bank) may differ from the method used by international organisations. Thus, using both data in the same equation and the same figure may create potential problems.

1.6 Objective and methodology of the study

The objective of this thesis is to empirically investigate the outcomes of the booming oil (slumping oil) on the Iraqi economy during last five decades, using time-series data from 1970 to 2013. In this study, the investigation is influenced by the fluctuations in oil price on relative price, real exchange rate and the structure of the Iraqi economy. This issue has sometimes been related with the so-called Dutch-disease, where an increase in the price of a commodity export

(oil, in our case) causes an appreciation of the real exchange rate and then shifts the structure of the economy toward the non-tradable goods sector from the traditional sector due to a loss of competitiveness in the international market. To achieve the objectives of the study, this thesis will seek to answer the following questions:

- Did fluctuation in the oil revenue, affect the relative price of the non-traded goods sector against the traded goods sector?
- Did fluctuation in the oil revenue, affect the real exchange rate?
- Did the fluctuation in the non-tradable and tradable goods output as a result of fluctuations in the oil revenue?

In this thesis, we examine the impact of fluctuation on the rest of the economy under the assumption of a small open economy with a fixed exchange rates regime. In this situation, changes in the real exchange rate occur via changes in the nominal price of non-tradable goods, while the nominal price of tradable goods is determined by the international market. The fixed exchange rate assumption is made so as to focus the examination on the case of an oil-exporting country like Iraq, which follows a fixed exchange rate regime against US dollars, like most of the oil-exporting developing countries.

On the other hand, this thesis uses both descriptive and statistical analysis. The descriptive method will be used to analyze some Iraqi macroeconomic variables that have changed with the change of oil price, as well as the theory of Dutch disease and application of the Dutch disease syndrome in Iraq. A phenomenon observed in most oil-exporting countries is commonly known as the 'Dutch disease'. The Dutch disease theory forms the basis of the theoretical framework of this thesis. For the empirical analysis, a disaggregated macro econometric

model, the Edwards model (1983), is used. The model was originally designed for the study of the implications of coffee in Colombia's economy. It has been modified accordingly to suit the Iraqi situation, taking into consideration the 'Dutch disease' phenomenon. The econometric techniques used in this thesis depended on the nature of the equations tested. For the simple equations, Ordinary Least Square (OLS) technique is used. For the more complex equations, a two stage least squares technique is employed. The econometric analysis has been used so as to support the descriptive analysis of the effect of oil exports on the Iraqi economy. The ordinary least squares and two stages least square (2SLS) techniques were employed. This was done for two main reasons. First, the ordinary least square and two stages least square deliver an essential component of most other economic techniques; and, secondly, the have demonstrated fairly satisfactory outcomes in a wide range of economic relationships.

1.7 Hypotheses of the thesis

Four hypotheses are put forward and will be examined in this study.

1. The relative price of non-tradable goods against tradable goods is expected to increase (decrease) during booming (slumping) periods of oil sector.

2. The real exchange rate is expected to appreciate (depreciate) during booming (slumping) periods of oil sector.

3. The non-tradable goods output is expected to increase (decrease) during booming (slumping) periods of oil sector.

4. The tradable goods output is expected to decrease (increase) during booming (slumping) periods of oil sector.

1.8 Organisation of the study

The study is divided into seven chapters, the first of which is this introduction, which delivers the key general guide on the purpose, importance of the thesis and research questions. The other chapters are organized as follows:

Chapter 2 includes the theoretical and empirical literature on the impact of booming and slumping period (booming and slumping oil) on price, real exchange rate and the structure of the economy in both developed and developing countries. It particularly highlights the phenomena of the Dutch disease in both groups of countries.

Chapter 3 provides an extensive description of the Iraqi economic background. It gives a broad idea and a comprehensive understanding about the nature and complexities of the Iraqi economy and how the monetary and fiscal policy worked. Although this chapter discussed the history of the oil industry in Iraq since 1920 (since the beginning of oil production in Iraq), most of the discussion regarding this sector and its impact on the Iraqi economy is from 1970. After increasing international oil prices from 1973, the oil sector dominated the Iraqi economy. Therefore, the role of the oil industry was highlighted in its contribution to GDP, government revenue and foreign exchange, and its impact on the tradable sector (agriculture sector, in our case). On the other hand, the role and size and reservation of the Iraqi oil compared to other countries has also been described.

Chapter 4 contains details about the theoretical model which is employed in this thesis. The model has been built for the Colombian economy, while the issue of real exchange rate determination, and changes to the structure of the economy due to booming and slumping price of oil and coffee has been analyzed. The

Edwards model belongs to a class of models that identifies variations in the export commodity as an important determinant of the real exchange rate. Changes to the structure of the economy are due to the change of RER. This is because of changes in the international price of commodity exports (in our case, is oil). Our empirical analysis includes the formulation of a model to find the determinants of the relative price, real exchange rate and, eventually, changing the structure of the economy between tradable and non-tradable sector.

Chapter 5 offers the reader an overview of the descriptive of data and their measurements, which has been discussed in the economic literature. A distinction between tradable and non-tradable goods has been debated. Different indices have been discussed for the variables that we are going to employ in the empirical chapter. All these variables that are used in the empirical chapters are shown as a form of tables and figures to make a clear picture of the fluctuation of variables before turning to the empirical chapter.

Chapter 6 translates the theoretical framework developed in Chapter 4 into a quantitative analysis (econometrics application). In the first step, it empirically investigates the change in the relative price of non-tradable goods against tradable goods by using non-tradable goods GDP and tradable goods GDP in the Iraqi economy. Changing the real exchange rate would be a second step of our investigation empirically. The output of non-tradable goods and tradable goods are the last to be examined empirically in this chapter.

Chapter 7 is a summary of the major points of the thesis (the main conclusions), together with implications, and delivers some recommendations and government policy for promoting and diversifying the Iraqi economy in order to improve the tradable goods sector (manufacture and agriculture sector). It gives some

successful examples of some oil-exporting developed countries such as Norway and UK.

Chapter Two

Literature review

2.1 Introduction

The effect of natural resource exports in general, and oil exports in particular, on a domestic economy has long been debated. Some theoretical and empirical studies have been carried out to determine the changes of economic structure in the economies of industrial nations. However, the developing nations have had comparatively less attention given to them. Fewer studies have been conducted to investigate the consequences of instability in oil revenue or high oil revenue on a local economy, especially for oil-producing developing nations or low absorptive oil-producing nations. In addition, the issue of the Dutch disease is a great interest to many economists.

The core of the discussion involves analysing how a domestic economy can react to the emergence of a new major export boom industry – or, alternatively, to a significant increase in the international price of one resource (in our case, oil). In this regard, it can be argued that the emergence of the oil sector in most oil-producing developing nations has had negative side effects on the rest of the economy: by changing the composition of the economic structure, and negatively affecting the export competitiveness of the "other tradable goods" sector (either manufacturing or agriculture).

This chapter will be divided into six sections. Section 2.2 is a summary of the literature on the natural resource price and revenue instability. In section 2.3, the impact of the volatility in oil prices on oil economies will be analysed based on the literature. In section 2.4, a theoretical survey will be given of the predictions of a boom in natural resource exports, particularly oil, on the economy. These

predictions are termed the “Dutch disease”. In section 2.5, some previous empirical research concerning the Dutch disease will be analysed for both developed and developing nations. In section 2.6, a summary is provided.

2.2 Literature on the natural resource price and revenue instability

Many researchers, especially from the neo-classical field, would not have supported the view that natural resources, particularly oil, would come to play an important role in the economic activity of a small, open economy. These researchers believed that manmade resources, high technology and synthetic materials would increasingly act as a substitute, and have more impact than, abundant natural resources (Morley 1989). Such an assumption would have appeared fairly frequently prior to the 1960s. However, the 1973 international oil price upsurge, and its outcomes on economic activities, showed that natural resources, particularly oil, played a very significant role, not only in the domestic oil-producing nations, but also in developed countries and in the world economy. An increase in oil receipts, has drawn more attention to natural resource economics. As most of the developing nations focus on the production and exports of primary agricultural and mineral commodities, they depend heavily on these commodities in order to gain foreign exchange earnings (Alotaibi 2006). Therefore, export revenues increase, either for the owner of production factors (multinational companies) as returns, or for the government as royalties. Thus, any fluctuations in export earnings (due to changes in the oil price or changes in level of production) might influence of these export revenues.

On the other hand, it is argued that the instabilities in export and revenues of natural resources could be attributed to the inelasticity of demand and supply

curves of natural resources and the difficulty in predicting any shock regarding demand and supply sides (Blanchard and Gali 2007, and Almoguera, et al. 2011).

Inelastic demand and supply infer that any variations in quantity demanded or supplied would cause a significant impact on the price of natural resources, either increased or decreased, and consequently the receipt of the primary commodities. For instance, Baumeister and Peerman (2009) argued that, if the demand for oil drops slightly, the price and also the revenue will decrease sharply and vice versa. On the supply side, any decline in volume of production in oil can be accompanied by a sharp upsurge in the price (Kilian 2005). However, we should consider the factors that lead to disturbances in demand and supply of natural resources.

Oil prices are influenced by number of factors, with some speculation that they are mostly short-run impacts. Other factors, such as level of production by OPEC and expectation about future world demand for oil, also affect the international price of oil in the longer term (Fattouh 2007). Demand and supply of crude oil in the international oil market are balanced via responses to price movements, and the fundamental factors which determine demand and supply expectations are several and complex. According to EIA (2015), four factors have influenced the international price of oil, namely: level of OPEC production decisions and investment; the economics circumstance of non-OPEC oil producers; political stability in oil exporters and economic growth of industrial countries; and the economics of other liquid supplies such as natural gas. Hamilton and Herrera (2004) argued that the main oil price shocks were a result of significant disruptions of crude oil output triggered by geopolitical events in oil-exporting

developing countries, such as the Arab-Israel war in 1973. However, this was not the only factor causing an increase in oil prices in 1973, as there were also changes in monetary policy regimes by developed nations in the 1970s. Alternatively, Herrera et al. (2009) pointed out that the largest single source of change in exports was the result of strong growth in demand for oil from newly industrialised nations such as China and India after 1990, in addition to the failure of global output to rise (Barsky, and Kilian 2004). These factors have caused commodity speculation, which caused a small production decline – an attractive option for some oil-abundant countries such as Saudi Arabia. Moreover, the business cycles in developed nations, such as what occurred in 2008, are other factors of instability in oil prices (Yergin 2005).

On the other hand, policy makers and economists generally focus on the economic consequences of an increase in the prices of natural resources, and oil in particular; however, they focus less on the consequences of a collapse in oil prices or a decrease in the volume of oil production in oil-exporting countries. In the early literature about the collapse in oil prices, Mabro (1985) highlighted the reasons behind the decrease in oil demand in 1982. He attributed the collapse to two main reasons. The first factor related to the world-wide slowdown in economic activities during the early 1980s, as well as the decrease in world energy consumption because of an increase in prices of oil in the early and late 1970s. The second factor is the change in the structure of energy supplies with nuclear power, coal, as well as the growth of natural gas at the expense of oil. The low demand for oil by importing countries led to a decline in oil prices in 1982 (Mabro 1985).

However, the factor relating to the collapse of the oil price in 1986 was different to that of 1982. Tatom (1987) argued that the collapse of the oil price in 1986 resulted in an increased exploration and levels of production by non-OPEC producers. This led to increased oil production by non-OPEC oil exporters, triggering a drop in the share of OPEC as a main supplier in the oil market. From 1983 to 1986, non-OPEC exporting countries increased output by 10 million barrels per day. Although OPEC countries tried to set production quotas low enough in order to stabilise the oil price, their attempts were unsuccessful, since many member countries produced beyond their quotas. As a result, oil prices declined sharply to US $8 in May 1986. This was the second major oil price collapse. This means that an excessive supply of oil was the main factor behind the drop in oil price in 1986 (Mabro 1998).

The third oil price collapse occurred as a result of the unexpected economic crisis in Asia. By the end of 1997, OPEC had enlarged its output by about 2.5 million barrels per day. At the beginning of 1998, Asian Pacific oil consumption dropped due to an economic crisis in many Asian countries. Therefore, a low demand of oil and an increase in oil production by OPEC led to a sharp decline in the oil price. However, the decline in oil price did not last long, as OPEC and non-OPEC countries decided to reduce their oil production (Mabro 1998). Therefore, prices began to recover in early 1999, assisted by growing US and world economies. At the end of 2008, the oil price again collapsed, the main cause of this sharp decline being the economic recession which began in September 2008. This put downward pressure on world oil demand and oil prices collapsed from $147 a barrel in July 2008 to about $40 a barrel in December of that year (Singleton 2010).

Although the above analysis has explained the factors that have had an impact on fluctuation in oil prices (either increase or decrease), some scholars disagree with this analysis. Some theories have emerged with different predictions for the future pattern of oil prices (Coimbra and Esteves, 2004). Four main theories will be summarised below:

1 - The property right theory analyses the factors that led to an increased oil price in 1973, which are related to the transfer of the ownership of crude oil from the international companies to the producing oil nations (Fattouh and Mahadeva 2013). In 1960, the Organization of the Petroleum Exporting Countries (OPEC) was formed by five oil-exporting developing countries (Venezuela, Iran, Iraq, Saudi Arabia and Kuwait). This threatened the position of the multinational companies in an oil-dominated market. As a result, the multinational companies who dominated the production of crude oil in developing countries enlarged the level of oil production before losing their control on their crude oil. Consequently, the members of OPEC decided to shift the power of determining production issues away from the international oil companies to the home countries. This change or transfer of ownership to host nations triggered the oil price to increase in 1973.

2 - The target revenue theory is a main factor in the reduction of the production of oil in 1973 and, subsequently, to the limited absorptive capacity of the oil-exporting nations, which prevented these countries from absorbing the massive revenues from exports at that time. The OPEC members then had to cut levels of production, which triggered a rise in international oil price. The research of Crémer and Salehi-Isfahani (1989 and 1991) demonstrated that OPEC's policy rests on dropping levels of production when oil prices are increased in order to

avoid a high rate of inflation as a result of low absorptive capacity by developing countries (El-Anshasy et al. 2005 and Al-Yousef 1998).

3 - The cartelisation theory attributes the increase in the price of oil to an agreement between the members of OPEC to set a determined price. A model has been developed by Pindyck (1978) and Adelman (1986) in order to clarify the OPEC price behaviour. They found that the oil market is controlled by the oil cartel, in order to maximise their profits. This was done by setting prices with no competition between OPEC members (Weiqi et al. 2011).

4 - The market theory claims that, since the 1960s, the demand and supply of oil has increased gradually in the oil market. This has triggered the increase in oil prices, because the size of demand side has increased more than the size of supply side. This is due to high economic growth by developed nations and the fact that demand for oil has increased significantly; thereafter, the intersection of the demand and supply curves would be at a higher price (Aastveit et al. 2011).

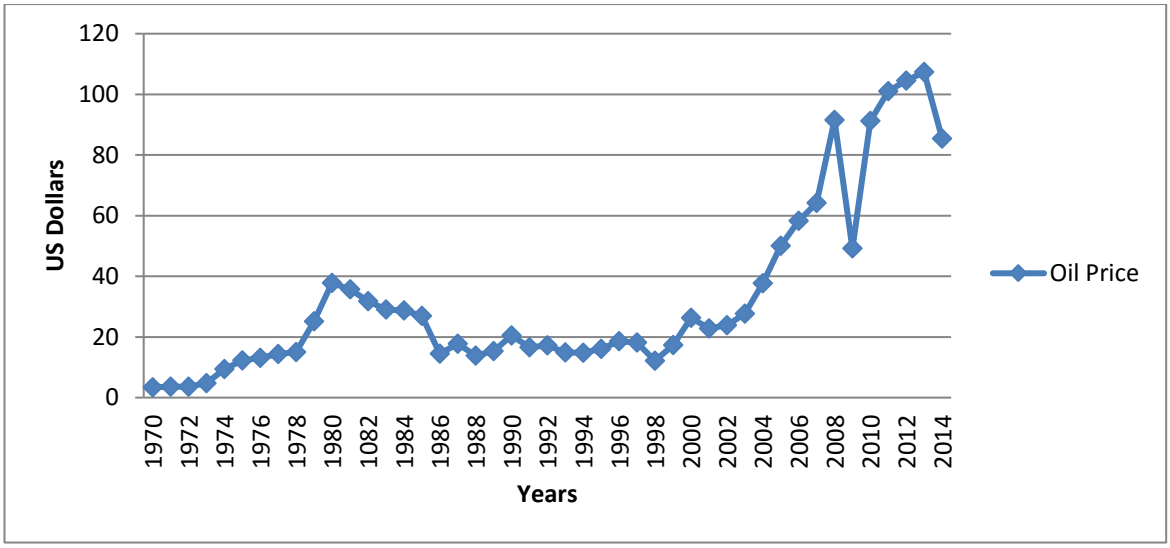
The main consequences of all the arguments set out above are that OPEC can affect real oil prices. The price of crude oil can be significantly influenced by OPEC over the medium and long term by adjusting the rate at which it adds capacity. However, in the short term, OPEC might not be able to influence the oil price by shutting down its operable capacity. It has been recently proven (between June 2014 and December 2014) that, when the price of oil declined from US $110 p/b to just close to US $50 p/b, OPEC could not reduce their level of production in order to avoid a greater reduction in international oil price, but that oil prices for the medium and long term will increase again (OPEC 2016).

On the other hand, it is argued that the challenges mostly stem from the volatility of oil prices. There is considerable evidence that oil prices show volatility in the

short-term and large instabilities over the medium term. This means that, for one-third of the time the oil price in international markets will be faced with the prospect of a monthly price change greater than 8% (Kilian and Park 2009 and Filiset al. 2011).

Figure 2.1 The price fluctuation of oil during last five decades.

Spot Crude Oil Price (1970-2014 $/ per barrel)



Source: BP Statistical Review of World Energy, January 2015

The last four decades have demonstrated that a huge annual price movement can occur in either direction. For instance, from Figure 2.1, it can be seen that oil prices have been dramatically increasing over time. For example, in 1970, the price of oil was about US$3.39 p/b, and then increased to US$37.82 in 1980, but it fell again in 1986 to about US$14.44 and increased again in 2003 to US$ 27.69. The average price increased again by approximately four times from $27.69 in 2003 to $107.32 in 2013. Therefore, it can be said that oil prices have been extremely changeable, twice as volatile as those of other commodities, even when fluctuations are measured as a deviation from recent trends. Furthermore, the fluctuation of oil prices has also been very poorly predicted and it was very hard to separate out temporary fluctuations from trends (Kaufmann 1995).

2.3 The Impact of volatility oil price on oil economies

The impact of the fluctuation of oil price on economic activities in oil-exporting developing nations has been examined by many scholars (such as; Warr 1986; Morley 1989; Looney 1990; Woo et al. 1994; Usui 1997; Mogotsi 2002**;** Égert and Leonard 2006 and Akpan 2009). The instability in oil price for oil-exporting developing nations may become a curse for economic activities, investment, economic growth and income distribution, appreciation and depreciation of domestic currency, instabilities in government revenue and expenditure, etc (Hammoudeh 1988). The dependence on natural resources as a main source of government revenue and export earnings confronts policymakers in oil-producing developing nations with the short-term matter of how to address unpredictable fluctuation in oil prices and revenue, and how to manage and use oil revenue (Looney 1990).

In most oil-producing developing nations, governments sector, which are substantially large, compared with the small private sector, obtain their oil revenue directly. The way governments spend this revenue constitutes a vital characteristic of the economy. Therefore, it is argued that fiscal and monetary policies depend mainly on oil revenue. In oil-exporting developing nations, fluctuations in oil revenue bring change to the real exchange rate. Since any increase or decrease in the price of oil is not permanent, the changeable nature of oil revenue injects fluctuations to the economy (Kulaksiz et al. 2014). If a positive shock is perceived as temporary, accumulating the budgetary surpluses in most developing countries is politically unpopular and the government will be subject to pressures to upsurge spending, particularly on public projects. For instance, during the period 1974-1978, 85% of the windfall revenues that

accrued to the governments of Nigeria were spent on increasing public investment (Gelb 1988). However, the government can use this revenue to finance developmental projects in order to raise welfare. In most developing countries, inefficient public spending results in a waste of expansionary fiscal policy (Talvi and Vegh 2000) and, over time, makes the economy more vulnerable to oil price volatility (Al-Yousuf 1990). This happens when the oil revenue increases (positive shock)[2].

On the other hand, when the oil price declines (and oil revenues decrease), this typically induces downward adjustments in government spending. This adjustment could be very costly. However, cutting operating expenditures is typically unpopular, since this has negative social consequences (Kulaksiz et al. 2014). In addition, cutting capital expenditures would disrupt public projects, reduce the productivity of the initial investment, and trigger high social costs. Moreover, if the shock turns out to be permanent (permanent low oil price), the persistent budget deficit and the growing public debt would cast doubt on the question of fiscal policy and current account sustainability, as well as government creditworthiness. Eventually, a larger adjustment at a higher cost would be unavoidable at some point in the future. For instance, in 1986, Venezuela did not allow for any spending adjustment in response to the negative large oil shock (decline oil price). In 1989, the impending balance of payments crisis brought about substantial costly adjustments.

In contrast, it is argued that, declining oil price could have some positive consequences for oil exporting courtiers, among the positive consequences of the decline in oil price, is the fact that a decrease in the rate of extraction might

[2] Oil revenue increases due to either increase oil price or increase level of exporting oil or both factors.

preserve oil as an investment in the long run. This can enable the oil-exporting countries to preserve their oil and to bring the extraction rate to an optimum path. Besides this, the decreases in oil revenues, which accrue directly to the governments, could encourage the governments to make improvements in their economic management. Moreover, if the oil revenue is used for inefficient projects in oil-exporting countries, then a decrease in oil revenue (if this drop is due to quantity and not a decrease in oil price) is not as large as it may appear (Pritchett 2000). In contrast, it is better to produce and export less oil than to exchange further volumes for inefficient projects which drain revenue away from the economy rather than generating economic earnings.

Another issue related to wasteful current expenditure by governments is explained by Arestoff and Hurlin (2010). Wasteful current expenditure might contain excessive spending on unnecessary expansion of government employment; huge subsidies might be given to several activities, including giving loans with a zero-interest rate, or payment of huge commissions for agents of contractors. Later, when the oil revenue declines, governments curtail these expenditures and then this can be construed as beneficial. Incremental oil is better conserved than spent in wasteful expenditure. Therefore, a fluctuation of government expenditure (either capital expenditure or current expenditure) due to fluctuation of oil revenue leads to an unstable economy, the costs of which are relatively high. On the other hand, it is argued that a negative oil shock usually encourages downward adjustments in government spending. This adjustment might prove to be very costly, as cutting current expenditures is typically unpopular due to its negative social consequences. On the other hand, cutting capital spending would disrupt public projects; this would cause a drop in the

productivity of the initial investment, triggering high social costs and eventually leading to a decline in economic growth rate (Hausmann and Rigobon, 2003).

Abd-alhassan (1999) argued that fluctuation in oil revenue has negative influences on development, causing an expansion of money and inflation, emigration from rural areas to urban areas, and damage to traditional productive sectors (tradable agriculture sector). Coleman (2012) argued that high oil revenue encourages appreciation of the domestic exchange rate, which this leads to an increase in local demand and then an increase in import size.

Barnett and Ossowski (2002) argued that reliance on oil revenue, as a main resource, leads to reduced short-term fiscal management and budgetary planning, while the efficient use of public resources would be difficult. For example, in Venezuela, oil revenue accruing to the public sector dropped from 27% of GDP in 1996 to 12.5% of GDP in 1998, before rising again to 22.5% of GDP in 2000. Besides this, a change in the oil price of US $1 per barrel on an annual basis is accompanied by a variation of nearly 1% of GDP in Venezuelan public sector revenue (Ibid). Hobdari et al. (2004) mentioned that the windfall accompanying an oil boom damaged the authorities' commitment to carry out necessary restructuring of immature economic sectors. Subsidies these sectors, which were easy to finance during the boom period, became very difficult to finance during a slump period. In order to avoid the results of a mismanaged oil boom, oil-exporting developing countries need to make vital decisions about investment, saving and consumption. In addition, a diversification policy should be carried out during the booming periods.

Moreover, the International Monetary Fund (2006) identified that Libyan oil proceeds reached 68% of GDP. Non-oil revenue dropped as a result of non-

transfer of the interest on the Oil Reserve Fund by the Libyan government and lower collections by customs and domestic governments. Partly reflecting the weakness of the new tax law and customs tariff, government expenditure was enlarged by about 33%, due to a sharp upsurge in the wage bill of 25%. The non-oil deficit enlarged to 35% of GDP. This affirms that the projected levels of investment and growth in the non-oil sector were not enough to create new job opportunities for the country. On the other hand, when demand declines (as a result of declining government revenue), unemployment is expected to increase either due to sticky prices or downward wage rigidity, with businesses temporarily off their long-term supply curves.

However, a fast growth in public spending (either investment spending or operating public spending) is likely to decrease the quality of capital formation, in addition to increasing costs as a result of hastier planning and the need to progressively use more costly factors at higher growth rates. On the other hand, cutbacks mean costly cancellation or delay, with partly completed ventures yielding no production. Even if they are completed at a later date, postponement will have declined their rate of profit. Lastly, some programmes and government strategies that were put in place throughout the boom periods might prove difficult to reverse as oil income declines. For instance, restrictions on dismissing civil servants may encourage a ratchet effect[3] in the public wage bill. Politically, it might be difficult to cut investments in the energy sector, even if declines in the world oil market decrease their profitability. “Ratchet Effects” worsen the distribution of resources.

[3] In labour markets, the ratchet effect refers to a situation where workers subject to performance pay choose to restrict their output, because they rationally anticipate that firms will respond to higher output levels by raising output requirements or cutting pay.

In fact, some countries such as Norway, Canada, Chile, Venezuela, Ghana and Kazakhstan have implemented that strategy. Petersen and Budina (2003) confirm that Kazakhstan's stabilisation funds firstly protect the economy from the negative impacts of volatility because of a variation in government tax revenues; secondly, the stabilization fund decreases uncertainty that originates from an instability in natural resource revenues. By transferring revenues to the stabilization fund, the government can improve overall fiscal discipline. However, Mehlum et al. (2006) argued that better governance and stronger institutional arrangements play a major role in minimising the problems regarding the impact of natural resource price volatility on economic performance. Perhaps it is due to this mixed success that Sachs et al. (1995) and Sachs and Warner (1999) found no strong relationship between the slower growth of mining economies and mineral price instability.

In summary, the impact of oil price shocks on economic activities has been explained in this section. This section demonstrated that a dependence of a domestic economy on a natural resource sector, like oil, can significantly increase economic instability. Changing revenue due to an increase or decrease in oil price can significantly affect the macroeconomics for oil-exporting developing countries. Therefore, it can be said that the volatility of export price and, consequently, revenue is the reason why developing countries as part of their policy try to diversify their exports. To the extent that production and exports are diversified amongst different primary products and between commodities, manufactures, and service sectors, there is more stability of export earnings. In this case, any fluctuation in the market would have a reduced impact on total exports. However, oil-exporting developing nations faced other problems, such

as a changing economic structure (Dutch disease), as a result of oil activities. The next section will discuss this.

2.4 Theoretical survey of the literature on the Dutch disease

The growing expansion of the natural resource sector has brought about a huge and growing literature focusing on the influence of such growth on the rest of the economy. The boom of the exporting natural resource sector might influence other economic sectors either positively or negatively. Some economists have argued that the changes in economic structure would occur due to changes in the real exchange rate, spending effect and resource movement effect. Such adverse effects resulting from a boom are termed the 'Dutch disease'. This 'disease' was identified in the 1970s, after the discovery of huge natural gas reserves in the Netherlands (Corden 1981). The Netherlands' economy experienced certain sectoral structural changes since this time. These changes were in the form of a reduction in the non-natural resource (gas) traded sector, which later caused de-industrialisation and also an enlargement in the services sector. That was caused by an appreciation in the local currency and a modest upsurge in local wages, as well as the increasing cost of the social security system (Rodrik 2007).

In the very early stages, Salter (1959) introduced the two economic sectors framework for the macroeconomic model. He introduced a diagram to explain the features of the linkage between price and expenditure effect. To reconcile the balance of payments and the full employment strategy, Salter divided the product market into two main categories: traded goods and non-traded goods. Traded goods consist of importable and exportable goods with perfect

substitution. Their prices are exogenously determined. Non-traded goods, on the other hand, are produced and also consumed locally so that their prices are determined by the interaction between domestic demand and domestic supply. Salter also mentioned the three means by which one of them may affect an internal and external disequilibrium. These means can be explained as follows:

- Excess demand:

An increase in income will lead to excess demand for both groups of goods (tradable and non-tradable) and, consequently, trigger an increase in expenditure. Changes in relative prices will appear if the expenditure continues to rise (e.g. as a result of high revenue from the oil sector), leading to an increase in the price of non-traded goods relative to traded goods. This outcome resulting from the price impact will make the slope of the income and expenditure lines steeper (lesser slope). However, the magnitude of responses in the supply and demand for both types of goods (tradable and non-tradable) depends upon the degree of elasticity of substitution. On the other hand, excess demand must always lead to a balance of payments deficit; for here, the price and expenditure effects work in the same direction so that there is no question of the one offsetting the other. External and internal balance can be brought back through lowering home costs and prices relative to those of overseas. This kind of adjustment can be made via a devaluation of local currency, as well as an additional cut in expenditure.

- A rise in world prices:

As long as the price of traded goods is determined exogenously, any increase in the price of tradable goods (e.g. an increase in world prices) will lead to an increase in the price of domestically traded goods as well. Subsequently, on the

supply side, the amount of production of traded goods will enlarge at the expense of non-traded goods. However, on the demand side, in the case of increasing prices in the global market, the influence of expenditure will rely on the behaviour of consumers' domestic income. Let us assume that expenditure is constant. In this case, the real expenditure drops, leading to a drop in the quantity demanded. The unemployment rate might increase, especially when the elasticity of demand is greater than one. This implies that the real expenditure effect is more influential than the price effect, which may reduce the relative prices (Aliyu 2009). The remedy for this is the appreciation of the exchange rate. In contrast, if expenditure increases, income increases as well, triggering over-employment and a surplus in the balance of payments. This consequence can be dealt with via an appreciation of the exchange rate to decrease expenditure.

- Overseas capital inflows:

Such an inflow of capital (either in the form of FDI or portfolio) will cause an upsurge in expenditure, shifting its line upwards and generating overemployment. Additional expenditure will cause an excess demand for non-traded goods and/or an increase in investment, leading to an increase in relative prices (Lartey 2008). In this case, the volume of imports may also increase due to extra expenditure, if the internal balance exists (meaning no changes in local prices and levels of production of non-traded goods) bringing about structural changes. The cure will transfer the additional expenditure to the balance of payments, allowing the internal balance to reconcile with capital inflow.

The previous analysis is related with the hypothesis that the terms of trade remain fixed. However, internationally, the prices of goods and services change over time and may influence the terms of trade, both importable and exportable.

Hence, a drop in the export price brings about an adverse movement of the terms of trade; as a consequence, national income will drop when it is measured in terms of importable trade and increase in terms of exportable trade. To return the external and internal equilibrium, a devaluation of domestic currency is increasingly possible in the case of a decrease in exportable prices to increase non-traded goods prices and increase demand for traded goods. An depreciation occurs when an increase in the importable price triggers the price of non-traded goods to be cheaper and the price of traded goods to be more expensive. Moreover, Salter has mentioned the influence of import restrictions in order to stop, or at least minimize, a drain on foreign funds. However, that policy could bring about growth in demand for non-traded goods, which eventually leads to internal imbalance. To prevent extra demand from being transferred to non-traded goods, governments must cut some of their expenditure until changes in the relative price return to an equilibrium point.

In the following diagrammatical analysis, the mechanism and impact of the boom oil price is analysed. The diagrammatical analysis is used to discuss the impact of an increase in the price of oil on the relative price of non-tradable goods to tradable goods, real exchange rate and the output of tradable and non-tradable goods.

Salter (1959) illustrates the implications of such changes in both relative price and level of output in the economy. In figures 2.2 and 2.3, the non-traded goods output is located on the horizontal axis in the figure, while the tradable output sector is located on the vertical axis in the figure. It is assumed that domestic resources are fully employed along the Production Possibility Frontier (PPF) represented by the TN curve.

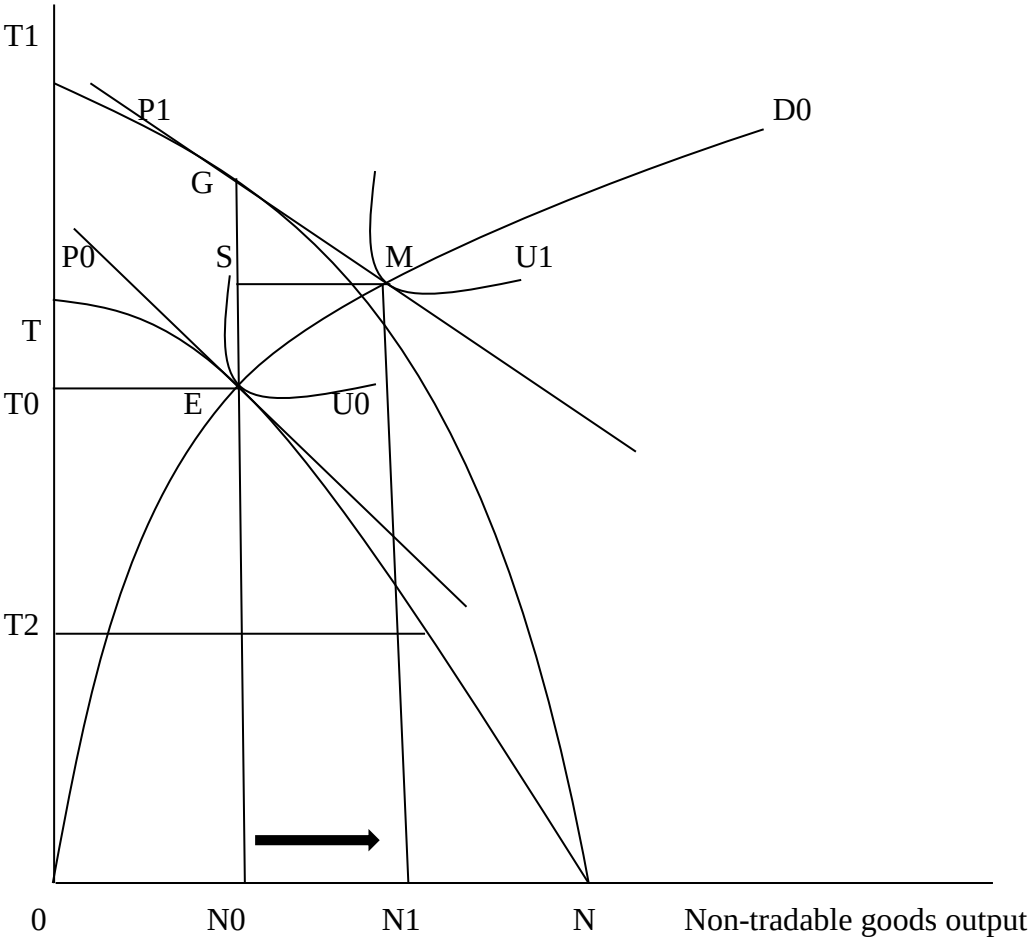
To begin with, we will focus on figure 2.2, showing the local economy experiences equilibrium at point E, where:

(i) When the slope of the relative price line (P0) is tangent with the marginal rate of the transformation curve, the level of profits is maximised. The line of relative price (P0) demonstrates at which point the tradable and non-tradable goods can be exchanged (real exchange rate).

(ii) With regard to the maximisation of utility needs, the slope of indifference curve (U0) is tangent to the slope of relative prices (P0). In the figure, the D0 curve is the income expansion path, which demonstrates the mixture of demand on non-tradable and tradable goods when income rises.

Before the emergence of the booming sector, the economy is in equilibrium at point E where, for all composite goods (tradable and non-tradable), output produced and quantity demanded are equals. The production of non-traded goods is represented by 0N0 and tradable goods by 0T0. An increase in oil price moves the PPF curve vertically upwards from NT to NTI, as we have assumed that the amount of production of non-traded goods is unchanged in the short run (Neary and Wijnbergen 1986).

Figure 2.2 The impact of spending effect in the booming period on output of tradable and non-tradeable goods



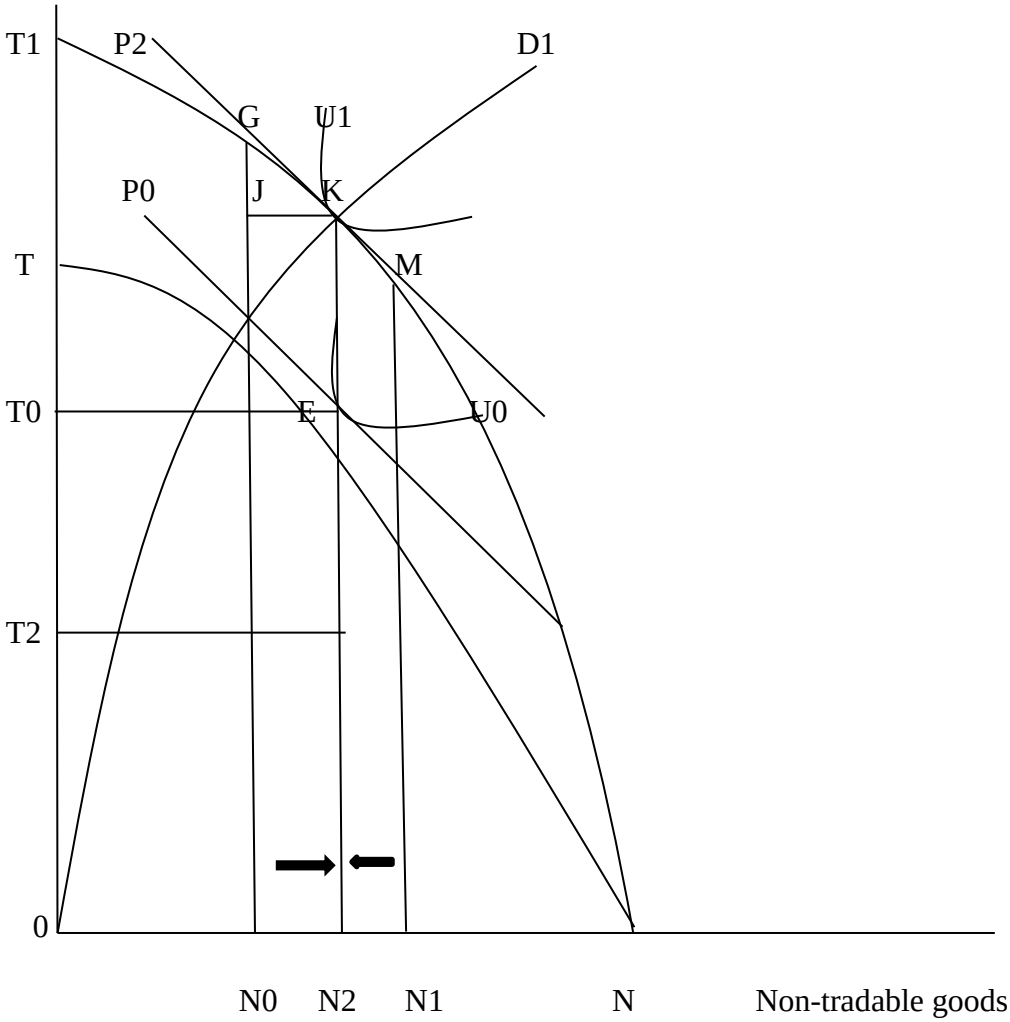
After receiving a high rate of revenue from natural resources and increased real government expenditure, money supply and real income per capita in the domestic economy, the equilibrium point shifts from point E to point G (in the beginning we assume a fixed relative price of non-tradable goods against tradable (Pn/Pt)). As long as the relative price is unchanged in the short run, the slope of the relative price line (P0) at point (E) equals the slope of the price line (P1) at point (G). The amount of consumption that willing to consume is determined at point M, and the new indifference curve (U1) is equal to the relative price (P1) and to the income-expansion path.

Thus, we can find that the local economy is in a disequilibrium condition at point G, since, at point M, the demand for non-tradable goods is bigger than the supply of non-tradable goods, as denoted by SM (0N1 – 0N0 = N0N1) in figure 2.2. Meanwhile, the extra demand for tradable goods, denoted by ES, is in excess of its production at T0 (the surplus in the current account is equal to the distance between point S and point G). Therefore, the excess demand for tradable goods is satisfied through increased imports, since the price of tradable goods is determined exogenously. Therefore, its price will not be affected. Conversely, the excess demand for non-tradable goods brings about an increase in its price. This encourages the relative price of non-traded goods to traded goods to increase, and hence the RER of the domestic currency will appreciate.

A rise of the relative price of non-tradable goods to tradable goods (Pn/Pt) leads to three consequences: (a) Regarding the demand side, an increase in the price of non-tradable goods leads to a decrease in the quantity demanded for non-tradable goods; (b) Regarding the supply side, an increase in the price of non-tradable goods leads to an expansion in the output of non-tradable goods because of the higher profitability attained from an increase in price; (c) The slope of the relative price of non-tradable goods to tradable goods (Pn/Pt) becomes steeper than it has been before. A change in the slope of the curve relies on the strength of the substitution and income effects affecting the non-tradable goods sector. Thus, the influence of income and substitution effects was changed to spending and resource movement effects by Corden and Neary (1982). However, an increase in the relative price of non-tradable goods to tradable goods (Pn/Pt) eliminates the excess demand for non-tradable and excess supply of tradable goods.

Figure 2.3

The impact of spending effect in the booming period on output of tradable and non-tradeable goods



It can be noted that the income curve expands moved from D0 in Figure 2.2, to Dl in figure 2.3 (a shift upward from D0 to D1 resulting from higher oil revenue). The equilibrium point is located somewhere between point G (excess supply of tradable goods by ES) and point M (excess demand for non-tradable goods) and where the PPF curve tangent to the relative price curve (P2) crosses the demand curve (D1) at point K (a new equilibrium points after boom occurred). The substitution and income effects will determine the location of point K.

As Figure 2.2 and 2.3 have shown, the impact of the spending effect (real government expenditure) on the output of tradable and non-tradable goods can be identified by: (a) a worsening of the local, tradable output from T0 to T2, and (b) an enlargement of the output of the non-tradable goods from No to N2. Therefore, de-industrialisation results from the impact of the spending effect, thus triggering RER appreciation, and so domestic products will be more expensive (loss of competition).

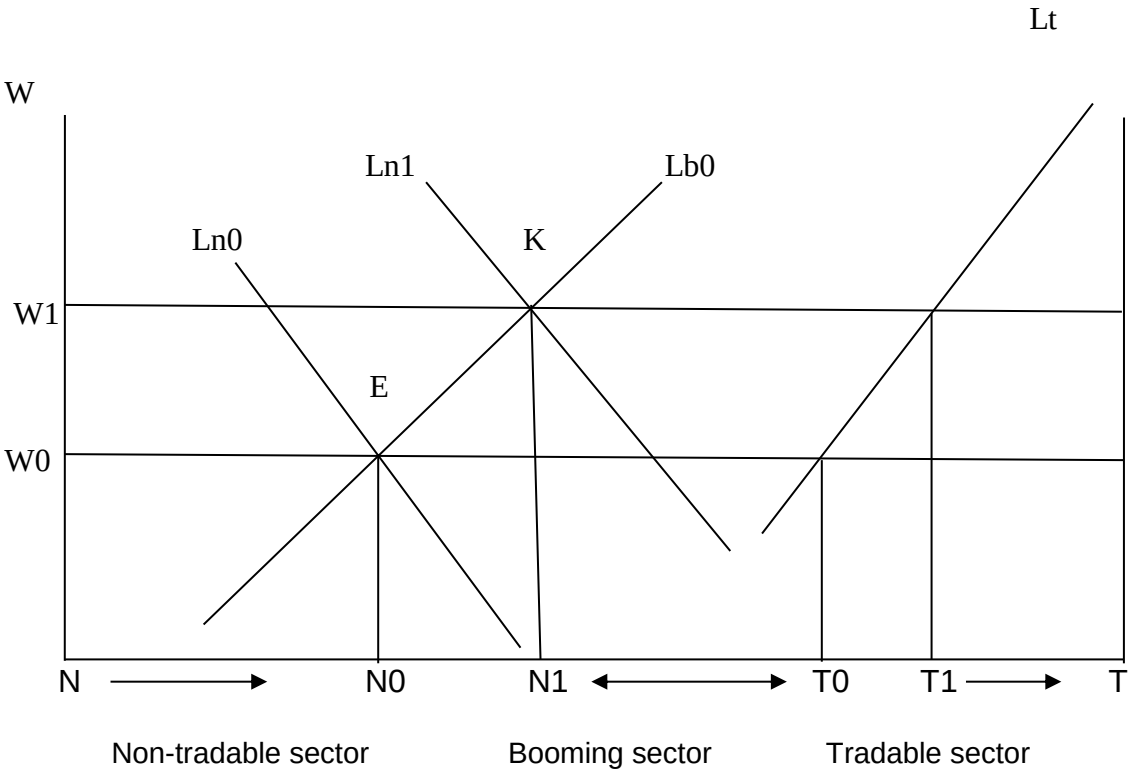
In the previous analysis, the commodity market has been discussed, though we have not analysed what happens in a labour market during high oil revenues when we assume labour can freely move between economic sectors. In Figure 2.4, the horizontal line T-N measures the labour factor for producing the output of tradable goods and non-tradable goods, whereas the vertical line measures the wage rate in terms of tradable goods. The production of traded goods is measured from the right-hand side of the figure, while the non-tradable goods output is measured on the left-hand side of the figure. In the case of this figure, the traded goods are divided into oil sector and non-oil tradable goods (agricultural and manufacturing sector). In Figure 2.4, the Lt curve indicates the demand curves for the tradable goods sector, the Ln curve indicates the demand curve for the non-tradable goods sector, and the Lb curve indicates the demand curves for the booming sector.

As can be seen from Figure 2.4, the pre-boom equilibrium condition in the labour market is achieved at point E. At this point, the output of the tradable goods sector is the distance between T and T0, while the output of the non-tradable goods sector is the distance between N and N0. Once the price of the oil sector increases (the boom occurs), the price of non-tradable goods will increase. This

leads to an increased demand for labour in the non-tradable sector, eventually leading to the demand curve for labour moving upwards from Ln0 to Ln1. Therefore, the new equilibrium will be located at point K. Consequently, the rate of wages increases from W0 to W1.

Figure 2.4

The impact of spending effect (during boom) on labour market



As long as we assume that the labour input can move freely between economic sectors, an increase in rate of wages in the non-tradable goods sector leads to an increase in the rate of wages in all other sectors including the tradable sector. In such cases, the increase in rate of wages in the tradable goods sector leads to a decline in the output of tradable goods from T0 to T1, and raises the output of non-traded goods from N0 to N1 (expanding output of non-tradable goods sector at the expense of a deterioration in the traded sector). Thus, an appreciation in RER will take place resulting from the spending effect.

The prior analysis is concerned with long-term changes. Such analysis assumes the flexibility of the factors of production. In reality, the quantity in which both categories of goods (traded and non-traded goods) can be produced is determined by the short-term current structure of production, instead of long-term prediction. Therefore, responses to adjustments in relative prices are initially on the demand side, whereas responses on the supply side have little influence in the short term either towards internal or external equilibrium. However, the cure may not be devaluation or deflation, due to the possibly severe outcomes of the amount of production and investment, but changes to relative prices may help the situation. This change will lead to disequilibrium in the balance of payments for the sake of full employment (Salter 1959). Following the Salter's model, several other economic models have been developed, particularly after increasing international oil price in the beginning of 1970 to analyse the impact of increasing natural resource revenue on domestic economics of natural resource exporters.

A partial equilibrium model (apparently the first model after increasing oil price in 1976) has been developed by Gregory (1976) in order to examine the effect of the discovery of mineral resources, on the structure of different economic sectors. Due to the discovery of mineral resources, the surplus in the balance of payments has influenced the volume of exports and import-competing industries via an adjustment in the exchange rates, and also raises the price of non-tradable goods relative to the price of exports and imports. Therefore, import-competing and pre-existing export industries are squeezed. Moreover, Gregory’s analysis demonstrates that the influence of the mineral exports sector is equivalent to a doubling of the tariff on the traditional export sector, whereas the fast growth of

the mineral resources export sector, from the standpoint of the import competing sector, is equivalent to the elimination of the tariff. The increase in the mineral resources sector has resulted in a 25% overall decrease in tariffs coming from different economic sectors.

However, Gregory examined only the influence of the spending effect which comes from new mineral discoveries. The changes, essential in order to bring back equilibrium, depend on the extent of the mineral resource discoveries, the price of demand and supply elasticities of mineral resource exports, and the price elasticity of supply and demand of imports and traditional exports sectors. In Gregory's analysis, the impacts of income and the costs of import-competing and traditional exports industries have been ignored. This is one of the main limitations of Gregory's model.

Later, Gregory's model would be amended by other scholars such as Snape (1977), Eastwood and Venables (1982), Corden and Neary (1982) and Long (1983). For instance, the theoretical equilibrium model has been developed by Snape (1977), resting on Gregory's assumptions. Snape aimed to investigate the impact of natural resource exploitation income on the costs of import-competing export sectors. Moreover, he tested the influence on price elasticity of demand and supply for imports, mineral exports and non-mineral tradable goods exports sectors. His outcomes regarding the influence of the expenditure effect and resource effects can be summarised as follows:

(i) Output of non-mineral tradable goods may decline.

(ii) Social benefits can be achieved even if the output of non-mineral goods remains constant.

(iii) While the price of non-tradable goods can be expected to rise, their production may increase.

On the other hand, a theoretical macroeconomic model has been developed by Eastwood and Venables (1982) to examine the influence of the exploitation of oil on an open economy. This model assumes that oil is completely tradable and its receipts are independent of an oil depletion strategy. This infers that there is no cost in extracting the oil. Other assumptions about the economy include full employment, zero inflation, and that capital and current accounts are balanced. These assumptions are based on Dornbusch's (1976) method which uses five equations concerning domestic non-oil demand, money market equilibrium, output, foreign exchange equilibrium and the Phillips curve. Eastwood and Venables concluded that predicted oil earnings bring about an increase in the rate of unemployment, as well as price deflation, if spending is not adjusted immediately after the exploitation of oil.

However, Eastwood and Venables' study examined only the influence of oil receipts on the spending effect, and ignored such an effect on money demand. Neary and Van Wijnbergen (1986) pointed out that this omission is logical because oil discovery would increase expenditure, and constant money demand permanently would be inconceivable. Neary and Wijnbergen justified their opinion on liquidity grounds. The huge revenue which comes from exporting oil will significantly influence money demand either directly via the private sector or indirectly via the government. Therefore, the wealth of the private sector should increase via the predicted decrease in future tax liabilities.

In order to minimise this gap, Neary and Van Wijnbergen (1986) applied Eastwood and Venables' model incorporating the wealth effect on asset markets.

Assuming a positive wealth elasticity of money demand, the higher wealth resulting from oil revenue would encourage excess money demand. To accommodate this condition, an increase in real money stock has to occur, causing an appreciation of the exchange rate and a lower post-shock price level than given by Eastwood and Venables (1982). Neary and Van Wijnbergen (1986) concluded that greater oil receipts might bring about a downturn, even without a spending lag. They justify this conclusion by arguing that an increase in wealth will raise the demand for money.

Based on what has been analysed and argued above about relative price and economic structure due to a booming sector, Corden and Neary (1982) develop a core model with both direct and indirect de-industrialisation effects of energy discoveries. They assume that the economy is divided into three sectors, a booming sector (B), a tradeable sector (T) and a non-tradeable sector (N). The prices of the first two sectors (booming sector and tradeable sector) are determined by the international market (exogenously), while prices for non-tradeable goods are determined by the domestic market. Output in each sector is produced by a factor specific to that sector and by labour which is assumed to be mobile between all three sectors. The direct impact of the boom on the economy is referred to as the Resource Movement Effect. The greater labour demand in the booming sector will trigger the movement of labour from the tradable sector to the booming sector (oil sector) and will therefore lead directly to lower output in the tradable sector. In other words, the resource movement effect means that the boom in the natural recourses sector (oil) increases the price of the marginal products of mobile factors (labour), and so draws resources out of the tradable sector (i.e. agriculture or manufacturing sector) and moves

them to the booming sector. Moreover, the movement of labour from the non-tradable goods sector to the booming sector will reduce the supply of non-tradable goods and create an excess demand for them. In this situation, the price for non-traded goods, in terms of traded goods, will increase (a real appreciation) and further movements of resources out of the traded sector into the non-tradable sector are expected (indirect de-industrialisation).

The indirect effect (spending effect) is based on the idea that the boom results in a balance-of-payments surplus which leads to an increase in the national income and then in government expenditure. This causes an increase in demand for both tradable and non-tradable goods. Subsequently, the prices of non-tradable goods will increase, whereas the prices of tradable goods are not affected since they are determined by the global market. This again encourages more appreciation in the real exchange rate, which in turn leads to an additional movement of labour out of the tradable sector into the non-tradable sector, reinforcing the indirect de-industrialisation phenomena (Allcott and Keniston 2014).

Although the model described above predicts that the output of the tradable sector will finally contract because of the expansion of the booming sector, there are some ways in which the core model might be altered. This can be done by changing some of the fundamental assumptions in the model: the potential effects of the boom on the tradable sector may be less severe and in some cases, there may not even be a Dutch disease at all. For example, as Cordon (1984) pointed out, if one is initially in a condition where all domestic resources are not fully employed before the boom period, the boom may deliver a stimulating effect on the tradable sector. Consequently, the traded goods can be

recovered and then, to some extent, the appreciation of the real exchange rate could be avoided.

Bruno and Sachs (1982) extend Corden and Neary's core model by changing it to a dynamic model. They claim that the effects of the boom on the non-traded and traded goods sectors are inherently dynamic. An increase in national income moves demand towards the non-tradable sector from the tradable sector and, hereafter, will result to profitability on capital in the two sectors diverging and differing from the rate of return given on world capital markets. Therefore, according to the dynamic model, a capital-accumulation process in the non-tradable sector and dissimulation in the tradable sector will be predictable. To account for this matter, Bruno and Sachs assume that physical capital moves freely between sectors and from abroad to the local economy and in this case the marginal product of capital is always equal to the rate of return given on international capital markets. Based on this assumption, Bruno and Sachs demonstrate that, although the basic outcome of the Dutch-disease analysis is confirmed again, international-capital mobility profits to the point where the relative price rise of non-traded goods is fully eliminated.

Long (1983) also develop a model to clarify the influence of an export boom industry through resource-movement effects and spending effects on the rest of the economy. He concentrated on changes in prices of non-traded to traded goods and the volume of production of each industry. Such changes will happen via moves in the demand curve, as well as the supply curve. To some extent, the outcome of this analysis contradicts what is predicted with the Dutch disease. According to Long's (1983) analysis, the following economic effects may occur:

(i) The price of non-traded goods can decrease relative to the price of traded goods (except the mining sector).

(ii) The non-mineral traded goods can enlarge, even in the case of decreases in price relative to the price of non-traded goods.

(iii) The enlargement in the non-mineral traded goods might be associated with a contraction of production of the booming mining sector relative to its pre-boom equilibrium output.

Roemer (1994) re-examined Corden and others' medium-run and Long's long-run theoretical Dutch disease framework for developing countries. He concentrates on the influence of an export boom in the oil and gas sectors on the developing nations' economies. The characteristics of the developing countries' environment in relation to the Dutch disease have been considered. Roemer argues that, in developing countries, one cannot generalise the predictions of the Dutch disease phenomenon. Such a conclusion arises from the fact that these nations have different structures and features, which bring about an unpredictable influence compared to what occurs in developed countries. For instance, developing countries are suffering from underemployment (particularly disguised unemployment) instead of full employment.

On the other hand, Edwards (1983) and Edwards and Akoi (1983) introduced a model of a developing country that relies heavily on the exports of a particular goods is fully worked out. The model highlights the impact of changes in commodity export prices on money creation, inflation and real exchange rate. In this model, the monetary side is also included into real side. The monetary aspects of the boom are parallel forces by which the boom revenue is

accommodated into the local economy, and which reinforce the real effects (Edwards 1983, 1984 and 1986). For instance, if this revenue (oil revenue) accrues to the government and is deposited in the central bank, the money supply of domestic currency will not be increased unless the government increases expenditure at home, or local credit to the private sector is increased (for instance if revenue accrued to the private sector is deposited in the commercial banks, the money supply of domestic currency will increase). If government expenditure is absent, the rise in net foreign assets of the central bank is precisely offset by the decline in net local credit to the government. Therefore, the supply of money will rise because government domestic spending monetises the boom revenue. Indeed, the extent of change in the local money supply relies on the extent of foreign exchange revenue from oil revenue, as well as the extent to which the monetary authorities sterilise these proceeds to neutralise their impact on the money supply of domestic currency. As we can see:

Change in Monetary = Change in Domestic credit + change in foreign reserve

Any change in oil price leads to an increase in foreign reserve at home (change the second term in the right-hand side of the equation above). The net monetary effect of oil revenues relies on how much domestic credit (the first term in the above equation) would be influenced by oil revenue, and also depends on the authorities' decision to accommodate the monetary impact (Edwards and Akoi 1983).

Based on this model the relative prices will overshoot, and that the tradable sector will have a greater loss of competitiveness in the short-run than in the long-run. Edwards (1983 and 1984) argues that unexpected increases in price

of coffee in Colombia by increasing international reserves, led to increasing the quantity of money with consequent increases in the general price level and a decrease real exchange rate (real exchange rate appreciation). As a result of this appreciation, tradable goods become relatively more expensive and then become less competitive, both domestically and in international markets. Simultaneously, a strong local currency, against foreign currencies, will bring about an increase in imports as they become relatively cheaper than domestic goods, causing domestically produced goods to be squeezed out of the domestic and global market. The end consequence, according to Carneiro et al. (2007) will be the withering of the agricultural, manufacturing, and other tradable sectors of the economy, as well as possible loss of jobs in these sectors, and even greater economic dependence on the oil industry.

Harberger (1983) builds a model to study the impact of movements in the international oil price in a small open economy with a fixed exchange rate. This is pretty similar to the Edwards and Aoki model, but in this model Harberger presents reasonable dynamics. In the Harberger model the demands for tradable and non-tradable goods rely on the last period's monetary disequilibrium and the last period's income, while the wage equation is based on the last period's price levels of tradable and non-tradable goods. The dynamic simulations of the model show that the price of non-tradable goods increases in the long run due to an increase in the international price of oil; however, in the short run, the price of non-tradable goods overshoots its long-run equilibrium level.

Apart from Edwards, Noorbakhsh (1990) also argues that the conversion of oil revenues from foreign-exchange earnings into domestic currency becomes the most significant source of increases in the money supply in oil-exporting

developing countries. But he also says that the size of change in the domestic money supply depends on the size of foreign-exchange proceeds from oil revenue and the extent to which the money authorities sterilise these proceeds so as to neutralise their effect on the domestic money supply. Aghevli and Sassanpour (1982: p.792) argue that "Unlike domestic taxes, foreign revenues in the form of royalties on natural resources do not induce a reduction in disposable income, and their domestic spending leads to the creation of additional money". However, the consequences of such a boom rely on the responses of the money demand to the boom. If the change in the demand of money is equal to the supply of money, then the monetary effects might be of little consequence for the rest of the economy. Moreover, in the case of oil, it is not certain that a money-supply growth will follow the boom. In some oil-exporting developing countries, oil revenue typically accrues to the state; only if the government injects this money into the economy, for example through expanding the budget deficit, will the money supply expand (see Morgan, 1979). This raises the possibility of some deflationary pressure following the booming period if the money supply fails to increase as fast as the money demand.

On the other hand, In the economic literature, not in all cases the real exchange rate or de-industrialization phenomena occurred in oil exporting countries. Fardmanesh (1991) argues that some oil-exporting developing nations observed a growth in the manufacturing sector during the oil boom, the opposite of what the Dutch disease model expects. Rather, it was the agriculture sector which faced a substantial decrease in its share of GDP. Fardmanesh clarifies that, though the spending effect may worsen the trade balance, an increase in price of manufactured goods in the world market relative to agricultural goods (the

world price effect) following the oil boom might dominate the negative impact mentioned above and, as a result, bring about an enlargement in manufactured production. The observed enlargement of the manufactured production in most oil-exporting developing countries has also been explained by other scholars: For example, Neary and van Wijnberg (1986) consider this sector in these economies as a protected sector and so they put that sector under the non-traded category. Benjamin *et. al.* (1989: p. 90) attribute the unexpected phenomenon to the "imperfect substitutability between foreign and domestic manufacturing products as well as to their linkages with the rest of the economy". They argue that, in a typical agricultural country, the importable sector is the industrial one, which is to a certain degree protected from foreign competition by reason of the fact that its products are imperfect substitutes for imported goods. They demonstrate that, in some economies, this sector (the manufacturing sector) could increase its output during an oil boom. Empirical studies demonstrate that oil booms have not always been followed by a decline in the manufacturing sector. Explanations for this finding include: government protection of some parts of the economy (Neary and van Wijnbergen 1986) active government policies to avoid a decline (see Gelb (1986) and Usui (1997) in the case of Indonesia).

Moreover, Gylfason (2001) and Davis and Tilton (2005) criticized the structural adjustments that occur within a country throughout a natural resource boom. Some developed nations like Norway and the United Kingdom have gone through similar experiences. In reality, the Dutch disease allows a nation to take advantage of its newfound mineral wealth by enhancing resources to flow from other sectors to the booming sector. If natural (capital) assets are changed into

human or physical capital, then they can encourage the economic growth rate; however, if natural (capital) assets are consumed without converting these assets into other productive capital, then the economic activity will slow down. Therefore, in both cases, natural resources may improve economic development since these natural resources offer chances and opportunities to developing nations (Hutchison 1994).

Based on the previous analyses of models, the spending effect and resource-movement effect are the main tools that affect the real exchange rate and that change the structure of the economy (see Corden and Neary's core model, 1982). It is believed that in oil exporting countries particularly developing one, the spending effect (mostly related to fiscal policy) is more responsible for Dutch disease symptoms, since governments receive a high revenue from a booming sector (in our case, the oil sector). They then spend the massive revenue on inefficient economic activities in the local economy, which leads to greater demand for both tradable and non-tradable goods. The rise in demand for non-tradable goods would be much higher, which would lead to an increase in prices since the country's resources limit the supply of these goods (the price of non-tradable goods determined by domestic economic). On the other hand, the increased domestic demand on tradable goods may not lead to an increase in price of tradable goods since the price of tradable goods is determined exogenously. In this situation, tradable goods will be squeezed over time.

Fiscal policy is an important tool for avoiding Dutch disease. In reality, excessive public expenditure has been a main factor in the cause of economic mismanagement. Fiscal policy can have a significant role not only by modifying the "spending effect" related with the Dutch disease phenomena (especially in

developing countries), but also via smoothing expenditures to shrink production instability. An efficient spending policy would help in saving some of the revenues (revenue from booming sector), which could then be used to accumulate foreign assets (to be invested abroad). This can be helpful to minimise aggregate demand pressures on both the tradable and non-tradable goods sector and limit the spending effect; in addition, the strong appreciation real exchange rate would not have taken place. Moreover, spending some of the revenue on imported capital goods would also help limit the adverse side effect of Dutch disease.

On the other hand, the strength of the resource movement effect relies on the factor intensity of each sector (booming sector, tradable and non-tradable). If the booming sector is the capital-intensive sector, as is often the case in developing/developed nations, the spending effect to some extent dominates the resource movement effect. The resource movement effect may not be effective as a result of the surplus in labour supply in the labour market. The surplus labour supply would slow down the increase of price and even eradicate the real exchange rate appreciation. Furthermore, the production volume of the traded goods sector might not decrease, since the traded goods sector would not be subject to resource movement and lack of labour. Moreover, because of the great number of migrant labourers, the export boom might bring about the same consequences in less populated oil-producing countries.

Moreover, it is argued that the impact of the booming sector on the tradable sector is relatively not related to resource movement effect in almost all oil exporting developing countries, but is also related to low production and exports. A low export is related to an uncompetitive tradable goods sector, since the real exchange rate appreciated in oil exporter countries. Therefore, the increased

price of non-tradable goods infers an increase in wages in this sector (non-tradable). Subsequently, the labour force will be attracted from the tradable sector to the non-tradable sector. This change in labour will continue until factor prices reach an equilibrium between all sectors.

In summary in terms of theoretical framework, the consequences of the Dutch disease are summarised as follows: (i) an increase in the relative price of the non-traded goods with regard to the price of the traded goods; (ii) the appreciation of real exchange rate; (iii) a decline in the production of traded goods; and (vi) an enlargement in the output of the non-traded goods sector. However, empirically different conclusions have been resulted, therefore in order to complete the picture about the impact of booming sector on real exchange rate and structure of economic, the next section will be about the empirical studies and how the booming sector affect the domestic economy in both developed and developing countries.

2.5 Some empirical studies on the Dutch disease

The impacts of natural resource receipts on the economic structure have been covered by several scholars. All the studies conducted have been suited to the macroeconomic study in industrial natural resource-producing nations, such as Norway, the Netherlands, the UK, and Australia. Nonetheless, there are many studies which have drawn attention to specific natural resource-producing developing countries, and the differences in economic structure between developed and developing nations. Our aim is to analyse certain macroeconomic studies and examine the impact of a natural resource export boom on developing economies. In this section, the author is going to analyse some previous

empirical research studies linked to the Dutch disease and present their main outcomes. This section also provides some references in order to compare our results. This review of the literature helps us to consider the related variables and to select a suitable measure for them.

We first start with developed countries. Forsyth (1986) investigated the impacts of North Sea oil production on the non-oil sectors in the UK. In the past, the UK has been dependent on importing oil from abroad; however, after discovering huge amounts of oil in the North Sea, the UK became a self-sufficient oil-producing country. The increase in North Sea oil output brought about an increase in the national income in the UK by about 10% during 1970s. As a result, the local absorption of imported manufacturers enlarged, triggering a reduction in the manufacturing sector. Forsyth (1986) found, in his study, that a change in the real exchange rate by 20% from 1976 to 1980 brought about a change in relative prices by 12%. Forsyth provided two factors as to why the industrial sector grew by less than 20%: (i) the local exporters concentrated on absorbing part of the effect of revaluation; and (ii) the foreign exporters raised their margins. The structural changes were greater than the direct changes of oil on the UK economy, due to the upsurge in national income. Forsyth found that, the higher the exchange rate, the greater the benefits to the UK economy, in spite of the adverse impacts of unemployment and deficits. However, Forsyth's study only concentrated on the impacts of the spending effect. Forysth debates the indirect impact on the British real exchange rate of a reallocation of world income away from nations that compete with the UK as exporters. However, Corden (1996) argued that the problem of appreciation in the real exchange rate in the UK from

1979 to 1980 may be attributed mostly to the monetary squeeze, not to the impact of the Dutch disease.

Turning now to the developing countries, Warr (1986) examined the impacts of the oil returns from 1973 to 1982 on the economy in Indonesia in terms of income distribution and relative prices. He concluded that the participation of the agricultural sector in the general GDP decreased as a result of receiving high oil revenue, whereas the contribution of the manufacturing sector enlarged slowly. Later on, Roemer (1994) found in his study that the Indonesian government attempted to avoid the worst effect of the Dutch disease via prudent good exchange rate management. Kamas (1986) conducted a study to test the Dutch disease effects on economic performance resulting from the coffee export boom in Colombia during the period 1967-1982. She found that, when the exchange rate appreciated and the relative prices of the non-traded goods increased, the growth rate of the non-traded goods enlarged, whereas the non-coffee traded goods experienced slower growth (exactly what Corden and Neary expected in their model). The Colombian reaction to the Dutch disease effects led to an appreciation of the domestic exchange rate, which was less than that required to equilibrate the balance of payments. The main concentration of the Colombian strategies was based on a decrease of the absorptive capacity via contractionary monetary and fiscal measures.

Gelb (1988) conducts a widespread empirical cross-country study of the Dutch disease, examining the impact of the booming period in oil for a group of oil-exporting developing countries. However, almost all countries in the study demonstrated no Dutch-disease phenomena in the manufacturing sectors, whereas in nearly all the countries the output of the agricultural sector has shrunk

during the periods of study. A possible explanation for the missing Dutch disease in the manufacturing sectors was that these sectors were initially too small and that the subsidies and the price controls by the government, along with active promotion of the sectors, kept the manufacturing sectors from being harmfully affected by the booming sector.

Benjamin (1990) developed a multi-sectoral, computable general equilibrium model to examine the influence of the high revenue from the oil sector on the Cameroon economy in 1979. He found that the appreciation of real exchange rate by 8.5% brought about an increase in imports by 10.5 percent and a decrease in exports of tradable goods by 6.1 percent. This was a result of the appreciation of the real exchange rate, which reduced the competitiveness of the country's exports and domestic production of import-competing products. Benjamin concluded that there was a reduction in the traditional tradable goods sectors and an upsurge in the non-traded goods sectors.

Looney (1990) examines empirically the effect of the oil boom on the Saudi Arabian sectoral outputs via the Five-Year Plans for the period 1965-1985. He assessed a series of equations involving sectoral production to factors affecting relative profitability. He examined the production of the tradable sector (manufacturing, agriculture, mining and petroleum refining) and non-tradable sector (wholesale and retail trade, storage and communication, transport, and construction) against the level of government spending, level of inflation, real exchange rate, general non-oil GDP, as well as the added value of oil. His outcome was considerably linked to the existence of the Dutch disease in terms of appreciation in the real exchange rate and inflation. For the output of tradeable goods sectors, the Dutch disease is present, with the predicted sign indicating

that the appreciation of the real exchange rate has led to the output of tradable goods falling below the levels it would otherwise have achieved. For the output of non-tradeable goods sectors, the appreciation of the real exchange rate brings about a stimulus growth output of non-tradable goods.

Overall, the outcomes of this study confirm the Dutch-disease phenomenon (the expansion of non-tradable sectors and the contraction of tradable sectors) in Saudi Arabia for the study period. Fardmanesh (1991) developed a model to examine the effect of global prices on the share of manufacturing, agricultural and service sectors in the non-oil GDP in five oil-producing nations in OPEC. In these countries, oil made up the greatest contribution to GDP. Fardmanesh concluded that the oil sector has a negative influence on the agricultural sector and a positive influence on the services sectors. However, he mentioned that the impact of the oil sector is hard to evaluate, not only because of the dominance of the oil sector in the economy, but also because the non-oil tradable sector (agriculture) is highly underdeveloped (agriculture was the most important activity before the discovery of oil). In addition, oil rents may have decreased the incentives to proceed with reforms in the agricultural sector. However, Fardmanesh's study has ignored the influence of the spending effect and local prices on tradable and non-tradable production.

AI-Gaeed (1991) created a two-sector macroeconomics model to examine the influence of the oil on the structure of the economy in Saudi Arabia. He used a factor of spending effects. He found that the spending effect positively influenced the investment and consumption, and negatively affected the real exchange rate. As well as this, the traditional sectors contracted in favour of the non-traded goods. However, this study has ignored the resource movement effects, testing

only the influence of the spending effect on relative prices and real exchange rate.

Usui (1997) provides a comparison study between Mexico and Indonesia when both countries changed their policy adjustments due to an increase in the international oil price, with special reference to the Dutch disease phenomena. He found that Mexico shows a clear-cut example of the Dutch disease; however, Indonesia has not faced the Dutch disease phenomena. This outcome illustrates a striking contrast, particularly in the two countries' monetary and fiscal policy, and emphasises that good macroeconomic management (as was the case in Indonesia) is a very important factor in avoiding the Dutch disease phenomena. Besides subsidising investment by using oil returns to support the tradable sector is another factor helped for Indonesian success. This means that good management in fiscal policy may be a very significant factor in avoiding the Dutch disease syndrome.

Bjørnland (1998) analyses the economic consequences of the booming sector on manufacturing production in the UK and Norway. In his model, he used quarterly data from 1976 to 1994. The outcomes show that there is very weak evidence of the Dutch disease phenomenon in the UK, while, for the case of Norway, the manufacturing outcome has actually benefited from higher oil prices. Bjørnland emphasises that the role of government policies in oil-producing nations in response to external energy shocks is an important issue in order to avoid Dutch disease. Though the oil sector plays a much larger role in Norway than in the UK, the macroeconomic policy has been conducted significantly differently in these two major oil countries. For instance, in Norway, there were substantial subsidies to keep manufacturing output over the transitional period

of North Sea oil; thus, due to this policy, the unemployment rate remained lower during this period. However, in the UK, much of the oil revenue from the North Sea went into social security instead of investment in the manufacturing sector.

An empirical study was carried out by Larsen (2004) in Norway to demonstrate that Norway was able to avoid the effects of Dutch disease after the discovery of massive natural resources during the 1970s, and to examine the policies behind this success. He highlighted that a dominant centralised wage system limited increases in wages in all sectors from an expanding resource sector. The spending effect, in turn, was restricted since the government protected the economy through fiscal discipline and investing oil revenue abroad. Mogotsi (2002), however, analysed the impact of Botswana's booming sector (as a result of its diamond boom of 1982-90) on its economic structure. He found that Botswana did experience Dutch disease, as proved by an appreciation of real exchange rate, the effect of which was a drop in most of the manufacturing sector, particularly the textiles industries. However, Mogotsi concludes that the manufacturing industries did not drop in absolute terms, though there is an indication of a diminishing growth rate in the manufacturing sector during the boom period.

Subramanian and Sala-i-Martin (2003) were unable to find strong evidence of the Dutch disease in Nigeria because of oil-price fluctuation. Moreover, they found that the real exchange rate was insensitive to oil prices. They also emphasised an issue all too common in examining the effect of changing international oil prices on macroeconomic variables in oil-exporting countries, namely the importance of knowing the nature of government expenditure and not only the quantity of that expenditure. The spending of oil revenues on tradable

goods has no influence on the real exchange rate. Thus, if the bulk of the windfall is spent on traditional tradable goods, any signs of a Dutch disease may be weak. Ebrahim-Zadeh (2003) studied the Dutch disease effects in Kuwait throughout the oil boom. He applied a computable general equilibrium model to clarify the changing economic structure as a result of the boom. He found that (i) a relative increase in the output of non-tradable goods sector is accompanied by a decrease in the output of tradable goods sector; and (ii) a reallocation of resources results from an appreciation in the real exchange rate.

Budina et al. (2007) examined the possibility of the Dutch disease in Nigeria from the 1970s onwards (since the emerging oil). The study finds that, although Nigeria experienced an oil boom, the boom could not halt the country's continuous stagnation in the non-oil sectors of the country. In addition to this, the study highlighted that the high instability of government expenditure was the main reason behind the unsatisfactory non-oil sectors and not the Dutch disease. The study argues that Nigeria's fiscal policies did not only fail to smooth highly unstable oil revenue, but rather government expenditure was even more unstable than oil revenue.

Oomes and Kalcheva (2007) investigated the Dutch disease phenomenon in Russia, testing whether economic developments have been symptomatic of Dutch disease. After taking two symptoms (appreciation of real exchange rate and the declining manufacturing sector), Oomes and Kalcheva found that a 1% increase in the oil price brings about a 0.50 percent appreciation of the real exchange rate. In order to examine the second symptom of Dutch disease (declining manufacturing output), they used sector-level data to compare growth rates across Russian economic sectors for production level and employment

across different economic sectors. They evaluated the impact of higher oil prices on five non-oil manufacturing sectors. The authors found that Russia showed this symptom of Dutch disease. In particular, their sectoral data demonstrated that the growth of the manufacturing sector slowed down compared to other economic sectors. In addition, since 2001, the manufacturing employment growth rate had dropped.

However, Oomes and Kalcheva (2007) highlight that it is difficult to conclude whether Dutch disease was the only factor that led to a slowing down in the manufacturing sector, because this can also be affected by other factors. For instance, de-industrialisation has been a natural phenomenon even in developed countries, such as the US and European developed countries. These countries are not necessarily resource-rich; as long as the households become richer, then demand naturally tends to shift away from goods toward services.

Habib and Kalamova (2007) examine whether the oil price has an influence on the real exchange rates of three major oil-exporting nations: Norway, Saudi Arabia (1980-2006) and Russia (1995-2006). They found in the case of Russia that it probably has a positive relationship between the oil price and the real exchange rate. However, they found in the case of Norway and Saudi Arabia that there is no significant relationship between oil price and the real exchange rate. These outcomes may be explained by the institutional differences and accumulation huge of foreign assets and among these countries. in the case of Saudi Arabia and Norway their reserve foreign assets are huge relatively to their size of population but for Russian case despite its reserve is relatively smaller than those two countries. With high volatility of oil price, many oil exporting

countries have introduced Stabilization Funds to isolate a huge portion of the oil revenues from the economy.

Beine et al. (2009) analyse the Dutch disease phenomena because of the increase of Canada's oil production during 2000s. Their research uses a Bayesian approach to evaluate how much the Canadian Dollar is related with commodity prices, and then uses that to display the level of changes in commodity price on employment rate. They found that 42% of the industrial employment loss between 2002 and 2007 is linked to the Dutch disease phenomenon.

Ismail (2010) examines a model using microeconomic data for the existence of Dutch disease. In addition, he used annual data from 1977 to 2004 in 90 countries, and the data only related to the manufacturing sector because of data availability issues. He found that a permanent oil shock led to a reduction in the manufacturing sector. Moreover, these effects are stronger in countries with more open capital accounts. Apart from that, the relative factor price of labour rises in regard to capital. Subsequently, capital intensity rises in the natural resource shock, which is consistent with this labour-intensive sector. He also found that an oil price shock affects sectors with higher capital intensity less than the labour-intensive non-tradable sector.

Ruehle and Kulkarni (2011) study potential Dutch disease effects in Chile following the copper boom in the early 2000s. They found that there was an insignificant adverse effect in the manufacturing sector. However, the agriculture sector has been severely affected (declined output) and therefore conclude that the Dutch disease did occur. Their study, however, uses basic correlation matrices and single factor regression models that notably do not include real

exchange rate as a dependent variable, meaning that de-agriculturization may have occurred for a host of other reasons (for example, seasonality of agricultural production).

Overall, the results of the above studies show that the Dutch disease phenomenon is not common in all countries, particularly in oil-exporting countries, although it has been observed in several cases. In most empirical studies, good fiscal policies and prudent management of the real exchange rate, as well as strong government policies, have been identified as the main factors for the absence of the Dutch disease phenomenon. Although some of these nations (developed nations) involved in the study are oil-producing nations, these countries are not similar to oil-exporting developing nations in terms of economic structure, size of government intervention into economic activities, population size and the size of the manufacturing output. Subsequently, the outcomes of studies in developed nations may not correspond to an oil-exporting developing nation's economy. Almost all empirical studies found that oil-exporting developing nations faced a changing economic structure as a result of their high dependence on oil revenue (due to high oil price in international markets).

2.6 In summary

The economic results of a booming sector (oil and gas sector) drew the attention of the international trade economists in the 1970s. That boom was caused by an exploitation of massive deposits of natural resources and increased prices sharply in international markets. At the same time, booming natural resources had a negative side effect (the 'Dutch disease' phenomenon) in Netherlands' economy. However, the Dutch disease phenomenon has been analysed in

different terms, for example de-industrialisation or oil-syndrome, and from different perspectives, for instance compensations and foreign remittances. Accordingly, with regard to the export natural resource boom of agricultural commodities, gold and diamond, and oil and gas, widespread theoretical and empirical researches have been conducted regarding the increase in price of these commodities. Conversely, there have been relatively few studies on the influence of slumps in oil exports.

However, the consensus of most researches on the consequences of Dutch disease are summarised as follows: (i) the appreciation of real exchange rate; (ii) a decline in the production of traded goods; (iii) an enlargement in the output of the non-traded goods sector; and (vi) an increase in the relative price of non-traded goods with regard to the price of traded goods. The expectations of the core model of Dutch disease are founded on assumptions including flexible exchange rate, fixed labour supply, full employment, and the significant role of the private sector, which are better suited for the developed oil-exporting countries. However, these assumptions are less suitable to the Iraqi economy and even most oil-exporting developing countries. The model needs to be developed by taking into account some other factors, for instance, the limited manufacturing base, the flexible labour supply, fixed exchange rate and the significant intervention of government into economic activity via government spending.

In the literature, it is found that the adverse side effect of boom and slump occurs by way of the real exchange rate mechanism. For example, fluctuations of oil price may create instability in the economy, since any increase or decrease in the oil price leads to an increase or decrease in oil revenue; this, in turn, leads

to appreciation or depreciation in the domestic currency. In the case of increasing oil revenue, the domestic currency will appreciate and then lead to domestic products being uncompetitive in comparison with foreign products, and eventually lead to a slowdown in the tradable sector. However, in the literature it was found that exchange rate management might allow oil-exporting countries, to some extent, offset some of the Dutch disease effects ensuing from an energy price let boom. This is thought to have worked successfully in some countries such as Norway, as a developed county, and Indonesia, as a developing county. On the other hand, it is found that, when the oil price increases, the government has more money to spend. Although, this revenue can be used to finance developmental projects to raise welfare, the literature found that most oil-exporting developing nations spend revenue on inefficient public and fiscal expansion, which is generally wasted.

In the case of decreasing oil prices, most oil-exporting countries face difficulties in fiscal policy when their government budget faces a huge deficit. In this case, most countries cut their expenditure in order to shrink their deficit to a minimum; however, governments often cut capital expenditure more than operating expenditure, which badly affects economic activities and economic development. We found in the literature that some oil-exporting countries created stabilization funds (Norway and GCC countries) in order to prevent a sudden impact on their economy caused by a collapse in oil price. These were successful to some extent in the short term.

Our case study is Iraq, as long as oil has been a main export product in Iraq, so the Iraqi economy has faced and experienced instabilities in its oil export foreign exchange earnings. This tells us that the oil export revenues make up a high

percentage of the total exports. Furthermore, the total government revenues from oil exports make up a significant share of the total GDP. Therefore, it can be expected that Iraq faces severe problems from the oil export boom adverse side effect during booms in oil price. On the other hand, it may also be subject to the ‘reverse situation’ during the slump of oil price and its aftermath.

Chapter Three

The background Iraq's economy

3.1 Introduction

According to recent OPEC data (2015), Iraq has the fifth largest proven oil reserves in the world and some of the lowest exploration costs in the region (OPEC, 2015). The oil sector is the main source of government revenue, constituting between 75 and 95 per cent of total government revenue during the period 1970-2014. Since, the price of oil is determined by the international market (exogenously), any change in the price of oil can reflect the changes in global economy. Higher oil prices enhanced local development and modernised the country, generating rapid growth in certain sectors. Over the last five decades, the increased oil revenue has caused an unprecedented changing of the structure of economy. In some sectors such as service and construction, the contributions have been favourable, particularly during higher oil prices, while in some other sectors such as manufacturing and agriculture they have been discouraging. However, in order to be able to appraise to what extent the impact of the oil sector has been on the Iraqi economy, we should assess it from the following premises: the contribution of oil revenue to total government revenue, oil sector contribution to GDP, how oil affects the contribution of the non-oil sector to GDP and how changing oil prices affect international trade and Iraq's trading partners.

Internationally, Iraq has become one of the main strategic players in the world oil market as a result of its massive reserves and capacity of production, thereby attracting foreign investment and foreign asset ownership. Therefore, that investigating oil revenue and its effect on the whole Iraqi economy is worthy of

study, as we have recently seen how declining oil prices led to economic instability in most oil exporting developing nations.

The purpose of this chapter therefore is to demonstrate the structure of Iraq's economy and how it changed from a very small economy to one of the largest economies in the region in terms of GDP, government revenue and expenditure, trade balance and most other economic sectors. Therefore, this chapter is structured as follows: Section 3.2 is about real exchange rate. Section 3.3 will outline the government budget (government expenditure and government revenue), whereas section 3.4 evaluates the oil and non-oil sector. Section 3.5 The history and production of oil-sector is presented. In section 3.6 conclusions will be given.

3.2 Real exchange rate (RER)

As previously mentioned by economic literature (chapter two), oil exporting countries have had windfall revenues due to the increase price of natural resource particularly since 1970s. It is obvious from the theoretical and empirical literature that either a positive oil production shock or oil price shock exert a significant influence upon the structure of economy throughout real exchange rate. Therefore, the real exchange rate is the key variable that is affected by the shock of oil price and oil production, and the real exchange rate is considered as a key variable that affect the structure of economy in oil exporting countries. Thus, before analysing the features of the Iraqi economy it is important to analyse the Iraqi RER during last four decades. Among oil exporters countries Iraq is considered as a major oil exporter, the oil price has sharply fluctuated during last four decades compare to other products. Importantly, the level of oil exports in

Iraqi has also sharply fluctuated during last four decades (due to Iraq-Iran war in 1980s and economic sanction in 1990s). Thus, the RER in Iraq must be significantly fluctuated these shocks (oil price shock and oil production shock).

Figure 3.1 shows the appreciation and depreciation of the RER has been experienced throughout the period 1970-1979. This was associated to increased government revenue (due to increased oil prices), which led to increased real government expenditure (Foote et al. 2004). The consequences of increased real government expenditure led to an increase in the rate of inflation in Iraq. However, increased government expenditure caused the average rate of inflation in the non-tradable goods sector (domestic price) to be much higher than the average inflation rate in the tradable goods sector. Furthermore, the appreciating nominal exchange rate also made the price of international goods (tradable goods) cheaper, which means the rate of inflation of tradable goods became less and less. Thus, in the case of increasing prices of non-tradable goods due to increased real government expenditure, and decreasing prices of tradable goods due to appreciation of nominal exchange rate, the appreciation of RER will take place.

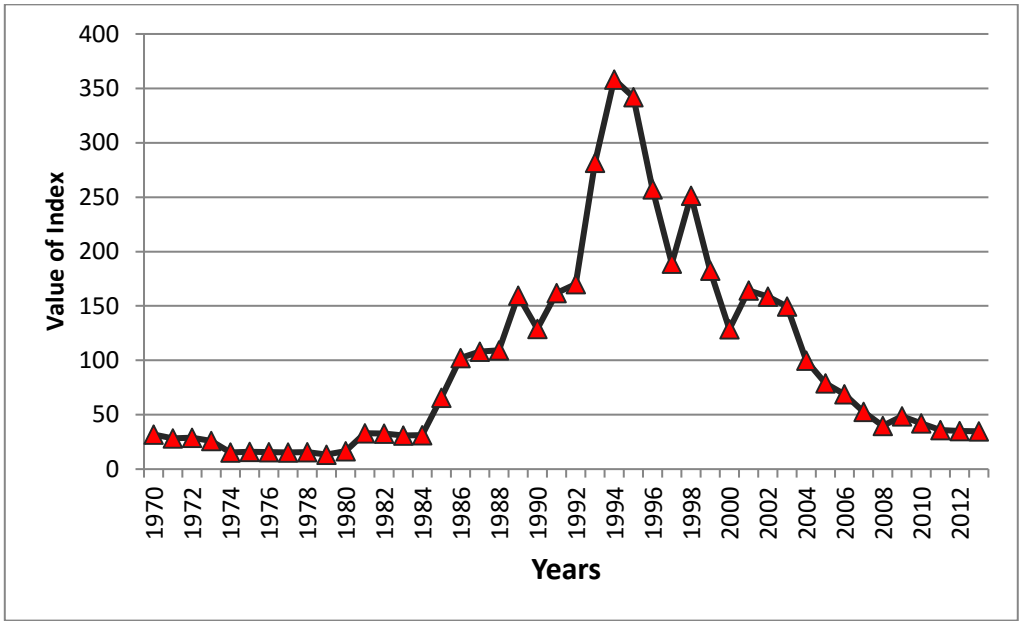
On the other hand, once the oil revenue decreased in the 1980s (due to a decline in volume of exports and falling oil prices during the period 1982-1986, and during economic sanctions in the 1990s, the RER started to depreciate sharply. Falling real government expenditure and a depreciation of the nominal exchange rate were considered as a potential reason behind the depreciation of the real exchange rate during the 1980s and 1990s (Boone et al. 1997). A decreasing real government expenditure meant a decreasing demand in tradable and non-tradable goods, which, in turn, led to a decline in the price of non-tradable goods

(since its price is determined endogenously). While the price of tradable goods does not change due to a decreased demand in tradable goods (since its price is determined exogenously), its price is increased due to a devaluation of the nominal exchange rate. Thus, the average inflation rate in the tradable goods sector was higher than the average inflation rate in the non-tradable goods sector, which led to a depreciation of RER.

It is noted from Figure 3.1 that the sharp depreciation of RER took place during the first half of the 1990s as a result of strict economic sanctions on Iraq, which were imposed by the United Nations (UN), and the government revenue from exporting oil became almost zero. More importantly, the nominal exchange rate was devalued by around 5000% between 1989 and 1995. This was the main factor that led to a sharp depreciation of RER during the first half of the 1990s (Alnasrawi 2002).

However, RER began to appreciate again after the Oil for Food Program (OFFP). According to this programme, the Iraqi government was permitted to export a limited amount of oil in order to import foods and medicine. During the OFFP (1997-2003), the Iraqi government gained a limited amount of oil revenue and the real government expenditure increased gradually. Increased real government expenditure attributed to an increase in real income per capita and which, in turn, possibly led to an appreciating real exchange rate via differentiation of the rate of inflation between tradable and non-tradable goods.

Figure 3.1 Real exchange rate during 1970-2013



Source: - Central Bank of Iraq / Statistical and Research Department / Annual Statistical Bulletin, various issues.
-World Bank, World Development indicator, (2015),

* Real exchange rate is measured as nominal exchange rate times US CPI divided by the Iraqi Non-tradable GDP deflator.

After the lifting of economic sanctions in 2003, Iraq was allowed to export unlimited amounts of oil and the price of oil gradually increased after 2004. In addition, the volume of oil production and exports also improved to a higher level after the ruining the government had been oil sector for more than a decade. Real government expenditure, as well as an increased real income per capita, which in turn led to an increased inflation rate of non-tradable goods (Ministry of Planning of Iraq 2010). On the other hand, due to the OFFP, the appreciated nominal exchange rate has appreciated from 1449 dinar to 1116 dinar for each US dollar. This has created cheaper tradable goods on the one hand, and increased prices of non-tradable goods sector (due to increased real income per capita) on the other hand.

Overall, one can conclude that the RER in Iraq can, in principle, appreciate (depreciate) because of two main reasons: first, because the relative price of tradable goods to non-tradable goods decreases (increases); second, because

of the appreciation (depreciation) of the nominal exchange rate. On the other hand, the appreciation and depreciation real exchange rate is strongly affected by “spending effect” as economic literature analysed (Corden and Neary 1982). Therefore, the following section is about the government budget.

3.3. The budget

Budgeting defines estimating in advance, the course of action in order to attain a specific goal in a given period of time alongside a numerical expression of the inputs required and outputs expected. In general, the government budget is divided into two parts: expected revenue and expected expenditure. The expected total revenues are achieved mainly from exporting oil and to a lesser extent from non-oil sectors. Meanwhile, public expenditure is represented by two broad sorts of government expenditure: the operating public expenditures and investing expenditure. The operating public expenditures correspond to the government purchases of current goods and services such as salaries, current and consumables expenditure, social welfare, aid, pensions, in addition to high military expenditure which high proportion of operating expenditure.

While, the investment expenditures correspond to the government investment either directly via public investment in infrastructure such as roads, communications, building of hospital, schools and universities, or indirectly via government subsidising of different economic sectors such as agriculture and manufacturing and by funding people to build a house.

As long as oil is by far the largest source of revenue in Iraq**,** estimating total revenue may not be accurate due to oil’s price instability in international market

(Tarnoff 2011). If the actual revenue is not close to the estimated revenue, then the estimated expenditure will not be close to actual expenditure.

Before breaking down total government revenue and total government expenditure, it is important to analyse surplus and deficit in government budget. Since, any surplus or deficit may influence the whole domestic economy via changing both monetary and fiscal policy, and then any variations of these two important tools can have a significant on impact on exchange rate, price level, foreign trade and level price. This will be more thoroughly analysed in model chapter (see; chapter 4).

As long as changes in total revenues are driven by changes in oil revenues, the reaction of total government expenditure to changes in total government revenues can be considered a good proxy for the reaction to changes in oil receipts. The oil booms of 1973 and 1979 brought unprecedented income to Iraq, due to the international oil price increase. This in turn led to budget surpluses during the 1970s, reaching its peak of US$ 28539 million in 1979, an extremely high amount. Since the monetary authority followed the fixed exchange rate (fixed to US dollars), then most of the reserve held in the central bank was used to support or back Iraq's domestic currency (Mouhammed 1990). However, when the Iraq's oil production and the price of international oil declined sharply in the beginning oil 1980s, the Iraqi government faced a severe deficit in her budget. A typical phenomenon in Iraq has been that, during oil boom years (1970s), large expenditure programmes were introduced, but during the subsequent period of lower government revenue (lower oil prices and production), these programmes were cut back or suspended (Foote et al. 2004).

It can be seen from the table 3.1 that from the beginning of 1981 to the end of 2003, the total oil export declined due to the Iraq-Iran war and also the oil price fell sharply in 1982 and 1986. During the 1990s however, the economic sanctions imposed on Iraq by the UN, banned oil export until 2003 when it was lifted. This means that from the beginning of the 1981 to 2003 can be called a slump period. Table 3.1 shows that the total value of the deficit is about US$ 17143.9 million in 1982, after declining the deficit in the following years, the level of deficit increased again to US$ 14579.5 million. During the 1980s the Iraqi government tried to fund its deficit by using its reserve which was saved abroad or held it in Iraqi central bank from the surplus period in 1970s to reduce budget deficits. However, due to the Iraq-Iran war, the amount of foreign reserve was not enough to cover all expenditure. Therefore, in order to get more funding, the Iraqi government attempted domestic and foreign borrowing. Apart from that, money creation (printing domestic currency) was another way to cover the budget deficit during 1980s which led to slight devaluation of market exchange rate then again increases the rate of inflation too (Alnasrawi 1994).

On the other hand, during the 1990s, Iraq's economy faced severe deficits because of economic sanctions. This was hardly surprising, given government reliance on oil revenue and oil export being banned. From 1990, the volume of real government expenditure decreased shapely due to economic sanction. Although, in 1996-97 the UN allowed the Iraqi government to export limited amounts of oil under the 'Oil for Food Program', the budget deficit was not resolved; however, it shrunk to -766.5 in 1997 (Foote et al. 2004).

During the economic sanctions, the deficit was only funded by money creation - in other words issuing money as a way of financing expenditures because the

foreign reserve had already been used for financing deficit during 1980s and Iraq could not borrow money from abroad.

Apart from that, domestic borrowing was also in deficit since per capita income declined sharply. Issuing money therefore made a severe devaluation of domestic currency. For instance, before Iraq's economic sanctions, one US dollar exchanged for around four Iraqi dinars while by the middle of 1991 a dollar bought eight Iraqi dinars, and by October 1995 it was possible to purchase 3,000 Iraqi dinars for one dollar. This high inflation rate was driven by the government's need to create money (printing money) so as to finance expenditures.

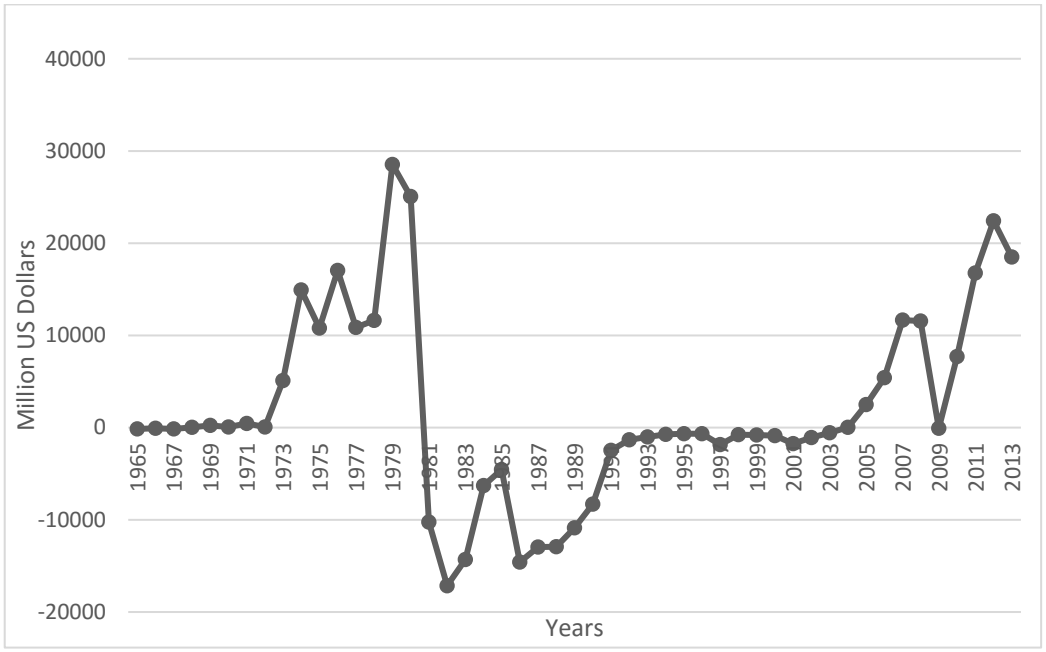
Table 3.1 Total Government Revenue and Expenditure (1965-2013)

(Constant; 2010 / Millions of US Dollars)

Years	Total Government Revenue	Total Government Expenditure	Value of Deficit or Surplus
1965	3720.3	3865.6	-145.3
1966	4062.2	4129.4	-67.2
1967	4449.1	4579.7	-130.6
1968	5591.7	5579.1	12.6
1969	5809.9	5560.2	249.7
1970	7030.8	6980.3	50.5
1971	8925.3	8483.6	441.7
1972	8196.5	8144.4	52.1
1973	17543.9	12443.7	5100.2
1974	33417.6	18492.6	14925
1975	32719.7	21940.1	10779.6
1976	46020.1	28979.1	17041
1977	43105.3	32250.7	10854.6
1978	51520.2	39885.9	11634.3
1979	71989.1	43450.1	28539
1980	82141.2	57096.6	25044.6
1981	42917.8	53158.5	-10240.7
1982	30902.8	48046.7	-17143.9
1983	23651.1	37953.9	-14302.8
1984	25593.7	31868.8	-6275.1
1985	24427.8	28965.3	-4537.5
1986	15454.8	30034.3	-14579.5
1987	17223.8	30192.1	-12968.3
1988	17966.8	30898.1	-12931.3
1989	17524.7	28395.2	-10870.5
1990	14265.7	22571.8	-8306.1
1991	1607.4	4093.9	-2486.5
1992	2076.1	3398.6	-1322.5
1993	2253.6	3258.9	-1005.3
1994	2053.6	2789.2	-735.6
1995	2183.6	2837.6	-654
1996	2439.8	3097.4	-657.6
1997	7517.7	9367.9	-1850.2
1998	8613.4	9379.9	-766.5
1999	18417.6	19223.4	-805.8
2000	27777.3	28665.1	-887.8
2001	22091.6	23826.8	-1735.2
2002	17769.3	18839.7	-1070.4
2003	10055.3	10630.2	-574.9
2004	22168.8	22133.1	35.7
2005	29224.9	26717.1	2507.8
2006	36874.1	31452.7	5421.4
2007	46131.4	34469.4	11662
2008	62204.3	50666.6	11537.7
2009	48826.8	48889.8	-63
2010	59628	51927	7701
2011	85559.3	68813.6	16745.7
2012	97192.7	74782.8	22409.9
2013	91059.1	72560.3	18498.8

Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.

Figure 3.2 The total Value of Deficit or Surplus (1965-2013)
(Constant; 2010 / Million US Dollars)



Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.

However, once economic sanction was removed in 2003, and international oil prices increased, then the oil revenue increased sharply and the budget turned from long term deficit to surplus. It can be seen from table 3.1 that there is a continuous surplus from 2004 to 2013. The highest value of surplus in whole data was about 22409.9 million US dollars in 2012. While, during the global financial crisis (2008-2009) the Iraqi budget faced a very small amount of deficit, which was US$ 63 million. This was due to the short-term declining of oil to below $50 dollars from above $100 dollars. During the second oil boom period (2004-2013), the government held all surpluses in a foreign reserve either in the central bank or in foreign countries. The reserve was partly saved in US dollars ($77 billion) and partly in gold (90 tons) in 2013 (Central Bank of Iraq, 2013).

In overall, dealing with this revenue represents a challenge and difficult for task Iraq's fiscal policy. Therefore, it can be said that the deficit and surplus of government budget is dominated by oil revenue. High oil revenue causes budget

surplus while low oil revenue will cause budget deficit. Since the oil price has seen a dramatic change and more instability than any other commodity, it cannot be predicted easily even in the short- time. This puts more pressure on the government when deciding to set a price of oil when preparing government budget. Eventually any imbalance between expected revenue and expected expenditure could affect the whole structure of economy. In the following sections, both total government revenue and total government expenditure will be broken down and analysed from the last five decades.

3.3.1 Government revenues

Until 1972, the pattern of government revenue is more or less similar to the pattern of government expenditure either in the same year or with one year lags (see table 3.1). A remarkable divergence between revenue pattern and expenditure pattern has occurred since 1973. Continuous surpluses in foreign trade caused from increasing government revenue from oil can be observed since 1973. Unlike developed nations that obtained their most of revenues from numerous taxes on the private sector, most oil exporting, developing countries including Iraq derive the majority of the government's revenues from exporting oil (Brown 1979). Iraqi citizens and even the foreign labour force in the country pay very little, or in some cases, no taxes.

This table shows (Table 3.2) volume and percentage of total government revenue from oil sector and non-oil sector from 1965-2013. It shows that the contribution of oil revenue to total revenue is less than 50% of total government revenue before 1970. However, 1973-80 was a period of dramatic increase in the government revenues from oil. This was as a result of sharp increase in oil

prices and also nationalization of the oil sector in 1972. In 1973, oil prices drastically increased within one year, rising from $4.75 to $9.33 for a barrel. Following the Islamic Revolution in Iran, the price of crude oil reached a highest of $37.82 a barrel by 1980. In addition, a factor like the increasing level of oil production in Iraq is another factor in increasing the contribution of oil revenue to total government revenue. Subsequently, oil revenues increased sharply in Iraq from U. S. $12968 million in 1973 to $74350 million in 1980. Consequently, the highest rate of proportion of oil revenues was during the 1970s and early 1980s with an average of around 80% to 90% of total revenues.

On the other hand, the non-oil revenue[4] also increased during 1970s but its percentage towards total government revenue declined sharply. For instance, the total non-oil revenue significantly increased from $2830 million in 1970 to $3848 million and $11639 million in 1975 and 1981 respectively, but its percentage declined from 41 per cent in 1970 to only 10 per cent in 1980. This is because the rate of oil revenue growth was faster than rate of non-oil revenue growth during the 1970s.

[4] The non-oil revenues in Iraq are divided into five categories: customs duties, corporate and business income taxes, fees and charges for government services and miscellaneous revenues.

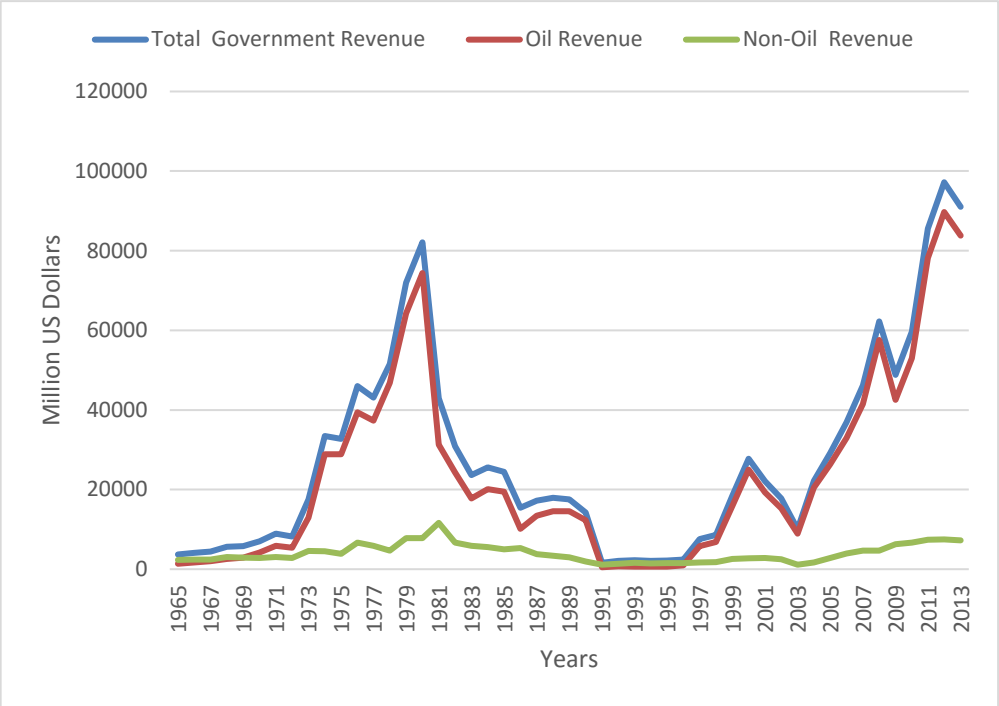
Table 3.2 Total Oil Revenues and Non-Oil Revenue

(Constant; 2010 / Million US Dollars)

Years	Oil Revenue	Non-oil Revenue	Total Revenue	% Oil Revenue to Total Revenue
1965	1389.9	2330.4	3720.3	37
1966	1685.3	2376.9	4062.2	41
1967	2012.3	2436.8	4449.1	45
1968	2570.2	3021.5	5591.7	45
1969	2896.1	2913.8	5809.9	49
1970	4200.5	2830.3	7030.8	59
1971	5833.5	3091.8	8925.3	65
1972	5407.1	2789.4	8196.5	65
1973	12968.9	4575	17543.9	73
1974	28886.2	4531.4	33417.6	86
1975	28871.3	3848.4	32719.7	88
1976	39369.1	6651	46020.1	85
1977	37273.2	5832.1	43105.3	86
1978	46834.5	4685.7	51520.2	90
1979	64227.3	7761.8	71989.1	89
1980	74350.5	7790.7	82141.2	90
1981	31278.6	11639.2	42917.8	72
1982	24252.7	6650.1	30902.8	78
1983	17768.5	5882.6	23651.1	75
1984	20069.9	5523.8	25593.7	78
1985	19448.6	4979.2	24427.8	79
1986	10156.7	5298.1	15454.8	65
1987	13455.3	3768.5	17223.8	78
1988	14588.7	3378.1	17966.8	81
1989	14557.3	2967.4	17524.7	83
1990	12339.8	1925.9	14265.7	86
1991	481.9	1125.5	1607.4	29
1992	749.1	1327	2076.1	36
1993	641.5	1612.1	2253.6	28
1994	619.3	1434.3	2053.6	30
1995	659.7	1523.9	2183.6	30
1996	945.4	1494.4	2439.8	38
1997	5814.2	1703.5	7517.7	77
1998	6836.9	1776.5	8613.4	79
1999	15845.4	2572.2	18417.6	86
2000	25035.8	2741.5	27777.3	90
2001	19315.8	2775.8	22091.6	87
2002	15266.1	2503.2	17769.3	85
2003	8912.6	1142.7	10055.3	88
2004	20492.5	1676.3	22168.8	92
2005	26404.4	2820.5	29224.9	90
2006	32953	3921.1	36874.1	89
2007	41470.5	4660.9	46131.4	89
2008	57569.8	4634.5	62204.3	92
2009	42538.4	6288.4	48826.8	87
2010	52975	6653	59628	88
2011	78168.1	7391.2	85559.3	91
2012	89716.4	7476.3	97192.7	92
2013	83801.2	7257.9	91059.1	92

Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.

Figure 3.3 Total Oil Revenues and Non-Oil Revenue
(Constant; 2010 / Million US Dollars)



Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.

However, the oil's share of the total revenue started to slow down from the beginning of 1980s. Iraq's revenue from oil sharply fell from a peak of $82141 million in 1980 to $42917 million in 1981 and continued to fall in 1983 to only $23651 million**.** This was due to two main factors; the first one was related to the Iraq's conflict with its neighbour Iran, which destroyed most oil pipelines and also Iraq's Gulf port facilities, negatively affecting the level of oil production and exports (Jaffe 2007). Second, factors related to the declining international oil price in 1982 made the situation for Iraqi oil revenue worse. However, the non-oil revenue did not significantly change as a result of development plans that were implemented during high oil revenue periods in the 1970s.

Again in 1986, the oil price sharply declined due to increased production by OPEC members and even non-OPEC members. In 1986, the total oil revenue declined to the lowest level of the 1980s at $10156 million. In the 1990s, the oil

revenue did not stop declining. The total oil revenue was worse than in the 1980s. This happened when economic sanctions were imposed on Iraq in August 1990 by the UN (Wallensteen et al. 2005). Iraq's oil sales fell from a peak of U.S. $14557 million in 1989 (just before the sanction) to only $481 million in 1991. During economic sanctions, government revenue mainly depended on domestic revenue like taxes and domestic production instead of oil exports. However, that small, non-oil revenue was not enough to cover all government expenditure. The government then decided to increase the supply of money by printing local currency so as to fund a budget deficit which in turn led to hyperinflation. The non-oil revenue also declined sharply to $1125 million in 1991, while the percentage of oil revenue of total revenue declined from 75 percent in the 1983 to 28 per cent in 1993. The low contribution of oil revenue to the total government revenue during first half of the 1990s was as result of economic sanction.

However, due to the Oil for Food Program (OFFP), again the Iraqi revenue from oil increased in 1996. According to this program, the UN allowed Iraq to export limited amounts of oil (partially removing sanctions) in return for basic foodstuffs and medication (Katzman 2003). Consequently, the oil revenue increased nine times from $659 million in 1995 to $5814 million in 1997, in the following years the program continued until 2003. However, once the sanctions were entirely removed in 2003, Iraq's oil started to be exported without any restrictions. Iraq's oil revenues increased gradually from $20492 million in 2004 to $42538 million in 2009 and $89716 million in 2012. While oil revenue has increased sharply, its percentage of total revenue has increased to around 90 per cent in 2012. This means that the Iraqi economy is a rentier economy since it depends mainly on

one product to export (oil). Therefore, any shock that takes place in industrial countries may transfer to Iraq's economy.

As the price of oil has been extremely instable over the past four decades, it has resulted in highly volatile revenue. Iraq's dependence on oil for government finances has meant that throughout periods of sudden oil price decline, the Iraqi government has desperately had to decrease the size of the budget or face large budget deficits. Moreover, the government has also been forced to allocate the burden of budget cuts.

3.3.2 Government expenditures

A typical expenditure in government budget is classified into two different types of expenditure: current expenditure and capital expenditure. Table 3.3 shows the growth patterns of the current and capital expenditure in absolute terms from 1965-2013. Despite fluctuations of both types of government expenditure, the two seem correlated to total oil revenue over last four decades.

Since the main source of government revenue is oil, and the price of oil has massively fluctuated during the last four decades, then the forecast of future government expenditure will be a very difficult task. It is very hard to forecast the receipts which come from oil as a result of the fluctuations on this product, either in terms of price fluctuation and production fluctuation. Iraq has faced both production and price fluctuations of oil during the last four decades. The price of oil is determined in the international market by a number of factors, such as speculation, that are mostly short-term. Other factors like OPEC decisions about oil output, non-OPEC oil producers, and economic and political instability and prediction about future world demand for oil influence prices in the longer term.

On the other hand, the prediction of non-oil revenues such as tax is comparatively easier than the forecast of oil revenues because of the small size of the non-oil revenues and crucially the fact that the non-oil revenues are not subject to the same instability oil revenues are.

Based on the above analysis, the prediction of government expenditure would be extremely a difficult task. However, oil exporting developing countries including Iraq have set a price and amount of production in order to determine total predicted revenue and then the total expenditure. Nevertheless, it can be argued that the oil price might be above or below the price set (expected oil price). For instance, Iraq estimated its oil price at around $23 to $26 per barrel (p/b), in the budget year for 1980, but the average price oil was around $37 p/b. However, difficulties can be overcome since the duration of the budget is a short-term process. For instance, in the budget year of 2008, the oil price was estimated at $60 p/b - the actual price of oil p/b, but in the last quarter of the year the oil price declined reached $45 p/b. This led to a big problem (big deficit) for the 2008 budget and even for 2009.

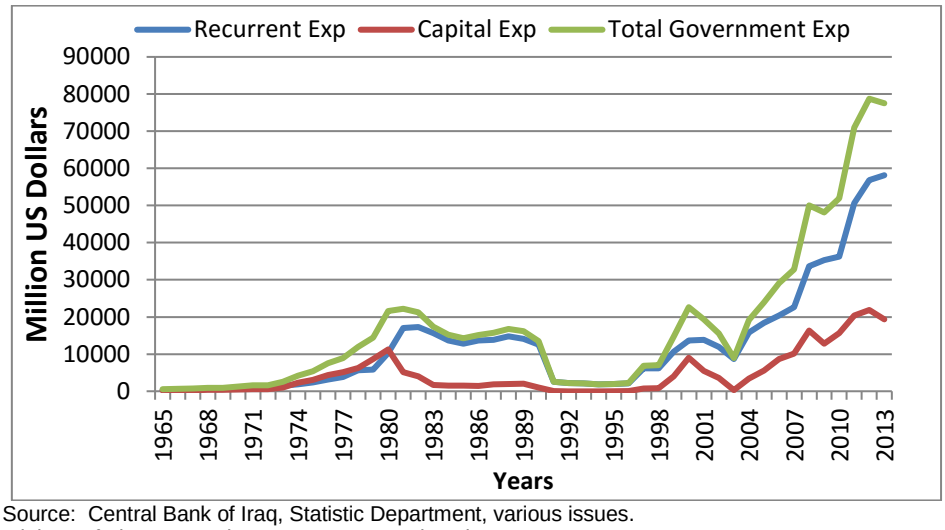
In this section, aggregate trend in government expenditure and the evolution of the composition of government spending over the period 1965–2014 is reviewed an analysed. The Ministry of Finance divides the annual fiscal budget into two main categories: recurrent (operating) expenditure and capital (investment) expenditure. The first chapter (recurrent expenditure) contains the financial provisions for administrative expenditure, wages, salaries, allowances, food subsidies and other purchases and services. Meanwhile, capital expenditure implies all development expenditures related to the capital goods spending within government projects and gross fixed capital formation.

Table 3.3 Components of the Budget Expenditures and its Percentage (1965-2013 - Constant; 2010/ Million US Dollars)

Year	Recurrent	% to Total Expenditure	Capital	% to Total Expenditure	Total Exp.
1965	2454.9	63	1410.7	37	3865.6
1966	2544.7	61	1584.7	39	4129.4
1967	2841.9	62	1737.8	38	4579.7
1968	3353.7	60	2225.4	40	5579.1
1969	3151.7	56	2408.5	44	5560.2
1970	4279.1	62	2701.2	38	6980.3
1971	5289.4	62	3194.2	38	8483.6
1972	5135.8	63	3008.6	37	8144.4
1973	7392.6	59	5051.1	41	12443.7
1974	8395.3	45	10097.3	55	18492.6
1975	9503.5	44	12436.6	56	21940.1
1976	12129.5	41	16849.6	59	28979.1
1977	13855.1	42	18395.6	58	32250.7
1978	18880.1	47	21005.8	53	39885.9
1979	17485.3	41	25964.8	59	43450.1
1980	27219.8	47	29876.8	53	57096.6
1981	40761.2	76	12397.3	24	53158.5
1982	39037.5	82	9009.2	18	48046.7
1983	34332.7	90	3621.2	10	37953.9
1984	28622.1	89	3246.7	11	31868.8
1985	25929.5	89	3035.8	11	28965.3
1986	27225.1	90	2809.2	10	30034.3
1987	26611.5	88	3580.6	12	30192.1
1988	27282.2	88	3615.9	12	30898.1
1989	24849.1	87	3546.1	13	28395.2
1990	20943.1	92	1628.7	8	22571.8
1991	4057.1	99	36.8	1	4093.9
1992	3389.3	99	9.3	1	3398.6
1993	3251.3	99	7.6	1	3258.9
1994	2783.3	99	5.9	1	2789.2
1995	2833.3	99	4.3	1	2837.6
1996	2991.7	97	105.7	3	3097.4
1997	8336.8	88	1031.1	12	9367.9
1998	8309.7	88	1070.2	12	9379.9
1999	13938.7	72	5284.7	28	19223.4
2000	17264.6	60	11400.5	40	28665.1
2001	17073.3	71	6753.5	29	23826.8
2002	14463.4	76	4376.3	24	18839.7
2003	10234.3	97	395.9	3	10630.2
2004	18232.3	83	3900.8	17	22133.1
2005	20521.3	76	6195.8	24	26717.1
2006	22048.6	70	9404.1	30	31452.7
2007	23811.8	69	10657.6	31	34469.4
2008	34111.5	67	16555.1	33	50666.6
2009	35845.2	73	13044.6	27	48889.8
2010	36246	69	15681	31	51927
2011	49087.3	71	19726.3	29	68813.6
2012	54006.2	72	20776.6	28	74782.8
2013	54423.7	75	18136.6	25	72560.3

Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.

Figure 3.4 Components of the Budget Expenditures (1965-2013) (Constant; 2010 / Million US Dollars)



Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.

Development expenditure contains infrastructure subsidies for economic sectors such as agriculture and manufacturing. Unlike capital expenditure, the current expenditure particularly salaries and wages, is not particularly subject to any reduction, even during austerity periods due to political reasons.

It is noted that during period of 1965 to 1972, the total government expenditure had low fluctuations in terms of growth rate and value. The total amount spent by the government was between 3865 and 8144 million US dollars. This was as a result of the shortage of income sources to finance the budget. The reason behind the shortage was related to the profit-sharing formula (fifty-fifty) with oil monopolies being applied and because the oil price was relatively low compared to later years (Brown 1979).

However, in 1973 when total government spending sharply increased, the government expenditure increased from 12443 million US dollars in 1973 to its highest level which was about 57097 million US dollars in 1980. The reasonable factor behind the increased government expenditure was related to increased oil

prices and also nationalization of the oil sector in 1972 which increased oil production during that time. On the other hand, during 1981-2003, the table 3.3 showed that total government expenditure has gradually declined - a slump period. This is because of the declining oil price between 1982 and 1986, in addition to declining oil production due to the Iraq-Iran war during 1980-1988 (Nordhaus 2002). Apart from that, during 1990s economic sanctions were imposed on Iraq by UN, and the UN embargo disrupted oil sales. The government was denied its main source of revenue.

Although the 1980s is considered as a slump period due to low oil prices and production, it is noticed that the total government expenditure was not severely affected; since Iraq's foreign reserve had been saved during the 1970s (first booming period). This reserve was used to fund Iraq's deficit during the 1980s.

However, it can be seen from the table that during economic sanctions of the 1990s, government expenditure declined sharply. For instance, government expenditure fell from $ 37953 million in 1983 to the lowest level which was about $2837 million in 1995. Since oil is Iraq's main export and also makes up more than 90% of total government revenue it is not surprising to see a sharp decline in government revenue during economic sanctions when the UN imposed an embargo on the Iraqi economy in the 1990s (oil was banned for export). Therefore, the real government revenue declined more than 10 times in the first half of the 1990s compare with the 1980s. However, after the oil for food program in 1996-1997, we can see that government expenditure started to increase gradually. Then once the economic sanctions were lifted and the oil price increased after 2004, the total government expenditure increased sharply to its highest level of 74782 million US dollars in 2012. Within 17 years (1995 to 2012)

it increased 50 times. This government spending was proportionally distributed between recurrent and capital expenditures. It is demonstrated from table (3.3), that the share of capital expenditure to total expenditure is lower than current expenditure in almost all years.

However, it is noticed that in some years of the 1970s, the proportion of capital expenditure exceeded 50 per cent of total expenditure. For instance, from 1974 to 1980, the capital expenditure ranged between 54 and 59 per cent of total expenditure**.** Meanwhile since 1981, the capital expenditure has made up less than 25 per cent of total expenditure. During economic sanctions, the capital expenditure recorded its smallest level in the last five decades, which was only 1 per cent of total government expenditure. This is the most inefficient expenditure that is common in almost all developing nations particularly oil exporting developing countries including Iraq.

In general, a sudden increase in government expenditure created bottlenecks regarding the low absorptive capacity of the economy which accompanied incompletion of infrastructure. Therefore, the inflation rate rose sharply and created a general macroeconomic problem. The problem was that capital expenditure was not only related to the low percentage of total expenditure, but also, Iraq's public investment was suffering from inefficiency and lack of effectiveness. In general, the government budget can be concluded as follows:

1) The majority of government revenues are received from exporting oil. Revenues from other economic sectors are fairly small in spite of all the efforts and policy that has been adopted by the government in order to diversify sources of government revenue.

2) Depending on a single exporting commodity (oil) as a main source of revenue makes it challenging to conduct fiscal policy with a medium-term orientation due to fluctuations in the international market. As we have seen, the oil export revenues are highly vulnerable to volatile international oil prices. Iraq has been subject to major fluctuations in its oil revenues. This outcome can lead to caution in domestic and foreign private investment with regard to uncertainty and risks in the business environment. The best example can be shown from the above table when the oil price declined and the government faced a severe deficit (see table 3.3 during 1980s and 1990s).

3) The heavy dependence on oil has two important implications for fiscal policy and institutions: first, a fluctuation in the oil price and subsequently oil revenues reflects directly on the scope of the government spending. Second, the authority faces little or no incentive to construct strong budgetary and transparency. Top-down fiscal policy and public scrutiny of expenditure and accountability is weak. In fact, the latter one is a main challenge of fiscal policy in Iraq.

It is shown in Table 3.3 that when the budget runs at a surplus (boom period), the capital expenditure takes a larger share than when the budget runs at a deficit (slump period). In contrast, during a budgetary deficit (slump period), the current expenditure share increases at the expense of capital expenditure. This is attributed to the fact that current expenditure contains government salaries and wages, which cannot easily be reduced. The decline in capital expenditure is mostly associated with a gradual reduction of subsidies, which are not a main component of recurrent expenditure. It is important to mention that the deficit has

generally been resolved by printing money instead of increasing taxes. This in-turn led to reduced current expenditure in real terms.

The above analysis has only illustrated the total government revenue and expenditure, which has not completed the whole picture of Iraq's economy. Thus, in order to fully understand Iraq's economy, it is important to analyse the contribution of different economic sectors to real GDP. In the next section, this issue will be analysed in more detail.

3.4 The contribution the oil and non-oil sectors to GDP

Iraq appears to be one of the least diversified oil-producing economies in the world. The contribution of the natural resource sector has been constantly increasingly during last four decades. However, with gaining high oil revenue, the Iraqi government has implemented some development plans, which has stressed the objective of building a viable economy by growing the contribution of the non-oil sector, particularly increasing manufacturing sector. Despite, the objective and strategies of development plans that are set to develop and improve the industrialisation of the country, the share of oil production to GDP is still relatively high compared with other sectors. However, it is noted that the contribution of the non-tradable sector (services and construction sectors), to gross domestic product has experienced a considerable increase, particularly during periods of high oil revenue, meaning that the oil boom was followed by an enlargement in the non-tradable sector. While it is noted from the table that the share of the tradable sector (manufacturing and agriculture) to GDP fell during high oil revenue.

The contribution of the oil sector and non-oil sector in the real GDP has been shown in the Table 3.4. During the first oil boom period of the 1970s, the contribution of the oil sector to real GDP gradually increased. In 1972 the oil sector contributed 37 percent of real GDP. By 1979 the oil sector contributions had increased gradually and reached its highest level of 44 per cent for that period. While the value of oil contributions increased three times from $2993 million in 1972 to $7878 million in 1979, increasing oil prices was the main factor. However, by 1982 the value of oil sector fell to only $5002 million, while the total value of the non-oil sector reached its highest level since 1970 at $17488 million. These changes in the value of both oil and non-oil sectors impacted on their contribution to real GDP. The contribution of the oil sector decreased to 22.7 per cent, while non-oil contributions increased to nearly 78 per cent. The declining oil value was attributed to the oil price decline of 1982 and the output reduction due to Iraq-Iran war of the 1980s. The sharp increase in the value of non-oil sector was attributed to the development plan implemented during the 1970s via establishing public manufacturing and supporting the domestic agriculture sector. More importantly the service sector has grown during high oil revenues, which significantly affects the total value of the non-oil sector.

On the other hand, the situation during the economic sanctions of the 1990s was different, since both the oil value and non-oil value declined sharply. However, the oil value has been more severely affected than non-oil sector. In 1991, the oil sector recorded the lowest oil value since 1973 which was 3289 million US dollars, its contribution declining to 26 per cent. Meanwhile, the value of the non-oil sector has fallen but at a lower rate than the oil sector.

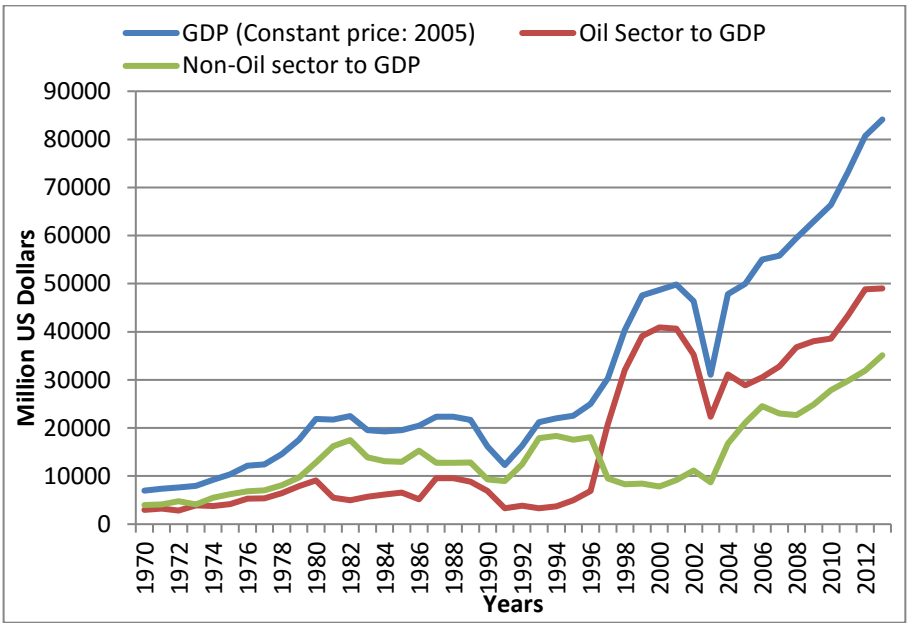
Table 3.4 Oil and non-Oil Contribution to Real GDP

(Constant 2005 price / Million US Dollars)

Years	Real GDP	Oil Sector	%	Non-Oil sector	%
1970	6971	2993.2	42.93	3977.8	57.07
1971	7345	3244.6	44.17	4100.4	55.83
1972	7620	2829.4	37.13	4790.6	62.87
1973	7957	3876.7	48.72	4080.3	51.28
1974	9239	3743.9	40.52	5495.1	59.48
1975	10393	4167.4	40.09	6225.6	59.91
1976	12178	5329.1	43.76	6848.9	56.24
1977	12410	5398.9	43.50	7011.1	56.50
1978	14526	6447.1	44.38	8078.9	55.62
1979	17558	7878.2	44.86	9679.8	55.14
1980	21904	9087.1	41.48	12816.9	58.52
1981	21744	5533.1	25.44	16210.9	74.56
1982	22491	5002.3	22.24	17488.7	77.76
1983	19551	5681.9	29.06	13869.1	70.94
1984	19260	6164.5	32.00	13095.5	68.00
1985	19540	6576.5	33.65	12963.5	66.35
1986	20449	5193.9	25.39	15255.1	74.61
1987	22351	9579.4	42.85	12771.6	57.15
1988	22347	9589.2	42.91	12757.8	57.09
1989	21650	8838.1	40.82	12811.9	59.18
1990	16168	6900.5	42.67	9267.5	57.33
1991	12284	3289.4	26.77	8994.6	73.23
1992	16288	3866.6	23.73	12421.4	76.27
1993	21222	3317.2	15.63	17904.8	84.37
1994	22039	3684.8	16.71	18354.2	83.29
1995	22507	4979.3	22.12	17527.7	77.88
1996	24987	6887.5	27.56	18099.5	72.44
1997	30294	20776.3	68.58	9517.7	31.42
1998	40354	32049.7	79.42	8304.3	20.58
1999	47537	39099.7	82.25	8437.3	17.75
2000	48713	40911.4	83.98	7801.6	16.02
2001	49806	40611.6	81.53	9194.4	18.47
2002	46397	35237	75.94	11160	24.06
2003	31039	22311.4	71.88	8727.6	28.12
2004	47849	31099.8	64.99	16749.2	35.01
2005	49955	28892.1	57.83	21062.9	42.17
2006	55029	30521.2	55.46	24507.8	44.54
2007	55787	32799.4	58.79	22987.6	41.21
2008	59474	36800	61.87	22674	38.13
2009	62930	38029.2	60.43	24900.8	39.57
2010	66415	38565.7	58.06	27849.3	41.94
2011	73198	43390.7	59.27	29807.3	40.73
2012	80731	48824.1	60.47	31906.9	39.53
2013	84132	49011.2	58.25	35120.8	41.75

Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues

Figure 3.5 Component of Oil and non-Oil Sector to Real GDP (Constant 2005 price/Million US Dollars)



Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues

The structural change in the economy is reflected in the declining importance of oil due to economic sanctions and the growth in non-oil sectors of the economy, particularly the agriculture sector. Despite that, the output of non-oil sector declined as well during the economic sanctions, compared with previous decades. However, after 1996 the situation turned in favour of oil sector, when the oil for food program was introduced by UN. Under this program, the Iraqi government was allowed to export a limited amount of oil, which in turn led to oil value increasing 8 times within 5 years, from $4979.3 million in 1995 to $40911.4 million in 2000. Also the contribution of the oil sector to GDP sharply increased from 22 per cent in 1995 to about 83 per cent in 2000.

On the contrary, the value of the non-oil sector declined to $7801 million in 2000 from $17527 million in 1995. This tells us that political factor has a significant impact on changing the economic structure since the partial lifting of sanctions in 1996-97 was the main factor that positively affected the oil sector's total output. It also led to the shrink of the non-oil sector.

On the other hand, after removing economic sanctions entirely in 2003 and increasing oil prices and production over time, the value of output of oil has sharply increased to $49011 million in 2013. However, its contribution to GDP decreased to 58%; while, the contribution of the non-oil sector to GDP increased to 42 per cent. This was mostly related to the increased output of the service sector during the second oil boom period (2003-2013).

In general, it can be said that the value and contribution of oil sectors during the last four decades has significantly fluctuated, due to fluctuating oil prices and oil production. It is seen that GDP mainly depends on the oil sector, particularly during recent years. The non-oil GDP also fluctuated during the last four decades, due to some economic and political factors. The non-oil sector is divided into three different economic sectors such as manufacturing, agriculture and the service sector. Therefore, Table 3.5 illustrates the picture of the non-oil sector in Iraqi and shows how the non-oil sectors are affected by variables, particularly fluctuating oil revenue.

Table 3.5 illustrates and summarises the values and percentages of the manufacturing, agriculture and service sectors measured in constant prices based on figures for 2005. These sectors represent the major non-oil sectors of the economy. It can be seen from the table that the manufacturing sector has stayed as a low percentage of GDP over last four decades, while others (agriculture and service sectors) vary to different degrees.

Table 3.5 Value added and Percentages of contribution Manufacturing, Agricultural and Service plus construction Sectors to Real GDP (1970-2013) (Constant; 2005 / Million US dollars)

Year	GDP, million. US$	Manufacturing value added	%	Agriculture value added	%	Service and construction value added	%
1970	6971	46.5	0.66	1073	15.39	2101.7	30.14
1971	7345	54.2	0.73	1116	15.19	2183.7	29.73
1972	7620	58.7	0.77	1345	17.65	2291.2	30.06
1973	7957	63.5	0.79	1025	12.88	2440.3	30.66
1974	9239	66.5	0.71	1221	13.21	3246.6	35.14
1975	10393	80.8	0.77	1049	10.09	4203.4	40.44
1976	12178	99.8	0.81	1287	10.56	4558.9	37.43
1977	12410	111.5	0.89	1255	10.11	4756.4	38.32
1978	14526	122.6	0.84	1270	8.74	5810.8	40.00
1979	17558	143.9	0.81	1252	7.13	7428.2	42.30
1980	21904	1458.3	6.65	1245	5.68	9231.8	42.14
1981	21744	1543.7	7.09	1269	5.83	12239.3	56.28
1982	22491	1462.6	6.50	1407	6.25	12642.5	56.21
1983	19551	1576.5	8.06	1353	6.92	10229.6	52.32
1984	19260	1558.2	8.09	1501	7.79	9458.6	49.11
1985	19540	1739.6	8.90	1737	8.88	9052.9	46.33
1986	20449	1720.9	8.41	1663	8.13	9533.6	46.62
1987	22351	2146.6	9.60	1504	6.72	9031.7	40.40
1988	22347	1622.3	7.25	1541	6.89	9145.2	40.92
1989	21650	1738.7	8.03	1701	7.85	9201.9	42.50
1990	16168	976.1	6.03	1297	8.02	6698.7	41.43
1991	12284	371.5	3.02	1966	16.00	4057.7	33.03
1992	16288	379.5	2.32	1645	10.09	5367.4	32.95
1993	21222	913.1	4.30	2022	9.52	9506.1	44.79
1994	22039	949.8	4.30	2166	9.82	9101.5	41.29
1995	22507	1105.3	4.91	2425	10.77	8270.7	36.74
1996	24987	1153.9	4.61	2605	10.42	9441.1	37.78
1997	30294	1079.1	3.56	1394	4.60	7019.4	23.17
1998	40854	895.4	2.19	981	2.40	6016.1	14.72
1999	48037	862.8	1.79	915	1.90	6514.2	13.56
2000	48713	706.3	1.44	908	1.86	6061.3	12.44
2001	49836	717.5	1.43	909	1.82	7359.6	14.76
2002	46397	1000.9	2.15	974	2.09	8829.7	19.03
2003	31039	808.3	2.60	1010	3.25	6446.8	20.77
2004	47849	606.9	1.26	1619	3.38	13221.4	27.63
2005	49955	659.6	1.32	2040	4.08	16962.8	33.95
2006	55029	728.9	1.32	3508	6.37	19808.7	35.99
2007	55787	704.4	1.26	2194	3.93	20006.3	35.86
2008	59474	505.4	0.84	2002	3.36	20087.3	33.77
2009	62930	695.4	1.10	1528	2.42	22442.9	35.66
2010	66415	864.4	1.30	1353	2.03	24926.1	37.53
2011	73198	1014.6	1.38	1745	2.38	26640.1	36.39
2012	80731	1186.8	1.47	1788	2.21	28205.8	34.93
2013	84132	1340.1	1.59	2243	2.66	31291.5	37.19

Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues.
%: indicate the percentage of contribution of each sector to real GDP.

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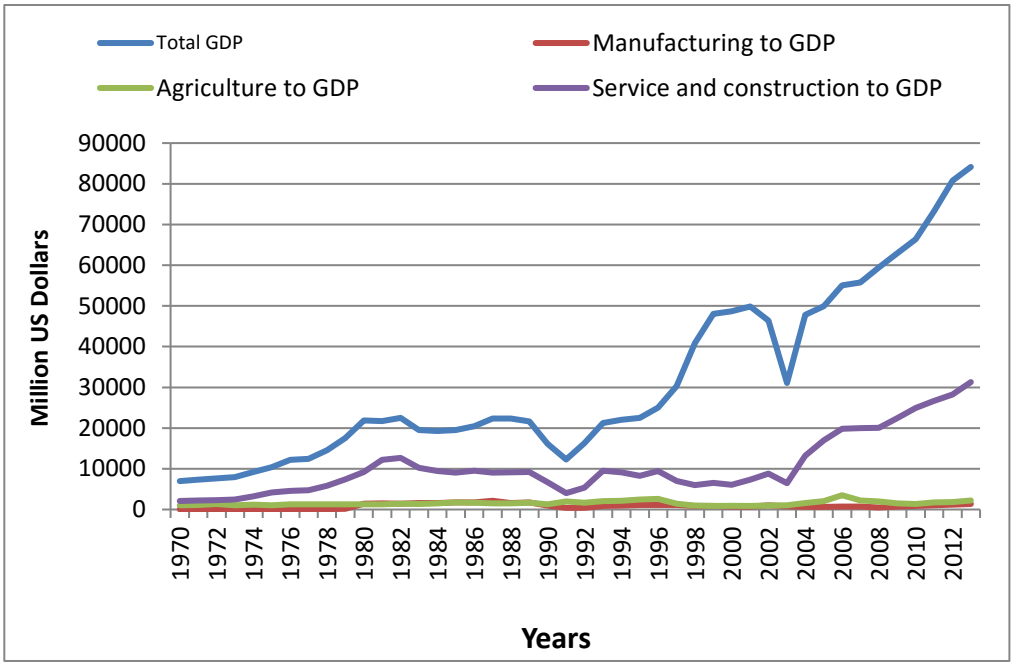
Figure 3.6 Value added of Manufacturing, Agricultural and Service plus Construction Sectors to Real GDP (1970-2013)
(Constant; 2005 / Million US dollars)



Source: Central Bank of Iraq, Statistic Department, various issues.
Ministry of Finance, Budget Department, various issues

During last four decades, the massive inflow of oil revenue has been used to encourage non-oil sectors, particularly agricultural and manufacturing sectors via implementing development plan. However, as the economic data shows in table 3.5, little has been achieved in this regard and the oil sector's contribution to GDP is still in high. Despite that, it is important to mention that converting oil wealth into the domestic economy has made a significant grow of non-tradable goods. In the next sub-section, some of main non-oil sector sectors will be analysed in detail. These are: agriculture, manufacturing and the service sectors.

3.4.1 Service and construction sector

The oil sector became more important to the Iraqi economy in terms of revenue and its contribution to GDP from the beginning of 1970s. Interestingly, from the same period, the share of services has significantly increased as well, indicating

a very rapid rate of growth of these sectors (service and construction sectors) as a result of the oil revolution in 1973. The service and construction sectors then became the second most important economic activity as a result of the growing oil sector. There was a continuous steady increase of output service and construction sectors and its percentage to GDP in 1970-82 was in line with the increase of the total output of non-oil sectors in total GDP. It is noted from the Table 3.5 that the share of services to GDP started to increase with the increasing oil price in the 1970s. The value-added service and construction sectors increased six times within ten years, from $2101 million in 1970 (30% of total GDP) to about $12642 million in 1982 (56% of total GDP). The increasing volume and percentage of the service sector to real GDP is attributed to higher international oil prices during the 1970s, since oil is the main export for Iraq's economy. Also, government revenue depends mainly on oil revenue; therefore, this triggered an increase in government expenditure during the 1970s which in turn led to a developed service sector via spending effect.

On the other hand, although between 1983 and 1990 the volume and contribution of the service and construction sectors declined compared to the 1970s, its contribution to GDP was relatively more stable in terms of added value. Also, its contribution to GDP was around 40 percent during 1983-1990. The reason behind the declining contribution to GDP is attributed to a sharp fall in government expenditure due to the declining oil price and also its level of export in the 1980s. Apart from this, the Iraqi-Iran war was another factor that affected the growing service sector during the 1980s.

Data from the first half of the 1990s is entirely different compared to earlier decades. Since the Iraqi economy was imposed with economic sanctions

(banned oil to export) by the UN and with government expenditure depending mainly on oil revenue, the oil revenue is almost close to zero. Therefore, Iraq's government became wholly dependent on domestic revenue, which previously made up a small proportion of total government revenue. Apart from that, the government tried to fund the deficit by printing Iraqi Dinars. This led to a sharp devaluation of the domestic currency. Therefore, it can be said that via declining government expenditure in real terms and devaluation of the domestic currency, Iraq's real per capita income declined sharply, which in turn brought about falling demand on the service sector. Consequently, the service sector became the least profitable sector and eventually its volume declined 50 per cent from $9201 million in 1989 (just before economic sanctions) to $4057 million in 1991. However, its percentage of GDP increased due to the declining oil sector.

Conversely, the situation in the second half of the 1990s has changed in favour of the service sector as a result of the partial lifting of economic sanction partially via the oil for food program (OFFP). Although, removing economic sanctions partially triggered an expected increase in the total output of the service and construction sectors, their percentage to GDP fell-ranging from 37 per cent to 12 per cent between 1996 and 2003. This is due to the increase in contribution of the oil sector to GDP being faster than the increase in contribution of the service sector to GDP.

From 2004 however, the situation adjusted in favour of the service and construction sectors. Output increased four times from $6446 million in 2003 to $31291 million in 2013. Also, its percentage of GDP has also increased to 37 per cent in 2013 from 20 per cent just before lifting of sanctions in 2003. The reason behind the sharp increase in the output of service sector was strongly related to

the increased oil revenue. Because the international oil price has gradually increased since 2004 and the UN sanctions on Iraqi oil were removed in 2003, there was an increase in government revenue. Subsequently, government expenditure has also increased sharply, which in turn positively affected the total demand on the service sector. Then, the service sector became the most profitable among the non-oil economic sectors, and then the output of service sector increased.

The growth rate of the output service and construction sectors can be summarised by considering the contribution of this sector in the total real GDP. During the first boom period (1970-1980) and second boom period (2004-2013), it is noted that the output of the service sector has increased sharply due to high oil revenue. Meanwhile, during low oil revenue (1981-2003) we notice that the contribution of the service sector to GDP was relatively low. In conclusion, the Iraqi service sector depends mainly on oil. In the next sub-section, the other non-oil sectors will be investigated.

3.4.2 The agriculture sector

The importance of the agriculture sector for any country comes not only from its share to the national income so as to exceed the growth rate of the population. The encouragement of the agriculture sector to have a high growth rate is related to its contribution to real GDP. Diversifications of the economy then reduce dependence on one export product as a main source of national income. Moreover, the agriculture sector encourages economic growth and also employment in other economic sectors through its backward and forward linkages.

In the case of Iraq, the agriculture sector was a largely agrarian economy before the discovery of oil. Unfortunately, the rapid growth in the volume and value of oil exports in the beginning of 1970s coincided with a sudden decline in the contribution of the agriculture sector to the real GDP. As shown in Table 3.5, the output of the agriculture sector was slowing down and its contribution to real GDP decreased gradually. The decline took a dramatic turn following the oil revolution of 1973. From the beginning of 1970s, the oil sector had effectively underwritten dramatic economic growth in other sectors of the economy. While this economic growth was taking-place, a once dominant agricultural sector was sinking to an insignificant position, providing **a** lower percentage to GDP in 1981.

However, it is argued that there cannot be a clear contrast between the negative linkage of oil with the agriculture sector and its positive linkage with the service sector. Neither can there be any doubt about the chain of causation. Moreover, the decrease in the contribution of the agriculture sector was not only a relative one. In the sense that the decline of the share of agriculture was essentially attributable to the rapid growth of oil sector during 1970s from 1973 of the oil sector as a contributor to GDP; in absolute terms, the output of the agriculture sector has increased. Interestingly from 1973 inwards, the contribution of the service sector has significantly increased due to the increased international price of oil.

On the contrary, the contribution of agriculture has been rapidly declining between 1973 and 1980 (high oil revenue). The contribution of the agriculture sector to real GDP declined sharply from 12 percent in 1970 to 5 per cent in 1980. Conversely, its output increased from 1025 million US dollars in 1973 to 1245 million US dollars in 1980. The decline in the contribution of agriculture

sector was essentially attributable to the very rapid growth of oil in 1973 as a contributor to GDP. On the other hand, increasing the output of the agriculture sector was related to massive government subsidising of this sector during the 1970s.

Moreover, the role of real exchange rate cannot be ignored. When the oil price has increased (increase oil revenue), the real exchange rate has appreciated due to increasing real government expenditure, particularly current expenditure (see Table 3.3). This led to a loss of competitiveness for domestic products against foreign products and discouraged domestic producers from increasing their production, particularly for agricultural products (see Table 3.5). This led to people migrated from the agriculture sector in rural areas to the service sector in urban areas because the service sector was more profitable sector due to the spending effect (Corden, 1984). Therefore, the increased oil price and slowing down growth of the agricultural sector led to a decline in the percentage of the agriculture sector to real GDP.

On the other hand, during slump periods of the oil sector (1981-2003), the contribution of the agriculture sector to GDP increased significantly, particularly during economic sanctions (1990-2003). During the 1980s, the output of agriculture sector grew. Although it fluctuated, the highest output was $1701 million which was greater than the 1970s. However, its percentage to real GDP did not exceed nine per cent, in spite of the decline of the contribution of oil to GDP. This was due to the increased percentage of the service sector to GDP. The growth rate of the service sector was faster than the growth rate of the agriculture and oil sectors during the 1980s. This is because in Iraq and most oil

exporting developing countries, investors give priority to the service sector because it is the most profitable sector, particularly during high oil revenues.

Conversely, during economic sanctions (1990-2003) almost all economic sectors reduced their total output, with the exception of agriculture. Since the shortage of foreign exchange created a rapid relative increase in the price of food, and since food demand has been maintained even with the declined real income per capita, then the agriculture sector became a highly profitable sector. Apart from that, the sharp depreciation of the nominal and real exchange rate during the 1990s was the main factor leading to agriculture's increased output and its percentage contribution to real GDP (Schnepf 2003). Although food imports were not prohibited by economic sanctions, the nominal and real exchange rate depreciated sharply leading to an increased price for imported products. In the absence of food imports which the country had become reliant on, there was growing pressure for Iraq's producers to increase domestic agricultural production. This led to the agriculture sector becoming a more profitable sector during low oil revenue periods.

However, this is not the only factor that affects the share of the agriculture sector to GDP. The declining share of the oil sector to GDP is another factor that affects the increased contribution of the agriculture sector to real GDP during economic sanctions. Therefore, the output of the agriculture sector increased and oil production declined due to economic sanctions during the 1990s. Then the contribution of the agriculture sector to real GDP increased sharply and the highest level of contribution to real GDP occurred in 1993 at 18 percent, when the contribution of the oil sector to GDP was at its lowest level.

In 1996-97, however the situation changed in favour of the oil sector when the Oil for Food Program introduced by UN removed the embargo partially. The output of the agricultural sector fell to about 915 million US dollars in 1999, and its contribution to real GDP declined to the lowest level of 1.9 percent in 1999. The shrinking agriculture sector in the second half of 1990s was due to the appreciation nominal and real exchange rate. In other words, whenever there were signs that the sanctions might be relaxed, the Iraqi Dinar appreciated. Increased oil revenues would reduce the government's need to print money. This, combined with the relative increase of the supply of foreign currencies in the domestic economy, triggered an appreciation of the exchange rate.

On the other hand, during the second boom period (2004-2013) after removing sanctions, Iraq's oil was exported again without restrictions, the price of oil increased gradually (except 2008-2009) and the output and contribution of agriculture sector has gradually improved due to government subsidies. The output value of the agriculture sector increased to $3508 million. However, due to the government ignoring this sector, its contribution to real GDP declined sharply to 2.3 percent in 2010. The main reason was related to the increased high oil revenues. Although there are some other factors that made the fall in the output of the agriculture sector, the appreciation of the real exchange rate made the price of imported agriculture goods chapter than domestic one.

It is found from above analyses that the increased contribution of the agriculture sector to GDP is associated with a decline of the oil price and vice versa. Meanwhile the growth rate of the output of the agriculture sector depends on some macroeconomic adjustments such as real exchange rate, fiscal policy and government policy.

3.4.3 The Manufacture Sector

The manufacturing sector in Iraq makes one of the smallest contributions to total GDP compared with other economic sectors, as shown in Table 3.5. Although since the 1970s, the manufacturing sector has grown in nominal terms, the sector is still below the declining agricultural sector in its share of real GDP. Nonetheless, the real rate of growth is still positive on average. However, there were some years of negative rate of growth, particularly during economic sanctions.

During the first boom period (1970s), the contribution of the manufacturing sector to real GDP was relatively low. Although it grew gradually during the 1970s due to government subsidies, it still contributed little to GDP - ranging from 0.66 per cent in 1970 to 0.89 per cent in 1979. However, its total output increased three times, from only $46 million in 1970 to about $143 million in 1979. Low contribution of the manufacturing sector to GDP in the 1970s is related to the rapidly increasing oil price in 1973 and 1979 which meant the growth rate of in the volume and value of oil exports was higher than the growth rate of manufacturing sector, which in turn led to lower growth of manufacturing contribution to GDP. It is noted that the decline in the volume and value of oil exports in the beginning of 1980s coincided with a sudden growth in the contribution of the manufacturing sector to real GDP. It increased ten times compared to 1979, while, the value of manufacturing increased only three times. This was related to decline the oil production and export, which in general led to the fall in the share of the oil sector to real GDP thereby increasing the contribution manufacturing sector to GDP.

It is argued that the depreciation of the real and nominal exchange rates which occurred during the 1980s is the main factor that encouraged the manufacturing sector, since the real exchange rate depreciated due to declining real government expenditure and oil revenue. Apart from that, the developed manufacturing sector during 1980s was also influenced by the development plan which was implemented during the 1970s and the government built up state manufacturing via introducing sizeable direct and indirect subsidies. Therefore, the highest level of its output reached to $2146 million in 1987 and its percentage to GDP was 9.6% which was the heights level in the whole data.

However, the decline in oil revenues in the 1990s has adversely influenced the provision of loans, decreasing subsides to the manufacturing sector, which lowered the output of the manufacturing sector. During economic sanctions (1990-2003), the output of the manufacturing sector was affected severely, as were other economic sectors since Iraq's government cut all subsides. Despite this, the contribution of the manufacturing sector to real GDP was still high at three percent of real GDP in 1991. However, its value of output declined to $371 million.

On the other hand, after 1997 the contribution and also the level of output of the manufacturing sector were decreasing because Iraq's government started to export limited amounts of oil under the oil for food program. Even after removing of sanctions in 2004, the total manufacturing gross output and its contribution to real GDP declined until it reached its lowest level in 2008 (0.84 per cent to total real GDP). The reasons behind that are related to the investors. Most investors (domestic and foreign) did not get involved in the manufacturing sector. This is firstly because increased oil revenue, particularly after 2004 led to appreciation

of the real exchange rate making domestic manufacturing more expensive than imported products. Secondly, alternative profitable investments associated with high returns, short-term investment and low-risks were more attractive. The most obvious examples of these investments were real estate, house building, trading, and the services sectors. During high oil revenue periods, most government expenditure goes to these sectors, making them more profitable at the expense of the manufacturing sector.

The above analysis demonstrates that the manufacturing sector did not grow much relative other economic sectors, particularly during periods of high oil revenue. In spite of this, the value of output has increased faster for the short periods of time compared to other economic sectors, but overall, the manufacturing sector has experienced very low growth despite government intervention in this sector. It is argued that the government intervention in the form of injection of funds was greater in this sector compared to other economic sectors. This was because the government tried to diversify its economic, away from the natural resource sector, since it is known that any economy that depends on one product to export will be more vulnerable than a highly-diversified economy. Therefore, the decline in output and its relative contribution to GDP in real terms indicates elements of a Dutch Disease. Also, without government subsidies, this sector may have declined overall. As long as the role of oil sector in Iraqi economy is significant in terms of its contribution to GDP and also to government revenue. Thus, the next section will be about the oil sector; including the brief history of oil discovery in Iraq, production and name of fields and their level of output.

3.5 The Oil Sector

The oil sector has an important role in the structure of Iraq's economy. As shown in previous sections its share and impact on the GDP, the foreign sector (export and import) and government expenditures and revenues is crucial. Thus, in this section, the impact of the oil sector on domestic economy is paid less attention. Instead of that, the history of the oil sector's development, prices, level of production and amount of reserves will be focused on. Initially, it is important to refer to the main features of the oil sector before concentrating on other aspects. In fact, to a large extent, the nature of the oil sector is different with other economic sectors since the oil sector is considered as an enclave sector, which means it has less linkage with other economic sectors in terms of backward and forward linkages. In other words, the oil sector is mostly isolated from other economic sectors in terms of capital and labour mobility. The oil sector only provides finance to build and support other economic sectors.

3.5.1 Oil Discovery in Iraq

From the early 19th century, the Mesopotamian region became famous for its remarkable potential for oil exploitation. The collapse of the Ottoman Empire generated some chances for those seeking to exert political and economic influence over the region now known as Iraq. Many international companies expressed their interest in concessions (Styan 2006).

The first oil company to exploit Iraqi oil was established in 1911 by the Turkish Empire. It was called Turkey Petroleum Company (TPC) to exploit oil field in Mosel province. In October 1927, TPC discovered oil in the Kirkuk field. It contained reserves of approximately 16 billion barrels (Shwadran 1977).

However, TPC could not continue to work under the Turkish state. In 1929 the name of the Turkish Petroleum Company (TPC) was changed to the Iraqi Petroleum Company (IPC). For the following years, the IPC exploit all Iraqi oil fields and the relationship between Iraq's government and the IPC controlled by the Hashemite Monarchy remained until 1958 (Anderson and Stansfield, 2004). After the revolution of 1958, the Iraq National Oil Company (INOC) was established in 1964. The new company tried to improve the concession areas which were taken over by international oil companies (Styan 2006).

The previous discussion was about the process of development oil field and how the regional and international oil companies exploited Iraqi oil in the very early stages. However, the previous paragraphs have not provided any discussion about the level of oil production and its revenue. The first field that produced oil was in Mosel province. The level of production in 1915 was about 10 thousand barrels per day (bpd) and by 1925 it reached 25 thousand bpd. These companies contributed to oil production in the Mosel field: the Near East Development Company (NEDC) and the Pan American Petroleum and Transport Co. Nearly 90% of oil revenue were divided between the Turkey Petroleum Company and these two international oil companies (Shwadran 1977). Iraq's government received only 10% of the total oil revenue. However, after discovering oil in Kirkuk city in 1927, a pipeline was built from Kirkuk to Al Haditha in 1930. The revenue and level of production significantly increased to roughly 100,000 bpd in 1938 (Anderson and Stansfield 2004). In addition, the international oil companies were forced to increase Iraqi share of oil revenue from 10 percent to 35 percent of total revenue.

Moreover, in 1948, a new pipeline was built - the Al-Faw pipeline. Oil exports began to flow through a new pipeline through Al-Faw on the Persian Gulf coast. Then, in 1952, an additional pipeline was built to connect Kirkuk's oil to Baniyas port in Syria. Therefore, by 1952, Iraqi production of oil had increased to 400,000 b/d, up from nearly one fourth of that in 1938 (Shwadran 1977). Although oil production increased during 1940s and 1950s, its revenue for Iraq's government was still low or did not affect total government revenue. The reason behind that was related to the fact that the international oil companies received two-thirds of oil revenue and the oil price was relatively low in international markets. Also, the daily assessments of crude oil prices and its production level in Iraq were firmly controlled by the international oil companies. They did not consult the Iraqi government on oil price and quantity produced. They determined the price of oil and the volume of production by themselves.

However, after the revolution of 1958, Qassim[5] attempted to wrestle more money from the international oil companies gave control of the price of oil and its quantity to Iraq's government rather than international oil companies. Qassim's repeated attempts to negotiate with the international oil companies led to increased government revenues from $124 million US dollars in 1957 to $353 million US dollars in 1962. By 1972, Iraq's government eventually nationalised all oil fields (Anderson and Stansfield 2004).

Although during the 1950s and 1960s, the role of oil revenue was not less important (its contribution to total government revenue was high), it is argued that the importance of oil revenue really increased in the early 1970s, for three main reasons. The first reason is related to a sharp oil price increase during the

[5] Qassim is a leader of the revolution of 1958.

1970s which led to increased total government expenditure. Secondly, increased levels of oil production only started in the early 1970s. The third point is the nationalization of the oil sector meant that most oil revenue comes back to Iraq's government.

3.5.2 Oil Production

As has been explained in the previous section, the daily set of oil prices and level of oil production were managed by international oil companies in the first half of 20th century. These international oil companies unilaterally determined the price of oil and its size of production without consulting the oil producing developing nations (host countries). For this reason and also some other factors such as political factors, the oil exporting developing countries tried to take control of their role in determining the level of production at the beginning of the 1960s when they established oil petroleum exporting countries (OPEC).

Currently, the Iraqi Ministry of Oil controls all oil production in Iraq (except oil production in Kurdistan since 2004). However, the oil fields are operated by international oil companies (except Kirkuk's field) under contracts known as "technical service" contracts. The technical service contracts specify the initial oil production target and also the maximum remuneration fee per barrel, in addition to compensation of the international oil companies for investment and operating expenses and payment fees of about 2–3 US dollars per barrel.

Table 3.6 classifies all Iraqi oil fields, demonstrates the contributions of the international oil companies in oil production and the production capacity of each oil field. In the table, all oil fields in Iraq are divided into four regions: southern fields, central fields, northern fields and Kurdistan region fields. According to

2013 data, the Rumaila field in the southern region has the highest level of production at 1.430 million barrels per day. The Rumaila oil field is operated by two international oil companies: China National Petroleum Corporation (CNPC) and British petroleum (BP). West Qurna-1 is the second largest oil field in Iraq. It is located in the southern fields. Its daily level of production is about 550 thousand barrels, which consist of about one sixth of the total production in the southern fields. Three international oil companies (Exxon Mobil, PetroChina and Shell) have developed this field. Apart from these two fields, there are six other oil fields in the southern region. Thus, the total oil production in southern fields is about 3.320 million barrels per day. The central oil fields have the lowest production level (180.000 barrel per day) compares to other regions. All fields in the central region are operated by Gazprom Neft, Kogas, Petronas and CNPC.

The northern fields on the other hand consist of Avana & Baba, Bai Hasan, Jambur, Khabbaz and some other small fields. The total production capacity is about 525 thousand barrels per day – three times more than the total oil production in central region. More interestedly there are other fields that have been developed since 2004. They are located in the Kurdistan region in the very north of Iraq. The most productive fields in Kurdistan are Khurmala Dome, Tawke, Taq Taq and Shaikan. The main international oil companies contributing to oil production in Kurdistan are DNO, Genel Energy, Gulf Keystone and Sinopec. The total production in Kurdistan fields was about 427 thousand barrels per day in 2015 (Ministry of natural resources in Kurdistan).

Table 3.6 Iraq's Oil Fields, Lead Foreign Partner, and Production Capacity (2014)

- **Southern fields**

Main oil fields	Lead foreign partner	Production capacity (000 bbl/d)
Rumaila	BP, CNPC	1.430
West Qurna-1	Exxon Mobil, Petrochina, Shell	550
West Qurna-2	Lukoil	220
Zubair	Eni, Occidental	360
Majnoon	Shell, Petronas	200
Garraf	Petronas, Japex	100
Missan fields	CNOOC	135
Halfaya	CNPC, Total, Petronas	110
Other fields	NA	215
Total southern capacity		3,320

- **Central fields**

Main oil fields	Lead foreign partner	Production capacity (000 bbl/d)
Ahdab	CNPC	140
Badra	Gazprom Neft, Kogas, Petronas	15
Other fields	NA	25
Total central capacity		180

- **Northern fields**

Main oil fields	Lead foreign partner	Production capacity (000 bbl/d)
Kirkuk (Avana & Baba)	NA	220
Bai Hasan	NA	185
Jambur	NA	40
Khabbaz	NA	30
Other fields	NA	50
Total northern capacity		525

- **Northern fields (Kurdistan Regional Government - KRG)**

Main oil fields	Lead foreign partner	Production capacity (000 bbl/d)
Khurmala Dome	NA	110
Tawke	DNO, Genel Energy	130
Taq Taq	Genel Energy, Sinopec	130
Shaikan	Gulf Keystone	21
Other fields	NA	36
Total KRG capacity		427
Total Iraq (Baghdad) capacity		4025
Total Iraq capacity		4452

Source: U.S. Energy Information Administration based on information from the Energy Intelligence Group, Iraq Oil Report, and Middle East Economic Survey.
Note: This is the latest information available prior to the June 2014 attack by the Islamic State of Iraq and the Levant.

It is important to mention that the production policy and contract type has been done without any consulting of Iraq's central government. Thus, there have recently been some conflicts between the central government and Kurdistan's regional government. Thus, Kurdistan exports its crude oil without consulting the central government at the moment.

The previous analysis has concentrated on only the name and location of Iraqi oil fields and the contributing international oil companies in these fields. The level of production has not yet been discussed. In the following analysis will follow the level oil production in the last five decades.

By looking at Iraqi's oil production since the middle of 1965, one can see that the level of oil production has fluctuated over the last five decades. These fluctuations are mostly due to political and economic factors. Table 3.7 illustrates total crude oil production, daily average export and daily domestic consumption of oil from 1965 to 2013. It is noted from the table that the growth pattern of both oil production and oil exports tend to move exactly in the same direction. More interestingly, the volume of export crude oil to total crude oil production has been over 90 per cent during last four decades. This means that a negligible amount of crude oil production has been used in domestic economy.

In the first boom period, oil production increased sharply from 853 thousand barrels per day in 1965 to Iraq's all-time highest oil production at nearly 3.8 million barrels per day in 1979, just prior to the war with Iran. This trend of increasing production and exports during the 1970s can be mainly attributed to the production policies that were formulated after political circumstances changed. Subsequently, the conditions of oil production policies changed as well. Furthermore, the nationalization the oil sector in 1972 was another factor

affecting the increasing total oil production in the country between 1965 and 1975. Apart from these factors, an increased oil price during the 1970s is another main reason that pushed international oil companies into increasing their investment and volume of production.

However, there was a small downwards trend in some years (1972 and 1977) in most oil exporting countries including Iraqi. The stagnation in capacity of oil production and exports reflected the slackening world demand for petroleum during 1977 and part of 1978. The overall pattern of both output and export of crude oil can be described as successive peaks from 1965 to 1979. Each successive peak is greater than the previous one, which can be interpreted as the rising tendency of output and exports over time.

Conversely the Iraqi level of production and exports began to fall in the 1980s, which was reflected in the global economic recession and political and military reasons. The level of crude oil production dropped sharply from 3.8 mb/d in 1979 to approximately 2.5 mb/d in 1980. It can be argued that the reduction in the production capacity of oil resulted from the outbreak of Iraq-Iran war which disrupted the activities of some of the oil companies located in the war area which in turn destroyed most pipe lines in the south of Iraq.

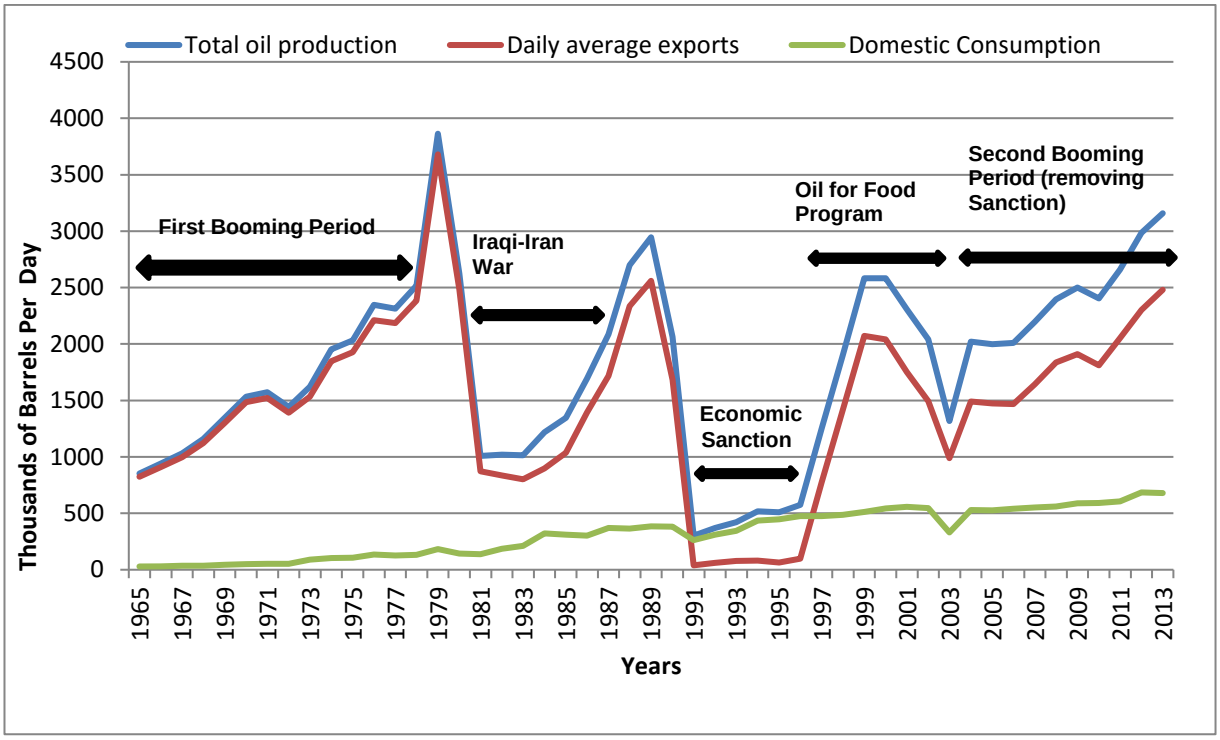
Moreover, the Iraq-Iran war caused many international oil companies such as Shell, Petronas, BP, CNPC and Lukoil to discontinue production in the first half of 1980s. In addition, during the 1980s, Iraq accepted an OPEC imposed quota, since it joined this organisation in 1960. Reduced quotas implemented by OPEC due to the sharp decrease in the oil price in 1982 and 1986. The declining oil price during the first half of 1985 led to discouraged international oil companies increasing their investment in the oil sector.

Table 3.7 Iraqi Oil production, exports and local consumption 1965-2013 (Thousands of Barrels)

Years	Total oil production	% change	Daily average exports	% change	Domestic Consumption	% change
1965	853.7	-	824.9	-	28.8	-
1966	941.4	1.2	910.5	10.4	30.9	7.2
1967	1030.6	9.4	995.7	9.3	34.9	12.9
1968	1158.7	12.4	1121.8	12.6	36.9	5.7
1969	1345.4	16.1	1301.2	16.1	44.2	19.7
1970	1532.4	13.9	1485.8	14.1	49.6	12.2
1971	1573.1	2.6	1520.9	2.3	52.2	6.1
1972	1442.7	-8.4	1390.1	8.6	52.6	0.7
1973	1621.2	12.4	1531.8	10.1	89.4	69.9
1974	1953.5	20.4	1849.1	20.7	104.4	16.7
1975	2031.9	3.9	1926.8	4.1	105.1	0.9
1976	2346.2	15.5	2211.1	14.7	135.1	28.5
1977	2312.9	-1.5	2185.4	-1.2	127.5	-6
1978	2516.6	8.6	2384.4	9.1	132.2	3.9
1979	3863.1	53.4	3680.1	54.3	183	38.6
1980	2626.3	-32.1	2482.2	32.6	144.1	-21.4
1981	1009.4	-61.6	872.1	-64.9	137.3	-4.9
1982	1021.1	1.1	836.3	-4.2	184.8	34.3
1983	1014.3	-0.7	802.2	-4.1	212.1	15.2
1984	1218.6	20.1	897.4	11.8	321.2	47.1
1985	1347.2	15.5	1035.4	15.3	311.8	-3.2
1986	1696.1	20.5	1393.5	34.5	302.6	-2.9
1987	2086.4	22.9	1717.1	23.2	369.3	22.1
1988	2699.2	29.3	2335.3	35.9	363.9	-1.7
1989	2944.5	9	2560.4	9.6	384.1	5.7
1990	2064.4	-29.9	1682.2	-34.3	382.2	0.6
1991	301.9	-85.5	39.1	97.6	262.8	31.5
1992	371.4	23.2	60.7	53.8	310.7	18.3
1993	422.5	13.7	79.2	31.6	343.3	10.6
1994	516.7	10.6	80.2	1.2	436.5	-1.6
1995	509.9	8.9	63.5	-22.3	446.4	2.2
1996	573.4	12.5	98.1	55.5	475.3	6.5
1997	1252.3	118.4	776.6	708.3	475.7	0.08
1998	1902.6	51.9	1417.3	82.6	485.3	2.1
1999	2582.1	32.4	2070.9	42.1	511.2	5.3
2000	2581.9	2.4	2039.8	-1.5	542.1	6
2001	2308.8	-10.6	1751.2	-14.2	557.6	2.7
2002	2039.7	-11.7	1494.6	-14.7	545.1	2.2
2003	1318.1	-37.1	988.6	-33.9	330.5	39.5
2004	2020.5	53.2	1490.1	50.2	530.4	60.6
2005	1999.4	-1.1	1472.2	-1.3	527.2	0.6
2006	2009.4	0.5	1467.8	-0.4	541.6	2.6
2007	2195.6	9.3	1643.1	11.9	552.5	2.03
2008	2394.5	9	1835.2	11.6	559.3	1.2
2009	2499.2	4.3	1910.1	4	589.1	5.3
2010	2402.8	-3.9	1812.3	5.2	590.5	0.1
2011	2658.9	10.6	2052.1	13.2	606.8	2.7
2012	2986.3	12.3	2301.2	12.1	685.1	13
2013	3157.6	5.7	2479.3	7.7	678.3	-1.1

Source: US Energy Information Administration

Figure 3.7 Iraqi Oil production, exports and local consumption 1965-2013 (Thousands of Barrels)



Source: US Energy Information Administration (2016).

Then the volume of oil production became worse and worse. It is important to mention that the decline in oil price and production during the 1980s severely affected monetary and fiscal policy as the government faced a big deficit in budget and depreciation of nominal and real exchange rates.

The end of the Iraq-Iran war in 1988 coincided with a steady increase in oil production. The level of oil production increased from 1.6 mb/d in 1986 to just under 3 mb/d in 1989. The sharp increase was as a result of a number of cumulative factors. Among them were the improvements in exploration activities and also the reconstruction of all the damaged production facilities. However, the situation changed to discourage increasing oil production after the invasion of Kuwait by Iraqi military forces in 1990. This caused a big reduction in Iraqi

production and exports. The consequences of that invasion affected the Iraqi economy; the United Nations Security Council imposed an embargo on Iraq and the oil export was prohibited. Therefore, post-war (after 1991) oil production was held near the level of domestic consumption. Nonetheless, in the period during which economic sanctions were imposed, the Iraqi government reportedly conducted illicit oil deals with its neighbours in order to make funds that it could use without restriction. In spite of that, the level of production was low until 1996, at which point Iraq agreed to the Oil for Food program.

Subsequently, due to the sanctions, Iraq's amount of oil exports dropped to only 39 thousand barrels per day in 1993, down from 2.560 million barrels per day in 1989. While daily domestic consumption is 262.8 thousand barrels per day. However, in the second half of 1990s the situation was different. Since the expansion of oil production and exports was related to the Oil for Food programme, which was managed by UN. Under this programme, Iraq's government was allowed to export a limited amount of oil to buy and import food and medicine for Iraqi people. At that time, the volume of export gradually increased again from 776 thousand barrels per day in 1997 to more than two million barrels per day in 2000. Nevertheless, the crude oil exports started to decline again in 2001 and 2002 due to frequent disputes with the United Nations over pricing and other aspects of program administration and over production techniques that allowed water intrusion into oil-bearing geologic zones that generally deteriorated infrastructure.

Moreover, since most spare parts for the oil industry are made in industrial and Western countries, the oil sector in Iraq suffered severely during sanctions from a lack of appropriate maintenance. Thus, the capacity of oil production and

exports were seriously curtailed. Therefore, it can be said that the oil sector, which is the crucial engine of Iraq's economy suffered badly through vast losses in terms of production level and revenue.

Since 2003, after lifting of UN sanctions, oil production increased gradually, except in 2003 during operation Iraqi freedom). It ranged from 1999 mb/d in 2005 to 3157 mb/d in 2013. This increase can be mainly attributed to the lifting of the UN sanctions in 2003. The nominal oil price has experienced a sharp increase since the early 2000s, except in 2008 when the global economy faced a financial crisis. These factors have allowed major international oil companies to return to Iraqi and raise their oil exploration efforts. The volume of crude oil exports increased from 1.490 mb/d in 2004 to 2.479 mb/d in 2013 (EIA, 2015).

In summary, it can be said that the volume of production and export of crude oil has fluctuated considerably during last five decades. Therefore, the fluctuating oil production during last five decades can be divided into five periods (boom and slump periods). The first production boom was 1965 to 1980. The second period is slump from 1981 to 1986. The third period is a period of high oil production from 1987 to 1990. The fourth period is declining oil production from 1991 to 1996. It then moved to high oil production and export from 1997 to 2014. These sudden and sharp fluctuations during last five decades have severely affected Iraq's economy since oil's contribution to GDP is relatively high and the oil revenue's contribution to total government revenue is more than 90 per cent.

3.6 Chapter summary

The objective of this chapter was to give a wide overview of the background of Iraq's economy during last five decades. From the previous sections, it is evident

that oil export has made a significant contribution to the Iraqi economy. This contribution, as we have analysed took the form of periodic injections of purchasing power into the domestic economy. However, changes in the country's earnings were mostly influenced by crude oil revenues, reflecting global prices of oil and daily level of oil production. Then the fluctuating oil price and production levels disturb this injection and also disturb whole Iraqi economy. The fluctuation of oil price and production was considered as an exogenous variable since these changes were determined by international factors. This high reliance on exporting crude oil caused economic difficulties as Iraq experienced some extraordinary cycles of booms and slumps during the whole sample period. Therefore, the fluctuating oil price has made two types of period: high oil prices created boom periods while low oil price created slump periods.

The booming period can also be divided into two different periods. The first period is 1970-1980, and the second period is 2004-2013. During these two periods, the government could save and have a substantial trade and government budget surplus due to high oil revenue. This entire surplus was held or saved in foreign reserve and gold. The period between 1981 and 2003 is considered an oil slump period since during this period the trade balance and government budget faced a severe deficits due to low oil revenue.

From the beginning of the 1970s, the Iraqi economy was in an oil booming period, which ended in 1980. During the 1970s, two substantial oil boom shocks occurred: the first oil boom shock in 1973 was a result of the Arab-Israel conflict in 1973, while, the Iranian revolution in 1979 led to the second oil boom shock. It ended with the oil price increases in 1980. In the first boom period, the international oil price increased sharply. Between 1973 and 1975 the

international oil price increased five times. The second international oil shock boom led to the oil price increasing to nearly $37, which is 15 times higher than 1972. The high oil price led to substantially higher Iraqi oil revenue and created a great surplus in both trade balance and government budget. Furthermore, due to high oil revenues, the structure of the economy has changed towards the oil sector and non-tradable sector and caused shrinking of the tradable sectors of agriculture and manufacturing. The Iraqi economy then became a more rentier economy compared to previous decades. On the other hand, Iraq's government has tried to diversify into other economic sectors, particularly agriculture and manufacturing. Some development plans have been implemented by the government using its large amounts of international reserve saved during high oil revenue periods. However, once the government cut the subsidies to these sectors, the growth rate of these non-oil tradable goods declined over time.

On the other hand, slump periods have been divided into two different stages. The first one started in 1980-81 and ended in 1989, while the second started in 1990 and ended in 2003. In the beginning of the 1980s, precisely from last quarter of 1980, economic circumstances became different because oil revenue started to decline steadily due to the Iraq-Iran war. Meanwhile declining international oil prices, as a result of a global recession made the situation for Iraq's budget and trade balance more difficult. The decline in oil revenue coincided with increased government expenditure, particularly for the military sector. The second oil slump shocks took place in 1986. Again, the international oil price declined for the second time due to over-supply of crude oil in international markets. During that time, the Iraqi government depended mainly on foreign and domestic borrowing, in addition to funding a deficit via money

creation. However, printing money to fund a budget deficit has negative consequences through devaluating the real and nominal exchange rate. On the other hand, declining oil price and production during the 1980s led to an increase of the added value and contribution of the non-oil sector to real GDP. This was the main goal of Iraq's government, since domestic producers tried to increase their production, particularly for the agriculture and manufacturing sectors.

Although during the 1980s, the declining oil revenue was mainly a result of economic factors. Two slump oil shocks have taken place (1982 and 1986). However, the sharp decline in oil revenue during the 1990s was not because of the declining oil price but because of economic sanctions - Iraqi oil export was banned by the UN - and the total oil revenue fell to its the lowest level, close to zero. Subsequently, the contribution of oil revenue to total government revenue declined severely. In addition, the contribution of the oil sector to real GDP also declined, while the contribution of non-oil economic sector particularly agriculture sector to GDP increased. The budget government faced a severe deficit, mostly funded by money creation which negatively affected the real and nominal exchange rate and positively affected the added value of the non-oil sector. Despite facing economic difficulties, there are some positive economic consequences of the declining oil revenue, such as total government expenditure becoming more efficient particularly for public capital expenditure.

On the other hand, from 1996 the situation turned in favour of the oil sector when the UN allowed Iraq to export limited amounts of oil to import necessary goods and medicine under the oil for food program. We found that the increasing oil price affected the whole economy, particularly government expenditure and contribution of the oil and non-oil sector to GDP. Despite exporting oil, the

government was still suffering from deficit and steadily, the contribution of the oil sector getting become smaller. The oil for food program ended up in 2003.

The last stage of our period of study started in 2004 when the UN lifted economic sanctions on Iraq. This allows Iraq's government to export unlimited amounts of oil and led to an increase in the oil revenue. Apart from that, steadily increasing international oil prices after 2004 created a positive position for Iraq's economy in terms of surplus of balance of trade and government budget following 22 years of continuous deficit in trade balance and government budget. Overall, the data shows Iraq's economy has seen several fluctuations during the last five decades. The reason behind the sharp fluctuation was related to depending on one single product for export - oil, in this case. It is noticeable that during high oil revenue periods the rate of growth in the service sector is greater than other non-oil economic sectors, while during slump periods, the circumstances were more helpful in enlarging manufacturing and agriculture sectors. The government should implement a strong economic policy through using fiscal and monetary policy to encourage the non-oil economic sector and create less reliance on oil revenue.

Chapter Four

Analytical model framework

4.1 Introduction

In this chapter, a model will be presented to examine the impact of a commodity export boom on the rest of the economy, under the assumption of a small open economy based on the economic literature. In this case, changes in the real exchange rate occur via changes in the nominal price of non-tradable goods, (Edwards 1983), assuming that the price of tradable goods will be relatively constant during a booming period, or at least the rate of change in the price of tradable goods is less than the rate of change in the price of non-tradable goods. The model also assumes that the oil sector is owned by the government. This assumption corresponds closely to what we observe in developing nations. In this thesis, the assumption is made that the fixed exchange rate is chosen only during booming period, most of which follow a fixed rate regime with respect to the US dollar (i.e., Saudi Arabia, Kuwait, Venezuela, and Iraq).

However, with slumping oil revenues the monetary authority may not be able to continue with a fixed exchange rate regime, and a black market for the exchange rate may appear due to the inability of the monetary authority to provide enough foreign currencies into the domestic market. This happens when a government budget faces a severe deficit.

This chapter develops and presents a model of the interactions among commodity export prices, money creation, inflation, the real exchange rate and the output of the tradable and non-tradable goods sector. The mechanisms of effecting high (low) oil price on relative price, real exchange rate, and the structure of the economy will be through those variables that have been defined

in the model, such as oil price, real government expenditure, money supply and real income, in addition to other factors such as nominal exchange rate and world inflation rate.

According to this model, the increased price of oil leads to an increase in the price of non-tradable goods to tradable goods through variables such as real government expenditure, real income and real money supply. By assumption, these variables increase the relative price of non-tradable goods to tradable goods. According to the model, these changes in the relative price of non-tradable and tradable goods will be the main factor of appreciation (depreciation) of the real exchange rate, and then increased (decrease) production of non-tradable goods and decrease (increase) in production of, and employment in, the tradable sector.

The plan of the chapter is as follows: Section two will be briefly about Justification of choosing Edwards model and its adjustment. Section 3 will analyse the detail of the model. It is divided into three main parts: monetary growth, inflation and real exchange rate block, and the output of tradable goods and non-tradable goods sectors. In section, four summarised specifications of equations will be presented. Section 5 will provide a general conclusion to the chapter.

4.2 Justification of choosing Edwards model and its adjustment.

There are many previous models that have been built to examine the consequences of increasing commodity export price on domestic economics (we have analysed some of these models in chapter 2). Although these previous models have made a significant contribution to the literature, but they focus mainly on oil-exporting developed countries rather than oil-exporting developing

countries. The theoretical context of the Dutch disease model, built by Corden and Neary (1982), is a helpful framework to improve our knowledge regarding the side effects of the natural resource sector in less developed nations. However, the characteristics and structures of oil-exporting developed countries are significantly different to oil-exporting developing nations, so the application of the Dutch disease model (See; Corden and Neary 1982) on developing nations may not be appropriate. Below, we can see some limitations of the implications of the Dutch disease model in developing countries.

First, the Dutch disease model assumes that the economy benefits from full employment (all factors of production employed). However, in Iraq, there is large unemployment. Before the discovery oil, most Iraqis were engaged and working in the agriculture sector, which is characterised as a low productive sector. Those in the urban areas were engaged with some traditional jobs, while others were unemployed urban job seekers. Thus, it can be expected that those workers would have been engaged in the non-tradeable sector, as a result of resource movement and spending effects. These two factors lead to the increased relative price of non-tradable goods and, thus, the appreciation in the RER.

Second, the model assumes that both domestically produced commodities and imported commodities in the same sector are perfect substitutes. However, this assumption is very hard to sustain in almost all developing nations. At the very least, there would be differences in quality between domestic products and imported commodities, or “substitutes”. Therefore, it is reasonable that the two commodities will not command the same price.

Third, the Dutch model assumed that the de-industrialisation phenomena emerging from natural resource discoveries (exploitation natural resource field)

and increase its prices in developed countries such as UK and Netherlands. However, the case of the Iraqi economy is totally different with regard to developed countries. Before increasing the oil price (oil revenue) in 1973, the manufacturing sector in Iraq was limited and the contribution of manufacturing in GDP was insignificant. Therefore, the side effect of a high oil revenue had not adversely affected the manufacturing sector. However, the agriculture sector was the main sector that the economy depended on. Therefore, it would have been more likely for de-agriculturalisation, instead of de-industrialisation, to occur (Timer 1982; Roemer 1985). The sharp shrinking of the output in the agricultural sector in Iraq can be found from the data as shown in Chapter Three.

Fourth, in many developing countries including Iraq, the natural resource sector is considered as an enclave sector. Most of its factor of production, such as capital, labour, and even intermediate goods, are imported. Therefore, the resource movement effect cannot be observed. Only the spending effect remains.

Fifth, the Dutch disease model ignored the role of government in economic activities (government intervention), since the impact of government on economic activities is significantly high, particularly for oil-exporting developing countries. Moreover, the short-run financial effects of the changes in oil revenue, functioning through the government budget constraints, were also ignored. This kind of assumption is not appropriate for Iraqi circumstances since, in most developing countries, including Iraq, the role of the private sector is negligible in economic activities. Therefore, the consequences of increasing oil prices or an emergent booming sector will differ between these two groups. Therefore, the

assumptions of Dutch disease may be more suitable for developed countries rather than developing ones like Iraq.

On the other hand, some studies have recognised certain features which differ from oil-exporting developing nations, e.g. Warr (1986), Morley (1989), Looney (1990), Woo et al. (1994), Usui (1997) in several African countries, Mogotsi (2002), Akpan (2009) research in Nigeria, and Égert and Leonard (2006) research in Kazakhstan. The most significant difference is the existence of a successful manufacturing and agricultural sector before the oil discovery and dominant oil activity in the domestic economy. However, in Iraq, before the emerging oil sector, the manufacturing sector was limited and, therefore, the de-industrialisation phenomena as defined by the Dutch disease theory did not occur in the same way. Prior to the booming sector, the Iraqi economy was mainly dependent on the agricultural sector, and then the de-agriculturalisation phenomena occurred, in addition to a slower growth rate of the manufacturing sector. Thus, in order to analyse the reaction that an economy might have to an increase or decline in oil revenue as a result of fluctuation in the international oil price, a simple model will be developed to examine the export boom and bust phenomenon.

Most of the previous studies used models that had been designed for developed or emerging countries. It is argued that these models are difficult to apply for developing countries, particularly for the very least developing ones, such as the Iraqi case. However, this study will employ Edwards' (1983, 1984 and 1985) model, which is a more suitable model for developing countries, since Edwards' model (1983, 1984 and 1985) was originally designed for the study of the implications of the coffee boom in the Colombian economy. Edwards's model

analyses in some detail the relationship between exogenous changes in the price of coffee, money growth, inflation and the real exchange rate in Colombia. The basic hypothesis being investigated is that an increase (decrease) in prices of coffee (oil in our case) will tend to increase the relative price of non-tradable goods to tradable goods via monetary and real factors. This, in turn, will lead to a reduction (an appreciation) of the real exchange rate, with the consequent loss of competitiveness in the tradable goods sectors.

The traditional Dutch disease theory is more concentrated on the real factor, while the monetary consequence of an export boom was ignored. However, Edwards's model was extended to add a monetary side in the model. The model shows that a high commodity export price (high oil price in our case) affects the monetary side. Moreover, during low oil revenue, the government faces a deficit in budget; most governments from developing countries try to fund their deficits by printing money (money creation). This point is the most important issue in this model, since it is more suitable for Iraqi circumstances and even for most other developing countries.

Although Edwards' model is a more appropriate model for most oil-exporting developing countries, it still needs some modification. Thus, the model will be adjusted accordingly to suit the Iraqi economy. Edwards' model, for instance, allows for a fairly general exchange rate policy, ranging from a fixed exchange rate to a crawling peg based on a PPP rule. Since 1967, the monetary authority in Colombia has changed the exchange rate regime from a fixed exchange rate regime to a crawling peg based on a PPP rule. However, in this study, the

exchange rate regime is a fixed rate regime[6] (peg to US dollars), thus equations related to the nominal exchange rate will be modified to suit our case.

Moreover, despite the role of real government expenditure (as a known spending effect in Dutch disease theory), it is vital to determine the relative price of non-tradable goods to tradable goods and real exchange rate as mentioned by several studies such as Corden and Neary (1982), Bond and Knöbl (1982), Neary and Wijnbergen (1984), Gelb (1988), Looney (1990), Fardmanesh (1991), Hutchison (1992), Akpan (2007), Ismail (2010) and others. However, in Edwards' model, the real government expenditure has not been entered into the equation as an independent variable. Instead of real government expenditure, Edwards (1985) entered real income per capita as an independent variable that affects RER.

Although Edwards did not provide any justification for including real income per capita and excluding real government expenditure as an independent variable, a plausible justification for this is related to the nature of the commodity export boom in Colombia. In the case of Colombia, the commodity export boom is coffee, which is owned by the private sector rather than the government. This means that the price of coffee tends to increase real income per capita (increase private sector revenue), rather than increase government revenue (government only gains some taxes). In this case, the role of real income per capita is more important than real government expenditure, while, in oil-exporting countries, the oil sector is owned by the government. Therefore, any increase in the price of oil leads to an increase in real government revenue, which in turn leads to an

[6] Although, the monetary authority in Iraq followed fixed exchange rate regime throughout the period of this study. However, the monetary authority could follow fixed exchange rate only during booming period (1970-1980 and 2004-2013). While during slumping period (1981-2003), the market exchange rate dominated the nominal exchange rate in Iraqi economy, (the detail will be presented in chapter five).

increase in real government expenditure. In this case, the role of real government expenditure is important, thus it cannot be ignored. Edwards and Aoki (1983) also mentioned that real government expenditure is one of the main factors that affect relative price, real exchange rate and the production of tradable and non-tradable goods sector. Therefore, as long as the Iraqi commodity export boom is oil, the role of real government expenditure is very important to our model, and the Edwards model will be modified via entering real government expenditure into equations.

Moreover, most developing countries have a centralised system and the rent gained by the government has very little to do with the productive efforts of the community as a whole. In addition, external rents are defined as stream revenue, of which is not necessary to reward a factor of production, such as labour and capital (Daniel 1990). Besides this, the cost of exploiting the natural resource sector is unrelated to the price of oil. The cost of oil production does not determine the price of oil in the international markets; rather, there are some other factors that can affect the price of oil (These factors have been discussed in Chapter two).

In the Iraqi case, for instance, because of the high quality of its oil and the relatively low cost of extraction, the oil cost at its peak capacity is of an average of 11 US$ per barrel (according to the Ministry of Oil in Iraq, 2015). The weak relationship between the domestic economy and the level of oil production in terms of participation in domestic capital (both physical and human capital) and labour in the process of oil production can be seen from the negligible effect of oil extraction cost on determining its price. For these reasons, the total revenue for oil-exporting countries, particularly developing ones, will be much bigger than

the Colombian case, since the nature of the producing coffee is totally different with producing natural resource sector in terms of production cost, ownership and determined prices in the international market.

In general, there are some characteristics of the oil sector that can be distinguished from other economic sectors: (i) the oil is priced and sold in U.S. dollars; (ii) the price of oil is determined in the global market rather than in domestic economic policies; (iii) the cost of extraction natural resources in general and oil in particular is insignificant compared with its revenue; therefore, the depletion cost is neglected in the model; (iv) the oil revenue accrues directly to the state rather than to the factors of production, since the oil sector is entirely owned by the government. It is accepted that, in net oil exporting countries, particularly developing ones, the government plays a significant role in the economic activities.

On the other hand, it is important to indicate that Edwards (1986) empirically investigated only the consequences of an increase in the price of coffee on money growth, inflation and real exchange rate. However, in terms of theoretical framework, Edwards strongly supported the idea (see; Edwards and Aoki, 1983) that the increase (decrease) price of oil tends to cause the loss (gain) of competitiveness in the tradable goods sector in the international market, which in turn leads to a decrease (increase) in the output of tradable goods and increase (decrease) in the output of non-tradable goods sector as predicted by Dutch disease theory (Edwards and Aoki, 1983). Eventually, the structure of the economy will be changed toward the non-tradable goods sector from the tradable goods sector during high oil revenue. Conversely, during low oil revenue, the

structure of the economy will be changed toward the tradable goods sector from the non-tradable goods sector.

In general, the main purpose of the model is to examine whether changes in the price of commodity exports (oil price) are indeed related to the relative price of non-tradable goods to tradable goods. The final aim is to examine how these consequences (consequence of real exchange rate) affect the output of non-tradeable and tradeable goods in the domestic economy. The model is simple and based on Edwards' model.

4.3 The cores model

The model concentrates on the effects of changes in exogenous oil prices and (or) changes oil production on the relative price of non-tradeable goods to tradeable goods and real exchange rate adjustment. In other words, the model considered that the boom is produced by an increase in the price of oil, but it could easily be adapted to the case of a boom generated by new oil discoveries and vice versa for slumping period (see; Edwards and Akoi 1983 p. 228).

The model also considers how the output of tradable and non-tradable goods will be affected by appreciation (or depreciation) of the real exchange rate during an increase (or decrease) in international oil price. In this model, it is assumed that the economy is open and small with no domestic financial market, and with a fixed exchange rate equal to one only during a booming period. While, during the slump period, it is assumed that the monetary authority will not be able to follow a fixed exchange rate since their international reserves decline and they will not be able to supply enough foreign currencies into the domestic economy. In other words, in a slump period the black market of nominal exchange rate appears. In

this model, the economic sectors are divided into three sectors: the booming traded sector (oil sector), the non-booming traded sector (agricultural and manufacturing sectors), and the non-traded sector (services and construction sector). Both the booming sector and the non-booming traded sector (tradable sector) contain all exportable and importable goods, whose prices are determined exogenously in the global markets, whereas the prices of non-tradable goods are determined endogenously via interactions between domestic demand and supply[7] (Edwards 1983, 1985, 1986; Edwards and Akoi 1983). It is considered that the oil sector is owned by the government, as is the case for most oil-producing developing countries. all above assumption is based on Edwards's model (see; Edwards 1983 and Edwards and Akoi 1983). The model is shown in the following equations:

- **Monetary block**

$$\widehat{M}_t = \alpha\, \hat{R}_t + (1-\alpha)\, \widehat{DCR}_t \qquad (1)$$

$$\widehat{DCR}_t = \beta DEF_t + z_t \qquad (2)$$

$$\hat{R}_t = \gamma_0 \left[\!\left[\widehat{M}_t^d - \widehat{M}_{t-1} \right]\!\right] + \gamma_1\, \hat{P}_t^O \qquad (3)$$

$$\hat{P}_t^O = \hat{E}_t \hat{P}_t^{O*} \qquad (4)$$

$$\widehat{M}_t^d = \hat{P}_t + \widehat{\alpha y}_t \qquad (5)$$

As is customary, the "hat" operator ($\widehat{X}$) denotes the percentage change in variable X. The following notation is used:

$\widehat{M}_t$= the rate of growth of nominal money in period *t*.

$\hat{R}_t$= the rate of change of international reserves (in US dollars)

[7] The assumption of determination of the price of non-tradable goods (determined by domestic economy) and determined price of tradable goods (determined by international market) is not only set by Edwards, but there are many other scholars, such as, Salter (1959); Corden and Neary (1982); Eastwood and Venables (1982); Benjamin et al. (1986); GeIb (1988); Fardmanesh (1991); Hutchison (1994); Ebrahim-Zadeh (2003); Égert and Leonard (2006), they set same assumption.

$\widehat{DCR_t}$ = the rate of change of domestic credit.

DEF_t= the fiscal deficit in period *t* as a proportion of the stock of high-powered money in period *t* – 1.

z_t = Other variables influencing domestic credit policy.

E_t =is the nominal exchange rate

$\widehat{\mathrm{M}}_{\mathrm{t}}^{\mathrm{d}}$ = the nominal quantity of money demanded.

$\hat{P}_t^O$ = the domestic price of oil.

y_t = real income

The letters $\alpha, \gamma, \varepsilon, \varphi, \theta \text{ and } \vartheta$ denote parameters in the above equations.

In order to have a complete model, it is important to discuss the process of money creation. Equations (1) to (5) denote the monetary approach of this simple model (see; Edwards 1983, p. 2). Equation (1) describes the process of creation of money in the economy. $\widehat{\mathrm{X}}$ denotes the percentage change in variable X. $\widehat{\mathrm{M}}_t$ then represents the growth rate of nominal money; both $\hat{R}_t \text{ and } \widehat{\mathrm{DCR}}$ represent the percentage change in international reserve and domestic credit, respectively (Edwards 1983, p.2). Equation (2) represents the growth rate of domestic credit. Here, it is important to mention that domestic credit creation is assumed to depend on the fiscal deficit (DEF). This assumption captures the fact that, in most developing countries, money creation is a vital source of financing for government expenditure, and occurs in most of oil-exporting countries during periods of declining oil price (Edwards 1983).

Regarding the international reserve, Equation (3) describes the behaviour of international reserves over time (during booming and slumping period). According to Equation (3), reserves respond to two factors. First, changes in the domestic price of the export goods ($\hat{P}_t^O$) in period t will be translated, in the same

period, into corresponding changes in reserves. Second, an excess demand for money ($\widehat{M}_t^d$) will be reflected in the accumulation of reserves and an excess supply of money will be reflected in the decumulation of reserves (see, Edwards 1983, p.3). Equation (3) clearly allows, in the short run, for international reserve oil shocks to be a major source of money creation. In other words, a resource-based commodity export boom usually results in a balance-of-payments surplus and an accumulation of international reserves. If this increase of international reserves is not fully sterilized, the monetary base will increase, and then inflation takes place (Edwards 1983, p.3 and Edwards 1986, p. 237).

The price of export goods can be converted into local currency via equation (4): Where P_t^{*O} represents the price of commodity export (international oil price) where E_t is the nominal exchange rate, expressed as units of domestic currency per unit of foreign currency. This is one of the significant mechanisms that affect whole domestic economic activities. Equation (5) depicts the rate of nominal quantity of demand for money, where it is assumed that the real money demanded is a function of real income (Edwards 1983, p.3).

Let us analyse the impact of a high (low) oil price on processing money creation[8]. When the price of oil increases (booming period), the amount of international reserve will increase, which gives the monetary authority the ability to supply and print more money in the domestic economy (see equation 1). On the other hand, during periods of declining oil price (slumping period), the government budget faces a deficit. In this case, in order to finance government expenditure, most oil-exporting developing nations depend on printing money (see equation 2). These

[8] The consequences of high oil revenue on money supply is different with the consequences low oil revenue on money supply, that is why we mentioned both scenario (high oil revenue and low oil revenue).

two factors affect the growth rate of money in the economy (Edwards 1983 and 1986).

The following equation for the growth rate of money is obtained through combining equations (1) to (5):

$$\widehat{M}_t = \alpha_0 \widehat{M}_{t-1} + \alpha_1 \hat{P}_t + \alpha_2 \hat{y}_t + \alpha_3 \hat{p}_t^{O*} + \alpha_4 DEF_t \qquad (6)$$

Since 0< α_0<1 the convergence of equation (6) will be oscillatory. Equation (6) depicts an increase in exogenous oil price (that is, P_t^O > 0) which will cause an increase in the rate of growth of money, including factors such as deficit, money supply in previous time, rate of inflation and real income. All above analyses (from equation 1 to 5) are theoretical justification to explain how the money supply is changed during fluctuation oil revenue. The effectiveness of money growth will be explained during booming and slumping periods. It is shown how growth of money affects the rate of inflation, real exchange rate and then how it affects the structure of the economy.

- **Inflation and Real exchange rate block**

$$\widehat{\mathrm{P}}_{\mathrm{t}} = (1-\varphi)\,\widehat{\mathrm{P}}_{\mathrm{Nt}} + \varphi \widehat{\mathrm{P}}_{\mathrm{Tt}} \qquad (7)$$

$$\widehat{\mathrm{P}}_{\mathrm{Tt}} = \widehat{\mathrm{E}}_t + \hat{P}_{Tt}^* \qquad (8)$$

$$\widehat{\mathrm{P}}_{\mathrm{Nt}} = \emptyset \hat{y}_t + \vartheta(\widehat{M}_t - \widehat{M}_t^d) + \omega \widehat{GE}_t \qquad (9)$$

$$\hat{E}_t = \varepsilon_1 \widehat{\mathrm{P}}_{\mathrm{Tt}} - \varepsilon_2 \hat{P}_t^{O*} \qquad (10)$$

$$\hat{y}_t = g_t + \tau(\hat{p}_t^{O*} - \hat{P}_{Tt}^*) \qquad (11)$$

$$RER_t = (E_t \hat{P}_{Tt}^*)/P_t \qquad (12)$$

E = the nominal exchange rate, defined as units of domestic currency per unit of foreign currency.

$\hat{P}_t^{O*}$= international price of oil.

y_t= real GDP per capita in period *t*.

P_t The domestic price level in period *t*.

P_T= the domestic price of tradable goods.

P_N= the domestic price of non-tradable.

GE_t= real government expenditure.

P_T^*= the world price of tradable.

$\hat{P}_T^*$= the world rate of inflation.

RER = the real exchange rate.

Before analysing the impact of an increase in oil price on real exchange rate, we first define the inflation block (see Edwards 1983) through equations (7) to (9). According to equation (7), the rate of inflation in the domestic economy is a weighted rate of change in the domestic prices of non-tradable and tradable goods. It is noted in equation (7) that the relative price of oil is not included in the argument, since it is considered that output of oil is only for exports rather than for home consumption, and domestic residents do not consume oil, or that there is negligible domestic consumption of oil, and that factors of production used in oil production are constant in the short term and long term (Edwards and Akoi 1983, p. 221).

Let us consider equation (8). This concerns factors which affect the price of tradeable goods; in a closed small economy (characteristic with restriction of free trade), the rate of change in the domestic price of tradable goods is determined by the interaction between domestic supply and demand. However, as long as it is assumed that the home country is a small open economy, where the law of one price holds due to the flow of goods across global boundaries, with no trade restriction, the domestic price of tradeable goods follows the international price of tradable goods (see; Edwards 1983 and 1986, p.237; Neary and Wijnbergen,

1985 p.23). In other words, if we consider that the home country is a small open economy, where the law of one price holds due to the flow of goods across global boundaries, then foreign prices of tradable goods (P_T^*) converted by the nominal exchange rate (*E*), give a measure of domestic prices of tradable goods (P_T) (Edwards 1983, p. 242). In this case, there are only two factors that affect the price of domestic tradeable goods (see equation 8): first, the rates of appreciation or depreciation of nominal exchange rate; second, the world rate of inflation.

Regarding the variables that affect the price of non-tradable, equation (9) which is the most important equation in this model since the increase (decrease) price of oil is significantly affect the non-tradable goods price via three channels which are real GDP per capita, money supply and government expenditure. Equation (9) shows that the rate of change of the price of non-tradable will depend on the change in the real GDP per capita, the excess flow of money supply and real government expenditure (see equation 9). Here it is important to mention that the real government expenditure added to the equation (9), since the original equation from Edwards's model did not include government expenditure into equation non-tradable goods. Unlike the oil sector, which is owned by the public sector, while the production of coffee in Colombia is typically in the hands of the private sector. The manner in which these gains are distributed are crucial due to their effect on fiscal policy and income allocation. In Colombia's case, even though it imposed an export tax on coffee, most of the gains from the seventies booms were passed on to private producers. This is a reasonable justification that Edwards did not include real government expenditure into non-tradable goods price.

Equation (9) shows the consequences of the change of money supply, real GDP per capita and government expenditure on the price of non-tradable goods during high and low oil price. Let us start with the consequences of money supply in both booming and slumping periods. According to this model (Edwards's model 1983 and 1986)[9], during both periods (booming and slumping periods) the monetary authority increases money supply either because the government receives higher international reserves, which can increase money supply during a boom, or the government faces a severe deficit and then prints money to finance its expenditure (see equation 2).

In booming periods (with fixed exchange rate) the increase in money supply leads to an excess demand for non-tradable goods which, in turn, leads to an increase in the price of non-tradable goods (since it is assumed that the price of non-tradable goods is determined endogenously via the interaction between the supply and demand curves). Excess demand for tradable goods (due to excess supply of money) does not affect its price, since the price of tradable goods is exogenously determined and any extra-domestic demand for tradeable goods can be satisfied only by increasing net imports rather than by increasing the domestic price of tradable goods. Therefore, an increase in supply of money during booming periods leads to an increase in the relative price of non-traded goods to tradable goods.

On the other hand, the monetary authority during the slumping period cannot respond to high demands on foreign currencies due to the fall in international reserves and high budget deficit. In this situation, in order to fund the deficit, the monetary authority will print money (see; Edwards 1986: p. 251), this creates an

[9] Both papers are almost similar to each other in terms of theoretical and empirical framework.

imbalance between the domestic money supply and international reserves in the domestic market (excess money supply). This, in turn, leads to a depreciation of the nominal exchange rate (Zalduendo 2006). Once the nominal exchange rate depreciates, this directly leads to an increase in the price of tradeable goods via equation (8). On the other hand, the impact of excess money supply also affects the price of non-tradeable goods during slumping periods; however, the rate of change of tradeable goods price would be more than the rate of change in the non-tradable goods price.

Regarding GDP per capita and real government expenditure, during booming periods, both variables (the real GDP per capita and real government expenditure) will increase. This leads to an increased demand for both tradable and non-tradable goods, according to Walras' Law (Drèze 1997). However, an increase in real GDP per capita and real government expenditure will only lead to an increase in price of non-tradable goods. In other words, any increase in demand for non-traded goods has to be satisfied through an increase in its price; otherwise, with a constant price, the domestic economy will experience a disequilibrium condition; this is because the output of non-tradable goods will be less than the consumption of non-traded goods. In order to get back to equilibrium, the extra demand needs to diminish via increases in the price of non-traded goods. Therefore, an increase in real GDP per capita, money supply and government expenditure (due to increase in oil price) leads to an increased price of non-tradeable goods via excess demand (Corden and Neary 1982 and Edwards, 1988). However, if we assume, for instance, that the extra revenue (which comes from high oil price) is invested abroad or saved, then the elasticity of income is equal to zero and the slope of the relative price between tradable

and non-tradable goods is unchanged. In this situation, the internal balances as well as the external balances are in equilibrium, meaning that output is equal to consumption and the surplus on the capital account is equal to the deficit current account. Here, it is noticed that the changing of non-tradable goods is the main factor that affects the real exchange rate in this type of economy (economies that depend heavily on one product to export).

On the other hand, an increase in real GDP per capita and real government expenditure does not affect the price of tradable goods, since prices are determined exogenously and the extra-domestic demand for tradeable goods can be satisfied by increased net imports rather than an increase in price. Therefore, an increase in real GDP per capita and real government expenditure affects only the price of non-tradable goods. The situation is vice versa during bust period for both real GDP per capita and real government expenditure.

In order to determine the inflation rate, it is necessary to combine equations (7), (8) and (9), to obtain equation (15), which is the domestic rate of inflation:

$$\widehat{\mathrm{P}}_{\mathrm{t}} = b_0\ \widehat{M}_t + b_1(\widehat{\mathrm{E}}_t + \widehat{P}_{T^*t}) + b_2\ \hat{y}_t + b_3\ \mathrm{GE}_t \qquad (13)$$

It is seen in equation (13) that an excess supply of money in this period, nominal exchange rate plus world inflation, growth of real GDP per capita and real government expenditure, affect the rate of inflation.

Equation (10) depicts some factors that affect the nominal exchange rate; for instance, an increase in the international price of tradeable goods and a decrease in oil price may bring about depreciation of the nominal exchange rate. If we consider the price of international tradeable goods as a control variable, then any change in the price of oil leads to a change in international reserves

and government budget. For example, some oil-exporting developing countries, particularly those whose national income depends mainly on oil revenues, have low international reserves and a big budget deficit when international oil price declines. This, in turn, pushes the monetary authority to finance the government expenditure, which then leads to depreciation of the nominal exchange rate (we have already explained this mechanism).

Equation (11) depicts the growth rate of real income. It is formed of two components: a term (g) is the long-term trend rate of growth of output**,** and the second term $(\hat{p}_t^{O*} - \hat{P}_{Tt}^{*})$ which depends on oil prices*.* An increase in the price of oil and growth of output in economy (g) causes an increase in real GDP per capita and vice versa. Finally, equation (12) depicts the definition of the real exchange rate (*RER)*. This precise definition of RER has been chosen since it has a close empirical counterpart. There are some studies that define the real exchange rate (*RER)* as the nominal exchange rate (*E*) multiplied by the ratio of foreign price level (P_T^*) to the domestic price level ($\mathrm{P_t}$). Examples of these studies are those of Edwards (1985), Zietz (1996), Flug et al. (1998); Kuralbayeva, et al. (2001), Ebrahim-Zadeh (2003), Beine, et al. (2009) and Ruehle and Kulkarni (2011) among others.

From the equation (12), the real exchange rate is a measure of the ratio of the domestic currency price of foreign prices (EP_T^*) to domestic price level. In this regard, it can be said that, if the international price of tradable goods (P_T^*) is constant, and having a constant nominal exchange rate (*E)*, any increase in domestic price takes place leads to a decrease in the *RER* (appreciation *RER*). Similarly, for fixed P_T^* and $\mathrm{P_N}$, a decrease in *E* triggers an appreciation of the real exchange rate and vice versa.

The relative price of traded to non-traded goods (after multiple nominal exchange rates to the international price of tradable goods) as a measure to define RER is the most popular and identifies more willingly the incentives that guide domestic resource allocation. Its focus on allocation of domestic resources has made this definition of RER a favourite tool for analysing the competitiveness of a home country relative to a foreign country, particularly for developing countries (Zietz 1996). In this case, the decrease in Pt/Pn means an appreciation in RER of domestic currency and a loss of international competitiveness, and reflects an increase in the domestic cost of producing tradable goods (Edwards 1986, p. 236-237). Similarly, any increase in Pt/Pn means a depreciation in RER and also brings about an improvement in international competitiveness.

In general, in this model both real and monetary sides have been combined and analysed. Therefore, the complete model works in the following way. Let us start by discussing the real approach which is contained in equations (9) and (11). In this situation, this model becomes similar to the Dutch disease model, which has traditionally focused on real aspects rather than monetary aspects. It is assumed that, E = 0, replacing (11) with (9), the change in the RER causes changes only in the price of commodity export:

$$RER_t = -\emptyset\rho\ \hat{P}_t^O \ < 0 \qquad (14)$$

According to equation (15), a permanent increase in the oil price will lead to a real appreciation (decrease) of the domestic currency. It is important to mention that equation (14) is the spending effect of a commodity export boom, as emphasised in the Dutch disease theory (Corden 1984). As in the real side model, an increase in the price of the commodity export causes an increase in real GDP per capita (through equation 11), which then causes an increased

demand for non-tradable goods via the spending effect. This higher demand on non-tradable goods, in turn, leads to increases (through equation 9) in the price of non-tradable goods generating the spending effect. It is noted from equation (15) that the extent of the appreciation of RER depends on the value of ∅, the real GDP per capita[10] elasticity of demand for non-tradable goods. If we assume that the value of ∅ = 0, for example if none of the increased real GDP per capita is spent on non-tradable goods, then the increase in the price of commodity exports will have no effect on the RER.

In light of what has been analysed above, and based on the definition of RER (see equation 12), as long as the RER depends on the relative price of tradable goods (international price of tradable goods) times nominal exchange rate divided by price of non-tradable goods (domestic price), Thus the RER equation is defined in equation (15).

$$RER = b_0 MS + b_1 GE + b_2 y + b_3 P_{Tt}^{*} \qquad (15)$$

It can be seen from equation (15) that four variables are affected the appreciation and depreciation RER. Although this equation (equation 15) is built to large extend based on (Edwards's model 1983), but, form the Edwards's RER equation, the price of coffee is also included into the RER equation, despite, he argued that, in principle, changes in the price of coffee affects the real exchange rate through disposable income and money supply (see Edwards 1983 and 1986, p. 237).

Although Edwards did not provide any explanation for including price of coffee in RER equation, but the reasonable explanation may be related to not having a strong multicollinearity between price of coffee in one hand and money supply

[10] In our case, real GDP per capita represents real income per capita.

and real GDP per capita in other hand. While, for Iraqi cases and even most of oil exporting developing countries, the correlation between oil revenue in one hand and money supply, GDP per capita and government expenditure is relatively strong and oil revenue cannot be employed with money supply, GDP per capita and government expenditure in the same equation as equation (15).

Equations (1) through (15) formally capture the main features of the model discussed in the preceding section. The model can be formally solved for the real exchange rate as a function of some endogenous (Government expenditure, GDP per capita and money supply) and exogenous variables (international price of tradable goods). In this section equations (6), and (13) are first solved then, the definition of the real exchange rate is used to find relative price of non-traded goods against traded goods and real exchange model. These solutions can be done via combining equation Money supply (equation 6) and inflation equation (equation 13). For simplifying, it is assumed that international price of traded goods P_{Tt}^{*} = 0, because this variable considers as an exogenous variable. The following expression for the actual change in the real exchange rate in period t is obtained: (the reduced forms for *MS and P* are provided in appendix 1):

$$RER = \beta_0 \pi_1 (\gamma_0 - 1)\partial^{-1} M_{t-1} + \beta_0 \pi_2(\gamma_0 - 1)\partial^{-1} y_t + A_1 g_t - (A_1 + A_2)\hat{P}_t^{O*} + P_{Tt}^{*}$$

(HHH)

$$A_1 = [\gamma_2 (1 - \beta_0 (\pi_2 + \pi_4) - \beta_1) + \beta_2(\gamma_0 - 1) + \beta_0\pi_3(1 - \gamma_0)]\, \partial^{-1}$$

$$A_2 = [\gamma_1 (1 - \beta_0\pi_2) + \beta_0\pi_4(1 - \gamma_0) - \gamma_1(\beta_1 + \beta_0\pi_5)]\, \partial^{-1}$$

and

$$\beta_0 = \frac{(1-\delta)\lambda}{1-\lambda\ (1-\delta)}; \quad \beta_1 \frac{1}{1-\lambda\ (1-\delta)}; \quad \beta_2 \frac{(1-\delta)\ (\lambda\eta - \rho)}{1+\lambda\ (1-\delta)};$$

$$\pi_1 = \omega\theta;\ \pi_2 = \omega\theta;\ \pi_3 = \omega\theta\mu;\ \pi_4 = \omega\varphi;\ \pi_5 = \omega\varphi$$

$\pi_5 = (1-\omega)\phi; \Delta = 1 - [\beta_0\pi_2 + \gamma_0(\beta_0\pi_{5+}\beta_1)]$.

From equation (14) it is possible to find out, among other things, how an increase in the international price of oil will affect the actual real exchange rate in period t. Let us first look at the term $\boldsymbol{A_1}$. This term captures the spending effect (government expenditure) of a change in the price of oil on the real exchange rate. Since stability requires that A > 0, the spending effect will, as expected, generate a real appreciation.

$\boldsymbol{A_2}$ captures the domestic inflation in period t. As can be seen from this expression, there are three different channels, in addition to the spending effect, through which changes in oil prices will affect RER. Two of these channels indicted that a higher price of oil will generate a real appreciation. The third channel, however, suggests that RER and $\hat{P}_t^{O*}$ are negatively related.

Let is first look at the forces that suggest that there is a negative effect of oil price and RER. First, a higher world price of the commodity results in an increase in international reserves and money growth in the same period ($\beta_0\,\pi_1\,(\gamma_0 - 1)\partial^{-1}\,M_{t-1}$). Assuming that, as a consequence, an excess flow supply for money results, this will generate inflation and, with other things given, a real appreciation. Second, according to expression ($\beta_0\,\pi_2(\gamma_0 - 1)\partial^{-1}y_t$), an increase in the world price of this commodity (oil) will lead to increase GDP per capita then create high inflation rate in domestic economy, this also works towards generating a real appreciation.

In the previous discussion the inflation and real exchange rate has been analysed, the next block will be about how the non-tradable and tradable goods output are affected via the change of real exchange rate.

- **Non-tradable and Tradable goods output block**

Non-tradable goods output sector:

$$H_N^S = H_N^S, (W, RER) \quad \text{Supply,} \quad (16)$$

$$\partial H_N^S / \partial \text{W} < 0 \text{ and } \partial H_N^S / \partial RER < 0$$

Tradable goods output sector:

$$H_T^S = H_T^S, (W, RER) \quad \text{Supply} \quad (17)$$

$$\partial H_T^S / \partial \text{W} < 0 \text{ and } \partial H_T^S / \partial RER > 0$$

H_N^S = output of non-tradable sector.

H_T^S = output of tradable sector.

W = real wage.

Equation (16) and (17) depict the output of non-tradeable and tradeable goods. According to these equations, factors of real wage and the real exchange rate affect the output of non-tradable and tradable goods. The non-tradeable goods and tradeable goods output is negatively related to the real wage, since when the real wage increases (with constant price level for tradable and non-tradable goods sector), the output of tradable and non-tradable goods decreases because of shrinking their profits and the circumstance is vice versa when the real wage decreases.

The real exchange rate however is negatively related to the output of non-tradable goods and but positively related to the output of tradable goods. In other words, it is expected that the real exchange rate appreciation (decrease RER) tends to increase the output of non-tradable goods sector and vice versa. At the same time, it is expected that the real exchange rate appreciation (decrease

RER) tends to decrease the output of tradable goods and vice versa. The theoretical justification behind the negative relationship between RER and non-tradable goods output, and the positive relationship between RER and tradable goods output, is related to the fact that the appreciation (decrease) in RER means that the rate of increase in the non-tradable goods price is larger than the rate of increase in the tradable goods price. This, in turn, leads to an increase in the output of non-tradable goods, while the output of tradable goods decreases. This scenario is vice versa during depreciation (increase) of RER (see Corden and Neary 1982; Edwards 1983, 1984, 1986 and Edwards and Akoi 1983).

We shall now analyse how the increase (decrease) in oil price affects the output of tradable and non-tradable goods via adjusting real wages, and real exchange rate.[11] During a time of high oil prices, the GDP per capita, money supply and government expenditure will increase, which this leads to an increase in the price of non-tradable goods without increasing price of tradable goods. At the same time, the increase in government expenditure and money supply leads to an increase in real wages in both public and private sectors and vice versa. The following equations express the output of non-tradable and tradable goods in a booming period.

Tradable goods output sector:

$$H_T^S = P_T^* - W \qquad (18)$$

$$\frac{\partial H_T^S}{\partial (P_T^* - W)} < 0$$

[11] The international price of tradable goods is excluded because it is assumed that exogenous variables (its price is independent from any fluctuation oil price).

Non-tradable goods output sector:

$$H_N^S = P_N - W \qquad (19)$$

$$\frac{\partial H_N^S}{\partial (P_N^* - W)} > 0$$

A rise in the real wage level is expected during a booming period with a constant price of tradable goods leading to a reduction in employment in the tradable sector, and then bringing about a reduction in the production of tradable goods (see Figure 4 in Chapter Two). On the other hand, an increase in price of non-tradable goods will be the main factor that positively influences the output of non-tradable goods. This stimulates the labour migration from the traded sector into the non-traded sector (resource movement effect). With an absence of government subsidy, firms may not be able to pay higher wages, which increases output costs because the price of tradable goods is linked with the global market instead of the local market. Therefore, the expression (18) is a negative result and means a decline in the output of tradable goods, while the positive result in expression (19) means an increase in the output of non-tradable goods.

On the other hand, in a slumping period, the government budget faces a severe deficit and, as we have explained in the model, the deficit is covered by printing money (Edwards 1986, p. 251).

In these circumstances, low international reserves (low amount of foreign currencies) and an increased money supply lead to a devaluation of the nominal exchange rate[12]. In this case, the price of tradable goods increases via equation (8) and the real government expenditure, and then the real price of non-tradable goods declines. At the same time, the real wage declines due to the devaluation

[12] The government cannot follow a fixed exchange rate any more.

of the nominal exchange rate. Therefore, the relative price of tradable goods to non-tradable goods increases. Any depreciation of the real exchange rate and decline in real wage leads to an increase in the power of competitiveness for tradable goods in the international market.

As a result, the expression (18) is a positive outcome. This means an increase in the output of tradable goods when the result of price mines wage $(P_T^* - W)$ is positive. The positive result is due to an increase in the price of P_T^* and decrease in real wage, while a negative outcome in expression (19) means a decrease in the output of non-tradable goods. The negative result was due to a greater decrease in the real price of non-tradable goods compared to that of real wages. Based on what we have analysed in this chapter, the output of the traded and non-tradable goods sector can be specified as a function of RER. On the other hand, the RER is a function of GDP per capita, money supply, real government expenditure and the real exchange rate.[13]

Tradable goods output sector:

$$H_T^S = H_T^S(\,\mathrm{RER}_t) \qquad (20)$$

$$\frac{\delta H_T^S}{\delta \mathrm{RER}_t} > 0$$

$$\mathrm{RER}_t = y_t, MS_t, \mathrm{GE}_t, P_{Tt}^* \quad \text{(Based on equitation 15)}$$

$$\frac{\delta \mathrm{RER}_t}{\delta y}, \frac{\delta \mathrm{RER}_t}{\delta MS}, \frac{\delta \mathrm{RER}_t}{\delta \mathrm{GE}_t} < 0 \; and \; \frac{\delta \mathrm{RER}_t}{\delta P_{Tt}^*} > 0$$

[13] Including variables like $y_t, MS_t, \mathrm{GE}_t \; and \; \mathrm{RER}_t$ into both equations 21 and 22 is because these variables were affected by changing international oil price, while Excluding oil price and international price of tradable goods from both equations 21 and 22 is because these two variables considered as exogenous variables. In both equations, we only wanted to analyse how the fluctuation oil price affect these variables. In the next sections, the detail of these variables will be explained more.

Non-tradable goods output sector:

$$H_N^S = H_N^S(\mathrm{RER}_t) \qquad (21)$$

$$\frac{\delta H_N^S}{\delta RER} < 0$$

$$\mathrm{RER}_t = y_t, MS_t, \mathrm{GE}_t, P_{Tt}^* \quad \text{(Based on equitation 15)}$$

$$\frac{\delta RER}{\delta y}, \frac{\delta RER}{\delta MS}, \frac{\delta RER}{\delta \mathrm{GE}_t}, < 0 \; and \; \frac{\delta RER}{\delta P_{Tt}^*} > 0$$

From equation (20), it can be said that the real exchange rate (*RER*) is positively related to the output of tradable goods. While the real exchange rate (*RER*) from equation (21) is negatively related to the output of non-tradable goods. In the next section, the specification of equations that will be employed in empirical chapter (chapter six) is summarised.

Solving above equations (equations related to the output of non-traded and traded goods sector), can be summarised below and the details can be seen from appendix 2.

4.4 Summarised specifications of equations

In the previous section, the model has been built and it explained the mechanisms of the changing macroeconomic variables due to a changing oil price. Therefore, the structural equation system has been built and four equations are constructed. Model 1 explains the relative price of non-tradable goods against tradable goods; model 2 explains real exchange rate (RER); model 3 explains non-tradable goods output; model 4 explains the output of tradable goods. Before moving to describe equation, it is important to mention that two dummies variables are added for each equation. The first one is the

Iraq-Iran war dummy variable (DUMW), to capture the Iraq-Iran war, which severely affected the level of oil production and its export. In addition, due to the war, some of the factors of production in different economic sectors have been destroyed, and massive government expenditure has been spent on military equipment. The second dummy variable is the economic sanction dummy variable (DUMS), this dummy variable introduces to capture the economic sanction that have been imposed by the UN, period of the dummy is 1990 to 2003. In the following sector, the detail of equation will be presented.

4.4.1 Relative price[14]

The first research question is related to how the fluctuation oil revenue affect the relative price of non-tradable goods against tradable goods. Now, based on the model, which was presented in the previous section, the independent variables that affect relative price is via three endogenous variables namely government expenditure (GE), real GDP per capita (y), and money supply (MS). The international price of tradable goods ($P^*_{T_t}$) is included as an exogenous variable.

(Model 1)

$$\mathrm{RP}_t = \alpha_0 + \alpha_1 GE_t + \alpha_2 y_t + \alpha_3 MS_t + \alpha_4 P^*_{T_t} + \alpha_5 DUMW_t + \alpha_6 DUMS_t + \varepsilon_t \quad (22)$$

$$\frac{\delta \mathrm{RP}}{\delta \mathrm{GE}}, \frac{\delta \mathrm{RP}}{\delta \mathrm{y}}, \frac{\delta \mathrm{RP}}{\delta \mathrm{MS}} > 0 \qquad \frac{\delta \mathrm{RP}}{\delta P^*_{T_t}}, \frac{\delta \mathrm{RP}}{\delta DUMW_t} and \ \frac{\delta \mathrm{RP}}{\delta DUMS_t} < 0$$

Where $DUMW_t and\ DUMS_t$represent the Iraq-Iran war dummy variable and the economic sanction dummy variable respectively.

[14] Relative price = Relative price of non-tradable goods against tradable goods.

4.4.2 Real exchange rate

Real exchange rate (RER) is a second research question in this thesis. Now, based on the model, in this chapter, the independent variables that affect real exchange rate is similar to the relative price one, which are namely government expenditure (GE), real GDP per capita (y), money supply (MS) and the international price of tradable goods ($P^*_{T_t}$).

(Model 2)

$$\mathrm{RER}_t = \beta_0 + \beta_1 GE_t + \beta_2 y_t + \beta_3 MS_t + \beta_4 P^*_{T_t} + \beta_5 DUMW_t + \beta_6 DUMS_t + \varepsilon_t \quad (23)$$

$$\frac{\beta \mathrm{RER}}{\beta \mathrm{GE}}, \frac{\beta \mathrm{RER}}{\beta \mathrm{y}}, \frac{\beta \mathrm{RER}}{\beta \mathrm{MS}} < 0 \qquad \frac{\beta \mathrm{RER}}{\beta P^*_{T_t}}, \frac{\beta \mathrm{RER}}{\beta DUMW_t} and \ \frac{\beta \mathrm{RER}}{\beta DUMS_t} > 0$$

Theoretically, it is expected that the sign of each GE, y, MS is negatively correlated agapist RER, while each of variables $P^*_{T_t}$, *DUMW* and *DUMS* are expected positively correlated against RER.

4.4.3 Non-tradable goods output

The Dutch disease model by Corden and Neary (1982) and the Edwards and Aoki model (1983) predict many consequences of an oil-led boost (slump), in oil exporting countries lead to loss of competitiveness in non-oil tradable goods and enlarge the non-tradable goods output via RER channel. Thus, RER is a main variable that affect the output of noon-tradable goods sector. As the theory of Dutch disease predicts, the output of non-tradable goods is expected to be negatively correlated to the RER.

(Model 3)

$$\mathrm{NT}_t = \gamma_0 + \gamma_1 RER + \gamma_2 DUMW_t + \gamma_3 DUMS_t + \varepsilon_t \qquad (24)$$

$$\mathrm{RER} = \varphi_0 + \varphi_1 GE_t + \varphi_2 y_t + \varphi_3 MS_t + \varphi_4 P^*_{T_t} \quad \text{(based on Equation 23)}$$

$$\frac{\gamma \mathrm{NT}}{\gamma RER} < 0 \text{ and } \frac{\gamma \mathrm{NT}}{\gamma \mathrm{DUMW}}, \frac{\gamma \mathrm{NT}}{\gamma \mathrm{DUMS}} > 0$$

4.4.4 Tradable goods output

As with the discussion of explanatory variable that affect the output of the non-traded goods, a RER is a main variable that affect the output of tradable goods. Therefore, based on what we have analysed in this chapter, the output of the traded goods sector can be specified as a function of the real exchange rate in addition to two dummy variables that related to Iraqi case.

(Model 4)

$$\mathrm{T}_t = \pi_0 + \pi_1 RER + \pi_2 DUMW_t + \pi_3 DUMS_t + \varepsilon_t \quad (25)$$

$$\mathrm{RER} = \varphi_0 + \varphi_1 GE_t + \varphi_2 y_t + \varphi_3 MS_t + \varphi_4 P^*_{T_t} \quad \text{(based on Equation 23)}$$

$$\frac{\pi \mathrm{T}}{\pi RER} \text{ and } \frac{\pi \mathrm{T}}{\pi \mathrm{DUMS}} > 0 \text{ and }, \frac{\pi \mathrm{T}}{\pi \mathrm{DUMW}} < 0$$

In summary, all variables used in the thesis are expressed in real terms by deflating them by suitable indices (see chapter 5), and all variables are transformed into natural logarithmic forms. the definition of all variables are explained below:

- Relative price of non-tradable goods against tradable goods (RP) implies the domestic price of GDP deflator for the service and construction sector (non-tradable goods) against the domestic price for the agricultural and manufacturing sectors (tradable sector).

- Real Government Expenditure (GE) is total government expenditure based on 2005 constant prices, adjusted for inflation. Government expenditure can be defined as recurrent and capital (investment) expenditure, which has been explained in Chapter Three.
- GDP per capita (y) implies Iraqi real GDP per capita.
- Real money supply (MS) implies the broad money supply.
- Real exchange rate (RER) measures the nominal exchange rate times price of tradable goods divided by price of non-tradable goods[15].
- Tradable goods (T) measures the contribution of the manufacturing and agriculture sector to non-oil GDP.
- Non-tradable goods (NT) measure the contribution of the service and construction sector to non-oil GDP.
- International price of tradable goods ($P^*_{T_t}$), the US wholesale price index used as a measurement of international price of tradable goods.
- The Iraq-Iran war dummy variable (DUMW), period of the dummy is 1980-1988, this dummy variable introduces to capture the Iraq-Iran war, which severely affected the level of oil production and its export. In addition, due to the war, some of the factors of production in different economic sectors have been destroyed, and massive government expenditure has been spent on military equipment.

[15] The detail of real exchange rate and use different indexes can be found from chapter five specially 5.4.2 The GOP Deflator, also see Harberger (1986) and Diakosavvas and Kirkpatrick (1990), see equation real 5.2 in chapter five as well (RER = $E\ P^*/P$). All information about this issue are available in chapter five.

- The economic sanction dummy variable (DUMS), this dummy variable introduces to capture the economic sanction that have been imposed by the UN, period of the dummy is 1990 to 2003.

4.5 Summary

This chapter has analysed the model that explains the effect of the external shocks (either positive or negative shocks) of a specific boom sector on relative prices and the real exchange rate and how they affect the rest of the domestic economy (in terms of changing the structure of the economy). Although the model in this chapter has been based mainly on Edwards's series of paper (1983, 1984, 1986) and on Edwards and Akoi (1983), the model is adjusted and modified in order to suit the Iraqi case. For example, adding government expenditure into the equation is one of the modifications, since the oil revenue in oil-exporting countries accumulates to government. This model started to analyse how the commodity export boom (the oil sector) affects the money supply, GDP per capita and government expenditure, which in turn affect the price of tradable goods and the non-tradable goods sector. It is found that changing the price of tradable and non-tradable goods is a key issue that affects the RER and then affects the structure of the economy.

With increasing regularity, the exchange rate is singled out as one of the most vital economic variables in developing countries, particularly for oil-exporting developing countries. In fact, nowadays it is impossible to discuss macroeconomic policy problems without addressing exchange-rate issues. For almost all oil-exporting developing countries, the real exchange rate is affected by increasing or decreasing the international price of oil and the consequences

of this appreciation or depreciation will have a significant impact on the structure of the economy (as explained by the Dutch-disease model).

A virtue of this model is that it highlights some economic variables that affect the price of tradable and non-tradable goods. These economic variables include real government expenditure (in the Dutch-disease model, this is called spending effect), excess money supply and real income. Apart from these variables, changing the nominal exchange rate, particularly during a slump in the oil price, can have a significant impact on the relative price of tradable goods and the real exchange rate and can alter the structure of the economy towards the tradable goods sector.

Based on what we have analysed, the key conclusions about the effect of an external shock can be summarised in the case of the boom as: (i) an increase in the price of non-traded goods versus traded goods; (ii) an increase in relative price (Pn/Pt) leading to appreciation in the real exchange rate; (iii) an appreciation in the real exchange rate leading to an expansion in the output of non-traded goods and a contraction in the output of traded goods, since the domestic product loses competitiveness in the international market.

Chapter Five

Measurement of variables and data descriptive analyses

5.1-Introduction

Before turning to the empirical study, it is worth examining some information about the data involved in this thesis. Making a distinction between the tradable and non-tradable sectors is the first important step, since it is related to the analysis of the relative price of non-tradable to tradable sector, the nominal exchange rate and the output of tradable and non-tradable sectors. However, scholars have experienced significant difficulty in obtaining data alongside tradable and non-tradable goods and this has acted as a constraint upon their empirical investigation.

On the other hand, the issue of price indices will be analysed in detail in this chapter. In the previous empirical studies, different price indices have been employed to measure the price of tradable and non-tradable goods. In general, four price indices have been employed in previous empirical literature to measure the price of tradable goods, namely: wholesale price index (WPI) and consumer price index (CPI) for the main trade partners, the export price index (EPI), and the import price index (IPI). At the same time, domestic CPI and GDP deflators have been employed to measure the price of non-tradable goods. All these indices will be analysed throughout the period of the study. Once the price of tradable and non-tradable goods is measured by these indices, the real exchange rate is a key economic variable that allows us to evaluate the price competitiveness of a country.

The paper is organised into nine sections. Section 2 classifies some simple formalised facts regarding the issue of defining tradable and non-tradable goods

sectors. Section 3, however, will be about the proxy variables that have been in previous empirical studies for the price of tradable and non-tradable goods. Section 4 analyses the relative price of non-tradable goods to tradable goods using different indices. In section 5, the nominal and real exchange rate will be analysed, since the real exchange rate in the empirical chapter will be the most important variable. Nominal and real money supply are analysed in sections 6. In section 7, the relationship between some main macroeconomic variables will be analysed; such variables include oil price, government expenditure, real exchange rate and output of tradable and non-tradable goods sector. Section, 8 descriptive statistics is presented. The conclusion of the chapter will be the last section (Section, 9) in this chapter.

5.2 Classification of sectors as traded and non-traded,

The distinction between the tradable and non-tradable goods sector of the economy has become a more important element in various branches of macroeconomics and international economics. Simultaneously, empirical study in the tradable and non-tradable sectors was always covered behind theoretical developments. The division of the economic sector into the traded and non-traded goods sector was first introduced and developed by Meade (1956), Salter (1959) and Swan (1960), while studying the Australian economy. In recent times, however, the impact of the boom sector on the structure of the domestic economy depends on a neat division of the commodities into two different sectors, namely the tradable goods and non-tradable goods sectors. Although this division does not fit with the available data, the objective of such division is for convenience for theoretical purposes. However, the division of commodities

into tradable and non-tradable sectors is difficult to support with empirical evidence.

1) The tradable sector, by definition, are those goods that can be produced and consumed either domestically or internationally. In other words, tradable goods contain those commodities which are traded in reality, as well as those which are feasibly traded (Knight and Johnson, 1997 and Betts and Kehoe, 2006). Therefore, for a small open economy, the prices of tradable goods are determined by international markets (law of one price).
2) Non-tradable is defined, generally, as those goods and services that are produced and consumed domestically. In other words, non-tradable sectors can be defined as those sectors which do not enter into global trade (not exported or imported at all), or have an insignificant share in both total imports and exports (Corsetti et al. 2012). This is because they are not globally traded; these commodities must have their markets cleared in domestic markets (Betts and Kehoe 2006). Consequently, while the domestic prices of traded goods are expected to change closely with their international prices, the price of non-traded goods is determined by domestic supply and demand conditions.

In almost all previous research studies, the manufacturing and agricultural sectors are treated as being in the tradable goods sector, although some of their activities are in the non-traded goods sector. On the other hand, the category of non-tradable goods contains the construction and service sectors, although some activities in the service sector are tradable goods. However, the well-known classification used in most countries is the Standard Industrial

Classification (SIC) of the United Nations. According to the SIC, goods and services are divided into nine different categories, as follows:

1) Agriculture, hunting, forestry and fishing
2) Manufacturing
3) Mining and quarrying
4) Financing, insurance, real estate, rental and business services
5) Construction
6) Electricity, gas, water and waste service
7) Wholesale and retail trade, restaurant and hotels
8) Transport, storage, postal and communication
9) Professional, scientific, technical, administrative, and support services, public administration and safety, community, social and personal services.

Overall, goods included in the first three categories (agriculture, manufacturing, mining and quarrying) are generally considered to be included in the most tradable goods sector, while goods and services in the rest of the categories are in general considered to be in the non-tradable goods sector (Dwyer 1992).

Therefore, based on the literature and previous discussion, this study considers the manufacturing and agricultural sectors as the closest approximation for tradable good sectors. Therefore, all activities relating to the manufacturing and agricultural sectors will be treated as being in the traded goods sector, while the service and construction sectors will contain real estate and business services, transportation and communication, personal and other services. This classification is the closest category to employ in this thesis.

The importance of classification of economic sectors into tradable and non-tradable sectors is to facilitate and provide information for an assessment of

sectoral changes in the economy during boom (high oil price) and slump periods (low oil price), particularly for oil-exporting countries. Apart from that, our study includes RER as a main variable, in the sense that is how the real exchange rate is affected by boom and slump periods and how the RER affects other variables, such as the output of tradable goods and non-tradable goods. Thus, in order to investigate RER, it is essential to classify the economic sector into tradable and non-tradable goods sectors.

On the other hand, the external oil shocks[16] have played a significant role on the Iraqi economy over the last four decades, influencing changes in the structure of the Iraqi economy (Sanford 2003 and Al-Chalabi 2005). Based on oil revenue, the entire sample has been divided into two types of periods, namely boom period (high oil revenue) and slump period (low oil revenue). The boom period lasted from 1970 to 1980 and from 2004 to 2013, while the slump period lasted from 1981 to 2003.

In the first external oil shock of 1973-1974, the oil price explosion led to an increase in the volume, as well as the growth rate, of non-tradable goods and tradable goods (Foote et al. 2004). However, the growth rate of non-tradable goods increased faster than the corresponding trend in tradable goods. If we look at the sector growth of value added, as shown in Figure 5.1, it can be seen that, during the boom period (1970s), at the aggregate level, the non-tradable sector

[16] Examples of external oil shocks were in 1973 when the price of oil increased sharply due to the Arab-Israel war in 1973 and increased demand on oil by industrial countries, in 1979 the international price of oil increased sharply again due to stop exporting oil from Iran because of Iranian revolution, in shock 1982 the oil price collapsed sharply due to the reasons behind the decrease in oil demand because of the global slowdown in economic activities during 1980s, in 1986 the oil price collapse for second time during 1980s due to an increased exploration and levels of production by non-OPEC producers, in the shock of 1990, the oil price increased due to invasion of Kuwait by Iraq which led to stop oil supply by 6 million barrels per day in international market since both countries Iraq and Kuwait are considered as a major oil exporters in the world, in 1997 the oil price collapse occurred as a result of the unexpected economic crisis in Asia. At the end of 2008, the oil price again collapsed, the main cause of this sharp decline being the global financial crises which began in September 2008. while the latest one occurred in the second half of 2014 when the price of oil declined by two-third due to global over-supply of oil.

was growing faster than the tradable sector until the beginning of the 1980s. An explanation for this could be that the sector (non-tradable sector) was becoming the more profitable economic sector, as its relative price to that of non-tradable goods increased, as predicted by the Dutch disease theory (see; Foote et al. 2004).

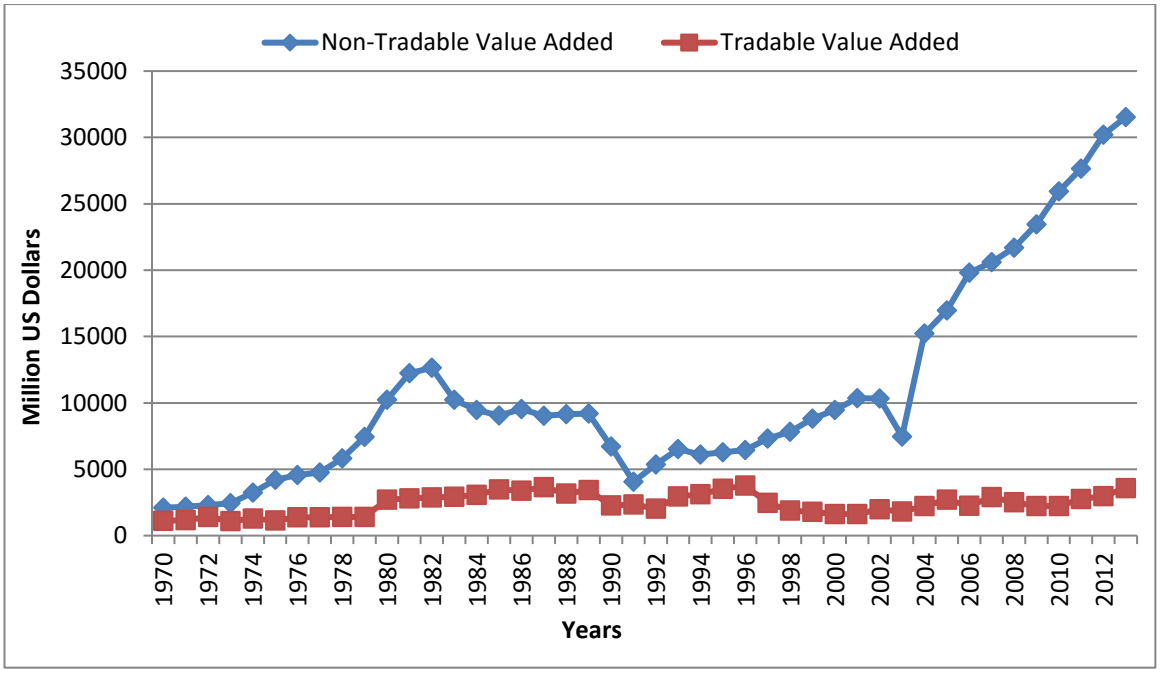
However, the growth rate of non-tradable goods began to slow down during the years 1976 and 1978, despite a high oil revenue during that period. This is attributed to the implementation of tight monetary and fiscal policy by the government in order to prevent high inflation rates in the economy (Central bank of Iraq, 2013).

One the other hand, The Iraqi government introduced enormous subsides to the manufacturing and agricultural sectors during the 1970s via what was called National Development Plan (NDP) (Ozlu 2006, p. 14). Nevertheless, these development plans have not significantly created a good opportunity to increase a real growth rate in the tradable goods sector. An explanation for this could be that the tradable sector was becoming a less profitable sector compared to the non-tradable sector, since the price of the tradable goods sector had hardly changed as real income per capita or real government expenditure changes because its relative price to that of non-tradable dropped, as predicted by the Dutch disease theory (Foote et al. 2004).

On the other hand, at the beginning of the 1980s, the era of low oil revenue began (due to a fall in oil production and its price). It is noted that the value added of non-tradable goods had started to decline gradually; in contrast, the output of tradable goods had gradually increased. The reasonable justification for these changes is possibly related to two main factors: the first was related to the sharp

decline in oil prices in 1982 and 1986; the second may have related to sharp decline in the production of oil at the beginning of the 1980s, due to the Iraq-Iran (Kumins 2005 and IEA 2013).

Figure 5.1 Output of Tradable and Non-Tradable Sectors, 1970-2013 (Constant, 2005)



Source: World Bank, World Development Indicator (2014)

The situation grew worse in 1990, when the UN decided to prevent the Iraqi government from exporting oil (economic sanctions due to the invasion of Kuwait by Iraq). This led to a sharp decline in oil revenue that indirectly affected the volume of output of the non-tradeable goods and tradeable goods sector. There was a sharp decline in the output of non-tradable goods due to the second Gulf war in 1991. In general, there was a lower value added of output of the non-tradable goods sector during 1981 to 2003, while the output of the tradable goods sector was greater in the 1980s compared with the boom of the 1970s. Even during economic sanctions (lowest oil revenue), the output of tradable goods has

grown more due to the depreciating nominal and real exchange rate (Saxton 2003).

Interestingly, after the removal of economic sanctions in 2003, as well as an increase in production and a rise of the international price of oil, it is noticeable from Figure 5.1 that the output of non-tradable goods sector has increased sharply, whereas, the output of tradable goods has not significantly changed. The plausible justification is related to lose of competitiveness of tradable goods sector due to appreciation RER. As long as RER is considered as a main factor that affect the structure of economic, thus it is necessary to discuss how to measure and calculate RER. Different indices are analysed in the next section.

5.3 Price Indices

The objective of selecting price proxies is to show the movement of tradable and non-tradable goods prices, the RER, and how these factors affect the structure of the economy between the non-tradable and tradable goods sector. In economic literature, the prices indexes are used either between countries, or domestic measures as proxies of the prices of tradable and non-tradable goods. There are several price indices that have been used by previous scholars. In economic literature, the conventional proxies for the domestic price are the consumer price index (CPI) and the price deflator gross (GDPDs). In other words, the Consumer Price Index (CPI) and the Gross Domestic Product (GDP) deflators are the most popular indexes that have been used as a proxy for the price of non-tradable goods in most of the developing countries, particularly oil-exporting countries. At the same time, the Import Price Index (MPI), Export Price Index (EPI), the Wholesale Price Index (WSPI) for domestic economy, the

Industrial Countries Wholesale Price Index (IWPI) and World Wholesale Price Index (WWPI) for foreign economies can be used as proxies for the price of tradable goods. As long as there are various price indices that can be used as proxies for the price of tradable and non-tradable goods, then it is not surprising that different conclusions are reached. In the next sub-section, the common price indices, which have been used to measure the relative price of non-tradable goods to tradable goods and real exchange rate, will be analysed.

5.3.1 Consumer Price Index (CPI)

Although the Iraqi government aims to have a relatively stable price for most consumer goods and services, the price trend has been unstable over the last five decades. A price index is a measure of the percentage changes in a set of price levels over time. The CPI measures changes in the prices of goods and services that households consume. Such changes influence the real purchasing power of consumers' incomes and their welfare (Engel 1999). The CPI in Iraq covers a wide range of goods and services such as food, housing, clothing, manufactured goods and transport services, as well as several other goods and services in the economy (Iraqi ministry of planning 2010). The CPI is traditionally considered as a closed proxy to measure non-tradable goods prices by several scholars, such as Corbo and Stelcner (1983), Rosensweig and Schultz (1987), Edwards (1992), Amano and van Norden (1995), Milner and McKay (1996), and Burstein et al. (2006). These scholars suggest the CPI as an appropriate proxy for the index of non-tradable prices, since they believe that the CPI is greatly influenced by the services sector.

However, other scholars such as Engel (1999) and Betts and Kehoe (2006) have stressed that considering the CPI as a non-traded goods price might not be a good proxy, because it covers many agricultural and manufacturing goods, which are considered as a tradable goods sector. They argued that the CPI includes price movements of imported goods (mostly tradable goods) and, therefore, it may not be an appropriate good measure of the prices of non-tradable goods. For instance, some types of services such as public administration, non-residential construction and business services are excluded, because they are not purchased by households. Moreover, the goods (as distinct from services) components of the CPI (apart from housing) are usually construed as tradable goods; and this, of course, is not met for an index that seeks to proxy non-tradable goods prices (Burstein et al. 2006). Apart from that, since its orientation is to local consumption instead of output, the CPI index includes the price movements of exportable and importable. Therefore, for the above reasons, the CPI cannot be considered as a satisfactory representation of non-tradable goods prices.

With respect to the Iraqi case, the CPI has a drawback containing a large number of traded and imported goods, so it is not reasonable to use it as a proxy for non-tradable goods prices. If we look at the CPI figure during recent decades, we can see that the movement of the CPI in Iraq has been significantly influenced by the global economy and international shocks (Sanford 2003). Before 1973, the rate of inflation was around 2% to 4%; then, after increased government expenditure due to increased oil prices, the rate of inflation increased gradually to around 7% to 11% during the period 1974-1979. In the 1980s, however, the situation was different, because the oil revenue had decreased sharply due to the reducing

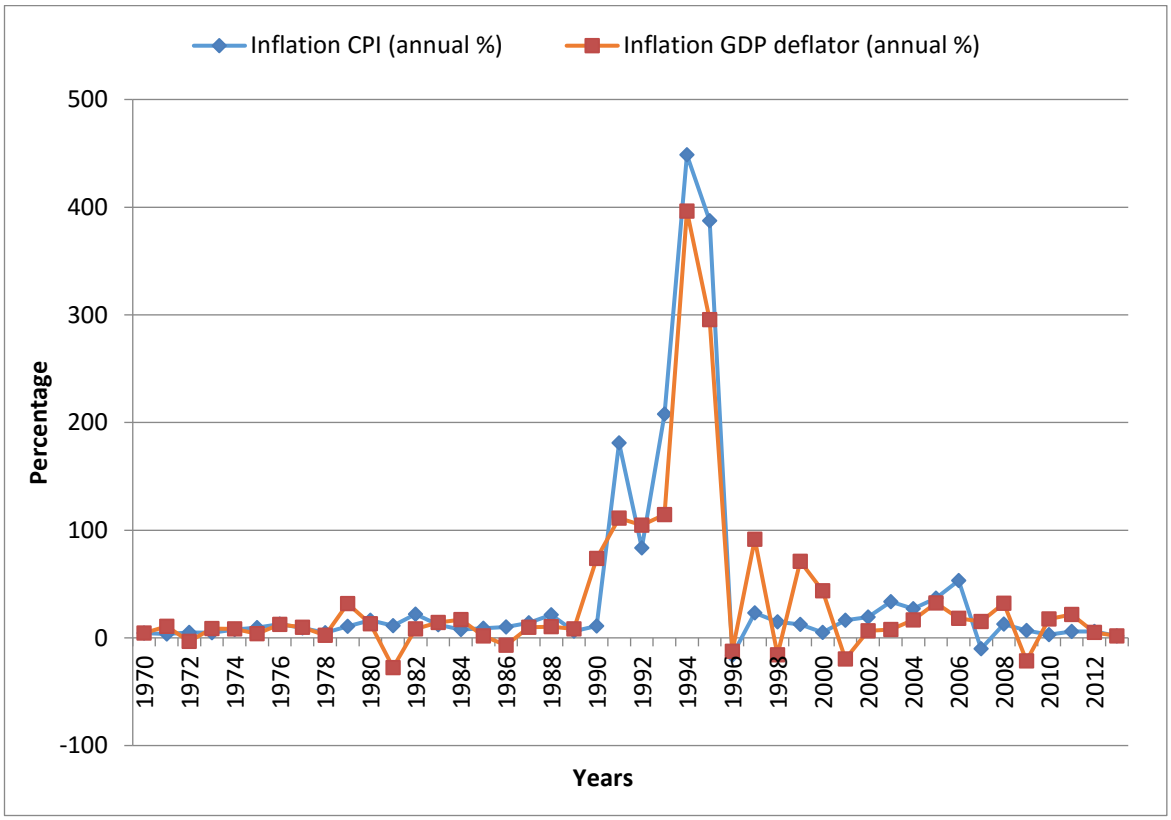
amount of exported oil and collapsing international oil prices. In the same period (1980s), the Iraq-Iran war led to price increases, as shortages resulted from the decline in domestic production in the non-oil sector, particularly the agricultural sector (Mouhammed 1990). The average inflation rate was around 12.49% annually. However, most of the basic items were subject to rationing and the prices of some other items were controlled by the government (Sanford 2003). Thus, the government adopted anti-inflationary policies and the provision of subsidies to limit price increases; otherwise the rate of inflation would have been much higher than what it was.

On the other hand, the devaluation of the nominal exchange rate was another factor that led to an increase in the rate of inflation during the 1980s (Kenneth 2003). The Iraqi monetary authority followed a fixed exchange rate, but the nominal exchange rate has depreciated which, in turn, led to an increased rate of inflation to 28% in 1988, which was the highest level during the 1980s.

During economic sanctions, particularly in the first half of the 1990s, the rate of inflation increased sharply from around 200% to 450%. One can conclude that the increased domestic price level was as a result of a sharp devaluation in the nominal exchange rate; otherwise, if the nominal exchange rate had been unchanged, the inflation rate would have been very low, or even negative, since real government expenditure had been sharply decreased during low oil revenue.

Figure 5.2

Percentage of CPI and GDP deflator indices (1970-2013)



Source: World Bank, World Development Indicator (2014)

However, at the beginning of the economic sanctions in 1990-91, the disparity between the nominal market exchange rate change and the rate of market food price inflation reflected the removal of subsidies. Therefore, as a result of the economic sanctions, the government downgraded its effort to regulate and control the foreign exchange and commodity markets, and it has since had to rely upon these markets to obtain its own requirements of foreign currency and some of its imported goods supplies. Consequently, the official exchange rate has been abandoned in practice, and traded commodities have come to reflect global prices in a way which was not familiar in Iraq before the sanctions.

However, once the economic sanctions were partially removed in 1997, the inflation rate declined due to an appreciating nominal exchange rate (Kenneth 2003). This tells us that the imported goods (agricultural and manufacturing

goods) have dominated the CPI categories. Again, in 2007, when the monetary authority decided to appreciate the official exchange rate against US dollars, the rate of inflation became a minus rate (see Figure 5.2), because the price of imported goods and services in the domestic currency became cheaper when it was converted to local currency. This means that most of the goods and services, which are listed in CPI categories, are imported from abroad; therefore, we cannot use them as proxies for domestic prices. Thus, the GDP deflator can be used as a better proxy to represent a country's price level.

5.3.2 The GDP deflator

In the literature, the deflator GDP is calculated as the ratio of nominal Gross Domestic Products (GDP) in a given year to real GDP of that year (Dornbusch et al. 1994). Therefore, as long as the GDP deflator is built on a calculation containing all the goods produced in the domestic economy, the GDP deflator (GDPDs) can be considered an appropriate measurement of changes in competitiveness in production since it is a genuine price index of total production and is not subject to direct distortions stemming from price controls, which have been applied in many developing countries.

There are several previous researches that have used the GDP deflator as a price of the domestic economy, such as Heien (1968), Goldstein and Khan (1978), Kravis and Lipsey (1978), Goldstein and Khan (1985), Dornbusch (1987), Harberger (1989), De Gregorio et al. (1994), Micossi and Milesi-Ferreti (1994), Marsh and Tokarick (1994), Chinn (2002), and Driver and Westaway (2005). Their justification for employing GDPDs is related to the fact that the advantage of GDPDs over the CPI is that the GDPDs measure the price movement level of

all domestic output on a value-added basis, not only that part of output purchased by households.

Although, the previous discussion supported using GDP deflator as a proxy for domestic price (non-tradable goods price), and even in Iraqi case, the GDP deflators (without oil sector) have a large component of non-tradable goods, compared with non-oil tradable goods (see Figure 5.1 above). But when we include oil sector into tradable goods sector, the contribution of non-tradable goods sector (service and construction sector) to total GDP (including oil) is not such high because of high contribution of oil sector[17] to GDP in Iraqi economy. Therefore, in this case, the GDP deflator cannot be represented as a non-tradable goods sector since the contribution of oil sector and non-oil tradable goods sector (manufacturing and agriculture sector) are significantly larger than non-tradable goods sector (service and construction sector).

In this regard, some scholars such as Harberger (1986) and Diakosavvas and Kirkpatrick (1990) have advocated the mis-aggregation of the more traditional price indices, such as GDP deflators, to attain better proxies for the price of tradable and non-tradable goods. Harberger (1986) suggested that, technically, the best index for the price of traded and non-tradable goods would be one built up from the implicit price deflators for the various sectors. Diakosavvas and Kirkpatrick (1990) also suggested that, in order to construct a proxy for tradable goods prices, the GDP deflators for the agricultural and manufacturing sector should be used, while the GDP deflator for non-tradable goods prices is given by the deflators for other economic sectors, since practical problems limit the applicability of this method (Diakosavvas and Kirkpatrick, 1990).

[17] Oil sector is considered as a tradable goods sector.

Based on above analysis, the Iraqi GDP deflator for non-tradable goods is employed as proxies for non-tradable goods price (NTGDPD) in both relative price and real exchange rate, while the GDP deflator for tradable goods sector (TGDPD) and US CPI are used as a proxy for tradable goods price in relative price and RER respectively (see, Harberger (1986) and Diakosavvas and Kirkpatrick (1990)). The detail of these proxies will be analysed in next sections. However, before analysing all proxies that will be used for both relative price of non-tradable goods against tradable goods and RER, it is important to analyse all proxies related to tradable goods in the following section.

5.3.3 Wholesale price index, producer price index, export price index and import price index,

These four indices (WPI, EPI, PPI and IPI) have been used in the literature as a measure of tradable goods prices. The Wholesale Price Index (WPI) reflects the average price changes of goods that are sold and bought in the wholesale market. This index (WPI) was calculated for the first time during the Second World War, based on Laspeyres's method. WPI is one of the price indices that have been used by some scholars as a measure of the price of tradable goods. It covers the prices of a representative group of traded goods (the cost of a given basket of goods). According to the World Bank classification of goods, the WPI covers nearly 400 products, classified by sectors like manufacturing, fishing, agriculture and livestock from both domestic and imported ones. It is argued that the WPI differs with the consumer price index (CPI) in terms of its coverage of items, since the WPI contains semi-finished goods and raw materials, which the

CPI does not. In other words, the WPI was more prone to world price movements of food and oil.

Since the WPI does not include services and its inclusion of a higher proportion of traded goods, in almost all empirical studies, the WPI is often regarded as a logical proxy for the price of traded goods. There have been some empirical researches, which have required price indices for traded goods. For instance, in their research of the Salter (1959) and Dornbusch (1974) models of devaluation in Mexico, Krugman and Taylor (1978) used the United States WPI as a proxy for the traded goods price index. Others such as Officer (1976), Harberger (1986, 1988), Edwards (1989), Ghura and Grennes (1993) and Papell (1994) used the WPI in their studies as a proxy for prices of tradable goods.

Unfortunately, the WPI, like other indexes, has its own deficiencies. One of the most common deficiencies with WPI is related to double-counting, since its component price indices measure commodities prices at varying stages of production, therefore leading to the probability of double-counting. The fact that the quantitative importance of this double-counting is hard to evaluate renders this defect all the more troublesome. In the Iraqi case, unfortunately this index is not available for the whole period of the sample due to large amounts of missing data. However, the US WPI can still be used as a proxy of tradable goods prices, as has been used in economic literature (see; Edwards, 1985).

On the other hand, two alternative price indices, which are related to the domestic economy, have been employed in the empirical literature to measure the price of tradable goods, namely: the import price index (IPI) and the export price index (EPI). In economic literature, the IPI and EPI have been used to measure the price of tradable goods, such as Milner et al. (1995), Engel (2000),

Burstein et al. (2006), Silver (2007) and Gopinath et al. (2010). IPI is measured as a weighted average of imported goods prices, whereas EPI is measured as a weighted average of exported goods prices. The justification of using these two proxies (IPI and EPI) is that product substitution and arbitrage possibilities in production and consumption are sufficiently powerful to safeguard the fact that domestic price and export of the same commodities in a given country, and the export prices of the identical commodities from different nations, will be closely aligned.

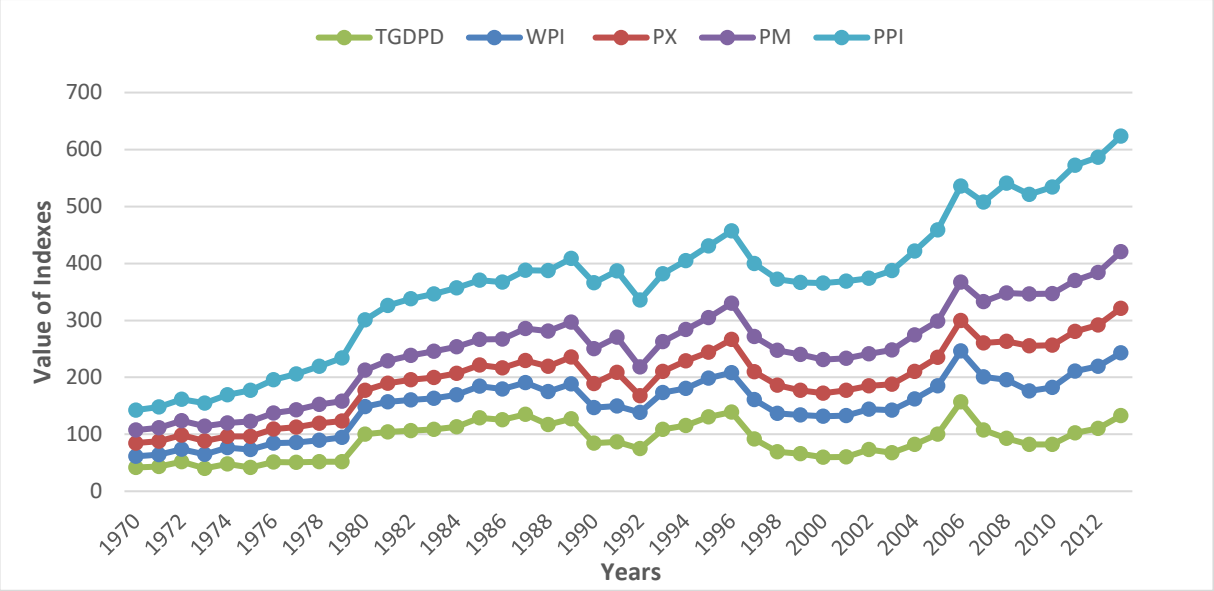
However, price-discriminating monopolists, cost of transportation and trade barriers suggest that departures from the "law of one price" are far from unusual, and this is the case even at fairly fine levels of disaggregation. For instance, Kravis and Lipsey (1977, p. 155) concluded their study of domestic and export price movements in the USA, Germany, United Kingdom and Japan. They found that there are considerable and prolonged divergences between the price of exports among different countries for the same commodities and notable differences within nations between domestic and export price movements. Therefore, considering IPI and EPI as a price measure for the tradable goods price can be a wrong procedure. Apart from that, the quality of the IPI and EPI as a proxy for imported and exported goods alone is suspect, since, the component price indices are mostly unit-value indices instead of true price measures.

Moreover, using IPI can have some other deficiencies compared to the EPI; this deficiency appears from the fact that the Iraqi import price index does contain imported military equipment (military goods made up 25 per cent of total Iraqi imports during the 1980s). In addition, the price of imported retail items can vary

considerably between, before and after the point of entry. This is attributed to some factors such as retailers in transportation costs, changes in the margin of wholesalers and tariffs. For these factors, it is believed that the EPI is the superior proxy variable compared to the IPI to measure the price of tradable goods.

Figure 5.3

Indices of TGDPD Deflator, US WPI, PPI, PM and PX



Sources: - PE, PX and PPI; Penn World Table (PWT), Centre for the international Data, (2015).
-TGDPD and US WPI; World Bank, World Development Indicator (2015).
Notes: TGDPD: Iraqi GDP Deflates for tradable goods (constant 2005).
US WPI: United States Wholesale Price Index.
PPI: Producer Price Index for Industrial Countries.
PM: Iraqi Import Price Index.
PX: Export Price Index.

Figure 5.3 shows the movement of Iraqi US WPI, IPI and EPI, PPI and TGDPD deflator. It is noticed that, to a large extent, their trends over the last four decades are similar; however, the IPI has a flatter trend than the EPI trend. This can be related to the fact that tariffs and transportation costs affect the level of IPI. It is also noticed that the price of Iraqi exports (oil and non-oil tradable goods) is significantly close to the trend of US WPI. The could be related to the law of one price, where it has been assumed that the price of domestic tradable goods is similar or close to the international tradable goods price. Here, it can be said that using EPI can be a better proxy for measuring the price of tradable goods.

5.4 Relative price of non-tradable goods to tradable goods,

In the previous section, the issue of different indices to measure the price of tradable and non-tradable goods has been explained. Both CPI and GDP deflators are the most popular indices that were used or represented as a proxy for the price of non-tradable goods by many scholars. On the other hand, other indices such as WPI, industrial countries PPI, industrial countries CPI, IPI and EPI are measured as a proxy for the price of tradable goods. However, it is pointed out that using international price indices (WPI, PPI and CPI) without including a nominal exchange rate may not provide a true measurement in the Iraqi case, since the Iraqi nominal exchange has fluctuated severely during the last four decades. For instance, the rate of inflation in Iraq (GDP deflator or CPI) has increased significantly during the 1980s and 1990s, mostly as a result of depreciating nominal exchange rate (Katzman 2003). The rate of inflation was about 400% during the first half of the 1990s due to the sharp devaluation of the Iraqi Dinar (Iraqi currency), while the rate of inflation in industrial countries or US was only around 2% to 10% (see above figure in this chapter).

In order for there not to be a wrong calculation for the relative price of non-tradable goods to tradable goods, real GDP is divided into tradable and non-tradable goods. Harberger (1986) proposed that the more suitable indices to measure the price of traded and non-tradable goods would be one built up from the implicit price deflators for the various sectors (GDP divided into tradable and non-tradable goods sector). Diakosavvas and Kirkpatrick (1990) suggested that, in order to construct a proxy for tradable goods prices, the GDP deflators for the agricultural and manufacturing sectors should be used, while the deflators for the rest of the economic sector give GDP deflators for non-tradable goods price.

Therefore, the analysis used in this section in order to calculate the relative prices was as follows. PNT: price index of non-tradable goods, 2005 = 100. This series is generated by dividing the nominal value of GDP originating in the non-tradable goods sector by the real value of GDP in that sector (non-tradable sector) and multiplying the result by 100. While PT refers to price index of tradable goods was calculated in the same way, the series was generated by dividing the nominal value of GDP in the tradable goods sector by the real value of GDP of that sector (tradable goods sector) and multiplying the result by 100. Then, the GDP deflator for both tradable and non-tradable goods sector will be given (see Officer (1976); Goldstein and Officer (1979); Harberger, 1986). Finally, the relative price of non-tradable to tradable is calculated by dividing the price of non-tradable sector (GDP deflators for non-tradable goods) by the price of the tradable sector (GDP deflator for tradable goods) and multiplying the result by 100. The result is shown in Table 5.1.

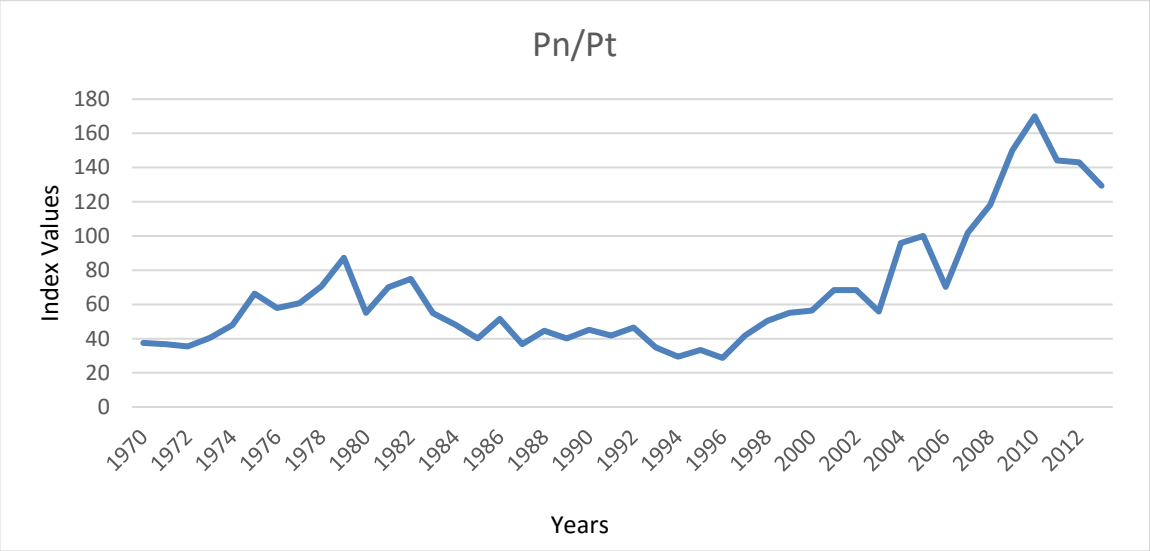
Table 5.1 The Iraqi GDP deflator for tradable and non-Tradable sector (1970-2013)

Years	NTGDP	NTGDPD	TGDP	TGDPD	NTGDPD/TGDPD*100= PN/PT
1970	2858.3	15.56529	1119.5	41.46911	37.53465
1971	2930.2	15.95683	1170.2	43.34716	36.8117
1972	3386.9	18.44385	1403.7	51.99659	35.47127
1973	2991.8	16.29228	1088.5	40.32079	40.40665
1974	4207.6	22.91309	1287.5	47.69225	48.04364
1975	5095.8	27.74991	1129.8	41.85064	66.30702
1976	5462.1	29.74465	1386.8	51.37057	57.90213
1977	5644.6	30.73848	1366.5	50.61861	60.72566
1978	6686.3	36.41121	1392.6	51.58542	70.58431
1979	8283.9	45.11117	1395.9	51.70766	87.24273
1980	10113.6	55.07507	2703.3	100.1371	54.99969
1981	13398.2	72.96183	2812.7	104.1895	70.028
1982	14619.1	79.61042	2869.6	106.2972	74.89416
1983	10939.6	59.57317	2929.5	108.5161	54.89801
1984	10036.3	54.65412	3059.2	113.3205	48.22969
1985	9486.9	51.66228	3476.6	128.782	40.11606
1986	11871.2	64.64633	3383.9	125.3482	51.5734
1987	9121	49.66972	3650.6	135.2274	36.7305
1988	9594.5	52.24823	3163.3	117.1766	44.5893
1989	9372.2	51.03767	3439.7	127.4152	40.05619
1990	6994.4	38.08901	2273.1	84.20136	45.23563
1991	6657.1	36.2522	2337.5	86.5869	41.86799
1992	6396.9	56.61782	2024.5	74.99259	75.49788
1993	6969.7	81.51966	2935.1	108.7235	74.97887
1994	6238.4	82.98291	3115.8	115.4171	71.89828
1995	7997.4	76.22486	3530.3	130.7712	58.28871
1996	7340.6	78.09381	3758.9	139.2391	56.0861
1997	7044.6	38.36239	2473.1	91.60987	41.87582
1998	6427.9	35.00406	1876.4	69.50659	50.36077
1999	6659.5	36.26527	1777.8	65.8542	55.06903
2000	6187.3	33.69383	1614.3	59.79775	56.34633
2001	7567.9	41.21209	1626.5	60.24967	68.40219
2002	9185.1	50.01879	1974.9	73.15528	68.37345
2003	6909.3	37.62559	1818.3	67.35442	55.86209
2004	14523.3	79.08873	2225.9	82.45296	95.91982
2005	18363.3	100	2699.6	100	100
2006	20270.9	110.3881	4236.9	156.9455	70.33533
2007	20089.2	109.3986	2898.4	107.3641	101.895
2008	20166.6	109.8201	2507.4	92.88043	118.2382
2009	22677.4	123.4931	2223.4	82.36035	149.9424
2010	25631.9	139.5822	2217.4	82.13809	169.936
2011	27047.7	147.2922	2759.6	102.2226	144.0897
2012	28932.1	157.5539	2974.8	110.1941	142.9785

2013	31537.7	171.7431	3583.1	132.7271	129.3957

Source: World Bank, World Development Indicator (2014)
NTGDP: Value of the GDP for Non-Tradable Goods
NTGDPD: Index for GDP Deflators for Non-Tradable Goods
TGDP: Value of the GDP for Tradable Goods
TGDPD: Index for GDP Deflators for Tradable Goods
PN/PT: Relative price of Non-tradable goods against Tradable goods.

Figure 5.4
Relative price of non-tradable goods with respect to tradable goods (1970-2013)



Source: World Bank, world Development Indicator (2015)

According to the Dutch disease theory, the increase of the relative price of non-tradable goods to tradable goods is predicted during a boom period (high oil price). During a slump period (low oil price), the relative price of non-tradable goods to tradable goods decreases. Table 5.1 shows that the relative price of non-tradable goods to tradable goods increased substantially during the years 1970-1980. The reason behind this was related to increasing oil prices and real government expenditure, which made the rate of increase of non-tradable goods prices faster than the rate of increased prices of tradable goods (Hussein and Benhin 2015).

However, once the oil revenue declined sharply at the beginning of the 1980s due to decreasing amounts of oil exports and a sharp drop in the oil price, this followed the relative price of non-tradable goods to tradable goods falling. It can

be noticed that the average rate of inflation in the tradable sector was lower than the average rate of inflation in the non-tradable sector during the 1970s (oil boom period). On the other hand, the rate of inflation in the non-tradable goods sector was lower during 1980 and 1990, which in turn led to a drop in the relative price of non-tradable goods to tradable goods (see Figure 5.4). However, after partially lifting economic sanctions in 1997 (Oil for Food Program), the Iraqi government began to export a limited amount of oil, and the relative price of non-tradable goods to tradable goods increased again. The sharp increase of relative prices after 2003 may related to increased oil prices and enlarged oil production, particularly after the removal of economic sanctions in 2003.

In general, it can be seen from the figures that, during high oil revenue (boom periods), the relative price of non-tradable goods to tradable goods increases (see 1970s and 2000s). Conversely, when the oil revenues declined, as happened during the 1980s and 1990s, the relative price of non-tradable goods to tradable goods declined. In other words, during the boom period, the rate of inflation of non-tradable goods sector is higher than the rate of inflation of the tradable goods sector, while the situation is vice versa during a slump period. The differentiate inflation rates between the tradable and non-tradable goods sectors, is the main factor for the appreciation or depreciation of the real exchange rate in the economy.

5.5. Nominal and real exchange rate,

The distinction between the nominal exchange rate (NER) and real exchange rate (RER) has become increasingly important in the literature. The NER is a monetary concept that measures the relative price between any two currencies

between two different countries (specifically, home currency unit per foreign currency unit). Therefore, the NER is defined as the number of units of the domestic currency that can purchase a unit of a given foreign currency.

An increase in home currency (with constant foreign currency) means a depreciation in home currency against foreign currencies, while a decrease in home currency means an appreciation in domestic currency against foreign currencies. Therefore, the level of the exchange rate can have a significant impact on the range of a country's export sector; for instance, growing it when the exchange rate depreciates, and contracting it when it appreciates (IMF 2006). Concern about the structure of exports away from the tradable goods sector makes the exchange rate a more important policy for the oil-exporting countries, particularly developing ones.

The exchange rate strategy involves selecting an exchange rate regime and determining the particular rate at which a foreign exchange rate transition will occur. In general, the exchange rate regimes are divided into two main regimes. The first regime is the fixed exchange rate, which means a fixed exchange rate to a single foreign currency (pegging the home currency to a single foreign currency), fixing domestic currency to a developed country's currency, or pegging domestic currency to a basket of currencies called Special Drawing Rights (SDR) (IMF, 2016. p, 27). There are still some countries among developing countries that continue to follow a pegged exchange rate regime, even after the collapse of the Bretton Woods system in 1971 (Obstfeld and Rogoff 1995). The second regime is the floating exchange rate regime, its rate determined freely by markets. Most of the developed countries follow a floating exchange rate. However, there are some other exchange rate systems between

these two regimes that some countries follow, such as the managed floating rate (Rose 2011).

The main objective of many oil-exporting developing countries in pegging to one currency like the US dollar is to avoid any fluctuations in the exchange rates, which may have a damaging influence on domestic economies in terms of the volatility of domestic price levels and incomes. Most of the oil-exporting countries have experienced a large fluctuation in their revenue due to the fluctuations in international oil prices, particularly countries like Iraq and the Gulf countries, whose oil revenue consists of over 90 per cent of total revenue.

The Iraq Currency Board was established in 1931 for the printing of notes and maintenance of reserves for the new Iraqi dinar. In the beginning, the Iraqi Dinar was pegged to the British pound (Central bank of Iraq, 2013). However, after 1959, the Iraqi dinar was switched to the US dollar. There were some reasons for this policy of pegging the Iraqi dinar to the US dollar instead of the British pound. Firstly, the oil revenues, which accumulate to the government, were priced in US dollars. Therefore, these revenues would be easily converted to Iraqi dinar, so this would enable the budget from the government to be estimated with no severe uncertainty, and would make it easier for the government when planning the annual budget. Secondly, most of the Iraqi trading partners use the US dollar as the main currency when trading with Iraq; thus, pegging to US dollar would give more stable prices of imports from those major countries that traded with Iraq, and pegging to the US dollar gives more stability at domestic and general price level (Ministry of Planning, 2005).

Regarding the effect of oil revenue on monetary policy, since 1973 Iraq has had an abundant foreign exchange as a result of huge oil revenues. The impact of

this revenue is observable in fiscal policy (as we have analysed in Chapter 3) and monetary policy. Therefore, the monetary policy was affected by the boom and slump periods, thus affecting the exchange rate. In order to identify how the fluctuation of oil revenue affects monetary policy, it is important to distinguish between official and market (parallel) exchange rates. In the following table, the two different types of nominal exchange rate will be shown.

Table 5.2

The Official and Parallel (Black Market) of Iraqi Nominal Exchange Rate (1970-2013)

Year	Official exchange rate (Iraqi Dinars)	Parallel exchange rate (Iraqi Dinars)
1970	0.355	0.359
1971	0.353	0.358
1972	0.332	0.336
1973	0.302	0.308
1974	0.295	0.299
1975	0.295	0.298
1976	0.295	0.299
1977	0.295	0.297
1978	0.295	0.298
1979	0.295	0.299
1980	0.295	0.360
1981	0.295	0.475
1982	0.298	0.480
1983	0.310	0.501
1984	0.310	0.571
1985	0.310	1.176
1986	0.310	1.676
1987	0.310	1.876

1988	0.310	2.014
1989	0.310	3.043
1990	0.310	4.054
1991	0.310	10.3
1992	0.310	21.5
1993	0.310	74.1
1994	0.310	456
1995	0.310	1674
1996	0.310	1070
1997	0.310	1471
1998	0.310	1620
1999	0.310	1972
2000	0.310	1930
2001	0.310	1929
2002	0.310	1957
2003	1985	1992
2004	1453	1473
2005	1472	1492
2006	1467	1487
2007	1254	1275
2008	1193	1219
2009	1170	1180
2010	1170	1185
2011	1170	1190
2012	1166	1195
2013	1166	1190

Source: Central Bank of Iraq / Statistical and Research Department / Annual Statistical Bulletin, various issues.

Table 5.2 demonstrates the movement of official and black (parallel) market exchange rates. The official exchange rate is fixed by the central bank of Iraq,

and the central bank sells foreign currencies, particularly US dollars, at fixed prices. In order to buy foreign currency from a central bank, all importers have to comply with the various foreign exchange regulations (Ministry of Planning, 2010). However, as long as all importers or financial institutions who want to buy foreign currencies are not granted approval by the Iraqi Central Bank. Thus, importers whose applications have not been approved by the central bank to provide foreign currencies will depend on the black market (parallel market), and the black market usually provides alternative sources for the purchase of foreign exchange to finance imports (Foote et al. 2004). Furthermore, the level of demand for foreign exchange in the black market is determined by the level of supply of foreign currencies by the central bank. Scarcities in the foreign exchange from the official market (central bank) necessarily involve a diversion of demand to the black market (Alnasrawi 2002). Therefore, there was an operative black market, under which dollars were widely available at higher rates relative to the official posted rates. The question here is why the parallel market exchange rate appeared.

The Iraqi economy has experienced a number of shocks, large fluctuations in the international price of oil. Political instability and war are examples of such shocks. Such factors possibly have an influence on the nominal exchange rate (Ministry of Planning, 2010). Overall, however, all shocks have been divided into two different periods; the first is called a boom period (1970-80 and 2003-13), while the second period is called a slump period (1981-2003).

Prior to the first oil boom period in the early 1970s, Iraq operated a fixed exchange rate regime under which the Iraqi dinar was pegged to the US dollar. It officially stood at 0.355 = $1 during the period 1970-1973, while the parallel

exchange rate stood at 0.359. It is noticed that the parallel exchange rate had been almost equal to the official exchange rate. More interestingly, once the oil price increased significantly in 1973, bringing about an improvement in the financial and economic conditions. With the improving political climate, the authorities appreciated the official exchange rate to 0.295 dinar for each US dollar (Ministry of Planning 2010). The central bank intervened frequently in support of the dinar in the parallel market in order to stabilise the nominal exchange rate in the fixed rate. Finally, the parallel exchange rate value was very close to the official rate for the whole period of 1974-1979 (Foote et al. 2004).

However, as can be seen from Table 5.2, the parallel exchange rate gradually depreciated during the 1980s. The possible justification behind the depreciation of the nominal exchange rate during the 1980s was the declining oil price. This factor led to a decline in the size of the Iraqi international reserve and a decrease in the volume of inflow hard currencies into the Iraqi economy (Schnepf 2003). Thereafter, the central bank could not supply enough US dollars; as a result, the Iraqi dinar devalued against major foreign currencies in a parallel market exchange rate. Apart from that, during the same period, Iraq had experienced a larger budget deficit (Alnasrawi 1994). The consequences of this budget deficit brought about a depreciation of the Iraqi dinar, as the monetary authority began to fund its deficit via money creation. This caused an imbalance between domestic and foreign currencies (a shortage of foreign currencies) (Foote et al. 2004).

Moreover, Iraq was involved in a massively destructive war with Iran during the 1980s. An increase in government expenditure towards imports of armaments brought about more devaluation in the parallel exchange rate (Hanke and

Sekerke 2003). The Iraq-Iran war forced the Iraqi government to impose some restrictions on importing some types of goods; in other words, imports were restricted quantitatively to save the foreign exchange, and the foreign exchange was allocated to prevent capital flights (Sanford 2003). Thus, the parallel exchange rate was devalued from 0.360 Dinars/$US in 1980 to 1.176, 2.014 and 4.054 Dinars/$US in 1985, 1988 and 1990, respectively. The parallel exchange rate in the Iraqi dinar has depreciated against the US dollar by more than 10 times from 1980 to 1989. Whereas, the official exchange rate has not changed, since the central bank tried to keep fixing a nominal exchange rate at a constant price.

On the other hand, during the 1990s, the situation became worse when the UN imposed economic sanctions on the Iraqi economy (Iraqi oil was banned from export). During the first year of the sanctions, the foreign exchange market (black market of exchange rate) did not fully reflect the magnitude of the shock. However, by the middle of 1991, one US dollar bought 10 dinars and, by December 1995, it was possible to purchase 1600 Iraqi dinars for one dollar. During that time, the monetary authority adopted a *de facto* managed float instead of an official fixed exchange rate. Factors such as the halt in exporting oil (due to economic sanctions), printing massive domestic currency, and political instability are the main reasons behind the sharp devaluation in the nominal exchange rate (Boone et al. (1997) and Foote et al. (2004)).

However, once the UN lifted the economic sanctions in 2003, the Iraqi dinar appreciated slightly to 1473 dinar/1 US dollars. Then, with increasing oil revenue, the central bank tried to appreciate the nominal exchange rate and to supply enough US dollars to the market and traders in order to affect the parallel

exchange rate and make it close to the official rate. Thus, it can be seen from Table 5.2 above that the nominal exchange rate had gradually appreciated against the US dollar, and the parallel exchange rate was very close to the official exchange rate.

The above analysis has shown that the monetary authority in Iraq has attempted to keep the nominal exchange rate at a fixed rate between the market rate and official rate. But only by doing this during periods of high oil revenues could the Iraqi central bank control the nominal exchange rate under a fixed rate, since the central bank had enough foreign reserves as a result of the balance of payment surplus (Ministry of Planning 2010). Conversely, during low oil revenues (either due to collapse of the oil prices or economic sanctions), the parallel nominal exchange rate was much higher than the official one, particularly during economic sanctions. The reason behind this was related to a budget deficit when the government depended on printing money to fund its deficit instead of implementing austerity (Foote et al. 2004). This led to a devaluation of the domestic currency against foreign currencies, as occurred during the 1980s and 1990s in Iraq.

The importance of analysing appreciation and depreciation of the nominal exchange rate does not only depend on an exchange between the two different currencies. An appreciation or depreciation of the nominal exchange rate can have a significant effect on the rate of inflation, income per capita, the volume of imports and exports, real exchange rate, international competitiveness (at least in the short run), and output of tradable and non-tradable goods, etc (IMF 2016). Therefore, without analysing the nominal exchange rate, the real exchange rate cannot be examined, since by definition the real exchange rate is equal to the

international price time nominal exchange rate divided by domestic price (Edwards 1985). If an appreciation of the nominal exchange rate takes place, the international price (in the case of a small open economy) will be cheaper and the relative price of non-tradable goods to tradable goods increases (appreciation real exchange rate). Conversely, if depreciation takes place, the price of international goods will increase and then the relative price of non-tradable goods to tradable goods will decrease (depreciation of real exchange rate). Therefore, the real exchange rate is affected by the nominal exchange rate and, at the same time, it will affect international competitiveness.

By definition, the Real Exchange Rate (RER) is defined as the nominal exchange rate (*E*) multiplied by the ratio of foreign price level (*P**) to the domestic price level (P).

$$\text{RER} = E\ P^*/P \quad \ldots\ldots\ldots\ldots \quad (5.2)$$

From equation (5.2), RER is a real exchange rate, where *E* represents the nominal exchange rate (NER), which is defined as the number of units of local currency per unit of foreign currency.

The relative price of traded goods (international price) to non-traded goods (domestic price) as a measure to define RER can be more powerful, and it identifies more willingly the incentives that guide domestic resource allocation (Korhonen and Juurikkala 2009). Its focus on allocation of domestic resources has made this definition of RER a favourite tool for analysing the competitiveness of a home country relative to a foreign country, particularly for developing countries.

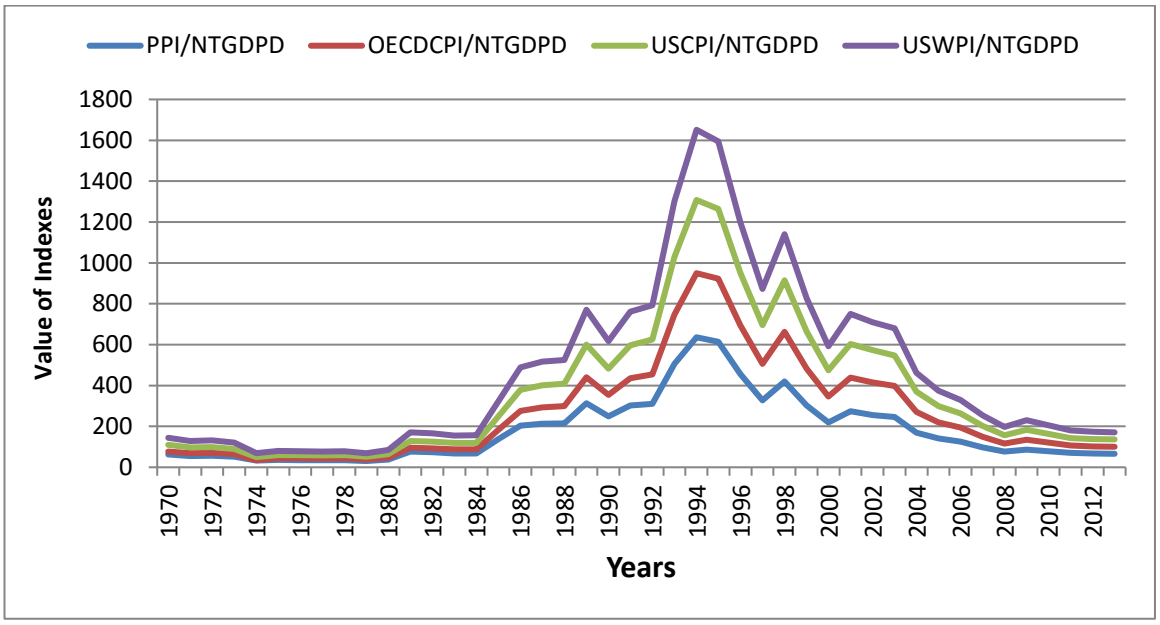
According to equation (5.2), any increase in the price of non-tradable goods with a constant price of tradable goods and fixed nominal exchange rate (E) leads to

a decline in RER (appreciation of real exchange rate). In this case, the decrease in *P*/P* means appreciation in RER of domestic currency and loss of international competitiveness, and reflects an increase in the domestic cost of producing tradable goods (Edwards and Akoi 1983). In the same way, a decrease in domestic price (*P*), while holding constant international price (*P**) and with no change in the nominal exchange rate (E), a depreciation of the RER will take place and bring about an improvement in international competitiveness.

To discuss RER changes means being more specific about the different price indexes represented by domestic price (*P)* and international price (*P**), with different RER concepts arising from different choices of price index (see Harberger, 1986). In the Iraqi case, the non-tradable GDP deflators are used as a domestic price (price of non-tradable goods), whereas Producer Price Index for industrial countries (PPI), US Consumer Price Index and US Wholesale Price Index are measured and tested as a price of international tradable goods (tradable goods price). However, most scholars such as Harberger (1986) and Edwards (1989) supported and used the US Wholesale Price Index to represent a price of tradable goods.

Figure 5.5

Iraqi Real Exchange Rate by employing different indices (1970-2013)



Source: - Central Bank of Iraq / Statistical and Research Department / Annual Statistical Bulletin, various issues.
-World Bank, World Development indicator, (2015),
- Penn World Table (PWT), Centre for the international Data, (2015).
* Iraqi Nominal Exchange rate: Iraqi Dinars shown in the first column of the table against each US Dollars.
* Real exchange rate is measured as nominal exchange rate times each of the PPI, OECDCPI, USCPI, USWPI divided by the Iraqi non-tradable GDP deflator.
PPI: Producer Price Index for Industrial Countries.
NTGDPD: Iraqi non-tradable GDP Deflator.
OECDCPI: OECD Consumer Price index
USCPI: US, Consumer Price Index.
USWPI: US, Wholesale Price Index.

Figure 5.5 illustrates the Iraqi RER during the period 1970-2013, as non-tradable GDP deflators represent the domestic price, while PPI, US CPI and US WPI represent the international price. It is noted that the trend for different indices is to be very close to each other. One can conclude that among the various proxies that have been used for the real exchange rate, the best of the conventional proxies seemed to be USCPI/NTGDPD.

5.6 Money supply

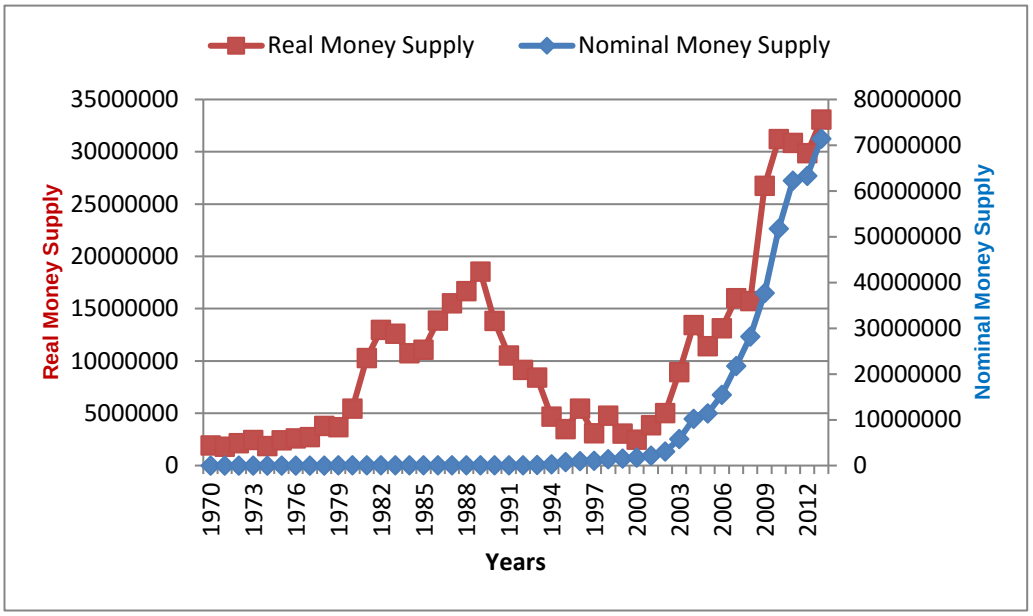
An interesting part of the result is that the shock of international oil prices affects domestic money supply in oil-exporting developing countries. This supports earlier studies by many scholars such as Dornbusch (1973), Edwards and Aoki

(1983), Edwards (1984), Kamas (1986), Edwards (1986), Frankel and Rose (1994), Obstfeld and Rogoff (1995), Hau (1998), Looney (2003); Frankel (2003, 2010), and De Paoli (2009), in that monetary policy responds to international oil price shocks (either positive shocks or negative shocks).

Edwards (1983) pointed out that money supply can be increased during high and low price of export commodities. However, the consequences of increasing money supply on macroeconomic variables is different during high and low price of export commodity (we have discussed in detail in chapter four). In this section, the movement of real and nominal money supply are analysed, in order to show the impact of price of commodity export on real and nominal money supply during last five decades based on Edwards's model (see chapter four) and link to Dutch disease phenomena.

Real and nominal money supply in response to different shocks are shown in Figure 5.6. However, in order to show a clear picture of nominal and real money supply in Iraq, the whole sample period of money supply was divided into three different periods based on the period of shocks. The first period considered a period of 1970-1989, as shown in Figure 5.7. The second period is the economic sanctions period (1990-2003) as shown in Figure 5.8, while the period 2004-2013 is considered as a third period, as shown in Figure 5.9.

Figure 5.6
Iraqi Nominal and Real Money Supply (1970-2013)



Source: Central Bank of Iraq / Statistical and Research Department / Annual Statistical Bulletin, various issues.

Figure 5.6 (above figure) has been divided into three periods of time in order to show clear picture of nominal and real money supply during last 5 decades in Iraq.

Figure 5.7
Iraqi Nominal and Real Money Supply (1970-1989)

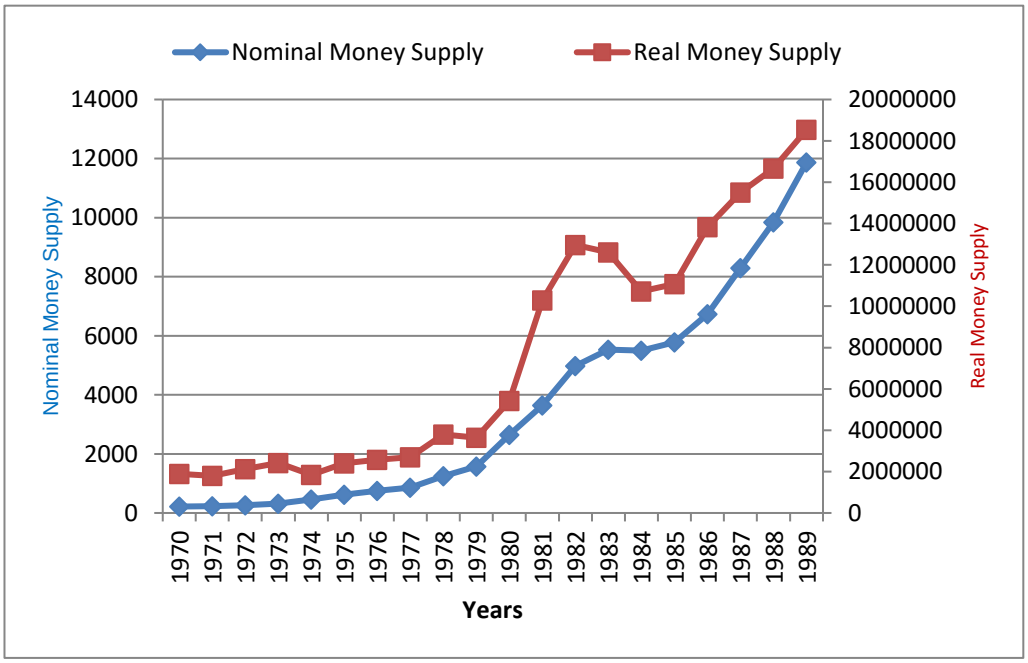
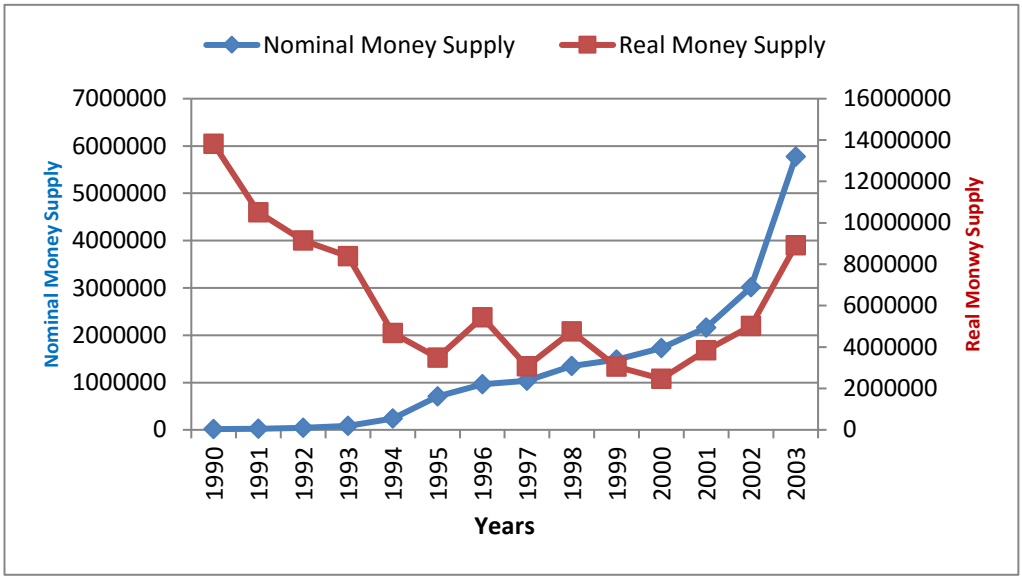
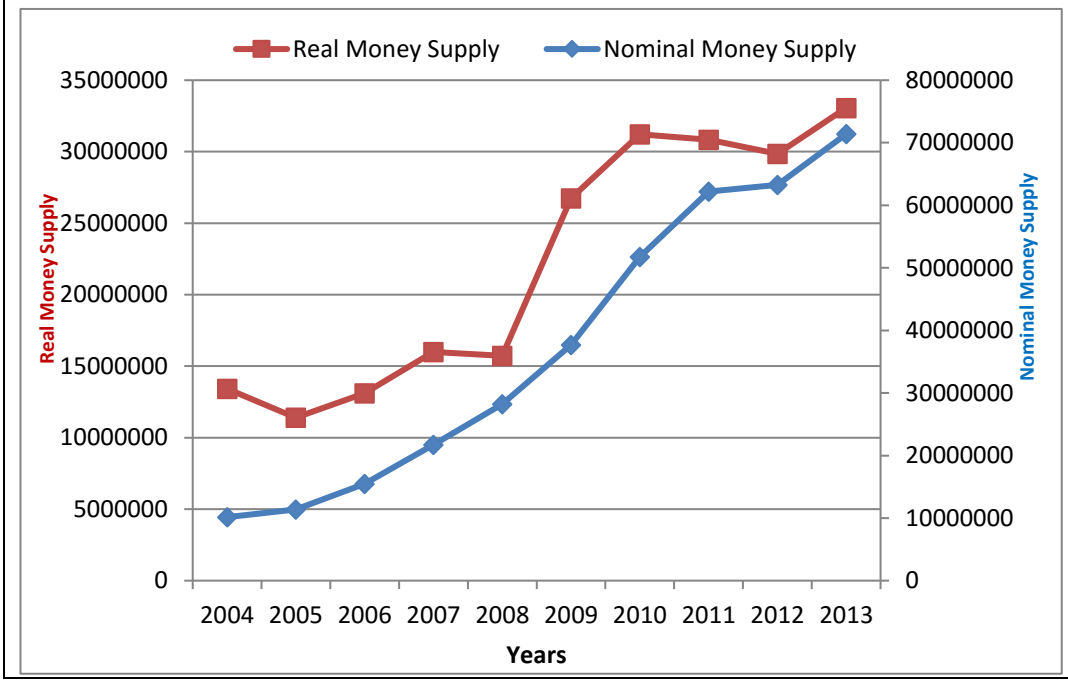


Figure 5. 8
Iraqi Nominal and Real Money Supply (1990-2003)



Figure, 5,9
Iraqi Nominal and Real Money Supply (2004-2013)



Let us now trace the growth of the real and nominal money supply. As oil, price and production became an increasingly dominant part of all government resources, and its impact on government holdings and money supply could no longer be discounted. Figure 5.7 demonstrates that the nominal and real money supply grew remarkably during the period 1970 to 1980. The currency in

circulation enlarged sharply at an annual rate of 15.7% on average. This increases in money supply is attributed to the increase oil revenue due to the nationalization of oil and the increase in oil prices during1973-1980 (Ministry of Planning, 2010 p. 55). This is exactly expected by Edwards (1983), that he pointed out if the price of export commodity increases then lead to increase foreign reserve and If this increase of international reserves is not fully sterilized, the money supply will increase (see chapter four). According to Iraqi Central bank data, part of the international reserve was converted to increase domestic money supply during 1970s. One of the major factors influencing the growth of the money supply is domestic government expenditure, since the domestic government expenditure exercises a dominant influence on the money supply through being the major source of liquidity (Ministry of Planning 2010). The expansion of the banking system could be another factor which cause an increase in real and nominal money supply according to ministry of planning, 2010 (see p. 54). The outcomes of increasing money supply led to increase demand on all goods and services which in turn led to higher inflation rate in Iraqi economy (Ibid, p.56). This is expected by outcome by most of scholars we have mentioned such as Edwards and Aoki (1983), Harberger (1989) and Kamas (1986).

On the other hand, during the collapsing in oil price in the 1980s, the trend of nominal money supply continued to be on the increase. As Edwards (1983) mentioned that during low price of commodity exports, the money supply can be increased to fund the deficit of government budget (see chapter four). However, increasing real money, supply is related to keeping the inflation rate below the rate of increased nominal money supply, despite the rate of inflation in the 1980s

was higher than the rate of inflation in the 1970s (Hussein and Benhin 2015). Keeping the inflation rate below the rate of increased nominal money supply was related to using massive Iraqi foreign reserves, which had been saved up during high oil revenues in the 1970s in order to keep the nominal exchange rate constant, which eventually led to the inflation rate of tradable goods being at a lower rate. However, it is important to mention that the rate of devaluation nominal exchange rate[18] (see nominal exchange rate table in this chapter) was higher than the rate of inflation. In this case, the increase price of tradable goods is higher than the increase price of non-tradable goods (Corden and Neary (1982) and Edwards (1983)).

However, there was a large excess of nominal money supply in 1990/91, which contributed to chronic inflation and economic instability in subsequent years (Hussein and Benhin 2015). During the first half of the 1990s (see Figure 5.8), monetary expansion was increasingly absorbed by an accelerating high inflation rate, which led to a sharp decline in real money supply. A sharp increase in the nominal supply of money was related to financing the government budget via money creation (Sanford 2003 p. 48). A nominal supply of money surged, while real demand for money declined further because of a continued depreciation of the Iraqi dinar in the parallel market. The consequences of increasing nominal money supply led the inflation rate to increase, however the rate of inflation of tradable goods sector would be higher than the rate of inflation of non-tradable goods sector. This is exactly happened during first half of 1990s in Iraq (Foote et al. 2004).

[18] In previous section in this chapter, we have explained why the devaluation of nominal market exchange rate took place in detail during 1980s.

However, in the second half of the 1990s, due to the Oil for Food Program, which allowed the Iraqi authority to export a limited amount of oil to import some basic goods and medicine products. Because of this program, the oil revenue increased, then the government less depended on printing money to support its expenditure (printing money was used by government to fund a budget deficit). Although, the nominal and real money supply continued to increase during this period, but the consequences were different because increasing oil revenue led to appreciation nominal exchange rate, in this situation, increasing money supply led to increase demand on both tradable and non-tradable goods, but, since the appreciation nominal exchange rate took place due to increase oil revenue (see previous section), then the rate increasing price of tradable goods was much lower than the increasing price of non-tradable goods (Alnasrawi 1994).

On the other hand, lifting economic sanctions in 2003 and increasing international oil prices led to substantial increases in the country's holdings of foreign assets, which largely accounted for the remarkable growth of domestic liquidity during 2004-2013 (Ministry of Planning 2010). This is because the revenue coming from the oil sector flows directly to the government. Once this revenue is spent in the domestic economy, the inflow of foreign exchange will be translated into domestic liquidity. Therefore, with increasing government expenditure, the nominal money supply has increased as well. The real money supply also increased during 2004-2013 because the rate of increase of the nominal money supply was much lower than the rate of inflation in the same period (see Figure 5.9). Despite increasing government expenditure over the last decade, the rate of inflation was under control via fixing a nominal exchange rate; this was helpful as it kept the imported goods price under control (Hussein and

Benhin 2015). Thus, after the lifting of economic sanctions, the real money supply increased in the same way as the nominal money supply.

The volatile nature of the money supply (either in nominal terms or real terms) emanates from the unpredictability of international oil prices. This is because the Iraqi economy depends mainly on oil for its revenue generation (Ministry of Planning 2010). The consequence of this is that the supply of money also follows the same dynamic trend.

5.7 Oil price, real exchange rate and structural change,

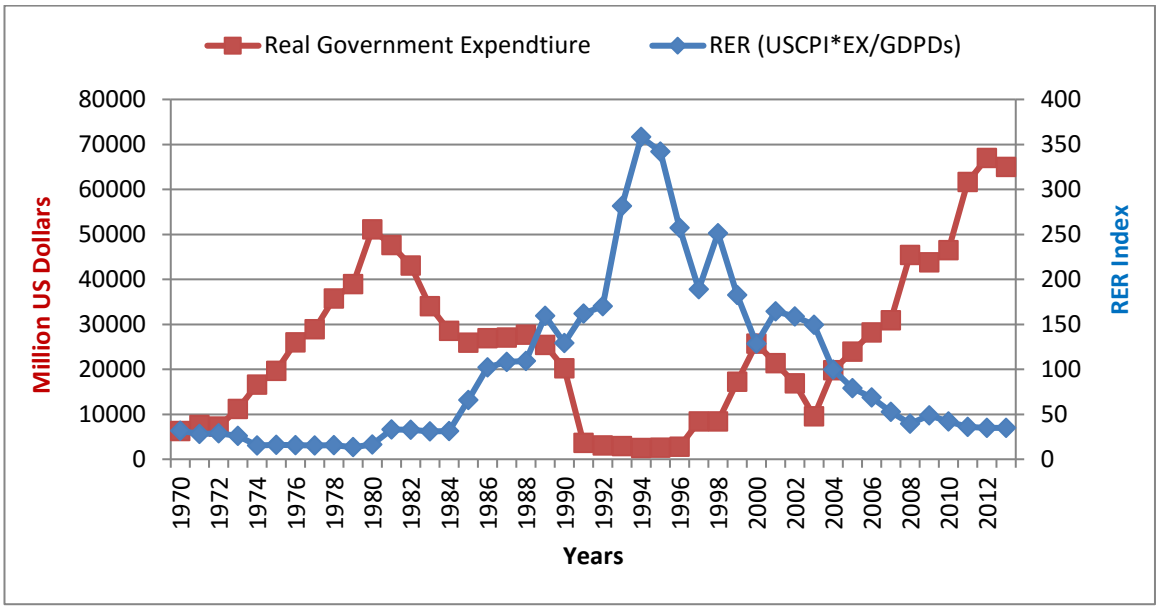
In the following sub-sections, we will analyse how export booms (oil sector, in our case) affect a country's real exchange rate, and how the real exchange rate, in turn, affects the output of tradable and non-tradable goods sector. These are important and integral points in understanding the Dutch disease phenomenon.

5.7.1 Real government expenditure and real exchange rate,

As we have analysed, Chapter 4 (equations) shows how the variance of real government expenditure affects the real exchange rate. Figure 5.10 demonstrates the relationship between real government expenditure and real exchange rate. As the figure displays, there seems to be a negative relationship between both variables, as when the real government expenditure increases, the real exchange rate declines (appreciates). For instance, during the 1970s, real government spending increased rapidly, while the real exchange rate appreciated (declined). Decreasing real government expenditure began in 1981 up until 1997, and the real exchange rate has increased (depreciated) sharply.

Figure 5. 10

Correlation between RER and real government expenditure (1970-2013)



Source: Authors' calculations using data from the World Bank and Central Bank of Iraq,

Again, after increasing real government expenditure, the real exchange rate started to decrease (appreciate) after 1997 (except in 2003 due to the Iraq-US war) because the real government expenditure increased again after the removal of economic sanctions, partially in 1997, but also completely in 2003. This is in line with Dutch disease theory, that high government expenditure is associated with appreciating (decreasing) real exchange rates and vice versa.

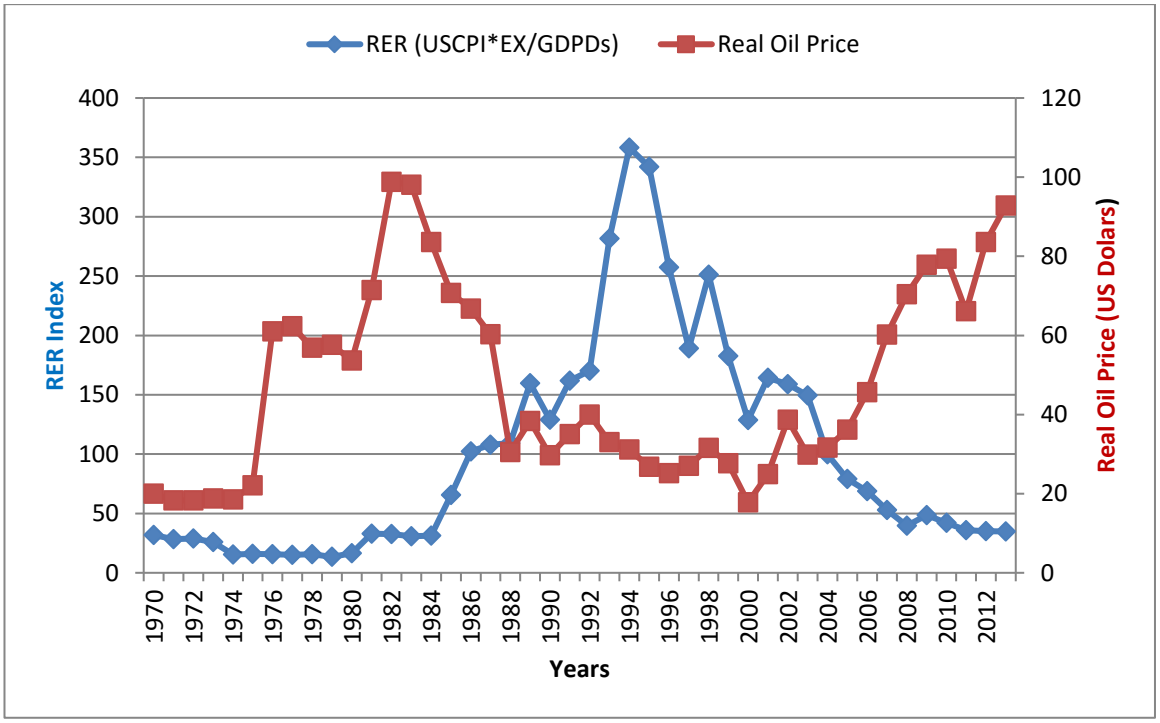
5.7.2 Real oil price, real oil revenue and real exchange rates,

Terms of trade are an important and the most frequently used variable in exchange rate analysis. Terms of trade are defined as a ratio of price of exports to price of imports. In empirical works, it is common practice to employ a commodity price as a proxy for terms of trade in cases when a commodity makes up a significant share of a country's exports. However, in Iraq's case, as long as crude oil makes up a significant share of exports, so the real oil price is employed

as an approximation for terms of trade. Many papers have previously suggested (see literature review in Chapter Two) that the oil price is considered a fundamental variable, which explains the long-running behavior of RER, when taken in terms of trade.

Figure 5. 11

Correlation between real oil price and RER (1970-2013)



Source: Authors' calculations using data from the World Bank and Central Bank of Iraq,

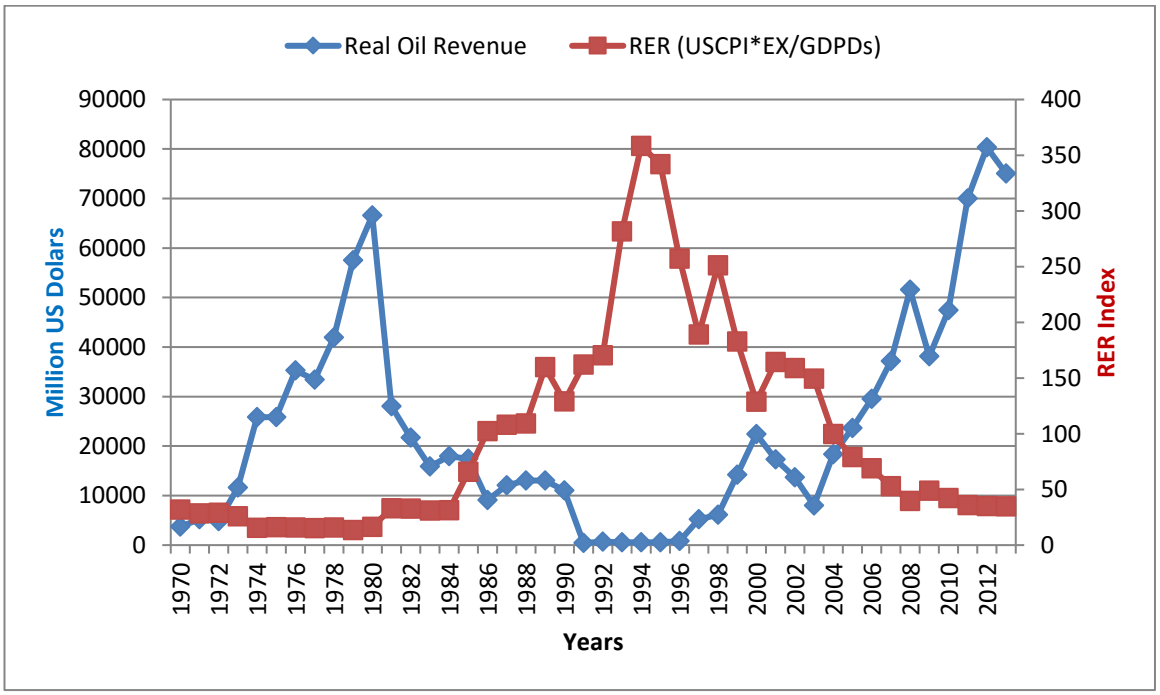
Figure 5.11, shows the correlation between the real oil price and real exchange rates from 1970 to 2013. The effect of the sharp increases in crude oil price in the 1970s led to a appreciation of the real exchange rate during the period (Foote et al. 2004 p. 23). Conversely, once the international oil price declined at the beginning of the 1980s, the sharp depreciation real exchange rate occurred. However, a sharp depreciation in the real exchange rate during the first half of the 1990s was not related to fluctuating international oil prices, but to international economic sanctions, which were imposed on Iraq in 1990. Therefore, any fluctuation in oil price during the first half of the 1990s did not

affect the real exchange rate in Iraq (Sanford 2003). However, with the introduction of OFFP in 1996 (which removed economic sanctions partially), the real exchange rate appreciated sharply, despite the international oil price which had not significantly changed. This is because the Iraqi government gained at least a limited amount of oil revenue from zero oil revenue (Ozlu 2006). Removing international sanctions on Iraq in 2003, and increasing international oil prices, caused an appreciation of the real exchange rate in the following years (IMF 2016).

As we have analysed, due to some political disruption in Iraq, during part of the sample period, the change in international oil price did not affect the real exchange rate, particularly during economic sanctions. Therefore, the correlation between real oil revenue and real exchange rate is essential in order to identify to what extent the oil sector is correlated to the real exchange rate.

Figure 5. 12

Correlation between real oil revenue and RER (1970-2013)



Source: Authors' calculations using data from the World Bank and Central Bank of Iraq,

Figure 5.12 shows the relationship between the real oil revenue and real exchange rate. During the first and second positive oil shocks in the 1970s, the real oil revenue increased sharply, which brought about appreciation of the real exchange rate in the same period (Foote et al. 2004). However, with declining oil revenues, due to a decrease in international oil prices and the Iraq-Iran war, which caused oil production to decline, the real exchange rate began to depreciate (Alnasrawi 1994). Furthermore, the economic sanctions during the 1990s led to the oil revenues being close to zero; this reflected to a sharp depreciation in the real exchange rate. However, increasing oil revenue after 1996 under the OFFP followed the real exchange rate to appreciate again. As a result of some political instability during 2002 and 2003, the oil revenue again declined, which led to a depreciating real exchange rate again. More interestingly, after the lifting of economic sanctions was completed in 2003, the international oil price started to increase, while the real exchange rate started to decline (appreciation) to the lowest level in 2013.

To conclude, it is found in the above analysis that, to a large extent, the appreciation of real exchange rates is caused by increased real government expenditure and real oil prices. Conversely, a depreciation of the real exchange rate is caused by a decline in real government expenditure and real oil prices. In the following sub-section, the effect of appreciation and depreciation on real exchange rates during the output of tradable and non-tradable goof sector will be analysed.

5.7.3 Real exchange rates and output of tradable and non-tradable

We have established the fact that an appreciating real exchange rate did take place during periods of high oil prices and high real government expenditure. Conversely, during period of low oil prices and low real government expenditure, the real exchange rate appreciates. This section seeks to investigate whether relationships exist between the real exchange rate and the output of tradable and non-tradable goods sectors. According to the Dutch disease theory, a positive relationship should exist between the real exchange rate and the rate of growth of tradable goods sectors. This would mean that, when the real exchange rate appreciates (decreases), and the output of tradable goods sector shrinks, a deprecation (increase) of real exchange rate results in an increase in the rate of growth of tradable goods (IMF 2016). On the other hand, the relationship between the appreciation (depreciation) of real exchange rates will be analysed in this section. Here, it is expected that there is a negative relationship between the growth rate of non-tradable goods and real exchange rate.

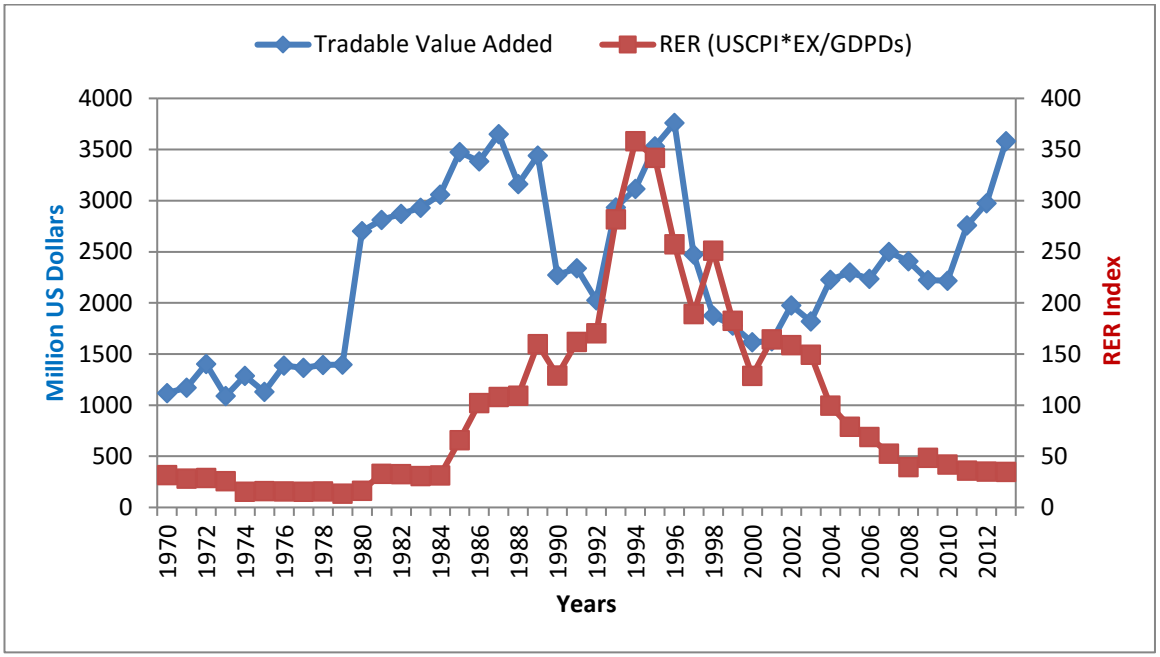
As Figure 5.13 shows, during the 1970s, when the real exchange rate appreciated, the output of tradable goods (manufacturing and agricultural sectors) fluctuated slightly and, during some periods, increased. During that time, the Iraqi government attempted to protect domestic producers via subsiding domestic producers (particularly the agricultural sector). This action at least protected the tradable goods sector from collapse (Foote et al. 2004).

However, the output of tradable goods sector began to increase sharply in 1980 and, in 1987, reached $3650 million from $1366 million in 1977. Two main reasons led to the increase in output of tradable goods. First, the Iraqi government introduced a development plan, in use since 1975, to support and

encourage the manufacturing and agricultural sectors (Ministry of Planning 2010). Part of the oil revenues during the 1970s were used to subsidise the tradable sector. The second factor, which is the most important factor, was related to the depreciation of nominal and real exchange rates in the 1980s, which caused domestic products to be cheaper than international products for similar products.

Figure 5.13

Correlation between output of tradable goods sector and RER (1970-2013)



Source: Authors' calculations using data from the World Bank and Central Bank of Iraq,

However, it can be seen that there is a sharp drop in the tradable goods output from 1990 to 1992, despite a sharp depreciation in real exchange rate during the same period. This was because of the Iraq-Kuwait war (invasion of Kuwait) during that time (Schnepf 2003). Apart from that, the 1991 uprisings in Iraq were a series of popular rebellions in northern and southern Iraq, in March and April 1991. Thus, the economy was disrupted and most production units in almost all economic sectors were halted due to political instability, which dominated the

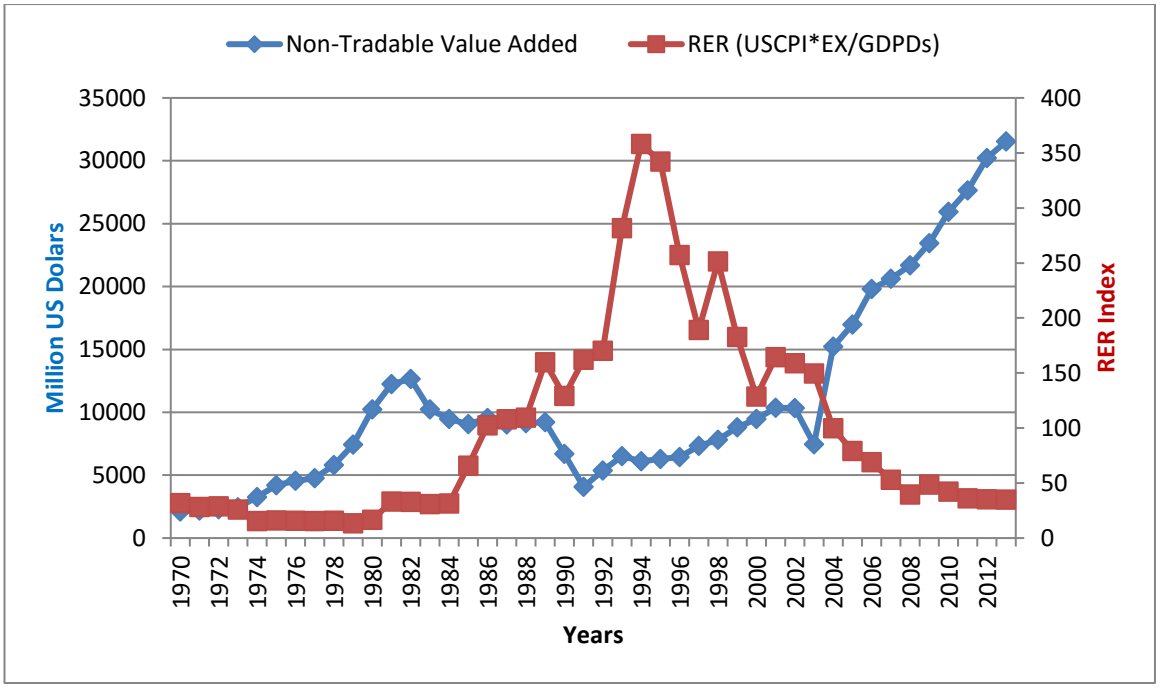
whole country. When the war ended, at the beginning of the 1990s, the output of the tradable goods sector started to increase with increased real exchange rates (depreciation RER), which are expected according to the Dutch disease theory. On the other hand, when the real exchange rate began to appreciate again in 1996 (due to OFFP), the output of the tradable goods sector began to decline. However, after 2003, the situation was different when the real exchange rate continued to appreciate, but the output of tradable goods increased instead of decreasing (the opposite of what the Dutch disease predicts). This was because the Iraqi government subsides financed the agricultural and manufacturing sector via development plans (Ministry of Planning 2010). This occurred after the government gained a huge amount of oil revenue after 2003. Despite a rapid increase in tradable goods output, its percentage to GDP is relatively small compared to other sectors, particularly the service sector.

On the other hand, the correlations between the real exchange rate and non-tradable goods output are shown in Figure 5.14. During the first and second oil shocks in the 1970s, the output of the non-tradable goods sector grew sharply due to an appreciating real exchange rate, bearing in mind the appreciation of a real exchange rate occurred when both oil prices and government expenditure increased. However, when the real exchange rate started to depreciate (increase) in 1980, the output of non-tradable goods sector started to decline, as the Dutch disease theory predicts. During the first half of the 1990s, the real exchange rate reached its highest level of depreciation and the non-tradable goods sector was steady in low output until 1996. When the OFFP was introduced by the UN in 1996, the real exchange rate appreciated sharply. As a result, the output of non-tradable goods sector gradually increased, except in

2003, as a result of the Iraq-US war. After the war, the situation was different, particularly when the UN decided to lift economic sanctions on Iraq. The real exchange rate declined (appreciate) sharply, which led to a significant increase in the output of the non-tradable goods sector.

Figure 5.14

Correlation between output of non-tradable sector and RER (1970-2013)



Source: Authors' calculations using data from the World Bank and Central Bank of Iraq,

In general, it can be said that there is a negative correlation between the real exchange rate and output of the non-tradable goods sector. When the real exchange rate increases (depreciate), the output of non-tradable goods sector decreases. During appreciation (decrease) of the real exchange rate, the output of non-tradable goods sector increases. This phenomenon has been explained by the Dutch disease theory.

5.8 Descriptive statistics

In order to make clearer the data that has been analyzed in this chapter, it is important to apply the summary descriptive statistics. Below, these two tests will be analyzed and an explanation given of how these variables are affected by each other and how they fluctuated during the last five decades.

Table 5.2 shows a summary of the descriptive statistics of all the variables, where the total number of observations is 44 (1970-2013). Oil price is the first and most important variable that should be analysed here, since it is considered a key variable that affects other macroeconomic variables. During the last five decades, the sharp volatility of the nominal oil price has taken place since the minimum value is 1.21, while the maximum value is 109.45. The real oil price, however, is less volatile since the US inflation rate has been taken out from the calculation of the value. The value is moved between 17 to 98; although it is still high, the volatile value is much smaller than the nominal one. As can be seen from the statistics table (Table 5.3), other variables have fluctuated significantly, such as government expenditure (both nominal and real term), real exchange rate (RER) and nominal exchange rate, particularly paralleled nominal exchange rate (nominal market exchange rate). These variables are significantly affected by a fluctuation in the international oil price. For instance, the minimum value of nominal government expenditure is 1243, while the maximum value is 60 times bigger than the minimum, which is 78740. The value of the RER is also huge, between 13 and 358. Surprisingly, the GDP per capita has not fluctuated in the same way as other macroeconomic variables; its value is between 2517 as a maximum value, with a minimum value of 682.

Table 5.3: Descriptive statistics

Variables	Obse	Mean	Median	Max	Min	Std. Dev.	Sum
T	44	2356.114	2305	3758	1088	808.676	103669
NT	44	10813.38	9041.5	31537.7	2101	7727.86	475788.7
RMS	44	10470456	9031356	33062423	1796390	8748836	4.61E+08
OER	44	333.55	0.31	1985	0.295	596.4359	14676.2
ROP	44	47.39773	38.525	98.78	17.79	24.21078	2085.5
PER	44	659.8245	15.9	1972	0.297	770.1492	29032.28
NOR	44	18124.43	9580	94463	301	23492.88	797475
ROR	44	23476.02	17358.85	80349.8	431.6	21454.93	1032945
NOP	44	31.715	21.275	109.45	1.21	28.78343	1395.46
Y	44	1446.83	1332.25	2517.6	682.1	518.5772	63660.5
RGE	44	25281.6	25551.78	66975.93	2498.047	17453.63	1112390
NGE	44	19065.2	14890.5	78740	1243	19924.51	838869
NMS	44	8907208	34289.5	71387000	217	18906874	3.92E+08
RER	44	98.99151	59.22525	358.2251	13.42694	91.58557	4355.627

Note: estimates are calculated by author based on annual data that has been collected for this study for period of study (1970-2013).

On the other hand, the output of tradable (T) and non-tradable goods (NT) are affected by the mentioned macroeconomic variables particularly RER. Overall, the volume of output of the non-tradable sector is much bigger than tradable goods, which are expected by economic theory. The value of the sum of the tradable goods output is around 103669, while the volume of non-tradeable goods output is about 475788. Regarding their minimum and maximum value, it

is noted that there is little difference between the minimum and maximum values of tradeable output (Max is 3558 while Min is 1088). The reason for this is that the increase in oil price, government expenditure and appreciation of RER have not encouraged the output of the tradable goods sector; rather, its output was affected negatively, as the economic theory expected. While the difference between the minimum and maximum value of non-tradable goods output is relative huge, its maximum value is 31537, whereas the minimum value is only 2102. The reason behind this difference is that most of the changing macroeconomic variables (oil price, RER and government expenditure) have a significant influence on the output of the non-tradable goods sector. In order to investigate the impact of the volatility of macroeconomic variables on the domestic economy of Iraq, the correlation matrix is also important to give a clear picture of the relationship between variables, before turning to the empirical study in Chapter Six.

5.9 Conclusion

This chapter has generally analysed how the changes in oil prices and production affect number of key macroeconomic variables within the Iraqi economy. These variables have been described and analysed in terms of their movement trends during the last four decades. However, before analysing the correlation between these variables, we must distinguish between the value of variables that is measured in real terms instead of nominal terms, since the real term is a more accurate measure in economic literature.

Moreover, all goods and services have been classified into tradable and non-tradable sectors. The standard industrial classification of the UN distinguishes nine different economic sectors. Both agriculture and manufacturing are the most tradable types of goods. Construction, transportation, and the various service groups are considered as comprising the non-tradable sector.

Using different proxies to measure the price of both the tradable and non-tradable goods sector is another important point that has been analysed in this chapter. Both domestic CPI and GDP deflators have been employed as an indicator of non-tradable goods price, while EPI and IPI are local measures of tradable goods, and US CPI, US WPI, PPI as international measures of tradable goods have been analysed. In this study, the Iraqi GDP are deflators that have been considered as a price of the non-tradable goods sector, while the US CPI is measured as a price of tradable goods. Based on these price indices, the relative price of non-tradable goods with respect to tradable goods and the real exchange rate has been measured and analysed by employing these indices. It is found that, in a boom period (high oil revenue), the real exchange rate has appreciated (decreased), while the real exchange rate has depreciated

(increased) when the oil revenues decreased. However, the movement of the real exchange rate is also affected by the output of the tradable and non-tradable goods sector. It is found that, during appreciation of the real exchange rate, the output of the tradable goods sector was less encouraged compared to the non-tradable goods sector; at the same time, during depreciation of the real exchange rate, the output of tradable goods has been affected more positively than the non-tradable goods sector. In general, the descriptive analyses are broadly consistent with the predictions of Dutch disease theory. However, in order to reach a precise result, it is important to check the correlation between those macroeconomic variables that have been analysed in this thesis. An empirical analysis will be necessary and will be applied in the next chapter.

Chapter Six

Empirical analysis of the impact of fluctuation in oil revenue on some macroeconomic variables

6.1 Introduction

In this chapter, we shall translate the theoretical framework developed in Chapter Four into a quantitative analysis. To facilitate a quantitative assessment of some of the effects of the boom sector (oil sector, in our case) on the Iraqi economy. The purpose of this chapter is to empirically estimate the behavioural equations that have been built in Chapter Four by using both Ordinary Least Squares (OLS) and Two Stage Least Square (2SLS) regression methods, which are employed using time-series data from 1970-2013. The reason behind using 2SLS is related to problems with "endogeneity".[19] Regarding satisfaction of time series data, before running the regression, it is important to satisfy properties of time series via testing stationarity, co-integration (long-term relationship), multicollinearity and some other tests.

The remainder of this chapter proceeds as follows. Section 6.2 is about the multicollinearity problem and, for this issue, the VIF will be used. Section 6.3 presented OLS and 2SLS methods and presents the specifications of each dependent variable's structural equation and estimation, in addition to the empirical results, which are identified and discussed. Section 6.4 provides a summary and conclusions derivable from this chapter.

6.2 Multicollinearity problem

Multicollinearity is a condition that takes place in a regression when two or more explanatory variables in the model have a relationship between each other

[19] In econometrics, an **endogeneity problem** occurs when an explanatory variable is correlated with the error term.

(Belsley 1991 and Murray 2005). Multicollinearity expands unnecessarily the standard errors of the coefficients. Enlarged standard errors, in turn, mean that coefficients for some explanatory variables might be found to be insignificant and far from 0. In other words, when the standard errors increase, multicollinearity creates some explanatory variables statistically, which are not to be significant when they should be significant. Without multicollinearity, those coefficients may be significant (Murray 2005). Therefore, it can be said that existing multicollinearity in any regression can change the outcome of the regression.

The reason for concentrating on the issue of multicollinearity in this study is because, in the case of the Iraqi economy, some of these explanatory variables can have a strong relationship between each other. For instance, oil revenue and government expenditure may have a strong correlation with each other, since the Iraqi government depends mainly on oil revenue. Entering these explanatory variables in the models is related to theoretical reason, since almost all models related to this subject support entering these variables.

In the economic literature, there is no clear-cut criterion for assessing multicollinearity of linear regression models. Some scholars use correlation coefficients of independent variables. However, using this method (correlation coefficients) to compute multicollinearity has been criticised by many scholars because high correlation coefficients do not necessarily infer multicollinearity (Meloun et al. 2002; Lauridsen and Mur, 2006; Kiers and Smilde, 2007; Alauddin and Nghiem, 2010). Therefore, the most common method that is used to check multicollinearity is via checking related statistics, such as variance inflation factor (VIF). The variance inflation factor (VIF) assesses how much the variance of an estimated regression coefficient increases when predictors are correlated.

According to the VIF rules, if no factors are correlated, the VIFs will all be equal to one. In other words, if the variance inflation factor (VIF) is equal to one, there is no multicollinearity among regressors. However, if the VIF outcome is larger than one but smaller than 5, the regressors have some correlation between each other and, in the economic literature, this is called moderately correlated. However, if the result of VIF is between 5 and 10, this indicates a high correlation between explanatory variables that may be problematic (Alauddin and Nghiem 2010). Also, if the VIF is above 10, it can be assumed that the regression coefficients are poorly estimated due to an extremely high correlation between variables, which should be handled accordingly. The formulation for calculating VIF is computed as follows:

$$\text{VIF} = \frac{1}{1-R_t^2} \qquad (6.1)$$

Before applying a Variance Inflating Factor (VIF), it is important to test multicollinearity via a correlation coefficients method, as a first step to check the degree of relationship between explanatory variables in the whole equation system.

Table 6.1 Correlation coefficient between explanatory variables

Variables	OR	GE	MS	y	PT
OR	1.0000				
GE	0.9732	1.0000			
MS	0.9026	0.4656	1.0000		
y	0.9273	0.5257	0.5872	1.0000	
PT	0.3762	0.2754	0.5362	0.6132	1.0000

Author's calculation based on E-view software.

Table 6.1 shows the oil revenue is highly correlated against all other the explanatory variables which is over 0.9 in all cases. in order to further investigation about having multicollinearity, it is important to employ VIF test.

Table 6.2 part one and 6.2 part two show the VIF test between all explanatory variables such as: Oil Revenue (OR) against International Price of Tradable Goods (PT), Government Expenditure (GE), GDP Per capita (y) and Money Supply (MS).

Table. 6.2 Part one, VIF test for explanatory variables including oil revenue

- Oil Revenue (OR) against International Price of Tradable Goods (PT), Government Expenditure (GE), GDP Per capita (y) and Money Supply (MS)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	1.178631	429.8351	NA
PT	0,006316	200.4196	1.767679
GE	0.005504	198.3470	15.69907
y	0.069375	1319.645	13.49583
MS	0.013174	1206.959	18.09568

- International Price of Tradable Goods (PT) against Oil Revenue (OR) Government Expenditure (GE), GDP Per capita (y) and Money Supply (MS)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	4.535405	524.8505	NA
OR	0.061673	100.5111	2.009545
GE	0.054416	317.9519	1.327660
y	0.019236	554.5577	1.620752
MS	0.001275	3.210475	1.349187

Author's calculation based on E-view software.

Table. 6.2. Part two, VIF test for explanatory variables including oil revenue

- Government Expenditure (GE), against Oil Revenue (OR), GDP Per capita (y), Money Supply (MS) and International Price of Tradable Goods (PT)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.469658	448.9287	NA
OR	0.000801	71.32977	16.55901
y	0.029353	1463.466	3.876991
MS	0.005030	1207.919	3.096027
PT	0.001275	3.210475	1.349187

- GDP Per capita (y) against Oil Revenue (OR), Government Expenditure (GE), Money Supply (MS) and International Price of Tradable Goods (PT)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.327945	414.8057	NA
OR	0.015849	134.1408	12.599332
GE	0.016763	2095.104	3.951584
MS	0.002352	747.2281	1.915227
PT	0.001275	3.210475	1.349187

- Money Supply (MS) against Oil Revenue (OR), Government Expenditure (GE), GDP Per capita (y) and International Price of Tradable Goods (PT)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	1.635780	504.4540	NA
Y	0.018424	529.1624	1.569957
GE	0.003314	192.1133	1.733485
OR	0.039560	636.3289	16.65753
PT	0.047212	177.2158	1.247589

Author's calculation based on E-view software.

The VIF test for both models (relative price of non-taxable goods against tradable goods and real exchange rate), contain Oil revenue (OR), Government Expenditure (GE), GDP per capita (Y), Money Supply (MS) and price of tradable goods (P_T^*). For model three and four, the multicollinearity test does not need to conduct since the RER is the only explanatory variable (except DUMW and DUMS) in these equations. In overall All results indicate that there is only serious concern about multicollinearity when oil revenue includes into equation with other explanatory variables, because all VIF cantered are over 10 points, which indicate that there is a serious multicollinearity issue between oil revenue in one hand and the rest of other explanatory variables (except international price of tradable goods which considers as a exogenous variable). Therefore, it is recommended to drop off oil revenue and used it in separate equation against dependant variables.

6.3 Method of OLS, TSLS and empirical test

Different methods have been used in economic literature to estimate equations; one of the common methods is the Ordinary Least Square (OLS). However, the econometric analysis suggests various problems while using estimation of equations when using OLS. The main condition for the OLS regression to be unbiased and consistent is that there is no correlation between the error term and explanatory variables. Those explanatory variables that are correlated with the error term are known as the endogeneity problem in the econometrics literature. Therefore, as a general rule, when a variable is endogenous, it means there is a correlation between explanatory variables and error terms, hence

violating the Gauss Markov assumptions and making our OLS estimates inconsistency and bias.

This is easily seen in the following example of two equations where *Y* and X_1 are both endogenous.

$$Y_i = \alpha_{10} + \beta_{11}X_{1i} + \beta_{12}X_{2i} + \beta_{13}X_{3i} + \ldots\ldots \beta_{1k}X_{ki} + u_i \quad \text{(A)}$$

$$X_{1i} = \alpha_{20} + \beta_{21}Y_i + \beta_{22}Z_{2i} + \beta_{23}Z_{3i} + \ldots\ldots \beta_{2k}Z_{ki} + u_i \quad \text{(B)}$$

Now substitute the first equation into the second:

$$X_{1i} = \alpha_{20} + \beta_{21}(\alpha_{10} + \beta_{11}X_{1i} + \beta_{12}X_{2i} + \beta_{13}X_{3i} + \ldots\ldots \beta_{1k}X_{ki} + u_i) + \beta_{22}Z_{2i} + \beta_{23}Z_{3i} + \ldots\ldots \beta_{2k}Z_{ki} + u_i$$

We can see that X_1 is a linear function of u (among other things), and hence will be correlated with u. This violates the GM assumptions, and the OLS estimator β_{11} will be biased.

To remedy this problem, the TSLS method is the best suitable method to avoid the endogeneity problem. However, when using TSLS, we need to identify one or more instrument variables (*z*). These instruments (z) must satisfy two conditions:

1. The instrument variables (*z)* must be uncorrelated with error term.

$$Corr(z, u) = 0$$

2. The instrument variables (*z*) must be correlated to that explanatory variable whose correlated to the error term.

$$Corr(z, x) \neq 0$$

In the model system from this thesis, four equations have been introduced. The OLS method can be employed in both relative price (first model) and real exchange rate (second model), since it is assumed that the correlation between explanatory variables (GE, y, MS and PT) from both equations (model 1 and 2) have a zero correlation to error term. Thus, OLS estimators can generate consistent and unbiased estimates of the variables affecting relative price and real exchange rate. However, in the right-hand side of equations of nontraded and traded goods (model 3 and 4), the RER is one of an independent variable, at the same time the real exchange rate in equation 2 is correlated to the error term (since the RER is the dependant variable in equation 2). Therefore, applying the OLS method in equations 3 and 4, under these circumstances, results in biased and inconsistent estimates due to the endogeneity problem.

Two-stage least squares (2SLS), as the name suggests, involves using OLS regression in two stages. In the first stage, a reduced form of the structural equation is estimated where the RER variable is regressed on all the explanatory variables in the equation system. Then, in the second stage, a fitted value of the RER variable is calculated by subtracting the residual of the regression from the actual value of the regressed endogenous variable. The fitted value ($\widehat{RER}$) is a linear combination of all explanatory variables; and, since the explanatory variables are uncorrelated with the error term, a linear combination of them will also be uncorrelated with the error term.

6.4 The direct impact of oil revenue on dependent variables.[20]

Before conducting the impact of transmission variables (government expenditure, GDP per capita and money supply) on relative price, real exchange rate, the output of non-tradable goods and the output of tradable goods. It is valuable to examine the direct impact of oil revenue on mentioned dependant variables. As long as the contribution of oil revenue to total government revenue is relatively high (see chapter three), thus the oil revenue becomes the main source of national income. Any fluctuation takes place in oil revenue can significantly affect the whole Iraqi economy.

6.4.1 Specification of the Relative Price

Based on theoretical framework (see chapter two), any increase of oil revenue may lead to an increased aggregate demand for non-tradable goods and tradable goods. However, as long as the price of non-tradable goods is determined by domestic economy, thus, high demand on the non-tradable goods may lead to increase its price at least in the short-term. Meanwhile, the increased demand on tradable goods is met by increasing the volume of imported goods (the economy is assumed to be open and a small economy). Thus, the price of tradable goods is relatively stable when the demand increases. Specification of the relative prices will be the first task followed by its statistical results.

$$\mathrm{RP}_t = \alpha_0 + \alpha_1 OR_t + \alpha_2 PT_t + \alpha_3 DUMW_t + \alpha_4 DUMS_t + \varepsilon_t \quad (6.2)$$

It is hypothesised that increasing oil revenue leads to an increase in the relative price of non-tradable goods against tradable goods: in other words, that the

[20] Independent variables = Relative price of non-tradable goods against tradable goods, real exchange rate, the output of non-tradable goods and output of tradable goods.

coefficient of α_1 is positively related to relative price of non-tradable goods against tradable goods, while the international price of tradable goods and both dummies are negatively related to relative price of non-tradable goods against tradable goods:

$H_0: \alpha_t = 0$ Null hypothesis

$H_1: \alpha_t \neq 0$ Alternative hypothesis

Where $\alpha_{1....4}$ is represented by the coefficient of each oil revenue, international price of tradable goods, DUMW and DUMS. In the following sections, the result of statistical test is applied and analysed**.**

- **Statistical Results**

The estimations in this section were carried out by applying the OLS technique for the relative price equation. Table 6.3 demonstrates the outcome of regressing the relative price of nontraded goods against tradable goods against the real oil revenue and international price of tradable goods, DUMW and DUMS variables as explanatory variables. Before moving to the main analyses, some diagnosing tests have been conducted in order to stratify the model, such as Heteroscedasticity, Serial correlation and Normal distribution. The result of the Heteroscedasticity for this model shows that the null hypotheses cannot be rejected; rather, it is accepted since the probability value for these tests is 45%, which is more than 5%, so we can easily accept null hypotheses. This means no Heteroscedasticity exists in this model.

The result of serial correlation shows that the *P* value is more than 5%, which is equal to 10%. This means we cannot reject null hypotheses. It further means that there is no serial correlation exists in this model, which is desirable. Regarding

the normal distribution of the model, the result shows that the probability value is more than 5% which is equal to 69%. This means that we cannot reject null hypotheses meaning the data is distributed normally which is desirable. The table below shows the result of the normal distribution for this model.

Table 6.3 demonstrates the outcome of regressing the relative price of nontraded goods against OR, PT, DUMW and DUMS. The result for the coefficient of oil revenue is consistent with the theoretical framework predictions in terms of coefficient sign and its level of significant. A 10 per cent increase in international oil price ceteris paribus, leads to an increase in the relative price by 7.2 percent and the *p* value is significant at 1 percent level.

Table 6.3

Regression Results of the Relative Price

Dependent Variable: RP
Method: Least Squares
Sample: 1970 2013
Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.948042	0.514236	-3.788226	0.0005
OR	0.724307	0.132101	5.482977	0.0000
PT	-0.283797	0.068154	-4.164046	0.0002
DUMW	-0.280295	0.075626	-3.706342	0.0007
DUMS	-0.242237	0.086480	-2.801067	0.0081

R-squared	0.912706	Mean dependent var	4.029692
Adjusted R-squared	0.898550	S.D. dependent var	0.552526
S.E. of regression	0.175986	Akaike info criterion	-0.491917
Sum squared resid	1.145927	Schwarz criterion	-0.208069
Log likelihood	17.82218	Hannan-Quinn criter.	-0.386652
F-statistic	64.47600	Durbin-Watson stat	1.345285
Prob(F-statistic)	0.000000		

Diagnostic Test:

Heteroscedasticity = 0.45

Serial Correlation LM = 0.10

Normality (J.B) = 0.69

The second coefficient from Table 6.3 is international price of tradable goods. in our result, a ten per cent decrease in international price of tradable goods ceteris

paribus, brings about a 2.8 per cent increase in the relative prices. The sign of coefficient for the international price of tradable goods is negative (it is correct predicted sign) which indicates that there is a negative relationship between the international price of tradable goods and relative prices. The coefficient for the international price of tradable goods is statistically significant at 1% level. This is predicted by Dutch disease model.

Regarding last two variables which are two dummy variables (DUMW and DUMS), are expected to have a negative relationship against relative price of non-tradable goods against tradable goods. The result of the coefficient first dummy (DUMW) shows to be negative and statistically significant at 1 percent level. A ten percent increase of DUMW ceteris paribus, led to a decline of 2.8 percent of relative prices. This is because, during Iraq-Iran war, Iraqi government lost most of the oil revenue and had enlarged budget deficits, at a time when the Iraqi government desperately depended on the creation of money to fund its deficit. In this case, the Iraqi dinar has devalued against major foreign currencies; this followed a high inflationary rate for imported goods and services.

On the other hand, the second dummy variable (DUMS) captured the impact of economic sanctions during 1990s, the outcome of the coefficient is negative and the *p* value is significant at 1 percent level. A 10 percent increase of DUMS ceteris paribus, led to decrease the relative price by 2.4 percent. Hence, the coefficient of both variables (dummy variables) tell us that the rate of inflation from the non-tradable goods sector is smaller than the rate of inflation from the tradeable goods sector. This means that the relative of non-tradable goods against tradable goods decreases due to these political instabilities.

To sum up, the regression model, shows that nearly a 91 percent variation in the relative price is explained by OR, PT, DUMW and DUMS all together, which are jointly statistically significant. the null hypothesis of the all coefficients of the variables are rejected in favour of the alternative hypothesis.

4.4.2 Specification of the real exchange rate

One of the symptoms of the Dutch disease is an appreciation of the real exchange rate resulting from an oil revenue (oil boom). The real exchange rate in oil-exporting developing countries is a main key variable that has been affected by changing oil revenue, which in turn affects the whole structure of the economy. In the economic literature, different indices have been used to measure the price of tradable and non-tradable goods (this issue has been discussed in Chapter Five). The Dutch disease theory and economic literature predict that a change in commodity exports, for instance crude oil revenue may significantly affect the appreciation and depreciation of RER. In this section, the oil revenue will be employed instead of transmission variables (GE, y and MS). Thus, the null and alternative hypothesis can be written as follows:

$$\mathrm{RER}_t = \beta_0 + \beta_1 OR_t + \beta_2 PT_t + \beta_3 DUMW_t + \beta_4 DUMS_t + \varepsilon_t \quad (6.3)$$

It is hypothesised that there is a negative relationship between oil revenue and real exchange rate as a dependant variable. While there is a positive relationship between international price of tradable goods and both dummies in one hand and real exchange rate on the other hand.

$H_0: \beta_t = 0$ Null hypothesis

$H_1: \beta_t \neq 0$ Alternative hypothesis

Where $\beta_{1.....4}$ represents the coefficient of each oil revenue, international price of tradable goods and both dummy variables.

- **Statistical Results Model**

The results of the RER model are presented in Table 6.4 From this estimation, all explanatory variables, including dummies, are significant at 1% level and their signs are consistent with the economic theory prediction. However, before analysing the outcome of the tests, it is vital to check the following diagnostic tests: heteroscedasticity, serial correlation and normality.

Regarding the result of heteroscedasticity shows that the P value is more than 5%, which is equal to 33% and means we cannot reject null hypotheses. This demonstrates that there is a homoscedasticity (no heteroscedasticity exists) in this model. On the other hand, the serial correlation, the result below shows that the *P* value is more that 5% which is equal to 40%. We can easily accept null hypotheses, as this means there is no serial correlation in the model, which is also desirable. However, the normal distribution of the RER model, the outcome shows that the probability value is more than 5% which is equal to 21%. This means that we cannot also reject null hypotheses, meaning that the data is distributed normally. Based on the above analyses, it can be said that the model (RER model) is satisfied in terms of heteroscedasticity, serial correlation and normality.

Let us start with the first explanatory variable, which is real oil price. Table 6.4 that shows variable oil revenue has the right negative sign, and is statistically significant at 1 percent level. A 10 percent increase in oil revenue ceteris paribus,

led to approximately 11.8 percent decrease of real exchange rate. This means that the RER appreciate by 11.8 percent when the oil revenue increases by 10 percent. It is worth noting that the coefficient of oil revenue is the strongest coefficient among coefficients in this equation (RER model).

Table 6.4

Regression Results of the Real Exchange Rate

Dependent Variable: RER
Method: Least Squares
Date: 10/04/17 Time: 16:42
Sample: 1970 2013
Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.096168	1.159897	-2.669348	0.0112
OR	-1.186088	0.271724	-4.365046	0.0001
PT	0.724307	0.132101	5.482977	0.0000
DUMW	0.561695	0.148366	3.785885	0.0005
DUMS	0.813142	0.198182	4.103000	0.0002

R-squared	0.899927	Mean dependent var	4.155004
Adjusted R-squared	0.883699	S.D. dependent var	0.982756
S.E. of regression	0.335148	Akaike info criterion	0.796422
Sum squared resid	4.155998	Schwarz criterion	1.080270
Log likelihood	-10.52128	Hannan-Quinn criter.	0.901686
F-statistic	55.45521	Durbin-Watson stat	1.436962
Prob(F-statistic)	0.000000		

Diagnostic Test:

Heteroscedasticity = 0.33

Serial Correlation LM = 0.40

Normality (J.B) = 0.21

The estimated coefficients of international price of tradable goods (PT) is also significant at one percent level and have the expected sign (negative sign). The result demonstrates that a 10 percent increase in PT ceteris paribus, leads to depreciate of RER by 7.2 percent; this is also consistent with economic theory. Finally, the two dummy variables are the last variables that has been included in model 2. The coefficient for the dummy variables (DUMW and DUMS) have shown significance at 1 percent level and a positive sign, which indicates that

the Iraqi-Iran war and economic sanctions had a positive (depreciation) impact on RER. A 10 percent increase in the value of DUMW ceteris paribus, led to increase real exchange rates (depreciate) by 5.6 per cent. While the DUMS is much stronger that DUMW, a 10 percent increase in DUMS ceteris paribus, caused increased real exchange rate by around 8.1 percent.

All explanatory variables jointly explain about 89 per cent of the variation in the RER. Thus, the null hypothesis of all explanatory variables are rejected in favour of the alternative hypothesis.

6.4.3 Specification of the Nontraded Goods Sector

The third symptom of the standard Dutch disease is the expanding of the output of the nontraded goods sector. The theory assumes that the reallocation of resources in favour of non-tradable goods at the expense of tradable goods resulting from the oil boom takes place through two channels.

The first is the increase in the relative price emerging from the high private and public demand for nontraded goods. The short-run economic implication of the higher demand is an increased in the profitability of non-tradable goods since its supply cannot be enlarged to match the expand in demand. The second channel is related to the first, and is that of a potential appreciation in the RER. The impact of the appreciation of the REER tends to be one where the demand for non-tradable goods is substituted for that of tradable goods to encourage the latter at the expense of the former one. These channels however are affected by booming sector which is oil revenue in our case.

On the other hand, in this model two dummy variables are also introduced to capture the impact of the Iraq-Iran war during the 1980s and economic sanctions,

which impacted on Iraq during the 1990s. It is expected this has a negative impact on the output of the non-tradable goods sector. It is expected (based on theoretical framework) that the RER and international price of tradable goods should have a negative relationship against the output of non-tradable goods output. The equations should be formulated as follows:

$$\mathrm{NT}_t = \gamma_0 + \gamma_1 RER_t + \gamma_2 DUMW_t + \gamma_3 DUMS_t + \varepsilon_t \quad (6.4)$$

$$\mathrm{RER}_t = \varphi_0 + \varphi_1 OR_t + \varphi_2 P^*_{T_t} \quad (6.3)$$

Equation 3A describes the two instrumental variables (OR, GE, y and MS) that affect the RER because of the endogeneity problem (as previously discussed). Thus, the null and alternative hypotheses of the coefficients of the output of non-traded goods can be formulated as follows:

$H_0: \gamma_t = 0$ Null hypothesis

$H_1: \gamma_t \neq 0$ Alternative hypothesis

Where $\gamma_1, \gamma_2 \gamma_3 \; and \; \gamma_4$ represent the coefficient of each real exchange rate, international price of tradable goods, DUMW variable for Iraq-Iran war and DUMS dummy variable for economic sanction (see; model 3). In the following section, the statistical result will be analysed.

- **Statistical Results**

The empirical outcomes of regressing the output of the nontraded goods sector against all regressors included in Equation 6.5 demonstrates that they are individually and jointly significant and are consistent with the economic theory predictions. Moreover, the variation in all explanatory variables explains about 95 percent of the variation in the supply of nontraded goods.

Table 6.12 shows the results from the two stages least square method (2SLS). The result of heteroscedasticity, serial correlation and normal distribution is also

conducted and shown that their *P* value are more that 5%, which are 0.55, 0.11 and 0.75 respectively. This means that the null hypotheses are accepted since it is more than 5%, which means there is no heteroscedasticity, no serial correlation in the model and the data is normally distributed which is also desirable.

Table 6.5 demonstrates that the real exchange rate affects the output of the nontraded goods sector as the economic literature predicts. Hence, the appreciation in the real exchange rate brings about an increase in production in non-tradable goods. Accordingly, the coefficient of the real exchange rate has the right sign and is statistically significant at a one percent level and thus a ten percent appreciation in the real exchange rate (decrease) induces a 11.9 percent enlarge in the output of the non-tradable goods. So, one can easily reject the null hypothesis and accept the alternative one.

The regression outcomes of the impact of all the explanatory variables, on the output of nontraded goods show that they are consistent with the economic theory prediction in terms of the coefficient signs and levels of significance. Table 6.5 shows that the coefficient of the RER has a negative sign and is statistically significant at 1 per cent level. A 10 per cent decrease (appreciation) of real exchange rate ceteris paribus, leads to an increase in the output of non-tradable goods by 2.3 per cent, this result is consistent with the literature prediction. Therefore, the null hypotheses can be easily rejected and we accept the alternative hypotheses.

In the same way, the outcome of the impact of both dummies also consistent with the economic theory prediction. Its coefficient has shown the negative sign and is statistically significant at one per cent level. A ten per cent decrease in the

DUMW ceteris paribus, caused an increase the non-tradable goods output by 2.1 per cent. This is the weakest coefficient in model 3. While, a ten percent of increase in the DUMS ceteris paribus, led to decrease the output of non-tradable goods by around 3 percent. Thus, the alternative hypothesis for both dommies are accepted, and the null hypotheses is rejected.

Table 6.5

Regression Results of the Non-Tradable Goods Output

Dependent Variable: NT
Method: Two-Stage Least Squares
Sample: 1970 2013
Included observations: 44
Instrument specification: OR PT
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.529759	0.213748	16.51362	0.0000
RER	-1.193270	0.198902	-5.999274	0.0000
DUMW	-0.211201	0.060283	-3.503479	0.0012
DUMS	-0.303957	0.083960	-3.620269	0.0008

R-squared	0.954288	Mean dependent var	9.054849
Adjusted R-squared	0.948273	S.D. dependent var	0.703416
S.E. of regression	0.159982	Sum squared resid	0.972581
F-statistic	158.6572	Durbin-Watson stat	1.454794
Prob(F-statistic)	0.000000	Second-Stage SSR	0.972581
J-statistic	20.32808	Instrument rank	8
Prob(J-statistic)	0.000039		

Diagnostic Test:

Heteroscedasticity = 0.55

Serial Correlation LM = 0.11

Normality (J.B) = 0.79

6.4.4 Specification of the Traded Goods

The consequences of increasing commodity price export is appreciation of the real exchange rate. The consequences of appreciating real exchange rate leads to shrink the output of traded goods sector. This phenomenon has also been known as de-industrialisation. Therefore, based on theoretical framework the

RER and two dummy variables affect the output of treaded goods. Therefore, the equation can be written as follows:

$$\mathrm{T}_t = \pi_0 + \pi_1 RER + \pi_2 DUMW_t + \pi_3 DUMS_t + \varepsilon_t \quad (6.5)$$

$$\mathrm{RER} = \varphi_0 + \varphi_1 OR_t + \varphi_2 P_{T_t}^* \quad (6.3)$$

Instrumental variables are: OR and P_T^*

Similar to the equation 3A, the equation 4A defines two instrumental variables (OR and P_T^*) that affect the RER (see model 2A) because of the endogeneity problem. Therefore, as long as there is an endogeneity problem, these instrument variables cannot be employed directly in model 4, it can be used via 2SLS. Thus, the null and alternative hypotheses of the coefficients of the output of non-traded goods can be formulated as follows:

H0: $\pi_t = 0$ Null hypothesis

H1: $\pi_t \neq 0$ Alternative hypothesis

Where $\pi_1, \pi_2, and\ \pi_3,$ represent the coefficient of each RER dummy Iraq-Iran war and dummy economic sanction respectively (see; model 4). It is expected theoretically that the coefficient of RER has positive relationship against the output of tradable goods. While, both dummies have a negative relationship against the output of tradable goods. In the following section, the statistical result will be analysed.

- **Statistical Results**

To examine how the oil boom affects the output of traded goods, one should regress the traded goods against real exchange rate and also included both

dummy variables. The role of oil revenue on the output of tradable will be inferred through their influences on the real exchange rate. The estimations regression for the model 4 in this section is carried out. The 2SLS method is applied. Table 6.6, shows the result of the regressing the output of traded goods sector as a dependant variable against RER and both dummies. It is important to explain some of the indicators such as heteroskedasticity, serial correlation, and normal distribution of the data.

The outcome of the heteroscedasticity and Serial correlation in this model demonstrates that the null hypotheses are not rejected because the probability value for these tests is 42% and 31% respectively which are more than 5%. This means no serial correlation and no heteroscedasticity (homoscedasticity exists) exists in this model. the normally of the data in model 2A, shows that the probability value is 59%, which is more than 5 percent. This means that the data is distributed normally.

In Equation 6.5 as shown in Table 6.6, the output of traded goods behaves consistently, as the theory predicts, regarding changes in RER as well as both dummy variables. A ten percent appreciation (decrease) in the RER causes the output of tradable goods sector decline by 9.1 percent. The coefficient has the right sign and is highly statistically significant at one percent. This means that the appreciation of the RER leads to increase in the supply of tradable goods in the domestic economy; this is because, during appreciation of the RER, the domestic product is more competitive in international markets. Similarly, the coefficient of DUMW has the right sign and is statistically significant at a one percent level. A ten percent increase in DUMW ceteris paribus, brings about a 9.1 percent fall in the output of traded goods.

Table 6.6

Regression Results of the Tradable Goods Output

Dependent Variable: T
Method: Two-Stage Least Squares
Sample: 1970 2013
Included observations: 44
Instrument specification: OR, PT
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.230938	0.654665	6.462754	0.0000
RER	0.928233	0.247709	3.747274	0.0006
DUMW	-0.911449	0.331387	-2.750408	0.0090
DUMS	-1.708084	0.615299	-2.776020	0.0084

R-squared	0.858224	Mean dependent var	0.104800
Adjusted R-squared	0.839569	S.D. dependent var	0.051974
S.E. of regression	0.020818	Sum squared resid	0.016468
F-statistic	46.00560	Durbin-Watson stat	1.619274
Prob(F-statistic)	0.000000	Second-Stage SSR	0.016468
J-statistic	0.648863	Instrument rank	8
Prob(J-statistic)	0.722938		

Diagnostic Test:

Heteroscedasticity = 0.42

Serial Correlation LM = 0.31

Normality (J.B) = 0.59

Regarding the coefficient of DUMS has also negative relationship against the output of traded goods sector. The *P* is statistically significant at one percent. The result of the coefficient DUMS demonstrates that a 10 per cent decreases in the DUMS ceteris paribus, leads to increases in the output of tradable goods by 17 percent. Thus, the null hypothesis of the coefficients of the DUMS can easily be rejected.

6.4.5 Some limitations of employing oil revenue instead of transmission variables (GE, y and MS),

After finding a strong multicollinearity in section 6.2 between oil revenue against transmission variables such as government expenditure, GDP per capita and

money supply, it is required to drop off oil revenue from equations and employing oil revenue in separate equation. However, using only oil revenue instead of transmission variables have some limitations. In this section, the limitations of the employing oil revenue will be discussed.

1) The total oil revenue usually in almost all oil exporting countries does not inject completely into domestic economy. Some of these foreign reserve (revenue) can be held in central bank as a reserve, or in some cases part of the oil revenue in some countries can be invested in foreign assets. Therefore, employing oil revenue can create a wrong estimation for equations to run a regression, since not all oil revenue is injected into domestic economy.
2) Based on the theoretical and empirical studies, each of government expenditure, GDP per capita and money supply have a significant effect on relative price, RER and structure of economy. The transmission variables are not only affected by oil revenue, there are some other factors that affect the transmission variables, for instance, apart from oil revenue, non-oil revenue like tax and tariff, the foreign aid and foreign debt are also considered as a source of government expenditure. Money supply can be a source of government revenue via money creation, particularly in some of developing countries. Therefore, using transmission variables instead of oil revenue as a main variable have more accurate or precise outcomes.
3) For policy purpose, it is suitable to employ transmission variables instead of oil revenue since using transmission variables will tell the policy makers

to what extent, each of these variables (transmission variables) affect the real exchange rate and structure of economy. While, policy makers cannot use a proper economic policy.

6.5 The indirect impact of oil revenue on dependent variables (transmission mechanism).

In this section, the impact of oil revenue on dependant variables will be examined indirectly via what is called transmission mechanism. In other words, instead of oil revenue, the researcher will employ some other variables which are considered as a endogenous variables such as government expenditure, GDP per capita and money supply. Apart from these variables, the international price of tradable goods and both dummies (DUMW and DUMS) are also included into models. In the following sections, all models will be examined based on transmission variables.

6.5.1 Specification of the relative price

According to the Dutch disease theory, any increase of oil revenue (oil price), may lead to an increased aggregate demand for non-tradable goods and tradable goods via some variables named government expenditure, GDP per capita and money supply. The consequences of increasing demand on non-tradable goods is met by increasing its price (the price of non-traded goods), and the supply of non-traded goods cannot be increased, at least in the short-term. Meanwhile, the increased demand on tradable goods is met by increasing the volume of imported goods, without increasing its price. Thus, the price of tradable goods is relatively stable when the demand increases. In Chapter Four, the

equation for relative price of tradable goods against non-tradable goods has been built as the following equation:

$$\mathrm{RP}_t = \alpha_0 + \alpha_1 GE_t + \alpha_2 y_t + \alpha_3 MS_t + \alpha_4 P^*_{T_t} + \alpha_5 DUMW_t + \alpha_6 DUMS_t + \varepsilon_t \quad (6.6)$$

It is hypothesised that increasing Government expenditure, GDP per capita, money supply and the price of tradable goods leads to an increase in the relative price of non-tradable goods versus tradable goods: in other words, that the coefficient of $\alpha_{1.....3}$ ($\alpha_{4.....6}$) is positively (negatively) related to relative price of non-tradable goods against tradable goods:

$H_0: \alpha_{1.....6} = 0$ Null hypothesis

$H_1: \alpha_{1.....6} \neq 0$ Alternative hypothesis

Where $\boldsymbol{\alpha_{1.....6}}$ is represented by the coefficient of each government expenditure, GDP per capita, money supply, the price of tradable goods, DUMW and DUMS.

- **Statistical results**

The regression of the relative price of non-tradable goods to tradable goods against government expenditure, GDP per capita, money supply, price of tradable goods and both dummies (DUMW and DUMS) is carried out. No serial correlation and no heteroskedasticity exist in this model. The data are also normally distributed since the probability is larger than the 5% level.

The estimations in this section were carried out by applying the OLS technique for the relative price equation. Table 6.7, shows the result of the regression of model 1. The performance of all explanatory variables is consistent with the economic-theory prediction, as the theory predicts, in terms of the sign of the

coefficient and the level of statistical significant, except MS which is not significant. The regression model, shows that nearly 91 percent variation in the relative price is explained by GE, y, MS, PT, DUMW and DUMS all together, these variables (except MS) are jointly and individually statistically significant. Thereby, one can conclude that, the null hypothesis of the coefficients of the all explanatory variables is rejected in favour of the alternative hypothesis.

Table 6.7

Regression results of the relative price

Dependent Variable: RP
Method: Least Squares
Sample: 1970 2013
Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.983550	1.033814	-3.853254	0.0004
GE	0.258895	0.076048	3.404357	0.0016
Y	0.708549	0.198610	3.567536	0.0010
MS	0.087750	0.094780	0.925825	0.3605
PT	-0.384548	0.086146	-4.463919	0.0001
DUMW	-0.496847	0.071429	-6.955844	0.0000
DUMS	-0.331725	0.102821	-3.226229	0.0026

R-squared	0.912641	Mean dependent var	4.029692
Adjusted R-squared	0.898475	S.D. dependent var	0.552526
S.E. of regression	0.176051	Akaike info criterion	-0.491174
Sum squared resid	1.146778	Schwarz criterion	-0.207326
Log likelihood	17.80583	Hannan-Quinn criter.	-0.385910
F-statistic	64.42355	Durbin-Watson stat	1.260629
Prob(F-statistic)	0.000000		

Diagnostic Test:

Heteroscedasticity = 0.55

Serial Correlation LM = 0.11

Normality (J.B) = 0.79

The coefficient of government expenditure also has the right sign and also statistically significant at a 1 percent level. A ten percent increase in government expenditure ceteris paribus, caused an increase in the relative price by 2.5 percent. The increased government expenditure for oil-exporting countries,

particularly in developing countries, led to increased domestic prices (non-tradable goods) against international prices (tradable goods). Therefore, the result of coefficient of the government expenditure is consistent with economic theory.

The second coefficient is real GDP per capita, which is expected to have a positive relationship against the relative prices. This variable is statistically significant at 1 percent level and has the correct predicted sign. The GDP per capita has the strongest effect among explanatory variables in this model. More precisely, a 10 percent increase in real GDP per capita income, ceteris paribus, led to a 7 percent increase in relative prices of non-tradable goods against tradable goods. This result is consisted with Edwards and Akoi (1983), who confirmed that an increase in GDP per capita leads to an increase in the domestic demand for both tradable and non-tradable goods.

The real money supply (MS) is a third variable in the model which is theoretically expected to have a positive relationship against relative price of non-tradable goods to tradable goods. The result shows that there is a positive relationship between MS and RP, as Edwards (1984 and 1986) and Harberger (1986) explained. However, its *P* value is not statistically significant. An increase in money supply by 10 percent ceteris paribus, causes an increase in the relative price by approximately 0.8 percent. This is the smallest coefficient in terms of the size of effeteness compare to other coefficients in the model.

in relation to changes in PT which represents the international price of tradable goods. A ten percent increase in the international price of tradable goods ceteris paribus, causes the relative price to decrease by nearly 3.8 percent. The coefficient has the right sign and is highly statistically significant. This outcome

is consistent with economic theory, since the increase price of tradable goods cause to decrease the relative price of non-tradable goods agapist tradable goods. This outcome is also supported and consistent with economic theory framework.

Regarding the result of two dummies (DUMW and DUMS), the coefficient of DUMW has the right sign and is statistically significant at a 1 percent level. A ten percent increase in the value of DUMW ceteris paribus, causes a 4.9 percent decrease in relative price. Similarly, the coefficient of DUMS also has the expected sign and is statistically significant at 1 percent level. A ten percent increase in the value of DUMS ceteris paribus, leads to a 3.3 percent decrease in relative price.

Overall, the empirical results of the impact of government expenditure, GDP per capita, money supply, price of tradable goods and also both dummies support the theory predictions of a positive relationship between GE, y, MS, PT in one hand and the relative price of nontraded goods to traded goods on the other hand. And all variables have right signs and also significant at 1 level, except Money supply is not statistically significant. Hence, one can reject the null hypothesis all variables in favour of the alternative hypothesis.

6.5.2 Specification of the real exchange rate

The real exchange rate in oil-exporting developing countries is a main key variable that has been affected by changing the international oil price (oil revenue), which in turn affects the whole structure of the economy. RER is defined as the measure of nominal exchange rates multiplied by international price of tradable goods divided by non-tradable goods price (see Chapter Four).

In the economic literature, different indices have been used to measure the price of tradable and non-tradable goods (see chapter five).

The Dutch disease theory and economic literature predict that a change in commodity exports, for instance crude oil price and also “the spending effect”, may significantly affect the appreciation and depreciation of RER. For example, it is found that increased international oil prices and government expenditure (spending effect) may lead to appreciating RER and vice versa. Bear in mind the Iraqi monetary authority followed a fixed exchange rate regime against the US dollar. However, the Iraqi central bank could not equalise the market exchange rate (black market exchange rate) and official rate of exchange rate during specific periods of time in the last five decades. Therefore, it is expected that, during high oil prices (boom period), the RER has appreciated (decreased).

$$\mathrm{RER}_t = \beta_0 + \beta_1 GE_t + \beta_2 y_t + \beta_3 MS_t + \beta_4 P^*_{T_t} + \beta_5 DUMW_t + \beta_6 DUMS_t + \varepsilon_t \quad (6.7)$$

It is hypothesised that there is a negative relationship between the explanatory variables (government expenditure, GDP per capita and money supply) and real exchange rate as a dependant variable. In other words, that the coefficient of $\alpha_{1\ldots\ldots3}$ is negatively related to the real exchange rate, while the price of tradable goods is expected theoretically has a positive relationship against RER. On the other hand, the dummy variables are expected to have a positive relationship against real exchange rate. Since the Iraq-Iran war and economic sanction are expected to depreciate (increase) RER, during these periods of times.

$H_0: \beta_{1\ldots\ldots\ldots6} = 0$ Null hypothesis

$H_1: \beta_{1\ldots\ldots\ldots6} \neq 0$ Alternative hypothesis

Where $\beta_{1.....6}$ represents the coefficient of each government expenditure and GDP per capita, money supply, price of tradable goods and both dummy variables.

- **Statistical results**

The estimated regression for model 2 in this section is carried out. The OLS method will be applied. Table 6.8, shows the result of the regressing real exchange as a dependent variable against 6 explanatory variables including both dummies.

Table 6.8

Regression results of the real exchange rate (Model 2)

Dependent Variable: RER
Method: Least Squares
Sample: 1970 2013
Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.694389	2.950742	1.252020	0.2184
GE	-0.889135	0.155235	-5.727669	0.0000
Y	-1.541873	0.508456	-3.032462	0.0044
MS	-0.425948	0.178548	-2.385622	0.0223
PT	0.407713	0.537083	0.759124	0.4526
DUMW	0.373406	0.170264	2.193100	0.0347
DUMS	0.915534	0.257787	3.551517	0.0011

R-squared	0.868672	Mean dependent var	4.155004
Adjusted R-squared	0.847375	S.D. dependent var	0.982756
S.E. of regression	0.383936	Akaike info criterion	1.068226
Sum squared resid	5.454043	Schwarz criterion	1.352075
Log likelihood	-16.50098	Hannan-Quinn criter.	1.173491
F-statistic	40.78939	Durbin-Watson stat	0.933042
Prob(F-statistic)	0.000000		

Diagnostic Test:

Heteroscedasticity = 0.66,

Serial Correlation LM = 0.10,

Normality (J.B) = 0.71

The outcome of the serial correlation and heteroskedasticity in this model demonstrates that the null hypotheses are not rejected because the probability value for these tests are 10% and 66% respectively which are more than 5%.

This means no serial correlation and no heteroscedasticity (homoscedasticity exists) exists in this model. The normally of the data shows that the probability value is 71%, which is more than 5 percent. This means that the data is distributed normally.

Table 6.8 demonstrates that government expenditure, GDP per capita, money supply, price of tradable goods and both dummy variables (DUMW and DUMS) are individually and jointly statistically significant in affecting the real exchange rate. Nearly 86 percent of the variation in the real exchange rate is explained by the variation in these explanatory variables.

Let us start with the first explanatory variable, which is government expenditure. This coefficient has the right negative sign and is highly statistically significant at even less than one percent level. A ten percent increase in the government expenditure ceteris paribus, brings about a decrease (appreciate) by 8.8 percent in the RER. Many previous studies found the same results, examples of which are: shumilov and Sosunov (2005), Olusi and Olagunju (2005), Olomola (2006), Oomes and Kalcheva (2007). The reason behind the strong coefficient of real government expenditure is related to the fact that the high percentage of government budget goes to recurrent expenditure (see, Chapter Three), and most of the recurrent expenditure is spent on the non-tradable goods sector. In this situation, the demand on non-tradable goods increased and the rate of its price would be larger than the rate of increase in the international price of tradable goods.

On the other hand, the coefficient for the GDP per capita variable (y) is the strongest coefficient among coefficients in model 2. Also, its sign is predicted and highly significant, even at the alpha level of 1 percent. A ten percent increase

of GDP per capita ceteris paribus, caused to appreciating RER of around 15.4 percent. Therefore, it can be reasoned that GDP per capita played a statistically significant role in explaining the decline (appreciation) of RER. A very strong coefficient of GDP per capita is due, owing to the fact that most of proportion of extra income is spent on non-tradable goods which, in turn, increase its price relative to the tradable goods sector. The GDP per capita has been introduced by Edwards (1983), who found a negative relationship between GDP per capita and RER. In other words, an increase in GDP per capita caused a decrease (appreciate) in RER.

The coefficient of money supply has a negative sign which is consistent with economic theory and statistically significant at 5 percent level. A ten per cent increase in the real money supply ceteris paribus, caused a decrease (appreciation) in the real exchange rate by 4.2 percent. The real money supply behaves consistently with the standard Dutch disease literature's prediction. During times of high oil price, under a fixed exchange rate, the monetary base will surely increase and the result will be inflation. In terms of the theoretical framework, the increased money supply results in an increased demand for non-traded goods and traded goods; this is in accordance with the 'Walras' Law (Drèze 1997). As Edwards (1992) also argued, an increase in money supply becomes one of the main causes of inflation in the economy, which has experienced the increased export price. This finding is consistent with some other recent studies like Devlin and Lewin (2004) and Iwayemi and Fowowe (2011). The negative sign of the coefficient money supply proved that the increase in real money supply caused a greater increase in the higher domestic

inflation rate than the foreign inflation rate, which resulted in the appreciation (decrease) RER.

The result for the coefficient of the price of tradable goods is consistent with the theoretical framework predictions in terms of coefficient sign. But, its *P* value is not statistically significant. A 10 percent increase in the price of tradable goods ceteris paribus, leads to an increase in the RER by 4 percent.

The sign of two dummy variables on the other hand are shown positive, this means these two events have a positive relationship against real exchange rate. The *p* value of DUMW and DUMS are statistically significant at the 5 and 1 percent level respectively. A ten percent increase in DUMW caused to increase (depreciation) real exchange rate by 3.7 percent. On the other hand, a ten percent increase in DUMS brings about 9.1 increase (depreciate) real exchange rate. A possible explanation for having a positive relationship between both dummies against RER is related to some factors such as, low oil revenue in 1980s due to Iraq-Iran war, almost zero oil revenue in 1990s due to economic sanctions, funding government budget via printing money during both events which eventually led to the devaluation of domestic currency against foreign currencies. Eventually the real exchange rate (increased) depreciated. In overall, the null hypothesis of the coefficients of the all explanatory variables in the model 2 can be safely rejected instead the alternative hypotheses is accepted.

The previous sections were about the relative price and real exchange rates, which are affected by the oil revenue via GE, y, MS, PT in addition to two dummy variables. In the next two sections, we will test to what extent the structure of the economy has been affected by RER.

6.5.3 Specification of the non-traded goods sector

Having discussed the relative prices and real exchange rates in the two previous sections in this chapter, this encourages us to investigate how these changes affected the structure of the Iraqi economy during the last five decades. This section seeks to examine the impact of appreciation (depreciation) RER on expansion (contraction). One of the main symptoms of increasing oil prices, as the Dutch disease theory mentioned, is enlarging non-tradable goods output. Appreciation of the real exchange rates means the rate of increase in the price of tradable goods is smaller than the rate of increase price of non-tradable goods sector.

The 2SLS method is applied for this model. Table 6.8, shows the result of the regressing real exchange as a dependant variable against 6 explanatory variables including both dummies.

Here it is important to mention that factors of government expenditure, GDP per capita and money supply can positively affect the output of non-tradable goods in terms of theoretical framework. But, in our equation system their effectiveness on non-tradable goods output will be indirect via RER. Since, the GE, y, MS and even PT cannot be used technically because of endogeneity problem. Thus, these variables can affect the non-tradable goods output through RER by using 2SLS.

On the other hand, in this model two dummy variables are also introduced to capture the impact of the Iraq-Iran war during the 1980s and economic sanctions, which impacted on Iraq during the 1990s. It is expected this has a negative impact on the output of the non-tradable goods sector. It is expected (based on theoretical framework) that the RER and international price of tradable goods

should have a negative relationship against the output of non-tradable goods output. The equations should be formulated as follows:

$$\mathrm{NT}_t = \gamma_0 + \gamma_1 \widetilde{RER} + \gamma_2 DUMW_t + \gamma_3 DUMS_t + \varepsilon_t \quad (6.8)$$

$$\mathrm{RER} = \beta_0 + \beta_1 GE_t + \beta_2 y_t + \beta_3 MS_t + \beta_4 P^*_{T_t}$$

Thus, the null and alternative hypotheses of the coefficients of the output of non-traded goods can be formulated as follows:

$H_0: \gamma_{1\ldots3} = 0$ Null hypothesis

$H_1: \gamma_{1\ldots3} \neq 0$ Alternative hypothesis

Where $\gamma_1, \gamma_2 \, and \, \gamma_3$ represent the coefficient of each real exchange rate, DUMW variable for Iraq-Iran war and DUMS dummy variable for economic sanction. In the following section, the statistical result will be analysed.

- **Statistical results**

The regression outcomes of the effect of all the explanatory variables, on the output of nontraded goods, demonstrate that they are consistent with the economic theory prediction in terms of the coefficient signs and levels of significance. Table 6.9 shows the results from the two stages least square method (2SLS). The outcome of the heteroscedasticity, serial correlation and normality show that the *P* value for each of them are larger than 5%, which is desirable, in this case null hypotheses cannot be rejected. which means there is no heteroscedasticity, no serial correlation in the model and the data is normally distributed.

The regression outcomes of the impact of all the explanatory variables, on the output of nontraded goods show that they are consistent with the economic theory prediction in terms of the coefficient signs and levels of significance. Table 6.9 shows that the coefficient of the RER has a negative sign and is statistically significant at 1 per cent level. A 10 per cent decrease (appreciation) of real exchange rate ceteris paribus, leads to an increase in the output of non-tradable goods by 7.7 per cent, this result is consistent with the literature prediction. This is predicted by most of theoretical framework including Dutch disease model.

Table 6.9
Regression results of the non-tradable goods output (model 3)

Dependent Variable: NT
Method: Two-Stage Least Squares
Sample: 1970 2013
Included observations: 44
Instrument specification: GE Y MS PT
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.118162	0.452894	11.30101	0.0000
RER	-0.771055	0.085837	-8.982785	0.0000
DUMW	-0.519847	0.235942	-2.203284	0.0334
DUMS	-1.415746	0.503138	-2.813832	0.0076

R-squared	0.818403	Mean dependent var	9.054849
Adjusted R-squared	0.789783	S.D. dependent var	0.703416
S.E. of regression	0.450525	Sum squared resid	8.118903
F-statistic	29.70519	Durbin-Watson stat	1.327691
Prob(F-statistic)	0.000000	Second-Stage SSR	3.188109
J-statistic	13.19436	Instrument rank	4
Prob(J-statistic)	0.001364		

Diagnostic Test:

Heteroscedasticity = 0.42

Serial Correlation LM = 0.13

Normality (J.B) = 0.26

This result also has been empirically confirmed by almost all previous studies, such as Bahmani-Oskooee (1995), Amano and Van Norden (1998), Devlin and Lewin (2005), Al-Otaibi (2006), Olomola (2006), Habib and Kalamova (2007),

Iwayemi and Fowowe (2011) and Bodart et al. (2012). Therefore, the null hypotheses can be easily rejected and the alternative hypotheses is accepted.

The two-dummy variables (DUMW and DUMS) are negative related to non-tradable goods output which is predicted and they are statistically significant, at 5 and 1 percent level respectively. The negative sign for both dummies indicated that there is negative relationship between Iraq-Iran war and economic sanction in one hand against the output of non-tradable goods, which Iraq has passed through during the 1980s and 1990s. A ten percent increase in the DUMW ceteris paribus, causes the supply of nontraded goods to fall by 5.1 percent. While, a ten percent of increase in the DUMS ceteris paribus, led to decrease the output of non-tradable goods by around 14.1 percent. Thus, the null hypothesis of the coefficient of the DUMW and DUMS variables can be rejected; instead, the alternative hypothesis is accepted. In both events the devaluation of nominal exchange rate could be one of the main factor that made the output of non-tradable goods to decline since, the devaluation of nominal exchange rate means increase price of international tradable goods which is assumed that equal to domestic tradable goods (see chapter 4), in this case the tradable sector becomes more profitable that non-tradable goods sector as happened during 1980s and 1990s (see chapter 3 and 5). In this circumstance, the investors shift to tradable goods sector from non-tradable goods sector.

Therefore, these all explanatory variables (3 variables) are jointly significant and explain 81 percent of the variation in the non-tradable goods output. Therefore, the null hypothesis of the coefficients of the all explanatory variables can be safely rejected. The next section will be about how the empirical supply of tradable goods is affected by fluctuations in the international oil price.

6.5.4 Specification of the traded goods

In the earlier section, the main symptom of the consequences of increased oil revenue (prices of oil) in oil-exporting developing countries is appreciation of the RER. According to the theoretical framework, this symptom (appreciation RER) will lead to a production of the de-industrialisation phenomenon (contrasting tradable goods sector). An appreciation of the real exchange rate also leads to loss of competitiveness of the tradable goods sector in international markets. This phenomenon has also been known as de-industrialisation, or the tradable-squeeze effect. Similar to the previous models, two dummy variables is also included into the model to capture the impact of the Iraq-Iran war during the 1980s and economic sanctions during the 1990s. Therefore, the equation can be written as follows:

$$\mathrm{T}_t = \pi_0 + \pi_1 \widetilde{RER} + \pi_2 DUMW_t + \pi_3 DUMS_t + \varepsilon_t \quad (6.9)$$

$$\text{RER} = \beta_0 + \beta_1 GE_t + \beta_2 y_t + \beta_3 MS_t + \beta_4 P^*_{T_t}$$

The null and alternative hypotheses of the coefficients of the output of traded goods can be formulated as follows:

H0: $\pi_{1\ldots3} = 0$	Null hypothesis
H1: $\pi_{1\ldots3} \neq 0$	Alternative hypothesis

Where $\pi_1, \pi_2 \; and \; \pi_3$ represent the coefficient of each RER , dummy Iraq-Iran war and dummy economic sanction respectively (see; model 4). It is expected theoretically that RER and DUMS has positive relationship against the output of tradable goods. While DUMW has a negative relationship since, the DUMW

considered as a source of destroy factor of production particularly agriculture sector. in the following section, the statistical result will be analysed.

- **Statistical results**

To understand how the fluctuation of oil revenue affects the supply of traded goods, one should regress the output of traded goods against each of the real exchange rate and both dummy variables. The two-stage least squares (2SLS) method of estimation is used to correct the inherent simultaneity bias in both quantities produced and their prices. The issue of serial correlation also is considered in this model as well. The outcome of the heteroscedasticity, serial correlation test and normal distribution are desirable. The *P* value for these tests are 0.34, 0.25 and 0.45 respectively which is more than 5 percent.

The result (see Table 6.10) for the coefficient RER, it behaves consistently with the theoretical framework predictions (displays the correct predicted sign) and is statistically significant at 1 per cent level. A ten percent increase of RER (depreciate RER) ceteris paribus, causes the supply of the traded goods sector to increase by around 4.2 percent. This means that the depreciation of RER leads to increases in the supply of tradable goods in the domestic economy; this is because, during depreciation of RER, the domestic product is more competitive in international markets. Therefore, the real exchange rate mechanism of the Dutch disease in Iraq seems to play an important role. The reduced competitiveness of its tradable sector (agricultural goods) in the international market causes that sector's contribution to non-oil GDP to decrease, just as the Dutch disease theory predicts. This result is consistent with many previous studies, for example Katouzian (1978), Corden and Neary (1982),

Gelb (1986), Kamas (1986) Al-Sabah (1988), Looney (1990), Pinto (1991), Rowthorn and Ramaswamy (1997, 1999) and Olusi and Olagunju (2005) found, in their study, that rising oil prices can breed appreciation of the real exchange rate, which will lead to a contraction of the traditional tradable sector (agriculture). However, it is worth noting that this is contrary to the finding of Roemer (1985), whose study was based on Nigeria, Mexico and Venezuela. Jazayeri (1986), who studied Iran and Nigeria among other studies of oil-exporting developing countries, made similar findings. However, the problem with these studies, which did not find evidence of the Dutch disease in these countries, was that they assumed the manufacturing sector was the sector that suffered, while agriculture is the traditional export sector of most of the oil-exporting developing counties, especially Iraq. Contrary to these studies, Chen and Ross (1986) examined the Dutch disease symptoms in the case of the United Kingdom. According to his study after the commercial exploitation of crude oil in the beginning of 1970s, the RER appreciated by about 10 percent between 1973 and 1982, and this led to a decrease in the manufacturing output in the UK. This was also established by Forsyth (1986), who confirms that there is evidence of the Dutch disease in the UK. The reason behind the impact of the booming period on a shrinking manufacturing sector in the UK is that, in the UK, the manufacturing sector was the main export sector, thus any appreciation of RER has significantly impacted the volume of the export manufacturing sector.

Table 6.10

Regression results of the tradable goods output (Model 4)

Dependent Variable: T
Method: Two-Stage Least Squares
Sample: 1970 2013
Included observations: 44
Instrument specification: GE Y MS PT
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.471445	0.385278	14.20129	0.0000
RER	0.420128	0.084176	4.991087	0.0000
DUMW	0.733391	0.340789	2.152036	0.0375
DUMS	1.708084	0.615299	2.776020	0.0084

R-squared	0.669203	Mean dependent var	7.851415
Adjusted R-squared	0.644393	S.D. dependent var	0.619186
S.E. of regression	0.369238	Sum squared resid	5.453471
F-statistic	24.35097	Durbin-Watson stat	0.772974
Prob(F-statistic)	0.000000	Second-Stage SSR	6.526041
J-statistic	1.054439	Instrument rank	4
Prob(J-statistic)	0.590244		

Diagnostic Test:

Heteroscedasticity = 0.34

Serial Correlation LM = 0.25

Normality (J.B) = 0.45

One the other hand, the last two coefficients in the model is both dummy variables, both dummies DUMW and DUMS have a positive and statistically significant at 5 and 1 percent level respectively. The sign of the DUMW variable's coefficient is not as expected in the theory and thus is positive. The outcomes of the coefficient of both dummies show different in terms of size of effeteness. Regarding DUMW a ten percent increase in DUMW ceteris paribus, cause the supply of tradable goods sector to increase by 7.3 percent. While, the coefficient of DUMS is stronger twice than the coefficient DUMW. A ten percent increase in DUMS ceteris paribus, caused to increase the output of tradable goods by nearly 17 percent.

Although, the political instability is usually caused by the output decreasing, but in the Iraqi situation the result shows an increase. The reasonable explanation for this may be related to the increasing price of tradable goods, particularly the agricultural sector, this was due to the devaluation of nominal exchange rate during that period and decrease oil revenue as well. The devaluation of nominal exchange rate (see sharp devaluation Iraqi dinar between 1980 to 1988) made the price of tradable goods more expensive compare to non-tradable goods, which means more profitable compare to non-tradable goods (see; raw data from table 3.5 in chapter three). In this situation, the investors shift to tradable goods sector from non-tradable goods sector. Then Iraqi economy went through this experience during 1980sand 1990s (the details of this experience has been analysed in chapter three and five).

In overall, the above regression (output of tradable goods) performed very well, explaining a good portion of the dependent variable's variation. The coefficient of determination (R^2) from model 4 shows that 66 percent of the variation in supply of tradable goods is determined jointly by all explanatory variables (RER, DUMW and DUMS). Although, the coefficient of determination (R^2) is not very high compare to other regression (previous regression), but it still in a great level, thus the ratio of model is fitted well. The null hypothesis of the coefficients of the real exchange rate and DUMS are easily rejected. On the other hand, the null hypothesis of the coefficient of the DUMW cannot be accepted but instead one would conclude that it is statistically significant with the opposite sign. In overall, the regression for the supply of tradeable goods indicates that Dutch disease (factor of RER), along with a host of other factors, contributed to its de-agriculturalisation.

6.5 Conclusion

This chapter employs a time-series technique to investigate and examine the impact of changing oil revenue on the relative prices, real exchange rates and changing the structure of economics via some variables named government expenditure, GDP per capita, money supply and price of tradable goods. However, before conducting regression, the stationarity and Johannsen co-integration test have been examined. It is found that all variables are non-stationarity at level, but when they transfer to first difference they become stationarity. Stationarity, in the same order for all variables, requires a Johannsen co-integration test to be performed showing, in all equations, that there is a long-run relationship between variables. The issue of multicollinearity is also satisfactory according to VIF test.

The empirical outcomes from the above estimated equations were based on the OLS and TSLS methods. Employing TSLS in this thesis is related to the problem with “endogeneity” which does exist in both model 3 and 4. Regarding the model one, it is found that all signs of the coefficient are the right signs, according to the economic theory and also statistically significant at 1 percent except money supply. The coefficient of determination is also high which is 91 percent. This outcome strongly supported by theoretical and empirical studies.

However, the result of the RER model is slightly different, in terms of size of coefficient and level of significant. Although, all sign of the coefficient has right sign but, among all explanatory variables, the variable of PT is not statistically significant. The coefficient of determination of model 2 is also high which is 86 percent. The result of RER is consistent with Edwards’ model of speculation and theoretical groundwork of Dutch disease. Moreover, the outcome of this

regression suggests that, in Iraq, the real appreciation resulting from increasing oil revenue has been accommodated partially by the “spending effect” (government expenditure and money supply, GDP per capita and international price of tradable goods). On the other hand, the impact of RER on changing the structure of economy has been examined. The non-tradable and tradable goods output were significantly affected by changing RER. In terms of sign and level of significant, the coefficient of RER is consistent with economic theory.

Overall, the analysis and outcome of this chapter is strongly suggestive that increased international oil prices are responsible for changing the relative price, real exchange rate and changing the structure of the economic sector from tradeable to non-tradeable. It is found that uncertainty about the international oil price implies uncertainty about the magnitude of the reduction in the tradable goods sector and enlarged non-tradable output sector. Moreover, how these changes are managed is important. In oil-exporting developing countries, the extent of the real exchange rates and structural changes will depend, among other things, on the fiscal policy response to how the oil revenue is spent, directly or indirectly by the authorities. Therefore, both fiscal and monetary policies are required to be used when oil prices increase and decrease in order to create a balance between the economic sector and expanding the production of exportable other than those of the oil sector, and at least to restore the initial structure of the pre-oil era.

Chapter seven

Summary and policy recommendation

7.1 Introduction

The main objective of the research as set out in Chapter One was to analyse the consequences of the increase or decrease in the international crude oil price on relative price, real exchange rate (RER) and changing the structure of economy. More importantly, it is wished to examine the cause and consequences of the “Dutch disease”, which is the squeezing of the tradable sector, enlargement of non-tradable sector during the oil boom, resulting in the domestic appreciation of RER. During the oil slumping period, the non-tradable goods sector squeezes and traditional tradable sector becomes enlarged due to depreciation of the domestic RER. This means that two hypotheses have been examined. The first hypothesis tested is that there was a positive relationship between the growth rate of the tradable sector and the RER. In other words, a depreciation of the RER would result in growth of the tradable sector, while an appreciation of the RER would result in a contraction of the tradable goods sector. The second hypotheses is related to non-tradable sectors. The hypothesis is that a negative relationship existed between their output and the RER: a depreciation of RER led to a decline, whereas an appreciation of RER led to an expansion of the sectors. This is shadowing by the highlights of the empirical analysis which forms the basis of the examination with reference to the theoretical and empirical findings. The limitations of the thesis and suggestions for future study in the last part of the conclusion are presented. Therefore, in this first step, this chapter presents a summary of the analysis presented in the prior chapters in the context of this objective.

Iraq appeared to have the right prerequisites for the Dutch disease and as the world's third largest oil exporter. It is clear that the contribution of the oil sector to the GDP is relatively large (see Chapter Three). It was also shown that Iraq is and has been mainly reliant on oil revenues, as they constitute the major part of the government revenues (see Chapter Three). The huge inflow of liquidity resulting from the increase in oil revenues caused high inflation.

On the other hand, the principal fundamental point of the entire contribution of this study is that it delivers a careful investigation with supporting empirical evidence of the issue of the macroeconomic effects of the fluctuation in oil revenue (oil price) on key variables set in a Dutch disease context for the Iraqi economy. The analysis reviewed the relationships between fluctuating oil revenue, relative price, real exchange rate and changing the structure of economics between the tradable goods and non-tradable goods sector, employing suitable current econometric methods. One of the main contributions of this study is that it delivers further empirical outcomes relating to the Dutch disease phenomena. It is very rare to find a study relating to the Dutch disease phenomenon on Iraq. The point that distinguishes this study from previous studies is that this study contained both boom and slump periods, while almost all previous studies contained only booming periods. In other words, this study delivers a precise detailed analysis of the consequences of fluctuation in international oil prices (boom or slump) and the Dutch disease phenomenon for the Iraqi economy.

It further extends to discuss the macroeconomic consequences due to fluctuation international oil prices. The period of the study (1970-2013) contains at least seven main international and local oil shocks. Examples of the international oil

shocks are in 1973, 1979, 1982, 1986, 1997, 2004, 2008 and 2010/11, while local shocks, which are related to some internal factors, are 1981, 1990, 1996 and 2003. The recent international oil shock has been excluded from this study because some political instability occurred after 2014. However, the entire study seems satisfactory from a purely economic slant, in that the main adjustments to the economic basics as a consequence of a major oil boom and slump should have worked through the economy.

Enlargement of the volume of crude oil production after nationalisation of the oil sector in 1972 combined later with the increased international oil price in 1973, and higher oil revenues to significant levels, allowing Iraq got great surpluses in current account and led to a build-up of huge foreign reserves, plus increasing real government expenditure (see Chapter There). The story begins from that point, when the foreign reserves and government spending increases due to an increase oil revenue. The Iraqi economy depended on oil revenue and its contribution to GDP is significantly high, and the oil sector became the main economy sector that drives other tradable and non-tradable goods sectors (Al-Chalabi 2007; and Behn 2007). The huge increase in Iraqi's wealth has considerably enlarged the opportunity for effective economic development in the country. Since the Iraqi government earned a huge amount of wealth during the first two oil shocks in 1973 and 1979, the development plan has been introduced to enhance the manufacturing and agriculture sectors. This has been done via strong government subsidising (Mundy and Musa 2010). Apart from these consequences of high oil revenue, the GDP per capita has increased sharply, which led to eradicate poverty and enhanced labour skills via providing free education. However, it is becoming gradually clear that high oil prices might have

been somewhat of a mixed blessing. Although Iraq has experienced a sustained, sharp increase in the rate of GDP growth and income per capita as a consequence of high oil prices, the local economy was subject to some negative side effects.

Political instability is another main factor that significantly affected the Iraqi economy, particularly during the Iran-Iraq war in the 1980s. It is found that the Iran-Iraq war has had a damaging effect on the Iraqi economy. The effects of disinvestment as a result of eight years of economic interruption were apparent in low and inactive rates of growth, particularly in the tradable sector (manufacturing and agriculture sectors, and even the oil sector). Moreover, the invasion of Kuwait (political instability) in 1990 was yet another disruption of the Iraqi economy, particularly the oil sector. In the following paragraph, the economic consequences of the invasion of Kuwait by the Iraq army will be analysed further (Sanford 2003).

Due to economic and political factors, overall the Iraqi domestic economy passed two main stages during the period 1970-2013. The first one is called the boom phase (1970-1980 and 2003-2013), while the second period was the slump phase (1981-2003). The economic characteristics of the first period (booming era) are: surplus in current account, nominal exchange rate in market is equal, or very close to, the official exchange rate, surplus in budget government, real government expenditure enlarged compared to pre-boom period, real money supply increases, the foreign reservation by Central Bank increases and use this reserve as back of domestic currency, GDP per capita increases, the rate of inflation among non-tradable goods sector is much bigger that the rate of inflation among tradable goods sector, and the economy mostly depends on imported

goods as substitutes for the domestic productions. The characteristics of the slumping phase are: deficit in current account, nominal exchange rate in market is much higher than the official exchange rate (relatively huge difference between market exchange rate and official nominal exchange rate), severe deficit in budget government, real government expenditure shrinks compared to booming period, money supply increases since it is used to fund deficit, which leads to a devaluation of the nominal exchange rate. Therefore, in real terms, the money supply decreases (after taking out the rate of inflation), the foreign reservation by central bank decreases and lack of foreign hard currency to create a back of domestic currency, GDP per capita decreases, the rate of inflation among non-tradable goods sector is much smaller than the rate of inflation among tradable goods sector, and domestic consumption is greater, depending on domestic production rather than importing goods and service. The above points comprise the features of the Iraqi economy during both eras in the last five decades.

As long as the oil sector is the key driver of the Iraqi domestic economy, any fluctuation in oil revenue is transmitted directly and in a robust way to the government budget. A huge oil sector increased the public-sector involvement in the Iraqi domestic economy. This is as a result of the government's possession of the oil sector. Furthermore, the effect of the boom operated via the "spending effect" (government expenditure) instead of the "resource movement effect" as a result of the nature of the oil sector as an "enclave" sector, which infers that the oil sector has no significant linkages with the rest of the economy. By employing the modified Edwards model to analyse the effect of the oil in the Iraqi economy, the empirical findings in this study indicate some side effect:

1) It is found that the oil revenue is positively related to real government expenditure, GDP per capita and real money supply (see Chapter Three). During high oil prices, the real government expenditure, GDP per capita and money supply are enlarged, while, during low international oil prices, these macroeconomic variables drop (see Chapter Three). In the empirical chapter (Chapter Six), however, the econometrical technique has been employed to test the relationship between some macroeconomic variables (real government expenditure, GDP per capita, money supply and price of tradable goods) and the relative price of non-tradable goods against tradable goods. The relative price equation (model one) provides supportive evidence that the government expenditure, real GDP per capita and money supply determine the relative price of non-tradable goods against tradable goods. When the government expenditure, money supply and GDP per capita changes positively, the rate of inflation increases. However, the rate of inflation among non-tradable goods is larger than the rate of inflation among tradable goods; this is because the price of the latter is determined by the international market.

   Thus, changes in government expenditure, money supply and GDP per capita have not significantly affected the price of tradable goods, while the price of non-tradable goods has been significantly affected by these mentioned variables, since its price is determined by domestic factors. These results are consistent with the economic theory predictions.

2) The outcome of the RER is also similar to the relative price of non-tradable goods against tradable goods.[21] In chapter six, we have estimated a RER determination model based on the Edwards model, which infers that real economy factors affect the sustainable equilibrium level of the RER. In general terms, our results delivered support for the Edwards model. The RER appreciates (depreciates) as a result of increases (decreases) in real government expenditure, increases (decreases) in GDP per capita, and increases (decreases) in real money supply. Increases in these macroeconomic variables push up the price of non-tradable goods, since the prices are determined by domestic economy, while the prices of tradable goods are not affected significantly, for two main reasons: a) the nominal exchange rate is fixed by the central bank, particularly during high oil prices (only during high oil revenue); b) the international price of tradable goods is not affected by changes in these macroeconomic variables that we have just mentioned.

   Therefore, it is found that, during high oil revenue, the rate of the changing domestic price (non-tradable goods) is greater than the rate of the changing international price (tradable goods). As a result, appreciation in the RER takes place (see the model two in Chapter Six). On the other hand, during low oil revenue, which began from 1980, the market nominal exchange rate has devaluated, as expected by the Edwards model (see Chapter Four), which directly affected the increase price of international

[21] The differences between the relative price of non-tradable goods against tradable goods and real exchange rate in this study are made by using a different measurement. The former one uses the price of domestic non-tradable goods (the output of GDP for service and construction sectors) as Harberger (1983) used it. While, the proxy which is used in this study is the US CPI (international price of tradable goods) times Iraqi nominal exchange rate divided by the non-oil Iraqi GDP which is consider as a domestic price or non-tradable goods as referred to by Edwards (1983) and Edwards and Akoi (1983).

tradable goods. In this situation, the RER depreciated (RER increases), since the price of tradable goods has been greater than the price of non-tradable goods (see RER figure in both Chapters three and five).

3) The output of non-traded goods sector is affected negatively by RER, while it is negatively affected by both dummies (DUMW and DUMS). It is found that appreciation (decrease) in the RER led to an increase in the output of the non-tradable goods sector, while depreciation (increase) of the RER led to a decrease in the output of non-tradable goods sector. The supply of the traded goods sector reacts to changes in the RER, the DUMW and DUMS positive as predicted in the economic theory.
4) It is found in this study that the government budget deficit and the devaluation of the nominal market exchange rate have been considered as two main important variables that have been significantly affected by changing international oil prices on one hand, yet they significantly affected the relative price of non-tradable goods against tradable goods, RER and eventually changing the structure of the economy between the tradable and non-tradable goods sector on the other hand. These issues have been considered as the main points in the chapter model (Chapter Four).

After increasing oil revenues at the beginning of the 1970s, the oil revenues began to decline when the Iraq-Iran war broke out in 1980 and the international oil price declined sharply (both the volume of export oil and its price declined sharply). This led to an extreme sharp drop in government oil revenues, which created a severe deficit in the current account and government budgets. The Iraqi authority tried to fund this deficit via money creation, which led to a sharp

devaluation of nominal exchange rates, since the supply of money is much larger than the availability of hard currencies in the domestic market, and even there was a lack of foreign reserves in the Iraqi central bank (see Chapter Five). Furthermore, in the 1990s, economic sanctions were imposed on the Iraqi economy, causing the sharp devaluation of the Iraqi Dinar. This resulted in the Iraqi authority having to confront a series of persistent current account and budget deficits once again. A large current account deficit, which is often linked with losses of foreign reserves and capital flight, and eventually a sharp devaluation of the nominal exchange rate, brought about a higher inflation rate among tradable goods than non-tradable goods in the domestic economy, which led to an increase in the contribution of tradable goods; the GDP enlarged, while the non-tradable goods contribution dropped sharply (see Chapter Three). This result is explained by economics literature.

However, despite the fact that the Iraqi Dinar came under periodic selling pressure during the 1980s until the removal of economic sanctions in 2003, as a result of high current account and fiscal deficits, the government began to support the market nominal exchange rate and made it close in terms of value to the official exchange rate. The Iraqi central bank strongly supported the local currency via its intervention in the foreign exchange in order to stabilise it. However, this was done after increasing oil revenues (due to the removal of economic sanctions and increasing international oil prices after 2003). The oil sector has produced an increase in the total exports and improved the current account. Consequently, oil production and its price developments exert a strong influence on the economy via foreign asset accumulation through the current account. Since the exchange rate regime operated with a fixed nominal

exchange rate for most of the period of the study, the money supply had to increase as a result of foreign reserve accumulation. This resulted in an increase of the domestic inflation rate, which was reflected in a higher price for non-tradable goods compared to tradable goods, causing more appreciation of the RER.

Regarding the impact of increasing oil price on government revenue and expenditure, it is found that an increase in the international oil price has significantly affected both oil revenue and government expenditure (see Chapter Three). This indicates that the oil revenue has mainly accrued to the government, meaning then the government could expand both its recurrent expenditure and investment expenditure. Thus, oil revenue has led to an increase in demand for non-tradable goods and tradable goods. This has led to a higher domestic price level and, in turn, an appreciation of the RER of the Iraqi Dinar. The spending effect is dominated by government policy decisions, and has most probably been the key channel in transmitting the effects of high oil revenue to the overall macroeconomic.

The summary arrived at, that Iraq had experienced a Dutch disease phenomenon during last five decades, is based on the theory that an appreciation in RER has occurred as a result of the oil boom. Moreover, the contribution of the non-tradable sector, such as that of services and construction in real GDP, has experienced an increase during high oil revenues; however, the tradable goods sector has experienced shrinking. In other words, the oil sector may have had an adverse effect on the tradable sectors, arising from the existence of the Dutch disease effect.

Finally, we explained the policy implications for Iraq. Drawing from the experiences of other oil-exporting countries, particularly developed ones, we arrived at the conclusion that the success of an economic policy is judged in terms of the economic objectives to which it is directed. We recommend that Iraq should use its revenue from the oil industry to develop productive activities in the country. However, public expenditure, particularly recurrent expenditure, must be kept within the economy's absorptive capacity. From the previous literature, some policies and strategies have been implemented to combat some macroeconomic problems that occurred due to booming natural resource sector, in the next section these policies and strategies will be presented.

7.2 Policy implication

The economic literature on the Dutch disease phenomena of massive oil revenue inflows to oil-exporting developing economies can potentially give rise to the "spending effect" and "resource movement effect" generating economic policy challenges in terms of international competitiveness and domestic macroeconomic stability. Since the Dutch disease phenomenon can bring about possible adverse side effects of natural resource booms, it is vital to consider policies that remedy or reduce the negative side effects of the disease. However, it is difficult to develop such policies as very little research has been undertaken in this area on the Iraqi economy. In order to be able to avoid the Dutch disease problem encountered in countries like Norway as a developed country, and Indonesia as a developing country, Iraq has had to implement a range of policies to restore the competitiveness of the non-oil sector. The issue of the real exchange rate has been put forward as being the most vital instrument because

of its role in influencing the relative prices in the economy. The problem of creating an economy toward a non-tradable goods sector from a tradable goods sector was due to the appreciation of the RER of most of the oil-exporting developing countries, including Iraq.

The theoretical and empirical framework suggests that the role of the RER is responsible for changing the structure of the economy. Structural reforms are immediately required to eradicate, or at least to reduce, dependency on the oil sector as a main source of government revenue and also to reduce the high contribution of the oil sector to total GDP in the Iraqi economy. The quality of economic policies could be improved via the following suggestions, which may cover the method of enhancing the current economic situation. Some economic policies are introduced and analysed based on economic literature and previous experience in order to minimise the adverse side effect of a boom in oil, and to maximise the benefits from an oil boom upon the non-oil tradable goods sector with the objective of maximising economic growth and development, were emphasised and conducted in this section. After the discovery of some evidence of Dutch disease in the Iraqi economy from the previous chapters, it might be practical to suggest what Iraq can do to minimise its economy's risk against this disease. Although the aim of this thesis is to study whether or not the Iraqi economy has experienced the Dutch disease, we briefly focus on some policies that might trigger success in avoiding the Dutch disease problem based on the experience of some other countries such as Norway and Indonesia. Almost all economies of the oil-exporting developing countries are heavily influenced by exogenous fluctuations of oil prices because their oil contribution to GDP and to the government is relatively high. This thesis proposes that governments need

to introduce some policies to minimise the side effects of the booming oil sector. When huge public-sector spending occurs during high oil revenue, it is often hard to decrease this when the oil revenue declines. Therefore, governments should stabilise their spending in either period (booming or slumping period). The following potential policies could be introduced to the Iraqi economy in order to at least minimise the Dutch disease phenomenon.

7.2.1 Stabilisation oil fund

The oil-exporting countries need to find a right balance between financing social, infrastructure development needs (by spending oil revenues) and maintaining macroeconomic stability (by sterilising oil revenues). If the extra revenue from oil during times of high oil price is not well managed, this will result in more economic instability, particularly when the oil price declines. The oil-dependent countries need to pay more attention to the effects of higher government expenditure on the RER and macroeconomic stability and should apply the best policy use of windfall gains for achieving long-term development. Oil stabilisation funds serve to stabilise the flow of revenue by insulating the government and the economy from revenue fluctuation that arises from the unpredictable oil extraction and sudden fluctuation oil prices. Instead, this fluctuation and uncertainty in production and price is transferred to the oil fund (oil stabilisation fund), and the State uses a mechanism to limit spending (Bagattini 2011). In this way, a government can limit the risk of Dutch disease because revenue is not spent as quickly (or slowly) during high (low) oil revenue. Such funds work in response to external factors; thus, they could quickly accumulate revenue, or revenue could rapidly be exhausted (Larsen 2004).

To avoid, or at least reduce, the macroeconomic volatility arising from the instability of oil revenues, it is strongly recommended that the Iraqi government creates an oil fund in order to avoid severe macroeconomic instability. There are many examples for other oil-exporting countries that have created oil funds, such as Norway, Azerbaijan, Chile (copper), the state of Alaska, Kuwait, Venezuela and Oman (see Engle 2000; Devlin and Lewin, 2005; Wakeman-Linn et al. 2003; Asfaha 2007). Although the benefits gained from an oil fund are different from one country to another, but in general it does work and countries with an oil fund have better experience with instability macroeconomic circumstances. In Iraqi case, the oil fund has not been established although, the contribution of oil sector to GDP is significantly high since 1970. It is argued that Establishing an oil stabilization fund abroad prevented exchange rate appreciation to large extend. Since decrease amount of saving means increase oil revenue in hand of government to spend which would trigger excess demand for non-tradable and overall increase in prices, this is shown in our data descriptive and empirical chapter.

On the other hand, stabilization oil fund is not only policy can Iraqi government implements. But there are some other policies beside this policy in order to avoid the Dutch disease to a larger degree. Accordingly, the following policies should be implemented by the Iraqi government.

7.2.2 Devaluation of the nominal exchange rate,

In view of the general adjustment problems challenging the oil-exporting developing countries, in 1979 the World Bank put forward an economic policy which, in their view, will guide the oil-exporting developing nations into a long-

term development of their economy. One of the main strategies is the devaluation of their over-valued nominal domestic exchange rate. Since it has been recognised that oil-exporting countries use their effect on the domestic economy via the exchange rate, the World Bank has stepped up its demand from the oil-exporting developing countries to depreciate their domestic currencies against foreign currencies. This is because it is understood that the exchange rate devaluation can significantly affect resources allocation in an economy and even affect the size of international trade in terms of competitiveness (Obstfeld et al., 2010).

The dominant opinion has been that increases in the relative price of foreign exchange (via devaluation of domestic currency against foreign currencies) will enlarge national production because, in the case of the devaluation of the domestic currency against a foreign one, the price of imports increases, which, in turn, encourages domestic output. Eventually, the domestic producers will gain more power for competition in the international market (see: Balassa 1974; Bomberger and Makinen 1976; Hanson and Hodrick 1980; Nashashibi, 1983; Sheehey, 1986; Nguyen, 1993; Abeysinghe and Yeok, 1998; Rawlins and Praveen, 2000; Agbola 2004; Bahmani-Oskoee and Ratha, 2004 and Bahmani-Oskoee 2005).

However, the strategy of devaluation of the nominal exchange rate against foreign currencies as a stabilisation strategy has become a controversial issue owing to the theoretical possibility that it might have deflationary effects on real output and employment in the domestic economy (see: Diaz-Alejandro, 1965; Cooper, 1971; Krugman and Taylor, 1978; Hanson, 1983; Devlin and Lewin 2005; Frankel, 2005; Hammes and Wills (2005)). Some other scholars suggest

that the aggregate supply function is backward bending in the short run, because the rate of nominal wages increases more proportionately than the rate of devaluation of the domestic currency. Dornbusch (1987) argues, a devaluation of the nominal exchange rate can potentially improve exports and then total output. But, on the other hand, devaluation makes imported goods more expensive which in an import-dependent economy has a contractionary effect on output (see Gylfason and Risager (1984) consider the circumstances in which a devaluation can bring about a contractionary effect on output. Lizondo and Montiel (1989); Faruqee et al. (1999); Frankel (2003); Setser (2007) conclude that a devaluation has an equivocal effect on output.

As Krugman and Taylor (1978) observe, a depreciation of the nominal exchange rate may not work in the way we have explained above. It is possible to have the seemingly unwelcome effects of shifting the income distribution against labour and reducing output and employment. The authors conclude that, as long as the balance of payments deficit is structural, in the short run both exports and imports will not be significantly sensitive to a change of prices for domestic output; rather, the impact of a devaluation of the nominal exchange rate on the trade balance comes mainly via economic contraction rather than substitution.

On the other hand, in an oil-exporting country where the role of the market is significant, it is likely that the nominal exchange rate changes could have a significant effect on sectors producing non-oil tradable goods (Obstfeld et al. 2010). This could be true in countries such as the UK and Norway, since the response of these countries to relative price changes is more sensitive when the nominal exchange rate changes, because these economies can absorb these changes quickly (Lama and Medina 2012). In contrast, in most oil-exporting

developing economies challenging to transform their economies, the dominance of the role of the government over economic activities infers that several decisions may prevent any sensitivity of relative price. Behdad (1988) states that the devaluation policy is not an effective instrument in the case of oil producers with a heavily import-dependent industrial sector. An effective devaluation nominal exchange rate is expected to cause an improvement in the balance of payments via reducing imports and encouraging exports. In oil-exporting developing countries, imports react to devaluation very sluggishly.

The previous experience has also revealed that the changes in the nominal exchange rate have not been successful in affecting the relative price in order to correct the price imbalance in the non-oil-traded goods sector of economies, such as Nigeria, Mexico, and Venezuela. The reason for this is not only due to the result of price disadvantage, but also there are many other factors, such as international protectionism and substitution of synthetic substitutes.

However, it must be documented that the devaluation of the nominal exchange rate strategy is just a partial step towards the restoration of the competitiveness of the tradable goods sector in the international market (Obstfeld et al. 2010). Therefore, in an oil-exporting developing country like Iraq, the success of the exchange rate policy is conditioned by the associated monetary, fiscal and other economic policies. Iraq's success in following the exchange rate devaluation to improve the competitive position of the tradable goods sector will rely on supportive economic management policies that are restrictive enough to keep a significant share of the original relative advantage caused by the devaluation nominal exchange rate (Lama and Medina 2012). This means that Iraqi's wish to

improve the competitiveness of its tradable goods sector calls for strict constraints on the rate at which the oil revenue is spent.

Based on the model and empirical result of this thesis, the devaluation of nominal exchange rate may have a significant improvement for tradable goods sector since domestic tradable goods sector can gain a competitiveness in international markets. Equation 5.2 in chapter five (RER = $E\ P^*/P$)[22] can easily show the important of devaluation nominal exchange rate for real exchange rate and reallocation of resources toward tradable goods from non-tradable goods sector. Acceding to above equation, devaluation nominal exchange rate means increase the price of international tradable goods (ceteris paribus), since traded goods becomes more expensive, and, at the same time, a decreased supply of non-traded goods as producers shift to the more profitable sector (i.e., traded goods). Thus, the output of tradable goods enlarges, while the output of non-tradable goods shrinks. Based on this argument to some extent, the allocation of resources can shift toward tradable goods.

Iraq has experienced the devaluation of its domestic nominal exchange rate during the economic sanctions in the 1990s. The Iraqi dinar devaluated sharply, which, in turn, led to a strong competitiveness in the international market, particularly for agricultural products, as the output and the contribution of the agricultural sector to GDP has increased sharply (see Chapter Three). However, the devaluation was not implemented as an economic policy, but rather it was related to economic sanctions. Thus, due to that devaluation, the rate of poverty has increased sharply. In 2008, however, when the economic sanctions were removed and the oil price reached its highest level, the monetary authority

[22] RER: Real exchange rate, *E*; Nominal exchange rate, *P**; International price of tradable goods, *P*; Domestic price.

decided to appreciate the nominal exchange rate from 1500 dinar against 1 US dollar to 1120 dinar against 1 US dollar, and fiscal policy decided to increase wages between 50% to 100%. The Iraqi tradable goods have since lost their competitiveness in the tradable goods sector in the international market (see data from Chapters Three and Five).

In summary, applying a devaluation policy at least mitigates the appreciation of the currency that the Dutch disease causes and gains some power of competitiveness in the international market. As such, the country's tradable goods sector does not become less competitive in international markets and, therefore, these sectors would not need to contract.

7.2.3 Fiscal policy (public spending and revenue)

A careful management of the expected oil boom is an important point in order to avoid the excessive increase of government expenditure that has characterised many oil-exporting developing countries. Otherwise, the oil revenue may adversely affect the performance of the tradable sector. From an economic point of view, the main objective of fiscal policy is the mobilisation of savings, to encourage investment and development, and a reduction of income inequality (Aziz et al. 2000). However, for most oil-exporting developing countries, the case is different. Where they have plenty of capital, which is gained through exporting oil, the mobilising of savings may not be a main issue, at least not in the short term. Since oil revenues accumulate to the government directly, fiscal policy in oil-exporting countries plays the most central role in directing development because it contains both macroeconomic decisions, which are related to government expenditure, and government domestic revenue (tax), which affects

the aggregate demand and microeconomic decisions. Choosing a form of expenditure or taxation that serves such aims is planned to discourage or encourage specific types of economic activity (Morgan 1979).

Since the government's extra revenues come from oil, representing a transfer from foreign economy, there is no withdrawal revenue from the domestic income stream, so that the revenues have no deflationary impact on domestic economy. Similarly, on the expenditure side, if the oil-exporting economy desires to avoid unwanted inflationary pressures, it should use the oil revenue to invest in foreign assets instead of domestic spending, since investing oil revenue into foreign assets does not cause an upsurge in domestic liquidity and incomes, and the problem of inflation does not take place. Corden (1981) described this approach as the “zero impact case”. It means that, if the whole of the oil revenues were used to accrue foreign exchange reserves or invest into foreign assets, there would be no change in the exchange rate or employment levels. The main point is that zero impact requires the government not to spend the revenue from oil, particularly when oil revenue increases suddenly. In this case, the domestic budget should depend only on non-oil revenues.

However, the zero-impact policy may not be able to apply to the Iraqi circumstance for several reasons. First, in this stage, it is impossible that the Iraqi domestic revenue can be actively employed as a tool of macroeconomic fiscal policy, since the contribution of the non-oil revenue to total revenue is very small. Secondly, increasing non-oil revenues could encounter political resistance and would have only limited influence on the demand/supply balance in the economy. Thus, it is predominantly through its domestic expenditure of the oil revenue that the government has its key impact on economic development.

Based on our empirical results, the government expenditure in Iraq has a significant effect on real exchange rate which is appreciation real exchange rate also responsible for reallocation of resources towards non-tradable goods sector. Therefore, it is believed that increasing government expenditure is one of the main variable which is responsible for an increase in the rate of inflation in the domestic economy; as such, the government expenditure must be kept within the economy's absorptive capacity.

On the other hand, a high percentage of government spending in Iraq went to recurrent expenditure during last five decades. This made the problem worse, since increasing recurrent expenditure means a rise in salary of government administrative personnel. This, in turn, means labour costs increases for the private sector and the cost of production for tradable goods increases. Apart from that, increasing government expenditure leads to an increase in the price of non-tradeable goods against tradable goods, which leads to an appreciation of RER and, eventually, loss of competitiveness for the tradable goods sector in the international market. Thus, it is important to avoid enlarged government expenditure, even during high oil revenue. The optimum policy should be the same as the Norwegian policy, in that Norway salary increases were limited to the rate of growth in productivity within the manufacturing sector. As a consequence, Norway was able to avoid a situation where significant wage increases in the growing resource sector led to upward pressure on wages in the rest of the economy (see Usui, 1997; Bjørnland, 1998; Bergevin, 2006). Moreover, excessive government expenditure can be avoided by investing the resource revenues in order to decrease the pressure on the domestic economy and the domestic currency. The Iraqi government should adopt fiscal policies

that include fiscal discipline. The extra saving can be invested by the government in the international financial markets. The government also can spend oil royalties to strengthen the tradable sector. It is argued that the government policy regarding how it should spend the oil revenues is very important in assessing the effects of Dutch disease. Direct subsidies for some inputs, such as investment in infrastructures, energy, research and innovation, as well as new technologies, may improve the competitiveness of the tradable sector in the international market and, as a consequence, alleviate the effects of the Dutch disease (Bagattini 2011).

7.2.4 Development plan, subsidies and impose tariffs

By converting the oil revenue into economic development, we have suggested the pursuit of a fiscal policy towards industry-specific policies, as a further practical instrument for stabilising the economy. This would use the accumulated assets to promote non-oil-tradable goods development. This could be achieved via the use of assets to import capital equipment, which would strengthen the industrial base and sustain the economic development. In line with this strategy, serious government support has to be given to the development of the manufacturing and agriculture sectors in order to diversify the economy. A development-oriented policy in the form of increased government spending (spending effect) on public physical capital, human capital formation, and technological acquisition in a shrinking tradable goods sector, will enhance the private sector real wealth and result in a positive economic welfare.

On the other hand, the use of export subsidies by a number of countries, including developed countries, must be assessed and considered in oil-exporting developing countries. Developing countries may be able to reduce the chances of retaliation from other countries if they use those export subsidies that are

allowed by the GATT and which are used by the developed countries (Balassa, 1978 and Amuzegar, 1983). The strategy subsidies may be seen as having two main advantages in the implementation of development strategies. Unlike devaluation of the nominal exchange rate, they are more adaptable and flexible, so that they are perfect for a specific economic activity. Apart from that, subsidies do not encourage higher consumer prices and an associated decrease in the scale of output, thus protective potential economies of scale in production. Subsidies also differ from devaluation in that they are more simply applied to particular factors of production, such as raw materials or capital equipment.

A certain subsidy per unit of output of tradable lead to expand the output of tradable goods since the price of tradable decreases further than or equal to the international price of tradable goods. Such an enlargement in the traded sector is attributed to two factors: an increase in domestic demand for tradable goods as long as they are cheaper than or at least equal to imported goods; the foreign demand for domestic tradable goods may rise if their prices of foreign tradable goods more expensive than domestic one.

The alternative method is to impose tariffs on imported goods. Hereafter, the price of foreign tradable goods (*P**) increases by the amount of tariff imposed (t). The new price of foreign goods is:

$$P^* = (P + T)$$[23]

As a result, in one hand, the demand for imported goods (foreign tradable goods) will deteriorate since they become more expensive, on the other hand, the increase price of international price of tradable goods trigger to encourage the

[23] *P**: international price of tradable goods, P: domestic price of tradable goods, T: amount of tariff imposed on international tradable goods.

domestic sector of tradable goods since it would be more profitable compared with non-tradable sector.

The major findings from the above policy analysis have pointed to the ability of government agencies to enhance productivity in the output of tradable goods by increasing government investment on infrastructure (physical capital), human capital formation, and technology acquisition. In other words, increasing government consumption spending (recurrent expenditure) at the expense of government investment spending (capital expenditure) upon physical capital, human capital formation or imported capital, retards economic development. The main problem in Iraq, in most of the cases, is that the capital expenditure is very small compared to government consumption spending (see Chapter Three). Thus, it is strongly recommended that capital expenditure should not be less than 70% of total expenditure.

7.2.5 Reducing unproductive expenditure

One of the most important problems with the Iraqi economy is its massive national income spend toward military activities and equipment during the last five decades. Edwards (1989) warns that government should not spend too much money on arms and weapons that has occurred in many countries, since it is considered as unproductive expenditure. This kind of expenditure must reduce to the minimal level consistent with political stability. In Iraq, high oil revenue is often related to unproductive and waste expenditures. Unnecessary spending should be eliminated completely, and rationalisation of government spending should be sought by giving priority to the human resource development, which would improve productivity.

To sum up, by illustrating the policy implications for Iraq, by drawing from the experiences of other oil-exporting countries, we reached the conclusion that the

success of an economic policy is exactly arbitrated in terms of the economic objectives to which it is directed. In this framework, we recommend that Iraq should use the revenue from oil to develop productive sectors in the country.

7.3 Suggestions for further study

It is important to recognise that there are further features or policy options, such as the issue of rent seeking, reform of financial markets and the process of privatisation, that are available to the Iraqi government to consider. Incorporating the role of government institutions would represent a significant extension of the existing macroeconomic model. Including a measure of the ability and transparency of Iraq institutions and government agencies in adopting and implementing the policy options would lead to a remarkable extension to the existing model. In the case of Iraq, the absence of a strong government institution and government agencies with high efficiency might have led to mismanagement of the oil revenue, particularly during times of high oil revenue. The huge revenue made from the oil sector might have formed rent-seeking behaviour by interested groups inside the Iraqi government, resulting in corruption and inefficiency. This behaviour could have caused an economic failure, including higher inflation, capital flight, poor institutional quality and, henceforth, lower growth rate and failure of economic development. Consequently, the economic indicators and lower social infrastructure might have been caused not only from the Dutch disease effects, but also from rent seeking.

In general, this thesis has recognised the prominent impact arising from oil shocks for a small oil-exporting economy like Iraq. It has also delivered some indications of the most probable economic outcomes arising from conducting alternative government policies for Iraq. The framework of the model employed

in this thesis is also likely to be applicable to other oil-exporting developing economies in the Middle East, which also suffer from Dutch disease consequences.

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Appendix 1

Solution of the equation related to the Real Exchange Rate

Equations (6) and (13) can be combined to find the reduced form solutions for *MS* and *P*.

(A1) $M_t = -\pi_1(1-\gamma_0\beta_1)\ \Delta^{-1}\ M_{t-1} + \pi_6\ (1-\gamma_0\beta_1)\ \Delta^{-1}\ y_t + [\pi_4\ (1-\gamma_0\beta_1) - \gamma_1\ (\pi_2\beta_1 + \pi_5)]\ \Delta^{-1}\ P_t^o - [\beta_2(\pi_2 + \gamma_0\pi_5) + \gamma_2\ (\pi_2\beta_1 + \pi_5) - \pi_3(1-\gamma_0\beta_1)\ \Delta^{-1}\ y_t,$

(A2) $P_t = -\beta_0\pi_1\ \Delta^{-1}\ M_{t-1} + \beta_0\pi_6\ \Delta^{-1}\ y_t - [\beta_2 + (\pi_5\beta_0 + \beta_1)\gamma_2 - \beta_0\pi_3]\ \Delta^{-1}\ y_t + [\ \beta_0\pi_4 - \gamma_1(\pi_5\beta_0 + \beta_1)]\Delta^{-1}\ P_t^o;$

RER $= \beta_0\gamma_0\pi_1\ \Delta^{-1}\ M_{t-1} - [\gamma_1(1-\beta_0\pi_2) - \beta_0\gamma_0\pi_4]\ \Delta^{-1}\ P_t^o - [(1-\beta_0\pi_0)\gamma_2 + \beta_2\gamma_0 - \beta_0\gamma_0\pi_3]\ \Delta^{-1}\ y_t + \beta_0\gamma_0\pi_6\ \Delta^{-1}\ GE_t$

where

$\beta_0 = \frac{(1-\delta)\lambda}{1-\lambda\ (1-\delta)}; \quad \beta_1\ \frac{1}{1-\lambda\ (1-\delta)}; \quad \beta_2\ \frac{(1-\delta)\ (\lambda\eta\ -\rho)}{1+\lambda\ (1-\delta)};$

$\pi_1 = \omega\theta; \pi_2 = \omega\theta; \ \pi_3 = \omega\theta\mu; \ \pi_4 = \omega\varphi; \pi_5 = \omega\varphi$

$\pi_5 = (1-\omega)\phi; \Delta = 1 - [\beta_0\pi_2 + \gamma_0(\beta_0\pi_{5+}\beta_1)].$

Appendix 2

Solution of the equations related to the output of non-traded and traded sector.

The variation expressions of (16) (17) are solved for w,

$w = fp_n$ (A1)

Where

$0 < f = L_N(W/P_N)°/\,[L_N(W/P_N)° + L_T(W/P_T)]° < 1.$

Variation of (5) yields, in view of (A.l)

$H_N^S = -S(W - P_N = S(1-f)P_N$ (A2)

$S = (1/H_N^S)\ (\partial H_N^S/\partial(W/P_N))\ > 0.$

We also need variation of national income. From (11),

$y = -\eta_1 W + \eta_2 P_N + \eta_2 P_O = \eta_1 P_N + \eta_2 P_O$ (A3)

where

$\eta_1 = \eta - \eta_1 f \qquad \eta_1 = (\sigma H_T^S/y) > 0,$

$\eta_2 = [(P_N/\,P_T)H_S/Y]°\,[1 + S(1-f)]\ > 0$

$\eta_2 = (P_O/P_T)\ O/y > 0$

Variation of the market clearing condition is solved for P_N. First, we note that

$$H_N^D - \alpha_1(P_N/\,P_T)OP_N + \alpha_2 y + \alpha_3(\delta M^S - \delta M^D) + G_E \quad \text{(A4)}$$

$$\alpha_1 = -[(1/H_N^D)\ (\partial H_N^D/\partial(P_N/P_T))]O > 0$$

$$\alpha_2 = [(1/H_N^D)(\partial H_N^D/\partial y)]O > 0$$

$$\alpha_3 = [(1/H_N^D)(\partial H_N^D/\partial M)]O > 0$$

$$0 < \mu = (M^D/M^S)O \leq 1$$

$$0 < \alpha_4 = [(G_E/H_N^D + G_E)]O < 1$$

Taking variation of (15) and noting (A.2), (A-4) and (19), the resulting equation,

$(H_N^S)o\ s(1-f)P_N = (\mathrm{H_N^D})\mathrm{o}\ [-\alpha_1(P_N/P_T)oP_N + \alpha_2 y + \alpha_3(\delta M^S - \delta M^D)] + G_E$

Is solved for $P_N\ and\ P_T$

$$P_N = \pi_0 P_0 + \pi_1(M^S - M^D) + \pi_2 G_E + \pi_3 y$$

$$P_T = \pi_0(\hat{\mathrm{E}}_t + \hat{P}_{Tt})$$

Definition of RER = P_T/P_N

$$H_N^S = f\mathrm{RER}$$

$$H_T^S = f\mathrm{RER}$$

H_N^S = Non-traded goods output

H_T^S = Traded goods output

Appendix 3

Test for determine lag length for model one

VAR Lag Order Selection Criteria
Endogenous variables: RP GE Y MS PT DUMW DUMS
Exogenous variables: C DUMMY
Date: 11/28/16 Time: 22:18
Sample: 1970 2013
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-159.1969	NA	0.000156	8.259843	8.513175	8.351440
1	90.00682	411.1861*	3.73e-09*	-2.400341	-0.627018*	-1.759163*
2	116.0953	35.21950	6.94e-09	-1.904767	1.388548	-0.714008
3	156.7344	42.67103	7.83e-09	-2.136721	2.676586	-0.396381
4	208.4582	38.79288	7.93e-09	-2.922912*	3.410385	-0.632992

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 4

Test for determine lag length for model two

VAR Lag Order Selection Criteria
Endogenous variables: RER GE Y MS PT DUMW DUMS
Exogenous variables: C
Date: 11/28/16 Time: 21:55
Sample: 1970 2013
Included observations: 40

Lag	LogL	LR	FPE	AIC	**SC**	HQ
0	-175.7745	NA	0.000357	9.088725	9.342057	9.180322
1	86.40462	432.5956	4.47e-09	-2.220231	-0.446907*	-1.579053*
2	128.5388	56.88120*	3.73e-09*	-2.526942	0.766373	-1.336183
3	166.3849	39.73840	4.83e-09	-2.619247	2.194060	-0.878907
4	216.1763	37.34355	5.39e-09	-3.308817*	3.024481	-1.018896

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 5

Test for determine lag length for model three

VAR Lag Order Selection Criteria
Endogenous variables: NT RER DUMW DUMS
Exogenous variables: C
Sample: 1970 2013
Included observations: 43

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-115.2002	NA	1.13e-05	5.637216	5.882965	5.727841
1	197.2352	523.1475*	3.00e-11*	-7.220240*	-5.499998*	-6.585868*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 6

Test for determine lag length for model four

VAR Lag Order Selection Criteria
Endogenous variables: T RER DUMW DUMS
Exogenous variables: C
Sample: 1970 2013
Included observations: 39

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-77.03985	NA	5.97e-05	4.463582	4.890137	4.616626
1	151.5241	375.0794	1.78e-09	-5.975596	-4.482656*	-5.439942
2	186.9138	49.00107	1.14e-09	-6.508399	-3.949074	-5.590135
3	225.9598	44.05186*	6.82e-10*	-7.228705	-3.602994	-5.927831
4	248.6022	19.73960	1.19e-09	-7.107807	-2.415710	-5.424323
5	295.4069	28.80286	9.13e-10	-8.225993*	-2.467511	-6.159899*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 7

Why stationarity is required?

Before starting to perform any empirical estimations of the model, it is important to investigate the time series data to check whether they are stationary or non-stationary (Clarke and Mirza, 2006). The method of estimation, using the OLS method, is built on the assumption that the means, variances are constant over time and the covariance between two variables does not depend on the actual observed time, but rather on their lag length of time. In contrast, variables whose means and variances change over time are known as non-stationary or unit root variables (Gujarati, 1995 and Lee and Strazicich, 2003). In economic literature, most time variables are non-stationary (has a unit root), because the value of one variable at a specific time does not only depend on the actual observed time, but also on the lag length of time. In other words, the value of the variable in one specific period is a vital factor in determining the variable's value in the following period, and the error terms for successive observations are auto-correlated (Perron, 1989; Christiano, 1992, Perron, 1997; Lumsdaine & Pappel, 1997).

Thus, regressing a time series variable on another time series variable, where both exhibit strong trends, will often exhibit a very high R^2 (coefficient of determination) even if there is no relationship between variables. This case demonstrates the problem of what is called spurious or **nonsense regression** because of the fact that the high R^2 observed is a result of the existence of the trend instead of the exhibition of the true relationship between variables involved in the model (Asteriou, 2007; Gujarati, 2011). On the other hand, before DF and ADF test, Granger and Newbold (1974) suggested the following "rule of thumb" for detecting spurious regressions: If the value of R^2 is larger than *DW* statistic then the estimated regression 'must' be spurious, while if the

R^2 becomes smaller than DW the estimated regression does not have to be spurious.

In general, in order to avoid spurious regression, it is required to test for stationarity via the unit root test, the common approach for determining the order of integration needed for obtaining stationarity. If the data demonstrates stationarity in levels, the data will be integrated of order zero, denoted as I(0). Conversely, if a time series is non-stationary this happens in most cases, and needs to be made stationary, which is done by taking the differences of that variable. If the first difference of non-stationary variable is stationary variable, then the variable is supposed to be integrated of order one, and it can be written as I(1), whereas if second differences are needed in order to attain stationarity, then the variable is integrated as order two, and it can be written as I(2).

- **The consequences of non-stationarity**

Much conventional asymptotic theory for OLS estimation considers stationarity of the independent variables around a deterministic trend. The differences between the characteristics of stationary and non-stationary independent variables can be summarised as follows:

- In the case of non-stationarity, the variance of x_t goes to infinity where *t* goes to infinity, while where the variables are stationary the variance of x_t is finite.
- In the case of non-stationarity variables, the innovation will influence the value of x_t permanently, while when the variables are stationarity the innovation will influence the value of x_t temporarily.

The stationarity properties of a time series are scrutinised by conducting the unit root test in order to avoid spurious or nonsense regressions. There are a

number of methods available for carrying out a unit root test. In the next section, these methods will be discussed.

- **Testing for Stationarity**

The previous argument made it clear that the stationarity of the variables under examination is the main factor in determining the econometric modelling plan. Given this, examining for stationarity or non-stationarity of the variables is of great importance in econometric modelling. There are some tests available to determine whether the series is stationary or non-stationary, such as Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP). Their extensions make up many tools by which one can formally test for a Unit root in a variable.

- ***Dickey-Fuller Test***

The simplest auto-regressive variables form of the Dickey-Fuller (DF):

$y_t = \rho y_{t-1} + \varepsilon_t \quad (6.1)$

Equation (6.1) is the fundamental equation for the Dickey Fuller test. The test statistic is the *t*-statistic on the lagged dependant variable. If $\gamma > 1$ (φ bigger than 1) or If $\gamma \; is \; equal \; to$ 1 (unity), the coefficient of the lagged dependant variable $(\gamma - 1)$ will be positive or equal to zero. In both cases φ_t will be non-stationary. The null hypothesis (H_0) in the Dickey Fuller test is that α is equal to 1. On the other hand, if $\varphi < 1$ $(\gamma - 1)$ is negative, reflecting a stationary process (alternative hypothesis H_1).

Ho: The series is non-stationary or contains a unit root: $\gamma = 0$ or $\gamma > 0$

$H1$: The series is stationary: $\gamma < 0$

The standard method for examining such a hypothesis is to build a t-test; however, under the non-stationarity condition, the statistic process does not

implement a standard t-distribution but, rather, a Dickey-Fuller distribution (Dickey and Fuller 1979).

However, Dickey-Fuller may face some problems, particularly in small or noisy samples; where the standard Dickey-Fuller unit root test can wrongly accept near-unit root variables and trend-stationary variables as unit root variables. One problem is that the critical values are sensitive to small changes in the time-series properties of the underlying process. Therefore, rejecting the null hypothesis will be more difficult, even when it should, in fact, be rejected. This problem can be sorted out via using either the Augmented Dickey-Fuller (ADF) or Phillips and Perron (PP) tests. These approaches include lagged values of the dependent variable in the regression model to eliminate the autocorrelation in the residuals (Watsham and Parramore, 1998). Thus, an extension of the Dickey-Fuller test is introduced and referred to as the Augmented Dickey-Fuller (ADF) test:

- **Augmented Dickey-Fuller Test (ADF)**

If the date generation process (DGP) follows an autoregressive (AR) process, then the error term (ε_t) in (6.1) will be auto-correlated. In this circumstance the Dickey Fuller (DF) test will be invalidated. The ADF test is the DF test when adjusted for some appropriate difference dependent variables in order to capture auto-correlation in the residual term.

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^{k} \varphi_i \, \Delta y_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots (6.2)$$

The hypothesis of this test is similar to the hypothesis used by the Dickey-Fuller test. In the above equation, lagged first difference terms of the dependent variables are added in order to eliminate auto-correlation in the

error term (ε_t). Schwarz Information Criterion (SIC) or Akaike Information Criterion (AIC) has been used in economics literature to determine the lag length. In equation (4.8) Δ indicates the first difference operator; *t* is the time trend; *k* denotes the number of lags used and ε_t is the error term at time *t*; and φ is parameters.

Appendix 8

Stationarity test at level and first differences for all variables

- **Stationarity and non-stationarity test**

Before starting to perform any main empirical estimations of the model, it is important to investigate the time series data to check whether they are stationary or non-stationary (Clarke and Mirza 2006). In this regard, the stationarity test will be done for all data via graphical test as an initial test and also empirical test as a main test.

- **Empirical Results for the ADF and PP Unit Root Tests**

The first-step in the estimation process is to ascertain the order of integration of the variables. To test the variables for stationarity and determine the order of integration of the variables, Augmented Dickey Fuller (ADF) and the Phillips and Perron (PP) tests for unit roots have been conducted for each variable. The choice of the lag length required for the test is based on Schwarz Information Criterion (SIC). All variables were tested with intercept and intercept plus trend. Based on the ADF and PP test, it is found that all of these variables are non-stationarity at level. All the data series were tested for stationarity to forestall the possibility of drawing conclusions based on the statistically spurious relationship.

Unit root tests at Levels (I(0)) and first difference (I(1))

At Augmented Dickey-Fuller ADF test

	In Levels				In 1st Differences			
	Intercept		Intercept and trend		Intercept		Intercept and trend	
Variables	t-Statistics	Prob.	t-Statistics	Prob.	t-Statistics	Prob.	t-Statistics	Prob.
RP	-1.653056	0.4474	-2.475534	0.3380	-8.187667	0.0000	-8.091122	0.0000
GE	-1.299303	0.6214	-1.318691	0.8698	-5.179242	0.0001	-5.120516	0.0008
Y	-1.283748	0.6286	-2.041255	0.5627	-5.600375	0.0000	-5.530864	0.0002
MS	-0.964264	0.7575	-1.334402	0.8656	-6.044837	0.0000	-5.968381	0.0001
RER	-0.932766	0.7681	-0.337550	0.9869	-5.128206	0.0001	-7.533780	0.0000
NT	-1.066029	0.7206	-1.616533	0.7698	-5.730239	0.0000	-5.662339	0.0002
T	-1.944554	0.3095	-2.006311	0.5814	-6.764992	0.0000	-6.687413	0.0000
P_T^*	-0.002625	0.9531	-1.577656	0.7854	-4.127410	0.0024	-4.603309	0.0034

Source: Author's computation (2016)
Note: Critical Values for ADF (Intercept) and (Intercept & trend) are at 1 percent of significant.

Unit root tests at Levels (I(0)) and first difference (I(1))

At Phillips-Perron (PP) test

	In Levels				In 1st Differences			
	Intercept		Intercept and trend		Intercept		Intercept and trend	
Variables	t-Statistics	Prob.	t-Statistics	Prob.	t-Statistics	Prob.	t-Statistics	Prob.
RP	-1.494178	0.5270	-2.396639	0.3761	-8.213487	0.0000	-8.115769	0.0000
GE	-1.676769	0.4356	-1.698535	0.7347	-5.210800	0.0001	-5.152744	0.0007
Y	-1.406765	0.5702	-2.041255	0.5627	-5.600375	0.0000	-5.530864	0.0002
MS	-1.181873	0.6737	-1.623333	0.7671	-6.111814	0.0000	-6.042338	0.0001

RER	-1.099790	0.7074	-0.512129	0.9791	-5.128206	0.0001	-5.261825	0.0005
NT	-1.066029	0.7206	-1.709612	0.7298	-5.732318	0.0000	-5.664512	0.0002
T	-1.929312	0.3162	-2.006311	0.5814	-6.763983	0.0000	-6.692270	0.0000
P_T^*	-2.260893	0.0231	-2.470940	0.3402	-4.150821	0.0022	-4.628549	0.0031

Source: Author's computation (2016)
Note: Critical Values for PP (Intercept) and (Intercept & trend) are at 1 percent of significant.

The unit root test outcomes are shown in Tables 6.1 and 6.2. The first stage of the empirical analyses involved testing the statistical properties of all the variables under consideration, i.e., Relative Price (RP), Government Expenditure (GE), GDP Per Capita (Y) Money Supply (MS), international price of tradable goods (P_T^*), Real Exchange Rate (RER), the output of tradable goods (T) and Output of Non-tradable goods (NT). The outcome of the ADF and PP unit root tests are summarised in Tables 6.1 and 6.2, respectively. The results suggest that, for both tests (ADF and PP), the null hypothesis of the presence of unit roots in the variables in levels could not be rejected, indicating that all the variables are non-stationary in levels. However, after taking first difference of the variables, the null hypothesis of the unit root in each of the variables was rejected at the 5% level of significance. Thus, it can be inferred that all the variables are integrated of order 1, that is, $I(1)$. Thus, the evidence of the outcome suggests that first differencing is sufficient for modelling OLS series considered in this study.

After finding that all the variables are stationary in the first difference (stationarity in the same order or all variables are integrated), then we will be able to use the co-integration test in order to find whether the explanatory variables have a long-term relationship with the dependent variable.

Appendix 9:

The issue of co-integration

- **Co-integration test,**

According to Asteriou and Hall (2007), the concept of co-integration was first introduced by Granger (1981). Later, this concept was further formulised and developed, by Engle and Granger (1987), Engle and Yoo (1987), Phillips (1987), Stock and Watson (1988), Phillips and Ouliaris (1990), and Johansen (1991 and 1995). As we have analysed in the previous section, the trended time series can possibly create problems in empirical econometrics as a result of spurious regressions. One way of resolving this problem is to take the differences from the series until stationary is achieved and then use the stationary data for running a regression (as we have done in the previous section).

However, according to Asteriou and Hall (2007), this solution is not ideal since it not only shows differences of the error process in the regression, but also no longer gives a unique long-run solution. If we have two non-stationary variables, then we can represent the error as a combination of two cumulated error processes. These cumulated error processes are known as stochastic trends; typically, we could expect that they would combine to generate another non-stationary process. However, in the special case that two variables are related, then we would predict that they would move together, and so the two stochastic trends would be very similar to each other. When we combine them together, it should be possible to find a combination of them, which removes the non-stationarity. In this special case, these two variables are co-integrated (Asteriou and Hall 2007). Nowadays, a co-integration test becomes a dominant requirement for any economic model using non-stationary time series data (Gujarati 2009). The results of these variables are integrated in the same

order (usually *I*(1)). If the variables are co-integrated, OLS regression yields consistent estimators for the co-integrating parameter. Conversely, if the variables do not co-integrate, the results obtained will be spurious (non-sense regression) and the econometric work becomes practically meaningless.

In the previous section, there is an absence of stationarity in all the variables at level and they became a stationarity when they transfer to the first difference. This implies that a co-integration analysis must be carried out in order to analyse if the series are co-integrated in the long run or not. In this sense, the Johansen's (1991) test for co-integration should be applied. To avoid spurious regressions (non-sense regression), the possibility of co-integration and a long-run equilibrium relationship between the variables should be checked. Individual series might not be stationary, but a linear combination of these series could be stationary. Thus, we test for a co-integration test between these variables. The Johansen (1995) procedure is applied to test for the existence of a long-run relationship between dependant variables and explanatory variables and determine the number of co-integrating equations.

On the other hand, it is established in the literature that, before running a co-integration test, determining the number of lags is essential, since the co-integration test is very sensitive to the lag length. A different lag order can seriously affect the substantive interpretation of co-integration results (see e.g. Hamilton and Herrera, 2004 and Kilian, 2005). The strategy in empirical studies is to select the lag order by some pre-specified criterion. In the econometric literature, a number of selection criteria can be used to determine the optimal lag order. The selection criteria considered in this thesis are the Schwarz Information Criterion (SIC), the Akaike Information Criterion (AIC), and the Hannan-Quinn Criterion (HQC). However, these criteria may not always draw the same conclusion on the lag order; in order

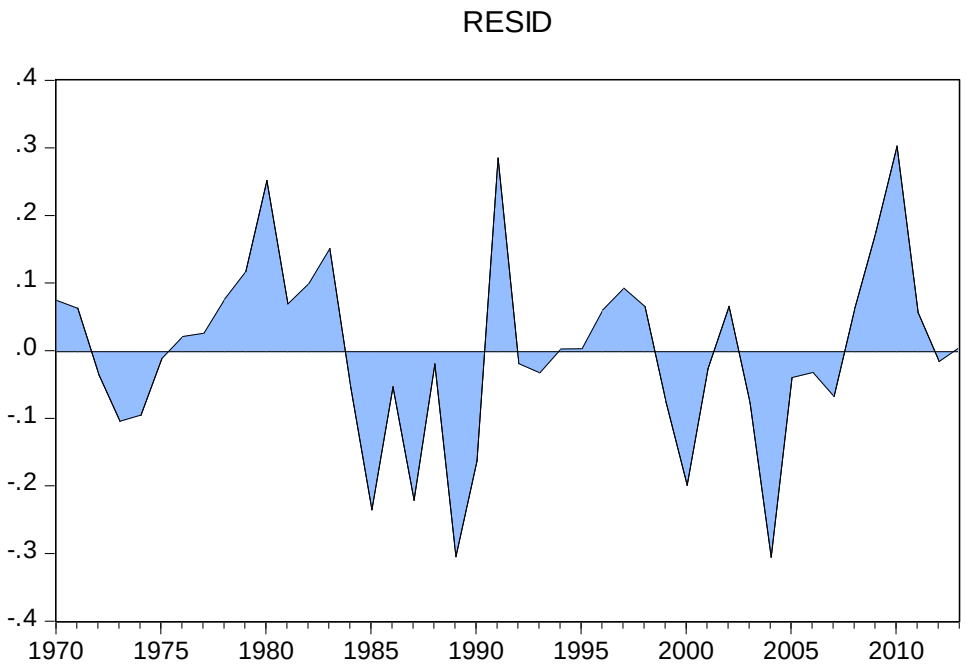
words, using different criteria may draw different conclusions about the number of lags. In our analyses, we have four different equations, which are relative price, real exchange rate, output of non-tradable goods, and output of tradable goods. Thus, co-integration tests are conducted for all these equations.

- **Co-integration tests for relative price (first model)**

The co-integration procedure is conducted for Relative price of non-tradable goods against tradable goods (Model 1) based on Johansen's co-integration test to check whether there is a long-run relationship between RP as a dependant variable and explanatory variables GE, y, MS, P_T^*, DUMW and DUMS.

It is important to mention that before running the Johansen co-integration procedure, the optimal lag length in the VAR system has to be selected. Here, the procedure used is based on the Schwarz Information Criterion (SIC). According to SIC criteria, the number of lag for relative price equation is equal to two lag (see appendix 2). Apart from that, the residual of the model should be stationary as an initial test for the model, if these deviations from long-run equilibrium are found to be stationary; the relative price and explanatory variables are co-integrated (exist long run relationship). Figure 6.3 shows the result of the ADF test conducted on the residuals of the long-run relationship for relative price (model 1). They demonstrated that the residuals are stationary at levels, meaning a long-run relationship is said to exist between relative price and explanatory variables.

Residual for model 1



On the other hand, the Trace Test and Max-Eigen test, reported in Tables 6.3 showed to determine the number of co-integrating vectors. The null hypothesis of no co-integration is rejected by both the Trace test and Max-eigen test. Table 6.3 shows that the Trace test and Max-Eigen test reject the null hypothesis of zero co-integrating vectors at 1 per cent level of significance, and the results for the Trace test reveal also that at least two co-integrating vectors exist among the variables of interest at 5 per cent level of significance. This means that there is a long-run relationship between dependant and explanatory variables.

Trace test and Max-Eigen test for model 1

Trace test

Sample (adjusted): 1973 2013
Included observations: 41 after adjustments
Trend assumption: Linear deterministic trend
Series: RP GE Y MS PT DUMW DUMS
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.824931	175.9807	125.6154	0.0000
At most 1 *	0.626127	104.5351	95.75366	0.0108
At most 2	0.425336	64.19772	69.81889	0.1294
At most 3	0.363907	41.48496	47.85613	0.1737
At most 4	0.343550	22.93615	29.79707	0.2492
At most 5	0.124681	5.678917	15.49471	0.7331
At most 6	0.005329	0.219064	3.841466	0.6398

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Max-Eigen test

Sample (adjusted): 1973 2013
Included observations: 41 after adjustments
Trend assumption: Linear deterministic trend
Series: RP GE Y MS PT DUMW DUMS
Lags interval (in first differences): 1 to 2
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.850154	77.82399	46.23142	0.0000
At most 1	0.581921	35.75547	40.07757	0.1417
At most 2	0.536920	31.56411	33.87687	0.0921
At most 3 *	0.521633	30.23246	27.58434	0.0223
At most 4	0.354490	17.94627	21.13162	0.1319
At most 5	0.234252	10.94301	14.26460	0.1571
At most 6	0.002897	0.118958	3.841466	0.7302

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

However, to pin down the exact number of co-integrating vectors, we conducted a Max-Eigen test, as revealed in Table 6.3. The outcome demonstrates that the Max-Eigen test also rejects the null hypothesis of zero co-integrating vectors at 5 per cent level of significance. In addition, the test confirmed that there are at least 1 co-integration vectors that exists between variables, namely the variables of interest. This indicates that, according to the Max-Eigen Test, the explanatory variables in model one move together with dependant variables in the long term.

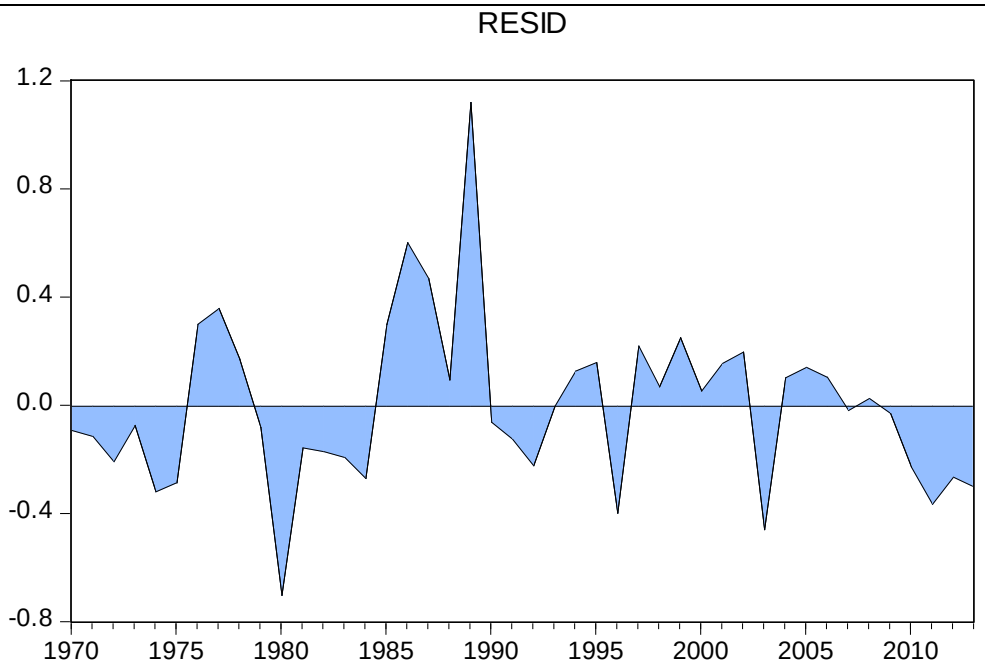
In overall, the implication is that, even though the series is not individually stationary at level, a linear combination was found to be stationary. This indicates that there is a stable long-run relationship between variables. Therefore, we can easily avoid both the inconsistent regression and spurious problems which otherwise would happen with a regression of non-stationary data. Since we have two co-integrating equations in trace statistics and one co-integration equation in Max-Eigen statistics, we can conclude that there is a long-run equilibrium relationship in the system of variables.

- **Co-integration tests for real exchange rate (second model)**

The real exchange rate is a second model in our equation system to check for the possibility of co-integration and long-run equilibrium relationship among the RER and explanatory variables, based on Johansen's co-integration test.

In the first step, the number of lag length in the VAR system is chosen. Here, the Schwarz Information Criterion (SIC) is used and the number of lag length is equal to one lag (see Appendix 3). On the other hand, the residual of the models 2 is stationary (see figure 6.4). The below figures showed the result of the ADF test conducted on the residuals of the long-run relationship for RER. This means that the real exchange rate and explanatory variables are co-integrated. Thus, a long-run relationship is said to exist between variables in Model two.

Residual for model 2



The Trace and Max-Eigen tests for the co-integration rank are performed for model two and summarised in Tables 6.4. The results of the test (Trace test and Max-Eigen test) for model 2 shows that the hypothesis of no co-integration amongst the variables is rejected at 1 per cent level of significance and the results reveal that at least two co-integrating vectors for Trace test and one co-integrating vector exist for Max-Eigen test among the variables at 5 percent level of significance. This means that there is a long-run relationship between dependant and explanatory variables amongst model 2.

Trace and Max-Eigen for model 2

Trace Test

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: RER GE Y MS PT DUMW DUMS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.685532	146.4200	125.6154	0.0015
At most 1 *	0.570590	97.83132	95.75366	0.0357
At most 2	0.369347	62.32691	69.81889	0.1710
At most 3	0.353445	42.96490	47.85613	0.1334
At most 4	0.277045	24.64881	29.79707	0.1744
At most 5	0.216971	11.02368	15.49471	0.2100
At most 6	0.017724	0.751072	3.841466	0.3861

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Max-Eigen Test

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: RER GE Y MS PT DUMW DUMS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

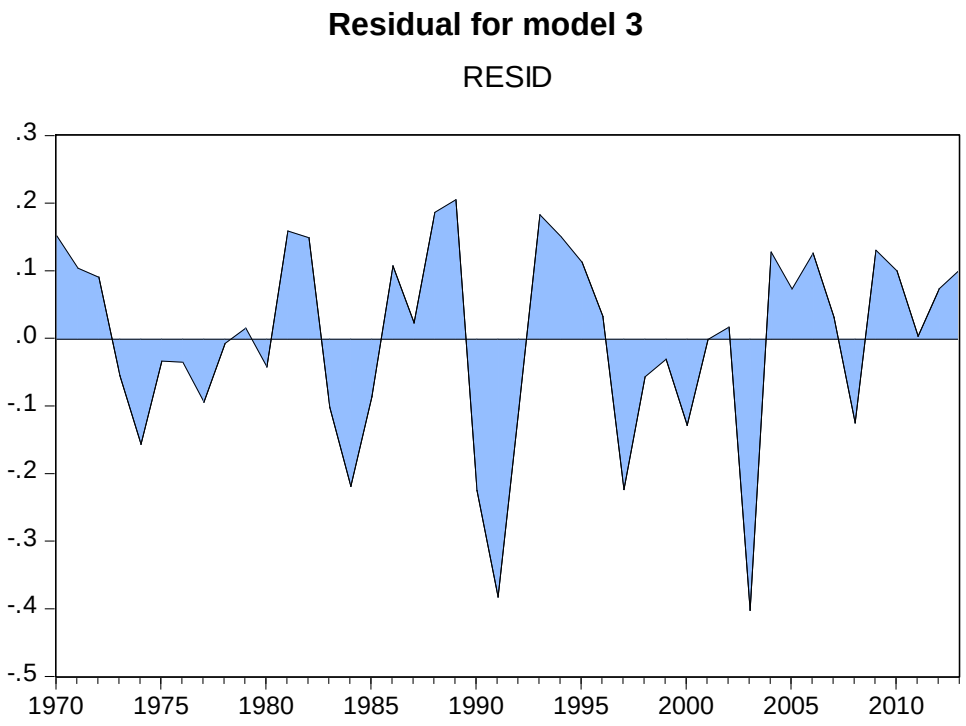
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.685532	48.58868	46.23142	0.0275
At most 1	0.570590	35.50440	40.07757	0.1498
At most 2	0.369347	19.36201	33.87687	0.7993
At most 3	0.353445	18.31609	27.58434	0.4690
At most 4	0.277045	13.62514	21.13162	0.3965
At most 5	0.216971	10.27260	14.26460	0.1946
At most 6	0.017724	0.751072	3.841466	0.3861

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

- **Co-integration tests for non-tradable goods sector (third model)**

In this section, the non-tradable goods equation is checked for the possibility of co-integration and long-run equilibrium relationship among the non-tradable goods output (NT) and explanatory variables (RER, DUMW and DUMS) in model three. The lag length for this model is determined based on the Schwarz Information Criterion (SC), which is equal to one lag length (see Appendix 4). Testing the

residual for this model has also been applied. Figure, 5 shows the result of the ADF test conducted on the residuals for model three which does not have unit root (stationary), which means that a long-run relationship is said to exist between the relative price and explanatory variables.



More investigation is examined via the Trace test and Max-Eigen test. Table 6.5 revealed the test for model three. Both Trace test and Max-Eigen test showed that the hypothesis of non-co-integration (null hypotheses is rejected) is rejected at 1 per cent of significance. It is found that at 5 per cent critical value, both tests confirmed one cointegration vector (for both Trace and Max-Eigen test) among variables in model three. In other words, according to this test, the co-integration between variables in model three found that variables among model three moved together in the long-run relationship.

Trace and Max-Eigen test for model 3

Trace tests

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: NT RER DUMW DUMS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.644887	83.33922	69.81889	0.0029
At most 1	0.363383	39.85576	47.85613	0.2277
At most 2	0.273347	20.88911	29.79707	0.3646
At most 3	0.143659	7.478232	15.49471	0.5228

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Max-Eigen test

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: NT RER DUMW DUMS
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

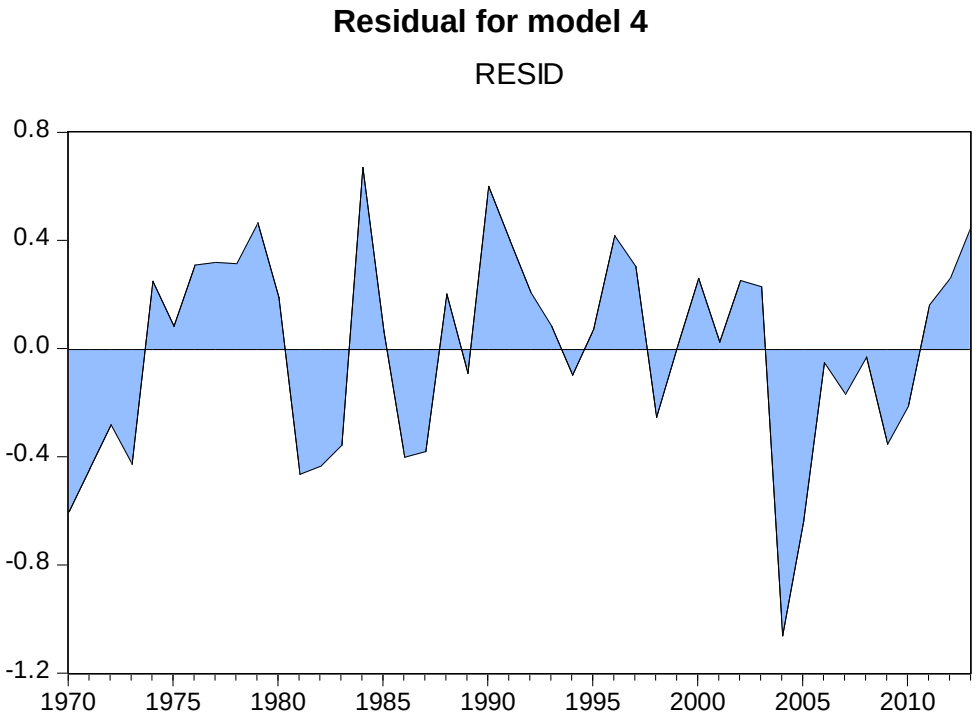
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.644887	43.48346	33.87687	0.0027
At most 1	0.363383	18.96666	27.58434	0.4171
At most 2	0.273347	13.41087	21.13162	0.4152
At most 3	0.143659	6.513636	14.26460	0.5482

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

- **Co-integration tests for tradable goods sector (fourth model)**

The tradable goods equation (model 4) in this section is checked for the possibility of long-run co-integration between variables in model four. The determined number of lag length has been applied on this model, which is equal to one lag length based on the Schwarz Information Criterion (SIC) (see Appendix 5). Testing the residual

for this model has been applied, which found that the residual is stationarity based on the ADF test.



Tables 6.6 report the results of co-integration tests among dependant (T) and explanatory variables (RER, DUMW and DUMS) for both Trace test and Max-Eigen test, respectively. According to the outcomes of the trace test and Max-Eigen test (see Table 6.6), the null hypotheses (hypotheses of no-co-integration between variables) can be easily rejected at the 1% level of significance, and 1 co-integration vector has been shown that are found at the 5% level of significance. Both tests confirmed that there is at least 1 co-integration equation that exists among the variables of interest in model 4 at 5 percent level of significance. this means, The dependant variable in the model four moves together with explanatory variables in the long term. This finding suggests that there is a high degree of co-integration between variables in model four.

Trace and Max-Eigen test for model 4

Trace test

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: T RER PT DUMW DUMS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.655482	117.6089	95.75366	0.0007
At most 1	0.308211	42.56648	47.85613	0.1435
At most 2	0.286587	27.09054	29.79707	0.0994
At most 3	0.223714	12.90734	15.49471	0.1183

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Max-Eigen test

Sample (adjusted): 1972 2013
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: T RER DUMW DUMS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.655482	44.75554	40.07757	0.0138
At most 1	0.513791	30.28689	33.87687	0.1265
At most 2	0.308211	15.47594	27.58434	0.7097
At most 3	0.286587	14.18320	21.13162	0.3502

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

To conclude the co-integration results, the existence of a stable relationship between independent and dependant variables is detected from all equations. The null hypothesis of non-co-integration can be rejected in all equations (all models). Although the issues of stationarity and co-integration have been examined in the last two sections, a multicollinearity issue is also important to test, since most of the

explanatory variables may have a close relationship, such as oil price and government expenditure. Therefore, a multicollinearity test will be conducted before applying regression analysis.

Appendix 10

Correlation coefficient for model 1 and 2

Variables	GE	y	MS	PT
GE	1.0000			
y	0.5257	1.0000		
MS	0.4656	0.5872	1.0000	
PT	0.4551	0.5915	0.4312	1.0000

Variance Inflation Factors

Tables 6.12
Multicollinearity Test- Price of tradable goods (PT) against Government Expenditure (GE), GDP Per capita (Y) and Money Supply (MS)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	1.163786	455.8484	NA
GE	0.004913	186.6716	1.684384
Y	0.036886	753.1508	2.013602
MS	0.005250	515.5049	1.564327

Tables 6.13

Multicollinearity Test- Government Expenditure (GE) against Price of tradable goods (PT), GDP Per capita (Y) and Money Supply (MS)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	4.896160	521.7950	NA
PT	0.066369	100.1818	1.941287
Y	0.104201	578.8808	1.547679
MS	0.028326	756.8114	2.296585

Tables 6.14
Multicollinearity Test- GDP Per capita (Y) against Price of tradable goods (PT), Government Expenditure (GE) and Money Supply (MS)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

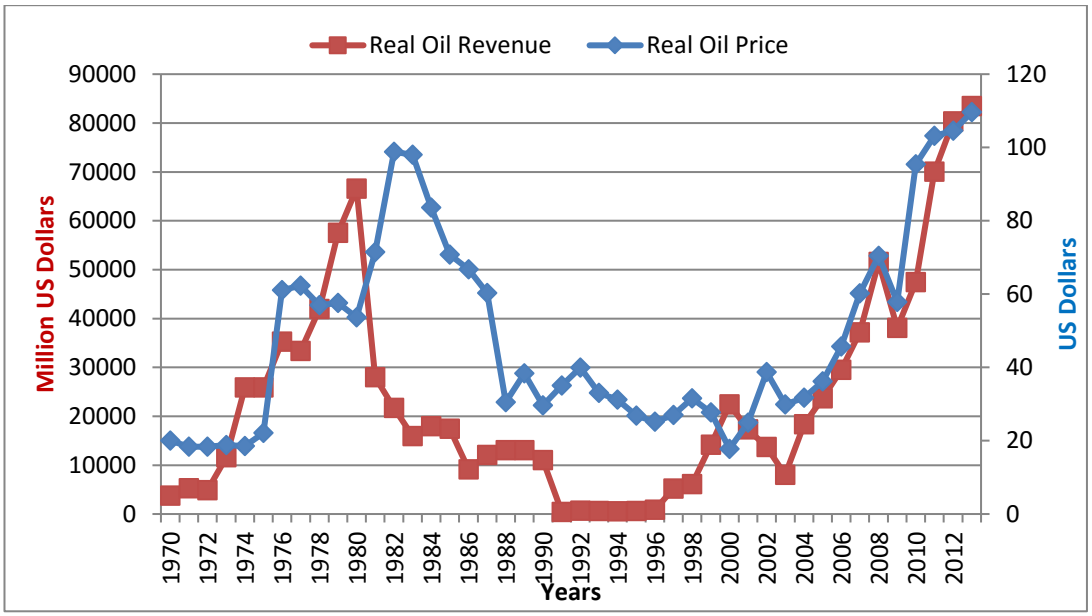
Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.731314	436.9934	NA
PT	0.015849	134.1408	2.599332
GE	0.003314	192.1133	1.733485
MS	0.004216	631.5323	1.916419

Tables 6.15
Multicollinearity Test- Money Supply (MS) against Price of tradable goods (PT), Government Expenditure (GE) and GDP Per capita (Y)

Variance Inflation Factors
Sample: 1970 2013
Included observations: 44

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	3.020082	380.4556	NA
PT	0.050751	90.55455	1.754733
GE	0.020272	247.7162	2.235204
Y	0.094849	622.8651	1.665274

Appendix. 11
Real oil revenue and real oil price, 1970-2013
(constant, 2005)



Sources of Real Oil Revenue: - Ministry of Finance, Final statement, various issues.
- Central Bank of Iraq / Statistical and Research Department / Annual Statistical Bulletin, various issues.
- Ministry of Planning / The Central Statistical Organization, Annual Abstract of Statistics,
Source of Real Oil Price: United States, Energy Information Administration (2015),
Note: Real oil revenue in period A = Nominal price in period A x (US Consumer price index 2005/ US Consumer price index in period A).