A MACRO ECONOMIC ANALYSIS OF THE SAUDI ABSORBTIVE CAPACITY

By

IBRAHIM SALIH ABOULOLA

B.A, King Abdulaziz University,Saudi Arabia, 1974

M.A, University of Colorado, Boulder, U.S.A 1979

A Thesis submitted for the Degree of

Doctor of Philosophy

in the Faculty of Social Sciences at the University of Leicester

September 1986

To My Parents with love and care............

ACKNOWLEDGEMENTS

I wish to express my profound appreciation to my advisor, Dr. Subrata Ghatak for his most constructive criticism , guidance , encouragement and valuable comments in the preparation of my thesis.

My gratitude also goes to Mr.Antony Jennings for his thorough review of the early drafts and for his useful suggestions. Thanks are due to Mr.Howard Rees for his valuable suggestions and for his help with the quantitative part of this study.

I also benefitted considerably from discussion with many of my colleagues in the economic department, and special thanks should go to Mr.F Khatib.

I am most grateful to King Abdulaziz University for their financial support. My thanks are also due to the Saudi Arabian Monetary Agency for their cooperation.

Last,but not least, may I try to express my appreciation of the enormous sacrifices made by my wife Hoda , my children Abdulsattar,Omar and Emad ; without their support and patience this work would never have been completed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PLOTS

CHAPTER ONE

1.1 Introduction

Most text books on economic development deal with absorptive capacity, although their treatment of the concept does differ. The concept came into fashion in the late 1950's and early 1960's. It was then defined to be that level of capital accumulation wherein a marginal change in that level of capital results in wastage. In the 1970s and 1980s, the term took on a new meaning, analysis of which now appears to gain popularity *pari passu* with financial surpluses. When these surpluses gradually declined in the late 1960's and early 1970's so did interest in absorptive capacity. The new wave of price explosions in 1973, 1979 and 1980, however, revived the interest and in a manner movements parallel to the increases in financial surpluses. These movements necessarily brought with them crucial conceptual changes and fluctuations not only as regards interest in the term absorptive capacity but also in what is meant by it. Initially, the term was confined to investment theory and the main emphasis by many economists[1] for example,

---

[1] Horvat, Branco, 'The Optimum Rate of Investment', *The Economic Journal* (December 1958), p. 748.

Higgins, Benjamin, *Economic Development: Problems, Principles and Policies* (New York: W.W. Norton & So., Inc., 1968), pp. 579-582.

(Footnote continued)

Horvat, Higgins and Mikesell, was on the criteria of "capital production" for a "potential optimum rate of return".But later on and since 1973, substantial and rapid increments in oil prices meant that huge oil revenues could be channeled to the oil producing nations, and particularly to the nations of the Organization of Petroleum Exporting Countries (OPEC). These massive revenues, undoubtedly, revitalized interest in capital absorptive capacity. Some Western economists[2] feared and doubted the effects of such financial surpluses and warned that such surpluses could produce shocks and repercussions that would affect the magnitude and the patterns of trade and finance in the international economy.

Originally the focus of economic analysis as it pertained to absorptive capacity concentrated on the "optimal rate of investment". The contention is that the developing nations are suffering from acute capital shortages and that the solution would be to provide them with financial resources. Apparently, however, this approach does not suit the oil-based economies and this has necessarily led to new techniques.[3]

---

[1](continued)
Mikesell, Raymond F. (ed) U.S. Private and Government Investment Abroad (Eugene, Oregon: University of Oregon Books, 1962), p. 360.

[2]As an example see:
Pallack, Gerald A.,:'The Economic Consequences of the Energy Crisis' , Foreign Affairs, volume 52 No.3. (April 1972) pp. 452-471.

[3]Many new economists have written on the subject. For example, El-Jehaimi, Tahar, Al-Awadi, Y., and El-Sarafy,S The latter went further in arguing that all the previous work was concerned with how much the Western economies would gain from the sudden oil wealth rather than with how the oil (Footnote continued)

These new techniques and theories will be examined in Chapter Three, but what is of major interest at this point is that they have turned the focus of absorptive capacity almost full circle; from emphasis on capital accumulation and supply, to capital formulation and demand, and the extent of investment opportunities in the economic development process. This movement away from the investment approach to what[4] we will call the "absorption approach" seemed necessary because:

1) The investment approach focuses on marginal productivity and interest rate concepts. This analysis assumes that a positive rate of return is always available; an assumption which is not always very realistic in the developing countries. This approach will be discussed later.

2) The investment approach, advocated by Adler[5] and others assumes a private enterprise economy, where the role of government role is quite limited. The application, however,

---

[3] (continued)
based economies will utilize their oil revenues productively.

El-Jehaimi, T. Absorptive Capacity and Alternative Investment Policies: A Case Study of Libya , Ph.D thesis, University of Colorado, 1975, p.62

[4] El-Mallakh, R. and Kadhim, M. 'Absorptive capacity, surplus funds and regional capital mobility in the Middle East', Estrarro dall Rivisita International di Science Economiche e Commerciali Vol. 24, No. 4, (1977), p. 310.

[5] Adler, J.H., Absorptive Capacity: The Concept and its Determinants (Washington, D.C.: The Brookings Institutions, (June 1965) p.5.

of such an approach to the oil based economies, where market imperfection is very clear, is likely to produce a biased analysis. This approach is not relevant to Saudi Arabia. It is worth noting that, until recently, the role played by private sector was very limited, and the government played a dominant role in the development process.

3) Since investment on human capital formation is not considered as an economic investment by this approach, it could be argued that the investment approach does not fit the developing countries economies, where human capital is of much greater importance from an economic development point of view.

1.2 The Problem

A number of the Arab oil-producing countries are persistently described as low capital absorbing nations.[6] Saudi Arabia would seem to be the most clear example. This phenomenon has attracted much discussion and analysis resulting in many interesting points of view. The amount of variations, discrepancies and irregularities among these studies are considerable. It is, therefore, prudent to ask the question: Why?

The problem is deep-rooted. It required that we define both the concept of absorptive capacity and how to measure it, that we take into account the special considerations of

---

[6] El-Mallakh, R. & Atta, J., The Absorptive Capacity of Kuwait: Domestic and International Prospectives (Lexington, Massachusetts: Heath & Company, 1981), pp.14-18.

the oil-based economies, and finally that we consider what is the most appropriate methodology to tackle the special conditions of the Saudi absorptive capacity.

This complex problem has produced different views and solutions for coping with it, none of which we entirely agree with. We identified more than eight studies[7] that consider the Saudi absorptive capacity. The output of these efforts were different results, estimates, definitions, methodologies and factors.

An efficient treatment to prescribe the proper solution is, therefore, essential.

1.3 Purpose of the Study

The purpose of this investigation is to evaluate existing studies related to the absorptive capacity of the Saudi Arabian economy. These studies are theoretically and quantitatively analysed and compared in such a way as to reach some explanation for the irregularities in their results. We then move on to the real challenge. We put forward a new approach in defining absorptive capacity, one which foresees what the special considerations in building a macro-economic model for an oil-based economy are. We felt that the Saudi economy lacks a macro-economic model. In constructing such a model, the special considerations of the country in question, must, of necessity, be identified. As these pertain to Saudi Arabia the following must be recognised: The government's role as a prime source for development, the weak private investment sector and the

---

[7] For more details see Chapter Four.

Saudi role in the international oil market. Simulation also performed by forecasting values of the exogenous variables of the desired horizons, introducing them to the model and obtaining values for the key macro variables (such as oil revenue,net foreign assets...etc).

Indeed, forecasts under different scenarios with respect to the exogenous variables and policy instruments are invaluable. In this way, we will be able to check the sensitivity of the key variables (through shocks) to the exogenous variables.

In so doing, we will be able to introduce a useful tool by means of which the Saudi planners can, we hope, make a better basis for a stable economy. With this tool we will be able to see first how successful the economy has been in utilizing oil revenues to expand its absorptive capacity. Second, how well these petro-dollars have been absorbed to transfer a single-based resource economy to a multi-base resource economy. Third, whether there is any signal to show the evolution of new sectors capable of continuing the path of economic growth after depletion of oil as a key resource. Is it industry, agriculture or services that will take the lead?

It is our hope that these issues as focussed upon in the third study will be used as guidelines in the Kingdom's future policies.

1.4 Scope and Methodology

Before we proceed with the economic model to test the absorptive capacity of the Saudi economy during the period 1963 to 1983, the literature on the concept of absorptive capacity in general needs to be reviewed. Different studies, including quantitative approaches, on this concept, and financial constraints are investigated. These can be found in Part II of our study.

[8] Each study was analyzed and critically evaluated with respect to definition, methodology and results. As a result of our dissatisfaction with these studies, a modified concept on absorptive capacity is introduced and a new approach of investigation applied.

---

[8]Bridge, John, N. 'Absorptive capacity and investment policies in the Arab World', in R. El-Mallakh, Energy and Development, Proceedings of the International Conference on the Economics of Energy and Development, Boulder, Colorado, 1974.

1.5 Organisation of the Inquiry

Part one contains two chapters: The Introduction and The Economic Structure of the Saudi Arabian Economy. This second chapter provides the reader with background information on the constraints of the Saudi absorptive capacity. However, one cannot discuss the economics of a nation without reference to natural factors etc., which shape the constraints of the absorptive capacity of any economy. We have, therefore, divided our analysis into two: the first period (1963-1973) considers the economy prior to the oil-boom and the second period (after 1973) considers the economy in light of the oil boom. An understanding of the first period is a prerequisite for the understanding of the second.

In order to analyse the economy after the discovery of oil, different issues and parameters were focused upon. The growth and sector contribution of the Gross Domestic Product (GDP) was used as an indicator of economic growth and as a means of assessing the diversification policy of the economy. This also shows how an economy depending only on oil, exchanging for everything the country imports, to an economy recently evolving where non-oil sector contributed over 45.00 per cent of the country's GDP in 1983.[9] The sectoral composition of the GDP (agricultural, manufacturing and services) was analysed to test for this transfer of the oil wealth to all the traditional sectors. International Transactions sectors are also analysed so as to show trends

---

[9] Please refer to Chapter Two.

in the economy's dependence on oil (exports/GDP), to investigate whether the imports of the country are for consumption or for capital goods based, which could create the necessary industrial basis for an import substitution process and so fulfill the diversification policies emphasised by most of the country's national plans. Finally, Development Plans were focused upon and their objectives and performances are carefully investigated.

Part Two contains 2 chapters which concentrate on investigating the absorptive capacity concept. Chapter Three provides a comprehensive review of the literature, covering more than three decades of research, on the absorptive capacity concept. This chapter also contains a discussion of the nature of the oil-based economies within the general framework of the absorptive capacity concepts. It also contains our own definition and approach in analyzing absorptive capacity as it pertains to the Saudi economy. Chapter Four investigates the available quantitative studies for the Saudi absorptive capacity. By way of an introduction, the various methods normally used in estimating absorptive capacity are assessed. This is followed by case study analysis for the available quantitative studies on the Saudi absorptive capacity.

Part Three contains three chapters. Chapter Five emphasizes the definitions and empirical investigations about the Saudi absorptive capacity have failed to take into account the reality of the Saudi economy. We believe that the definition of the Saudi absorptive capacity should, due to the effect of oil on the economy, include all economic variables that are directly related to the oil sector. Our study aims to be the first to fill this gap. In order to do this we use a Keynesian type of macro model. To the best of our knowledge, this model will be the first to utilize a macro-econometric approach to measure and forecast the Saudi Arabian absorptive capacity. This is necessary for a number of reasons.

First, the Saudi economy, with its unique features, represents an interesting development pattern, where the problem is not capital scarcity, but capital abundance. We believe that this criterion alone mandates a development model, which we have tried to fulfill in this thesis.

Second, Saudi Arabia is a major oil-exporting economy and a major goods and services importing country. Therefore, any decision to either reduce oil production or increase oil prices would have an inflationary impact on the world economy.

Third, Saudi Arabia was the only OPEC nation reluctant to reduce its oil production and increase oil prices - at least until 1983. This was a political decision. Despite the exhaustible nature of oil resources and the inability of the nation to absorb all its petro-dollars productively this stance prevails. Hence, an estimate of the magnitude of the kingdoms absorptive capacity is a key to the assessment of future oil production and export policy. A key that is definitely needed to save for future generations. For the sake of international stability the Saudi economy must be allowed to prosper and stabilize itself - we hope the modelling of the economy will contribute to this.

Chapter Five, therefore, tackles the main aim of the thesis. After a brief introduction the classification of the variables used are given. Then, the problems connected with empirical studies, for example, data sources, data limitation and the sample period, the functional form etc., will be discussed. The specifications of the equation and the model formation follow.

In formulating the model we followed a step-wise approach, whereby we introduced each variable in the model specifying our criteria for its choice, our hypotheses and its role in clarifying the sector, and our a priori inclination for the sign and the significance for its inclusion.

The statistical results of OLSQ for the complete model are presented in Chapter Six. All the statistical criteria (such as R^{-2}, t statistics, DW and F tests) are applied. Our rule of thumb in this chapter is to let the results either advocate or reject the a priori hypotheses. A critical comparison for previous studies is discussed.

Chapter Seven presents the simulation exercise of the model. The main idea here is to asses how reliable our model is in replicating the actual data. This will enable us to test for the validity, stability and the sensitivity of the model.

Chapter Eight will provide the Saudi planners with alternative future policy choices. The ex-ante simulation program (future simulation) is an interesting exercise where we compare our own projection for expenditure on the GDP during the Fourth plan period (1985-1990) with that of the government's. In this chapter we will also forecast the Saudi absorptive capacity to year 2000.

In Chapter Nine the study is ended by means of a summary, conclusion and recommendations which we think will be of much use to the decision makers in Saudi Arabia. We hope that this study could be of assistance to future scholars and contribute to the advancement of knowledge about absorptive capacity and its potential in an oil-based economy such as Saudi Arabia.

CHAPTER TWO : A REVIEW OF THE SAUDI ARABIAN ECONOMY

2.1.0 Introduction

The Kingdom of Saudi Arabia is bordered to the west by the Red Sea, to the east by the Arabian Gulf, to the north by Jordan, Iraq, and Kuwait and to the south by North Yemen, Aden, Oman, and South Yemen. The Arabian Peninsula, of which the Saudi Arabian State forms by far the largest part, covers well over 1,158,300 square miles. Saudi Arabia with about 888,030 square miles, is a country about 9.42 times the size of the United Kingdom.

Saudi Arabia's topography is mainly desert. The Rub al-Khali (The Empty Quarter) is a vast expanse of sandy wasteland too arid to support life. Rivers and large bodies of water are scarce. Rainfall is erratic, averaging 2 to 4 inches per annum, except in the Asir region. Rainfall in the Asir averages 12 to 30 inches in the summer. The country is known for its intense heat in the summer, frequently exceeding 120^{o} in the shade $(48.89)^{c}$, with high humidity along the coasts. Snow and ice are uncommon, but temperatures can drop below freezing in the northern and central zones.

The Western coast, which extends from the Gulf of Agaba to Maydi, is more than 1100 miles long. The northern boundaries, Agaba to Ras Mish'ab, are 850 miles long. The southern boundaries, Maydi to the Arabian Gulf, are 800 miles long.

Saudi Arabia consists of four main geographic regions: Najd, the heart land of the country and site of the capital city, Riyadh. This area covers about 650,000 square miles. Hijaz, runs parallel to the Red Sea and encompasses the two principal holy cities of Islam (Makkah and Medina), the commercial and cultural centre of Jeddah, and the summer capital of Taif. Hijaz covers an area of 135,000 square miles. Asir, a mountainous region along the southern Red Sea coast, is now regarded as the tourism capital. Asir covers an area of 40,000 square miles. Al-Hasa bordering the Persian Gulf, contains the largest concentration of oil reserves in the world. The Trans Arabian pipeline (Tapline) passes through its northern frontiers. Al-Hasa is also famous for agricultural production. The area it embraces covers about 40,000 square miles.

The purpose of this chapter is to introduce the reader to the main features of the Saudi's economy. In this chapter, we intend to investigate the structure and performance of the economy since 1963 and to assess the extent to which the economy has been successful in utilizing the oil surplus to increase the absorptive capacity and thereby raise the standard of living and create agricultural and industrial bases which can be considered as alternatives to oil revenue.

In section 1, we intend to present the main indicators of economic development which took place in Saudi Arabia during the period under review, i.e. 1963-1983. The population and labour force constraints and their impact on the potential absorptive capacity are examined. While section 2 presents a balanced analysis for the economy, prior and after oil discovery, the performance of the economy and the constraints which economic growth has faced are highlighted in section 3. Different indicators for social and economic growth will be used (such as real GDP rate of growth,real per capita GDP,real per capita consumption,...etc).

In order to investigate the sectoral contribution of GDP, the evolution of the main economic sectors need to be examined. This is done in section 4 where the main sectoral composition of GDP is disaggregated into Oil and Non-oil GDP, and the contribution of each component to real economic growth assessed.

Since oil is the main source of the Saudi's economy, and because of the importance of Saudi's exports in affecting the international markets, the foreign sector is investigated in section 5. This allows us to show the trend and direction of Saudi's international transactions and the extent to which the Kingdom influences international demand.

As a result of the specific role of government expenditure in stabilizing the Saudi's economy - due to the absence of monetary instruments - the role of the government in promoting economic growth and increasing the absorptive capacity of the country is assessed in section 6.

Finally, since the Saudi's economy is a planned economy,and in order to show the extent to which the national plans have been successful in fulfilling the economic objectives, section 7 examines these plans within an economic development context.

2.1.1 The Population and Labour Force

The actual size of Saudi Arabia's population has been the subject of controversy for some years and mainly because of inaccurate information published by different organizations. The comprehensive and accurate census carried out in Saudi Arabia in 1974 indicates that the total population of the kingdom is 7,012,642. These numbers are accounted for in fourteen admininstrative districts, as follows:

Table 2.1: The Distribution of Population

Administrative District	Population
Riyadh	1,287,388
Makkah	1,754,108
Eastern Province	769,648
Asir	681,261
Medina	519,295
Jaizan	403,106
Qasim	319,496
Hail	259,979
Tabuk	193,763
Baha	158,905
Najran	147,980
Northern Frontier	127,745
Jauf	65,474
Qurayyat	31,494
Border Bedouins	210,000
Saudi's abroad at time of census	83,000
Total	7,012,642

Source: Ministry of Information, Saudi Arabia and its place in the World, Jeddah, Saudi Arabia, Dar Al-Shoroug, 1979, p.21.

It is estimated that 27.00 per cent of the Saudi population are nomads. 39.00 per cent of the population live in towns of over 30,000 inhabitants. (This cannot be used as an indicator for the extent of urbanization in the Kingdom because of the geographical nature of the country). According to Wilson, Saudi Arabia's nomads find adjustment to city and town life difficult, and few find industrial employment an attractive proposition.This explains the high proportion of nomads among the Saudi's population.[1]

As far as population density is concerned the ratio, if the entire land area of Saudi Arabis is taken into consideration, is very low - not more than 3.0 persons per square kilometer. However, in some regions, Riyadh, Makkah and Jeddah, density is very high. With labour as one of the most needed resources in the Kingdom, it cannot be said that Saudi Arabia is over populated.

No accurate data, however, is available on the natural rate of growth of the Saudi population. Even with the 1974 census, the Saudi Central Bureau of Statistics is still uncertain about this rate. This problem may be related to the inadequate reportage of births and deaths throughout the nation, especially in rural areas. It is estimated that the natural rate of growth for Saudi population to be in the range of 2.80 to 3.00 per cent per annum.
[2]Net immigration increases the estimated population growth

---

[1]Wilson, R " The Economies of the Middle East ", The Macmillan Press LTD,London, 1979 p.43

[2]El Mallakh, R., Saudi Arabia: Rush to Development. London, Croom Helm, 1982, p.22.

to an annual rate of 4.0 per cent which, it is felt, if maintained, would raise the population of Saudi Arabia to 19.4 million by 2000. It is worthwhile mentioning here that over population is not and will not cause any problem to the economy for many years to come, given its potential absorptive capacity and the huge numbers of foreign, imported, labour employed in Saudi Arabia.

As regards the composition of age (age structure) it can be argued that Saudi Arabia has a youthful population. According to United Nations (UN) estimates, persons under 15 years of age constitute 44.00 per cent of the total population.

[3]This youthful feature of the population is a characteristic shared by most developing countries. Further, the proportion of women in the labour force is very low, about 6.00 per cent during the second plan period (1975-80). As a result, although the share of population 65 years and over is relatively small. The economic participation rate of Saudi males 12 years old and above was about 65.00 per cent in 1980, down from 69.00 per cent five years earlier in 1975.[4]In large part this is attributed to the longer span of formal education for the younger males. It is not only the population size that is held responsible for the scarcity of skilled and unskilled manpower in the Kingdom, but also that the literacy rate is still very high and because of the high proportion of unsettled nomads. With these constrictions to

---

[3]United Nation, Department of Economic and Social Affairs of the Secretariat, <u>Selected World Demographic Indicators, 1950-2000,</u> p.55.

[4]Ministry of Planning, <u>The Second Five Year Plan (1975-1980)</u>

the supply of labour in mind, the four development plans made efforts to devise more progressive educational programmes and to change the attitude of the society towards female labour so that women could assume a more important place in the process of economic development.

As far as the sectoral distribution of employment is concerned, considerable changes took place between 1975-1985. As it will be seen from Table 2.2 , agriculture and construction have the lead in the distribution of employment is still the leading sector despite its tendency to gain a lower share. In 1975 ,the share of the manufacturing production sector reached 56.60 per cent of total employment, but in 1980 and 1985 this share slightly declined to 47.00 per cent and 46.50 per cent respectively.

Within the production sector, a few interesting phenomenon can be observed as follows: employment in the agricultural sector was the leading sector in 1975, 39.80 per cent, declined to the second place in 1985, 13.90 per cent, after the construction sector, 19.90 per cent.

Since agricultural output has increased recently, the decline in employment is attributed to the degree of mechanization, [5]rural migration to urban areas, and wage differentials.

[5]Research Unit: Chamber of Commerce, Mechanization of Agricultural Sector and its Effects on Saudi Agriculture. Riyadh, Embassy publisher offset, Saudi Arabia 1985. (In Arabic) p 13-22.

Table 2.2: Employment by Economic Activity, (1975, 1980 & 1985)

(IN THOUSANDS)

Economic Activity	1000s	%	1000s	%	1000s	%
	1975		1980		1985	
Production sector:	988.6	56.6	1424.2	47.0	2067.2	46.5
Agriculture	695.0	39.8	545.6	18.0	617.4	13.9
Mining	3.4	0.2	2.3	0.1	5.1	0.1
Oil & Refineries	27.4	1.6	44.7	1.5	65.1	1.5
Manufacturing	74.4	4.2	170.4	5.6	411.4	9.3
Utilities	16.1	0.9	67.0	2.2	147.4	3.3
Construction	172.3	9.9	638.9	21.1	885.9	19.9
Service sector	511.2	29.3	1157.7	38.3	1844.6	41.5
Trade	153.6	8.8	323.1	10.7	556.1	12.5
Transport	114.5	6.6	180.0	6.0	303.4	6.8
Finance&Business	13.1	0.8	51.8	1.7	136.0	3.1
Community&social	230.0	13.2	602.8	19.9	848.8	19.1
Government	246.7	14.1	399.4	13.2	469.1	10.5
Total	1746.5	100.0	3026.0	100.0	4446.0	100.0

Source: Ministry of Planning, Third Development Plan 1980-1985 Riyadh, Ministry of Planning, Saudi Arabia, 1980, p.99.
Mininstry of Planning, Fourth Development Plan 1985-1990 Riyadh, Ministry of Planning, Saudi Arabia, 1985, p.66.

In addition the government policy to diversify the economic base by encouraging the private sector to play a stronger role may have tempted many farm labourers to transfer to private sector activities.

Another sector that deserves some analysis is the construction sector. We noticed that fluctuations in construction employment were sharp between 1975-1980 - 9.90 per cent, 21.20 per cent - but slightly declined to 19.90 per cent in 1985. This was due to the completion of infrastructure projects, and the decreasing need for new projects.

Within the service sector, community and social services employment movements were very active ranging from 0.80 per cent in 1975 to 1.70 per cent in 1980 and peaked to 3.10 per cent in 1985. This is indicative of the needs of the Saudi economy for such services so as to increase the efficiency of this sector and to fill the gaps which existed as a result of economic acceleration. Government employment ratios are, however, declining. In 1975 the ratio was 14.10 per cent but in 1980 and 1985 it declined to 13.20 and 10.50 per cent respectively. This may be because the private sector became more attractive thereby initiating a movement towards it.

2.1.2 Other Social Indicators

Economic and social development are interrelated and mutually reinforcing. The fourth plan (1985-1990) recognised this fact and therefore allocated 89.70 billion Saudi Riyals (17.94 per cent) for social and health development, representing an increase of 28.90 per cent from the third development plan. The focus of the fourth plan is Human and Economic resources development (17.94 per cent). However, only Human and Social development received an additional allocation in this plan. We will discuss this further in detail later.

As an indicator of the progress of social and health development, we may discuss the health and youth services in the Kingdom. There is a long standing policy of providing the finest possible health care free to all inhabitants. These services have experienced considerable improvement, although there is still much to be done. During the third plan the ratio of doctors to population increased from 6.7 per 10,000 in 1980 to 11.50 per 10,000 in 1984, representing an increase of 118.30 per cent. Also the ratio of hospital beds per 10,000 increased from 1.4 in 1975 to 2.2 in 1984, an increase of 57.0 per cent. While past development plans emphasized the importance for curative and preventative measures in the medical services, the fourth plan focuses on how to improve the quality and quantity of medical care facilities in the Kingdom.

2.1.3 Social and Youth Services

The fourth plan listed many items for concern and development. For example, social affairs, social security, social care, social insurance and youth programs and services. The main purpose of all these programs is to encourage the people and help them to help themselves. The significance of such programs is that they will point out how well oil-wealth is shared by the different segments of the society. The main hypothesis is that these services not only improve the quality of life but also encourage citizens to have more participation in the development process.

To achieve this purpose, twenty-two social development centres were established in urban areas and seventeen committees for local developments. Some of the centres activities are to organise seminars on Health care, adult education, agricultural training, child and elderly care ... etc.

2.2.0 The Structure of the Saudi Economy

It is important for the development analyst to recognise the factors which have interacted in the past to produce the current economic and social setting in Saudi Arabia, because it is likely that these factors will heavily influence the course of its future development. Any social and economic development plan can not achieve its objectives if it fails to give a proper weight to the past interrelationships among variables which resulted in the contemporary setting.

We have no doubt that the oil-sector plays a significant role in Saudi Arabia today, but the pre-oil mercantile activities played and still play an important role among the non-oil sector. Therefore and to provide the reader with a balanced perspective, we find it essential to divide the economic structure of Saudi Arabia into two periods: The structure of the economy prior to the discovery of oil and the structure of the of the economy after the discovery of oil.

2.2.1 The Structure of the Economy Prior to the Discovery of Oil

Owing to the presence of the Holy places, of Makkah and Medina, Saudi Arabia is the focus for huge numbers of pilgrims. It is known historically that the income from these thousands of pilgrims who come every year to the Holy cities, together with their barter trade, constitutes the greatest part of the country's economy. In addition, the strategic location of the Arabian Peninsula - between the Roman Empire, the Persian Empire, and Yemen in the South - was the most important factor in creating the mercantile class that prevailed in ancient history and before the creation of modern Saudi Arabia.

Accordingly, many activities were in existence for hundreds of years, including fishing, pearling, agriculture, ship building, and commerce. No adequate statistics exist to show the relative importance and magnitude of each of these activities, and, therefore, only a brief survey of the main economic activities is presented here.

Saudi Arabia has never been known as an agricultural country, nor has this sector been significant throughout its economic history. The majority of people lived at or near subsistence level. Local agriculural activities consisted mainly in the cultivation of certain crops, such as dates, domestic vegetables, wheat and barley. There have been several obstacles to agriculture in Saudi Arabia and these are inherent in the nature of its soil, water scarcity, and harsh climate. Only some limited areas on the north eastern province and the south were cultivated, using periodic rain water which fed some limited oasis. Local animal organic fertilizers were used on the larger farms.

Domestic industries were very limited. They were found only for skilled craftsmen where there were possibilities for such activities in the valleys and plains.

Commercial activities were considered to play a vital role in the Peninsula economy during this era. This was encouraged by the strategic and geographical location of the country as a connection point between India in the East, the Mediterranean Arabian Peninsula in the South and Iraq in the north. The East India Company established its regional office in Jeddah at the end of the eighteenth century.

Trade activities in land prospered after King Abdulaziz established strict rules of safety for the caravans.

Immediately prior to the discovery of oil in commercial quantities, in 1938, Saudi Arabia was a poor land. It is said that King Abdulaziz had in his treasury only about £3,000 and $4,000 in 1922. By 1932, however, the government's annual revenue was estimated at $500,000. Makkah pilgrims receipts and Zakat (income tax) constituted the main source of revenue.[6] During the great depression, 1929-1932, pilgrims' receipts declined sharply. King Abdulaziz unsuccessfully approached the United Kingdom and the Soviet Union for aid to finance the country's deficits. By 1932, the world depression effects lessened and revenues started to increase until in 1938 they reached $ 7.00 million.[7] About 50.00 per cent were from custom duties and the rest came from different sources. In 1938 the government began receiving oil-royalties (taxes on oil companies) which were estimated to be worth about $340,000. By means of this new source a new era in the Kingdom of Saudi Arabiahad commenced.

2.2.2 The Structure and Performance of the Economy After the Discovery of Oil

The Asudi Arabian economy is unique. This is so because of its multi-faceted nature. The economy combines extreme features of both developed and developing economies. It is a developed economy in the sense of high per capita income,

---

[6] Philby, H.J. The Heart of Arabia, London, Constable, 1972, pp.293-294.
[7] Ibid.

consistent surplus in the balance of payments, consistent and high growth rates, ... etc. However, the economy also has the features of a developing economy in the of low level of skilled manpower, over dependence on imports for both investment and consumer goods, rural urban migration, ... etc. This dual nature came into being with the commercial production of oil in 1938. Before we begin to analyze the structure and performance of the Saudi economy, we believe it is necessary to introduce the reader, briefly, to the history of oil discovery.

The oil-discovery in Saudi started when the Saudi government granted the California Arabian Standard Oil Company (CASOC) concessionary rights over an area exceeding one million square kilometers. The concession agreement lasted for 66 years (begun in 1933), during which time CASCO was to have exclusive rights over all phases of oil exploration and production. By 1936 the company recognized that because of high production levels, further marketing facilities were required and that these could be supplied by the Texas Company (now Texaco); as a result, Texaco acquired 50.0 per cent interest in the operation. With further discoveries of huge oil reserves in 1946, these two recognised that neither of them could cope with the market outlets, or the investment requirements, and hence in 1948 new arrangements were made to distribute the company between four major oil companies. Standard oil-company of California took 30.00 per cent, Texaco 30.00 per cent, Standard of New Jersey (now Exxon) 30.00 per cent and Socony Mobil 10.00 per cent. [8]The original contract established royalty payments as the governments basic compensation for developing these reserves. This contract reflected the relative bargaining positions of the two parties, but further agreements reflected the Kingdoms recognition of the financial rewards from these operations, and they were determined to improve their bargaining power towards the international companies. The last but not least arrangement is related to the government participation in the production activities of oil companies represented a new era in the oil industry in S. Arabia.

This brief account of the Saudi-American oil industry developments is necessary because of the major role which oil plays in the Saudi economy. The Saudi oil industry has a special character, due to its size, linkages, and prospects, that inevitably affects everything it touches. In our view, the overall performance of the Saudi economy can be accurately examined by investigating the Gross Domestic Product (GDP) growth rate (see Table 2.3). This analysis can either be done at a given point in time or more dynamically by looking at the way the GDP indicators have fluctuated over time. Both approaches are adopted here. In our analysis we noticed that the oil boom, in 1973, represents a new trend and that, therefore, it would be more accurate to distinguish between two periods in our analysis i.e. 1963-1972 and 1973-1983. This division will smooth out the upright shift of the 1973 boom price, but not prevent us from, occasionally, giving an overall picture of the economy from 1963-1983.

---

[8]For more details please see: Ray Labkicher et al, <u>Aramco Hand Book</u> (Dhran, Saudi Arabia: Arabian American Oil Company, 1960), pp.135-141.

Table 2.3 Contribution of oil and non-oil GDP (1963-1983)

Millions of Saudi Riyals
Current prices at purchasers value

Year	Oil GDP	% IN TOT.	NON-OIL GDP	%IN TOTAL	Total GDP
1963	5287.0	59.4	3792.0	40.6	9079.0
1964	5254.0	54.9	4306.0	45.1	9560.0
1965	5896.0	57.5	4769.0	42.5	10665.0
1966	6828.0	57.9	5378.0	42.1	12206.0
1967	7233.0	55.7	5909.0	44.3	13142.0
1968	8274.0	57.3	6382.0	42.7	14656.0
1969	8795.0	57.1	7180.0	42.9	15975.0
1970	9813.0	57.2	7586.0	42.8	17399.0
1971	14668.0	64.9	8253.0	35.1	22921.0
1972	19074.0	68.5	9184.0	31.5	28258.0
1973	29148.0	72.7	14103.0	27.3	40551.0
1974	83885.0	84.9	15430.0	15.1	99315.0
1975	111476.0	80.1	28123.0	19.9	139599.0
1976	117303.0	71.6	47323.0	28.4	164629.0
1977	137362.0	67.3	67694.0	32.7	205056.0
1978	137172.0	57.7	88229.0	42.3	225401.0
1979	142887.0	57.7	106652.0	42.3	249539.0
1980	250840.0	65.4	134967.0	34.6	385807.0
1981	363289.0	70.1	157253.0	29.9	520542.0
1982	340433.0	65.2	184292.0	34.8	524725.0
1983	209048.0	50.8	205437.0	49.2	414485.0
1984	163968.0	45.4	214000.0	54.6	377968.0

Source: SAMA, Annual Report, selected issues.

2.3.0 The Performance Record

Table 2.4 presents total and per-capita GDP (both nominal and real). A quick glance at the table shows that the economy performance has been uneven over the years. Available data allows for an evaluation of the economy performance since 1963; a 21-year period (1963-1983), is taken as a basis for our analysis. Nominal GDP on the average has grown at 24.25 per cent per annum. For the initial period (prior to oil price increases), the average growth rate was 13.90 per cent per annum. Real GDP on the average has grown at 13.81 per cent per annum, but 1963-1973 period had registered an average growth rate of 9.29 per cent per annum. The boom in oil prices and the special role the Saudi economy plays within OPEC (as a stabilizer) are behind such a remarkable performance.

Table 2.4: Economic Growth:Major Trends.

(IN MILLION OF SAUDI RIYALS)

Year	Nominal GDP	Nominal Per capita GDP	Real GDP	Real Per capita GDP	Growth of Per capita GDP %
1963	9079.0	1766.34	47041.45	9152.03	----
1964	9560.0	1814.04	46407.76	8806.03	-0.04
1965	10665.0	1971.35	50306.60	9298.82	0.05
1966	12206.0	2199.28	55735.16	10042.37	0.08
1967	13142.0	2305.61	59198.19	10385.65	0.03
1968	14656.0	2501.02	61839.66	10552.84	0.02
1969	15975.0	2649.25	57671.48	9564.09	-0.09
1970	17399.0	2806.29	59996.55	9676.86	0.01
1971	22921.0	3592.63	75398.02	11817.87	0.22
1972	28258.0	4301.06	89141.95	13568.03	0.14
1973	40551.0	5998.67	109894.30	16256.55	0.20
1974	99315.0	14248.92	221685.26	31805.63	0.95
1975	139599.0	19255.03	231507.47	31932.06	0.01
1976	164626.0	21718.47	207598.98	27387.73	-0.14
1977	205056.0	25890.91	232226.50	29231.53	0.08
1978	225401.0	27288.25	229532.59	27788.45	-0.05
1979	249539.0	28982.46	249539.00	28982.46	0.04
1980	385807.0	43058.82	372400.59	41562.57	0.43
1981	520542.0	55852.15	488313.31	52394.13	0.26
1982	524725.0	52472.50	486757.87	48675.79	-0.07
1983	414485.0	39777.83	381310.97	36594.14	-0.25

Source:Calculated by the author using SAMA Annual reports.

Another indicator which could be used for monitoring the Saudi economy performance is per-capita GDP. The nominal and the real values indicate that the average Saudi income, from 1974-1983, saw an impressive and healthy positive growth rate. The growth rate for the first ten years, 1963-1973, was 6.20 per cent and the average growth rate for the total period 10.7 percent. We noticed that the growth rate of GDP per-capita was at its peak in 1974 reaching 95.60 per cent and 43.40 per cent in 1980. However, the same parameter recorded a negative growth rate for the following years: 1969, 1976, 1982 and 1983.

The reason for the negative growth rate for the per-capita GDP in 1969 (-9.40 per cent) is believed to be the general political situation in the Middle East at this time. This situation, which could be described as one of dead-lock and uncertainty, produced a harsh and significant effect on the performance of the Saudi economy. The Saudi Governmet was committed to help the countries affected by the 1967 War by means of a large share of the subsidy agreed upon at the Khartoum (Sudan) summit. From 1967 onwards the growth in oil-income has appreciably slowed down. In part this was due to the intermittent disruptions in the operations of the Tapline. The slowdown in oil-exports (the main source of the Saudi GDP) in the post-war (1967) period and the closure of the Tapline for 110 days caused a substantial loss in oil-exports despite the partial diversion through Ras Tanura. [9]The 1976 negative growth rate

---

[9]Saudi Arabian Monetary Agency, Annual Report. 1969 pp.10-14.

in GDP per capita (-14.2) is attributed to local factors facing the economy in the 1973 oil-boom period. [10] In 1976 the economy witnessed a widening inflationary gap, the limited absorptive capacity of the petrodollars, the disequilibrium between supply and demand (supplies in the economy were unable to keep pace with the surging demand from both government and private sectors) and the slow down in oil prices and production.

The recent negative growth rate for 1982 and 1983 (-7.1 and -25.2 respectively) is due to the huge reductions in production of Saudi oil due to an international oil glut and the fragile structure of oil prices.

---

[10] Saudi Arabian Monetray Agency, Annual Report. 1976. pp 43-45.

Table 2.5: Consumption Expenditure (in million of Saudi Ryials

Year	CONSUMPTION (see Key) 1	2	3	4	5
1963	3986.00	20652.85	* n.a.	14207.25	6445.60
1964	4265.00	20703.88	0.04360	13762.13	6941.75
1965	4564.00	21528.30	0.04241	13726.41	7801.89
1966	4941.00	22561.64	0.05529	13817.35	8744.29
1967	5851.00	26355.85	0.15301	14310.81	12045.04
1968	7332.00	30936.71	0.21890	19345.99	11590.72
1969	8386.00	30274.37	0.11151	19350.18	10924.19
1970	9280.00	32000.00	0.07626	20203.45	11796.55
1971	10210.00	33585.53	0.06917	21092.10	12493.42
1972	11200.00	35331.23	0.06524	21813.88	13517.35
1973	13230.00	35853.66	0.14805	21395.66	14457.99
1974	19691.00	43953.12	0.44352	21935.27	22017.86
1975	33808.00	56066.33	0.65062	29679.93	26386.40
1976	52621.00	66356.87	0.48870	29934.42	36422.44
1977	75151.00	85108.72	0.36685	38672.71	46436.01
1978	98029.00	99825.87	0.25073	51929.74	47896.13
1979	130512.00	130512.00	0.27724	58608.00	71904.00
1980	179948.00	173694.00	0.32493	98827.22	74867.76
1981	196820.00	184634.16	0.05151	107790.80	76843.34
1982	255040.00	236586.26	0.20769	117359.92	119226.34
1983	249324.00	229368.91	-0.06182	127668.82	101700.09

key :

* Not available
1.Nominal Total Consumption.
2.Real Total Comsumption.
3.Percent Growth of Total Consumption.
4.Real private Consumption.
5.Real Goverment Consumption.
Source:Computed by the author using SAMA Reports, different issues.

Another scale which indicates the performance of the Saudi economy and the well-being of the Saudi citizens, is the growth of the real per-capita consumption rate. Table 2.5 shows that the highest growth rate was in 1975 at 65.00 per cent and that the lowest growth rate was in 1965 at 4.20 per cent. The average growth rate for the first period (1963-1973) was 9.8 per cent and the average growth rate for the whole period was 17.90 percent. It is quite clear that most of the growth was in the second period i.e. (1973-1983) and this can be considered considering the continuous increments in the per-capita GDP. From the above analysis, the growth rates which the Saudi economy has experienced are very impressive.

In order to show the nature of this real development, the sectoral cmposition and, therefore, distribution of GDP needs to be investigated. This is done in the following section.

2.4.0 The Basic Sectoral Composition of GDP

Given the unique characteristics of the Saudi economy, and for the purpose of our study, our suggested approach in analysing the growth of the economy will be to focus on disaggregating the GDP into two major components, oil and non-oil .

Table 2.6: The basic sectoral composition of GDP (1963-84)

At current producers value(Million Saudi Ryials)

YEAR	SECTORS									
	1	2	3	4	5	6	7	8	9	10
1963	3611	782	171	365	558	580	384	771	5287	8898
	40.6	8.8	1.9	4.1	6.3	6.5	4.3	8.7	59.4	100.0
1964	4315	804	188	402	598	650	459	1214	5254	9569
	45.1	8.4	2.0	4.2	6.2	6.8	4.8	12.6	54.9	100.0
1965	4361	856	207	442	714	720	519	902	5896	10257
	42.5	8.3	2.0	4.3	7.0	7.0	5.1	8.8	57.5	100.0
1966	4948	913	227	486	832	805	578	1107	6828	11776
	42.1	7.7	1.9	4.1	7.1	6.8	4.9	9.4	57.9	100.0
1967	5698	846	309	727	722	938	1366	789	7233	12931
	44.3	6.5	2.3	5.6	5.5	7.2	10.6	6.1	55.7	100.0
1968	6155	881	344	869	807	1010	1449	795	8274	14429
	42.7	6.0	2.3	6.0	5.5	7.0	10.0	5.5	57.3	100.0
1969	6612	957	385	977	938	1173	1615	566	8795	15407
	42.9	6.0	2.4	6.1	5.9	7.3	10.1	3.7	57.1	100.0
1970	7340	984	431	934	1008	1243	1678	1062	9813	17153
	42.8	5.7	2.5	5.4	5.8	7.1	9.6	6.2	57.2	100.0
1971	7913	1016	484	1007	1068	1479	1805	1054	14668	22581
	35.1	4.4	2.1	4.4	4.7	6.5	7.9	4.7	64.9	100.0
1972	8784	1059	543	1174	1177	1567	2145	1119	19074	27858
	31.5	3.7	1.9	4.2	4.2	5.5	7.6	4.0	68.5	100.0
1973	10940	1139	617	1809	1554	2121	2533	1167	29148	40088
	27.3	2.8	1.5	4.5	3.8	5.2	6.3	2.9	72.7	100.0
1974	14954	1242	730	2720	2355	2718	3490	1699	83885	98839
	15.1	1.2	0.7	2.7	2.4	2.7	3.5	1.7	84.9	100.0
1975	27747	1392	1600	7719	3897	2310	4990	5839	111476	139223
	19.9	1.0	1.1	5.5	2.8	1.7	3.6	4.2	80.1	100.0
1976	46589	1586	2211	15854	6180	4077	7890	8791	117303	163892
	28.4	1.0	1.3	9.6	3.8	2.5	4.8	5.4	71.6	100.0
1977	67694	1866	3063	25546	8507	6775	9720	12217	137362	203942
	32.7	0.9	1.4	12.4	4.1	3.3	4.8	6.0	67.3	100.0
1978	88229	3909	4066	31959	11049	9960	15146	12140	137172	223818
	39.7	1.7	1.8	14.2	4.9	4.4	6.8	5.4	57.7	100.0

(Continued on the next page)

1979	106652	4196	5173	34764	13912	12764	18912	16931	142887	247622
	42.3	1.7	2.1	13.9	5.6	5.1	7.8	6.8	57.7	100.0
1980	134967	4648	6467	43108	17760	15749	23384	25651	250840	383590
	34.6	1.2	1.7	11.2	4.6	4.1	6.1	6.7	65.4	100.0
1981	157253	5572	7721	50348	21984	17123	29905	24600	363289	517994
	29.7	1.1	1.5	9.7	4.2	3.3	5.7	4.7	70.1	100.0
1982	184229	6740	9124	58181	25064	19871	36361	28888	340433	522176
	34.8	1.3	1.7	11.2	4.8	3.8	6.9	5.5	65.2	100.0
1983	205437	8725	10685	54903	28088	21489	46585	34962	209048	411797
	49.2	2.1	2.6	13.2	6.8	5.2	12.22	28.5	50.8	100.0
1984	214000	9771	12395	50252	29548	23080	50654	38300	163968	377968
	56.6	2.6	3.2	13.2	7.7	6.0	13.3	10.1	45.4	100.0

Key

1. Non oil sector.
2. Agriculture.
3. Manufacturing.
4. Construction.
5. Trade.
6. Transport.
7. Services.
8. Others.
9. Oil GDP.
10. Total GDP.

Source: SAMA, Annual Reports, Sellected issues.

The oil sector dominates the country's economy. It represented about 62.54 per cent of the total GDP for the entire period (1963-1984). Table 2.6 shows that the oil sector is the prime force behind economic growth in Saudi Arabia and constitutes a major component of its GDP. To give more precise analysis, two periods can be distinguished in the record of oil growth for the Saudi economy. The first period is 1963-1972, while the second period is 1973-1984. The contribution of this sector to GDP averaged 59.00 per cent in the first period and increased to 66.00 per cent in the second. The nominal contribution of this sector to GDP was fluctuated between 57.0 per cent during the 1960's, and reached its peak in 1974 at 84.90 per cent.

As far as the rate of growth of oil GDP is concerned, Table 2.7 shows that, this sector registered its highest level in 1974 when the nominal rate of growth reached 187.70 per cent. The real rate of growth of oil GDP for the whole period averaged 9.30 per cent.

Table 2.7: Rates of Growth in Oil and Non_Oil GDP. (In Percentages)

Year	Growth Rate of Real GDP %	Growth Rate of Nom. GDP %	Growth Rate of Real Oil-GDP %	Growth Rate of Nom. Oil GDP %	Growth Rate of Real non-Oil GDP %	Growth Rate of Nom. non-Oil GDP %
1964	-1.3	5.2	---	-0.06	---	13.5
1965	8.4	11.5	9.0	12.2	7.6	10.7
1966	10.7	14.4	12.1	15.8	9.1	12.7
1967	06.2	07.6	04.5	05.9	8.3	09.8
1968	04.4	11.5	07.1	14.3	11.0	08.0
1969	-6.7	9.0	-9.0	6.2	-3.7	12.5
1970	4.0	8.9	6.5	11.5	0.9	5.6
1971	25.6	31.7	42.5	49.4	3.7	8.7
1972	18.2	23.2	24.7	30.0	6.7	11.2
1973	23.2	43.5	31.2	52.8	6.6	24.1
1974	101.7	144.9	137.0	187.7	11.4	35.3
1975	44.0	40.5	-12.0	32.8	35.4	82.2
1976	-10.3	17.9	-19.9	5.2	27.9	68.2
1977	11.8	24.5	5.1	17.1	28.4	43.0
1978	-1.1	9.9	-10.2	- 00.1	17.1	30.3
1979	8.7	10.7	2.2	4.1	18.7	20.8
1980	49.2	54.6	69.4	75.5	22.1	26.5
1981	31.1	34.9	40.7	44.8	13.2	16.5
1982	-0.3	00.8	-07.3	-06.2	15.8	17.1
1983	-21.6	-21.0	-39.1	-38.5	10.5	11.4

Source: Computed by the author using SAMA, Annual reports, selected issues.

The high rate of growth experienced during 1963-1982 begins to decline after 1983, [11]Oil GDP declined from 70.10 per cent in 1981 to 50.80 and 45.40 per cent in 1983 and 1984 respectively.

The non-oil sector components are agriculture, manufacturing, construction, trade, transport, services and others. Due to the fact that the Saudi primary goal is to increase the absorptive capcity of these sectors, a brief analysis of its growth ratio may provide the reader with a

---

[11]See; Saudi Arabian Monetary Agency. Annual Report 1984. and Field, Financial Times special survey on the Saudi economy, March, 1985, pp.1-12.

dynamic but true picture of the economy and how successful the government has been in achieving its goal.

The value added by the non-oil sector to GDP averaged 37.46 per cent for the whole period (1963-1984) 41.00 per cent for the initial period (1963-1972) and 34 per cent for the second period (1973-1984). However there is an interesting phenomenon for the years 1983 and 1984 where non-oil GDP reached an impressive value of 49.20 and 56.60 per cent respectively. In general this demonstrates shows that the Saudi planners were successful in injecting the oil wealth into the non-oil sector so as to build up a multi based economy. The question which now requires an immediate answer is; which sectors took the lead and how did that happen? Table 2.6 also shows the GDP allocations of all the non-oil sectors and their ratio to total GDP. In the following paragraphs we will focus on the main sub_sectors of the non-oil GDP.

2.4.1 Agriculture

Although in Saudi Arabia, the arid climate, and water scarcity present daunting obstacles to agricultural development, the agricultural performance has been most impressive. It is the government's determination to develop the country's agricultural and water resources with a view to diversify domestic food supplies to reduce the cuontry's dependence on imported food and to meet the fast growing demand for water.

Briefly, agriculture in Saudi Arabia is characterized by scarcity of water, small farms (with 55.00 per cent of the total farms just over one acre each), low level of productivity per acre,low level of machinery applications and high percentage of illiterate farmers.

Palm Dates,Wheat,Barley,Sorghum,Alfa_Alfa and Melons are the most popular agricultural products in Saudi Arabia.

Wheat production was registered as a surplus of 800,000 (tonnes) in 1985 and the Saudi government donated a 30,000 tonnes shipment to Bangldesh in a relief aid package. But how these achievements happened? The substantial rate of expansion is largely attributed to extensive government support, which takes the forms of interest_free agricultural loans granted on agricultural inputs, products and a heavy price support. Also the private sector investment in agriculture and agro-business projects, has also been an important contributory role.These projects receive intensive government support through interest free loans. Also, the huge government expenditure on infrastructural projects as roads linking production areas with major cities, dams and canals construction to conserve surface and underground waters and survying of potentially fertile valleys and reclamation of suitable areas were all indirect financial support to the agricultural sector. These factors resulted in increasing the absorptive capacity of this sector. This is evident through the rapid development which took place during our period is in question. The real growth rate for agriculture averaged to 12.80 per cent per annum during the whole period. After 1978 this real growth rate increased from -16.7 per cent in 1975 (it was negative between 1966-1976) to 8.80 per cent in 1978, 16.50 per cent in 1981 and 24.40 per cent in 1984.

Table 2.8:

Growth Rates of non oil sectors(1964-1983) (In percentages)

YEARS	Agricul.	Manufac.	Const.	Trade	Transp.	Services
1964	-0.036	0.030	0.031	0.004	0.049	0.120
1965	0.034	0.069	0.068	0.160	0.076	0.098
1966	0.032	0.063	0.064	0.128	0.082	0.076
1967	-0.085	0.339	0.476	-0.143	0.149	1.333
1968	-0.024	0.042	0.119	0.046	0.008	-0.006
1969	-0.070	-0.041	-0.037	-0.005	-0.006	-0.046
1970	-0.018	0.068	-0.087	0.026	0.012	-0.007
1971	-0.015	0.071	0.021	0.010	0.135	0.026
1972	-0.001	0.075	0.118	0.056	0.016	0.139
1973	-0.076	-0.023	0.323	0.134	0.162	0.014
1974	-0.101	-0.025	0.238	0.248	0.055	0.134
1975	-0.167	0.628	1.108	0.229	-0.368	0.062
1976	-0.133	0.050	0.561	0.205	0.342	0.202
1977	0.056	0.244	0.447	0.236	0.492	0.106
1978	0.883	0.193	0.124	0.172	0.321	0.401
1979	0.054	0.249	0.068	0.231	0.258	0.226
1980	0.069	0.206	0.196	0.232	0.190	0.193
1981	0.165	0.160	0.135	0.203	0.056	0.242
1982	0.196	0.168	0.142	0.127	0.147	0.202
1983	0.283	0.161	-0.064	0.111	0.072	0.270

Source: Ratios are calculated by the author using SAMA, Annual reports, selected issues.

To examine the attribution of this sector to GDP Table 2.8 shows that the nominal agricultural GDP averaged 6.75 per cent per annum between 1963-1973 but its share declined sharply to 1.43 per cent per annum between 1974-1984 and to 4.10 per cent per annum for the whole period 1963-1984. Its highest share was in 1963 (8.80 per cent) and its lowest was in 1977 (0.90 per cent). The main reason behind such decline is not that agricultural productivity declined; but rather due to the oil GDP share multiplied vastly. [12] This finding supports Kuznets' hypothesis that share of

[12] To support this argument please see: Saudi Arabian Monetary Agency: Annual Report "Agricultural Area and Production" p.68 1981, p. 86 1984.

agriculture is inversely correlated with the level of economic development measured in terms of GDP. [13]What policy implication could we derive from reviewing the agriclultural sector in S. Arabia ? We could say that despite the major obstacles, the sector faced favourable opportunities for agricultural development . The fact that the country achieved self sufficiency on wheat and eggs production in 1984 and exported the surplus gave an indication of the potential that can be achieved.

2.4.2 Manufacturing

The basic goal of the Saudi industrialization policy is to foster the diversification of its economic base in order to reduce excessive dependence on the oil sector, to achieve greater economic self-sufficiency, and to gain comparative advantages in local and international markets.

To achieve such objectives, the Saudi government is promoting private investment in manufacturing by offering a wide range of loans on favourable terms from the Saudi Industrial Development Fund (SIDF), tariff exemption on imported equipments and materials, selective tariff protection (to help the infant industries) from imported products, and other incentives to qualified investors. The government is always ready to assist in financing economic development process and assumes its responsibility to finance any project found to be beyond the capability of the private sector. The government has also entered into joint

---

[13]Ghatak, S. and K. Ingersent: Agricultural and Economic Development Harvester Press, 1984, p.28.

venture partnerships with foreign firms which have provided the managerial, technical, and marketing know how.

Let us take a look at the trends in this sector. Before 1975, real growth rate fluctuated between 6.80 per cent and -2.4 per cent (1973). After 1978 the real growth rate started to increase and reached its highest level in 1980 at 20.70 per cent. Due to the slowdown in oil activities after 1980, and the reduction in oil prices, real industrial growth rate declined from 20.70 per cent 1980 to 16.10 per cent in 1983.

The composition of manufacturing in Saudi Arabia is mainly food stuffs, plastics, textiles and some other consumer goods. Although manufacturing GDP constitutes only 1.90 per cent per annum for the whole period (1963-1984), 2.07 per cent for the initial period (1963-73) and 1.73 per cent for 1974-84, its contribution to GDP reached 3.20 per cent in 1984.

The Saudi manufacturing industry has maintained a pattern of expansion which was begun during the implementation of the second plan (1975-1980). The cumulative total of licences issued up to 1984 was 2,932. 1,581 of these, with a capital of 38.65 billion RS, began production before 1983. There is also considerable involvement on the part of foreign investors, both from developed and developing nations. The number of plants established under the foreign capital investment regulations stood at 346 with foreign equity participation being 47.00 per cent of the total capital of 18.8 billion RS. This expansion proved that the Kingdom was successful in enlarging its absorptive capacity, although we knew that the major share went to the oil industry and relevant manufacturing outfits.

There are three government agencies involved in the Kingdom's industrialization. These are: The Royal Commission for Jubail and Yanbu, The Saudi Basic Industries Corporation; and The General Petroleum and Mineral Organization (Petromin). Despite the growing importance of the GDP, the contribution of the Saudi manufacturing sector when looked at on an international scale is still minute. It is reported that the average contribution of this sector is 10.00 per cent in the oil based economies, 18.0 per cent in recently industrialized economies, and 28.00 per cent in developed economies. [14]

2.4.3 Construction

The construction sector played an important role in eliminating the backlog and bottlenecks which faced the huge projects during the second half of 1970. This can be shown by examining the real rate of growth for this sector. The rate of growth increased from 3.00 per cent in 1964 to 6.30 per cent in 1975. In 1978 this ratio increased to 19.0 per cent and reached its peak in 1980 at 20.7 per cent. After 1980 this rate of growth declined to 16.0 per cent in 1981, 16.80 per cent in 1982 and finally 16.10 per cent in 1983.

It can be argued that with the bottlenecks largely eliminated by 1980 and a shift in government emphasis away from infrastructure development, that it is unlikely that the construction sector will increase in the fourth plan at previous rates registered during the last years of the 1970s. Although expenditure on construction decreased to

[14] Ministry of Planning, Fourth Development Plan 1985-1990 Riyadh, Ministry of Planning, Saudi Arabia, 1985, p.224.

144.3 Billion RS in the fourth plan compared to 249.1 Billion RS in the third, however the huge volume of investment indicates that this sector will continue to be an important one as the industrialization plan will require a major construction effort.

2.4.4 Services

Two periods to be distinguished when discussing the economic growth in Saudi Arabia .

1) The first period started with the beginning of 1960s until 1973. During this period, an exceptionally large proportion of economic activity is in the service sector. In 1963, the contribution of services in the GDP was estimated at 4.30 per cent. In 1973,this ratio increased to 6.30 per cent.

2) The second period which started by 1974 and afterwards, was characterized by the declining trend in public administration and defence in favour of other services (such as trade and financial services).

Because of the boom in oil prices which started in 1974, high proportion of people left public services to join the prosperous sectors such as trade , transport and finance. Accordingly, the trade and banking sectors constituted a substantial part of GDP (16.30 per cent in 1984).[15] AS far as the evolution of this sector during the second period is concerned, it is worth noting that services has contributed to 3.50 per cent and 6.90 per cent of total GDP in 1974 and 1982 respectively. In 1983, this ratio increased to 12.22 per cent and finally reached 13.30 per cent in 1984.

---

[15] SAMA, Annual Report 1985 p.187

2.5.0 The International Transaction Sector

The Saudi economy is foreign trade oriented owing to its high dependence on imports and the large volume of crude oil it exports. As a single based economy, oil exports are the vehicle which support the rest of the economy.

This section will focus on the leading and stabilising role played by Saudi Arabia in the international oil market. It will also investigate the growing importance of the oil sector for the economy as a whole, the potentiality of the oil trend and its implication on the future absorptive capacity of the country.

2.5.1 Exports

The importance of Saudi oil exports is so significant not only for the Saudi Arabia but also for the world economy. In this respect Saudi Arabia had played a stabilizing role. It possesses the world's largest oil reserves, has been instrumental in meeting the rising demand for oil, and has also, since 1975,been a leading force in holding the price of oil down.

A comparison between Saudi and world exports of crude petroleum (Table 2.9) shows that during the period from 1963-1982, the share of the Saudi oil exports in world total crude petroleum exports increased from 14.00 percent in 1963 to 22.1 percent in 1973. This ratio increased from 25.50 percent in 1974 to 31.10 percent in 1980 and reached 35.60 percent in 1981. The above statistics illustrate that S. Arabia dominates more than a quarter of the international oil supply, and indicates the importance role it played in world oil trade.

Table 2.9: Saudi and world exports of crude petroleum

Year	World Exports 000 metric tons	Saudi Exports 000 metric tons	Saudi share %
1963	528,953	74,211	14.0
1964	604,281	80,025	13.2
1965	662,999	92,248	13.9
1966	742,341	113,088	15.2
1967	811,214	120,279	14.8
1968	919,553	131,982	14.4
1969	1,043,499	138,995	13.3
1970	1,164,850	159,537	13.7
1971	1,261,581	208,436	16.5
1972	1,379,404	270,962	19.6
1973	1,579,512	348,346	22.1
1974	1,548,258	394,414	25.5
1975	1,420,207	328,194	23.1
1976	1,604,167	397,928	24.8
1977	1,632,611	428,082	26.2
1978	1,588,662	385,300	24.3
1979	1,674,908	440,570	26.3
1980	1,483,401	461,873	31.1
1981	1,264,367	449,876	35.6
1982	1,133,203	281,135	24.8

Source:
Figures for 1963-1975 were obtained from: United Nations Statistical Papers Series J, No.22. World Energy Supplies 1973-1978. Figures from 1976-1982 were obtained from United Nations Energy Statistical Year book, New York 1984, p. 272.

The importance of the foreign sector (exports and imports) to the total absorptive capcity of the economy, be shown by investigating the contribution of the exports sector to GDP. Table 2.11 shows that the exports sector contributed about 54.00 per cent of GDP in 1963. This ratio increased from 86 percent in 1974 to 94.00 per cent in 1980. After 1980, this trend started to decline . It reached 52.00 per cent in 1982 and finally reached 38.00 per cent in 1983 (all figures are in current prices).

Table 2.10: The Saudi Trade and GDP (current prices)

122222 (1963-1984 and in Billion RS)

Year	GDP	Exports	Imports	BOP	X/GDP	M/GDP
1963	9.1	4.9	1.3	3.6	0.54	0.14
1964	9.6	5.5	1.4	4.1	0.57	0.15
1965	10.6	6.3	1.7	4.6	0.59	0.16
1966	12.2	7.3	2.1	5.2	0.59	0.17
1967	13.1	7.6	2.3	5.3	0.58	0.18
1968	14.6	9.1	2.6	6.5	0.62	0.18
1969	16.0	9.5	3.4	6.1	0.59	0.21
1970	17.4	10.9	3.2	7.7	0.63	0.18
1971	29.9	17.3	3.7	13.6	0.58	0.12
1972	28.3	22.8	4.7	18.1	0.81	0.17
1973	40.5	33.3	7.3	26.0	0.82	0.18
1974	99.3	85.7	10.1	116.1	0.86	0.10
1975	140.1	104.4	14.8	89.6	0.75	0.11
1976	164.6	135.2	30.7	104.5	0.82	0.19
1977	205.1	153.2	51.7	101.5	0.75	0.25
1978	225.4	138.2	69.2	69.0	0.61	0.30
1979	249.5	213.2	82.2	131.0	0.59	0.33
1980	385.8	362.9	100.4	262.6	0.94	0.26
1981	520.5	405.5	119.3	286.2	0.78	0.23
1982	524.7	271.1	139.3	131.8	0.52	0.27
1983	414.5	158.4	135.4	23.0	0.38	0.32
1984	381.6	129.8	118.7	11.1	0.34	0.31

Source: selected issues of SAMA Reports.

Concerning the volume and direction of exports, the export value increased from 4.9 billion RS in 1963 to 33.3 billion RS in 1973. Due to the oil boom prices exports value increased from 126.2 billion RS in 1974 to 362.9 billion SR in 1980, 405.5 in 1981 and 271.1 in 1982. This trend started to decline after 1982 when it amounted to 158.40 in 1983 and 129.80 in 1984.

As a percentage of GDP, oil exports contributed to 65.00 per cent during the whole period. The lowest ratio was 34 per cent in 1984 while the highest was 94.00 per cent in 1980 (table 2.10).

Concerning the direction of oil exports table 2.11 shows the changes that occurred in the share of each region. [16]

[16] This sub division is reported in : United Nations Yearbook of International Trade and Statistics, several issues. Unfortunately different patterns were used before 1968 and 1980 where a different indicators were applied .

Table 2.11: Saudi Exports by Region

(1963-80)

Region	63-68 %	1969 %	1970 %	1971 %	9172 %	1973 %	1974 %	1975 %	1976 %	1977 %	1978 %	1979 %	1980 %
1	74.3	78.7	72.0	72.0	76.1	72.8	72.0	69.4	67.8	70.6	75.8	78.0	77.7
2	17.7	18.3	21.0	21.0	21.1	24.7	23.5	23.9	24.6	23.9	22.3	20.6	21.1
3	0.1	0.0	0.1	0.0	0.0	0.0	-	0.1	0.1	0.0	0.0	0.0	0.1
4	7.4	3.0	6.9	7.0	2.8	2.5	4.5	6.6	7.5	5.5	1.9	1.4	1.1
5	44.4	46.5	45.2	50.6	53.3	50.9	50.6	43.4	41.0	39.5	37.2	40.2	41.4
6	21.6	23.8	21.3	15.5	15.1	14.8	15.9	19.6	20.1	19.0	20.2	17.4	17.4
7	4.0	3.6	1.3	4.3	5.8	5.4	4.7	5.4	5.8	11.0	17.2	19.1	17.5
8	13.4	13.8	14.9	14.0	14.5	14.6	13.0	12.9	13.2	15.4	17.3	16.3	16.5
9	3.3	3.3	4.1	5.6	5.3	8.7	8.9	8.8	10.0	7.5	4.2	3.2	3.3
10	7.0	7.1	5.8	5.5	5.3	4.7	3.8	2.7	2.8	3.6	3.5	3.3	3.3

KEY:

1 Developed markets
2 Developing markets
3 Centrally planned
4 Not distributed among them
5 Europe developed
6 Asian developed
7 American developed
8 Asian developing
9 American developing
10 Middle East

SOURCE:
United Nations *YearBook of International Trade Statistics*, 1978, 1980 issues.

As can be seen, there have been some changes in the regional shares as follows:

1) The Saudi exports to both developed and developing market economies had increased. The developed market economies share had risen from 74.30 per cent in 1968 to 78.00 per cent in 1980, while the developing market economies share had increased from 17.70 per cent in 1968 to 21.10 per cent in 1980.

2) Oil exports to European developed economies, the Saudi's largest consumer, had declined. Its share declined from 44.40 per cent in 1968 to 41.40 per cent in 1980. In contrast the American developed economies share had risen sharply from 4.00 per cent in 1968 to 17.50 per cent in 1980.

3) Oil exports share to Asian developed economies, of which Japan is the main consumer, had declined from 21.60 per cent in 1968 to 17.40 per cent in 1980, but the Asian developing economies share had risen from 13.40 per cent in 1968 to 16.50 per cent in 1980.

4) the Saudi oil export share to the Middle East economies had declined from 7.00 per cent in 1968 to 3.30 per cent in 1980.

To sum up, we may say that there is a general decline in the trend of Saudi oil exports to Europe and Asia developed economies contrasted by an increase in American developed and Asian developing economies. The decline in Saudi oil exports to European and Asian developed economies may be attributed to many different factors, among them, the North Sea oil discovery, conservation policies, and efficient methods in energy consumption.

2.5.2 Imports

In an open economy, such as S. Arabia, consumers can have their choice of commodity bundles,either domestic or foreign , in order to maximize their utility and subject to their income constraints. In the case of S. Arabia, imports are considered to be perfect substitute for domestic goods, given the weak industrial base in Saudi Arabia, where the country imports all its needs.

This is shown by the huge volume of imports as table (2.12) indicates. The import value was 1,266 million RS in 1963, and increased to 7310 million RS (about 6 folds) in 1973. During the second period (1974-1983) the growth of the Saudi imports was very rapid. This volume increased from 100,350 million of RS in 1980 to 139,335 million in 1981 and then declined to 135,417 million RS in 1983 (Tbale 2.12).

This high propensity to import is closely related to the rapid increase in oil revenues after 1973. If we disaggregate imports into its two main components i.e. producer and consumer imports, Table (2.12) shows that producer imports dominate the countries imports. This increased from 54.80 per cent in 1963 to 62.70 per cent in 1973, 71.90 per cent in 1978, and finally 70.50 in 1982.

Table 2.12: The Saudi imports (current values) 1963-83
(1963 -1983 and in billion RS)

Year	Total Imports	Consumer Imports	Share	Producer Imports	Share
1963	1266.00	572.23	45.20	693.77	54.80
1964	1358.00	631.47	46.50	726.53	53.50
1965	1693.00	748.31	44.40	941.31	55.60
1966	2058.00	854.07	41.50	1203.93	58.50
1967	2258.00	946.10	41.90	1311.90	58.10
1968	2578.00	1085.34	42.10	1492.66	57.90
1969	3377.00	1391.32	41.20	1985.67	58.80
1970	3197.00	1336.34	41.80	1854.26	58.20
1971	3668.00	1580.91	43.00	2105.43	57.00
1972	4708.00	1845.54	39.20	2862.46	60.80
1973	7310.00	2726.63	37.30	4583.37	62.70
1974	10149.00	3816.02	37.60	6332.98	62.40
1975	14823.00	4728.54	31.90	10094.46	68.10
1976	30691.00	8286.57	27.00	22404.43	73.00
1977	51622.00	14144.43	27.40	37477.57	72.60
1978	69180.00	19439.58	28.10	49740.42	71.90
1979	82223.00	24255.78	29.50	57967.21	70.50
1980	100350.00	31409.55	31.30	68940.44	68.70
1981	119298.00	37817.47	31.70	81480.54	68.30
1982	139335.00	41103.82	29.50	98231.18	70.50
1983	135417.00	39948.02	29.50	95468.98	70.50

SOURCE: United Nations: Yearbook of International Trade Statistics 1963-1983.

These ratios indicate the government efforts towards import substitution.

Import substitution is the main focus for the Saudi policy makers. The fourth development plan emphasized that "...although accurate estimates of the decline in imports is not possible now, this tends to signal the shape of structural changes in the non oil sector. Import substitution estimates can not be measured but to substitute local production for imports is quite clear as long as local marketing requirements are granted." This issue is quite important for both the third and fourth development plans

(1980-1985 and 1985-1990).[17] The second component of imports is consumer imports. Table 2.12 shows that the ratios were quite high for the first 9 years (1963-1971), where it fluctuated between 41.00-46.00 per cent. This ratio started to decline after 1973 and decreased from 37.3 percent in 1973 to 27.00 per cent in 1967 and finally reached 24.50 per cent in 1982.

One might conclude that this shift from consumer to producer imports signals a change in the future absorptive capcity of the Kingdom. With the infrastructure essentially required to diversify the economy is completed and with rolling of new industries, as was previously analysed, the potentiality for a prosperous economy is clear.

2.6.0 Public Finance

The availability of adequate financial resources has enabled the government sector to play a dominant role in accelerating the welfare oriented development of the Saudi economy. The government has seized this opportunity offered by the rise in oil revenue, to overcome centuries of inertia and underdevelopment through a re-injection of the oil wealth into the country's economy. However, given the low domestic resource base (both human and non-human, but other than crude oil) the effects of this re-injection of oil wealth have resulted in un welcome but indispensible bottle necks ,for example,inflation, port congestion, over dependence on foreign labour ... etc. and this the low absorptive capacity of the Saudi economy. Therefore,

---

[17] Ministry of Planning, Fourth Development Plan 1985-1990. Riyadh, Ministry of Planning, Saudi Arabia, 1985, p.123.

although financial resources are available, the physical and social infrastructure bottlenecks have placed constraints on the speed of the economic growth .

For the purpose of analyzing these trends, an adequate understanding of the structure and main characteristics of public financing in Saudi Arabia are essential. To study the evolution of the government budget during our sample, three periods can be distinguished. During the initial period before the oil boom (1963-1972) the budget only increased by 3.13 . This budget increased 24 fold during the 1974-84 period. [18] Table 2.13 shows that total revenue decreased from 368006 million RS in 1982 to 246256 million (or -33.08 per cent) and 190753 million (or -22.34 per cent) in 1983 and 1984 respectively. A new phase had began by 1983, when the world price of oil declined. Table (2.13) shows that total revenue increased from 5741 million Saudi Riyals in 1970 to 40597 million in 1974. This revenue jumped drastically to 100,103 million in 1975 (more than 2.5 fold). The increase in prices is considered to be the main cause behind such growth. Total revenues continued to increase until 1984 when the government revenue for the third time since 1969 (the first two occasions were in 1978 and 1979); registered a deficit in its budget. [19]For the period 1970-1983 the government expenditure was in balance with revenues for all the periods except in 1976 . The

[18]Unfortunately no data is available for the actual budget before 1970.

[19]In all times, allocation from reserves used to cover the deficit. See SAMA Annual Report 1984, p.19. Tables 2.1 and 2.2.

cause of this was that, 1978 and 1979 were the focus year of the second development plan, a plan that was devoted to building up the infrastructure of the economy and hence widen the country's absorptive capacity. It is worth mentioning here that prelimenary figures for 1984 indicates that government revenues started to decline as a result of the sharp decline in oil prices .The decline in 1984 (and afterwards) was attributed to huge declines in oil revenues.

Table 2.13: Government Revenues and Expenditures

(1969-1984 and in million RS)

Year	Oil Revs.	Other Revs*	Total Revs.	Total Recurring	Project	Total Exp.	Revenues minus Expenditur
1969	3096	458	3554	2573	1385	3958	-403
1970	4936	805	5741	3853	2175	6028	-287
1971	6944	1010	7954	3989	2304	6293	1661
1972	9945	1171	11116	4756	3374	8130	2986
1973	13669	1657	15326	5655	4503	10158	5168
1974	37493	3104	40597	8470	10125	18595	22002
1975	84618	15485	100103	15207	19832	35039	65064
1976	93873	9511	103384	38480	43304	81784	21600
1977	121902	14055	135957	52085	54652	106737	29220
1978	115412	16829	132241	70479	66631	137110	-4869
1979	116876	14629	131505	81771	64484	146255	-14750
1980	191105	20091	211196	96227	89497	185724	25472
1981	312819	35300	348119	83570	146846	230416	117703
1982	324790	43216	368006	112244	171014	283258	84748
1983	186572	59684	246256	98620	145176	243796	2460
1984	128109	62644	190753	90775	112657	223182	-32429

*Other revnues are mainly Saudi's investments abroad.

Source: Computed by author using figures from: Ministry of Planning, Achievements of Development Plans 1970-1982 , Riyadh, Ministry of Planning, Kingdom of Saudi Arabia, 1984, p.73.

For the purpose of our analysis government budget articles need to be disaggregated to show the composition of each sector and its impact on the future absorptive capacity of the country. Therefore, in the following section the sources of the government revenue and the composition of it's expenditure are briefly discussed .

2.6.1 Sources of Government Revenues

Oil income dominates the source of government receipts in such a way may be regarded as superfluous to talk about the composition of government revenues. However, in order to focus upon the danger of dependence on a one source economy and to emphasize the importance of diversification, the issue will be discussed. Government revenues can be divided to two major catagories: oil revenues and other revenues. Oil income is the sum of oil royalties and income taxes from oil companies. Oil income is the main source of the government revenue and constituted 80.00 per cent of its income for the whole period 1963-1983. The remaining 20.00 per cent is comprised mainly income tax (Zakat), custom duty, excise duties, fees and either the sale or rental of government properties.

As Table 2.13 shows oil revenue has been increasing at an accelerated rate. Its growth rate was 12.50 per cent in 1965 and jumped to 25.52 per cent in 1967 but declined to a negative growth of -10.74 in 1968 (after the Israeli-Arab war in 1967). The ratio increased again in 1970 to 23.87 per cent and escalated to 84.38 per cent in 1972. In 1975 the growth rate of the oil revenue reached 347.33 per cent, which was the highest ratio of growth in the oil revenue in the country's history. Between 1975-1984 the average annual growth rate was 10.75 per cent with a high positive growth rate for 1981 (64.32 per cent) and negative growth rate for 1984 (-39.20 per cent).

The relative share of non-oil revenue seems to grow at a modest low rate. It registered 16.8 percent during 1963-69, 15.00 per cent in 1970 and 25.50 per cent in 1971. Due to massive increases in oil revenue in 1973-74 non oil revenue share declined to 4.00 per cent in 1975. The average annual share for the period 1963-1972 was 13.25 per cent. For the second period (1973-1983) the average annual share was 9.90 per cent with non revenue accounting for more than one quarter of total revenue in 1984 (33.30 per cent). These results contrast with El-Mallakh's findings that non oil revenue not only was insignificant but declining. The above results proves that the government policy to diversify the economic base has achieved some success and this will have a positive effect on enlarging the abosrptive capacity of the economy. Unfortunately, the Central Bank in S. Arabia did not publish the data about revenues for each non oil sector. However, it is our belief that government investment on surplus funds dominates the main source of such increments. [20]An interesting issue that needs more analysis in the non oil revenues is the Saudi tax structure, the following section will highlight the Saudi tax policy.

The Saudi tax system could be described as clear and simple. Only foreign companies, foreign interests in joint Saudi foreign companies pay tax in Saudi Arabia. An exception is the 2.50 per cent tax on current net assets (including annual profits) or (ZAKAT) paid by Saudi companies and Saudi interests in joint Saudi foreign ventures.

Zakat has one major implication for income ditribution as it is levied on wealth. Within a decade, a Muslim will have one quarter of his total assets reallocated to help the poor and needy if the value of such assets remains static. However, this is unlikely and the need to pay Zakat may

---

[20]El-Mallakh, R.: Saudi Arabia: Rush to Development, London, Croom Helm, 1982, p.260.

serve as an incentive for many to build up their assets so that they will not be seriously eroded. Another advantage of Zakat is that it encourages people to put their assets to good use, as they are liabled to taxation whether are utilised or not.

As far as the role of Zakat as a fiscal instrument is concerned, it is worth noting that the rate at which Zakat is levied is fixed, and it would be considered illegitimate to increase Zakat rates because of fiscal needs.[21] Wilson argues that : " Given the significance of Zakat for total non-oil revenues in Saudi Arabia, this implies a considerable degree of rigidity in this system. In these circumstances using tax variation as an instrument of fiscal policy is largly precluded. Hence the chief instrument of fiscal policy is variation in government expenditures."[22] Imported and domestically produced goods are free of tax. The obvious reason for such a tax system is that the government can do without revenue originated from non oil sources, because of its huge oil revenues.

---

[21] Althoug, and according to some relegious sources , this rate could be increased in the case of wars or crisis.

[22] Wilson ,R " Islamic Business : Theory and Practice " , The Economist Intelligence Unit, October, 1984 pp:70-71.

2.6.2 The Allocation of Government Expenditures

Appropriations of government expenditure are divided into two major categories: project and recurrent expenditures. Wells [23] suggested that Saudi appropriations and expenditures can best be studied by categorizing them as consumption and development for the whole period (1963-1984).

2.6.2.a Expenditures on Consumption:

The level and composition of spending on consumption in the Kingdom are largely determined by government policy. Table 2.13 shows that spending on consumption (recurring) increased from 2,573 million RS in 1963-69 to 8,470 million in 1974, 81,771 million in 1979 and 112,244 million in 1982. As we mentioned previously, and because of the decline in oil revenues, spending in consumption declined to 98,620 million in 1983 and finally to 90775 million RS in 1984.

2.6.2.b Expenditure on Development:

The government of S. Arabia, with its substantial increase in oil revenues, allocated an increasing amount of its expenditures to development, as shown in Table 2.14. Actual expenditures on development increased at a rapid rate as percentages of total actual expenditures: 35.00 per cent for the period 1963-1969, 44.30 per cent in 1973. After the

---

[23] Wells, Donald A., Saudi Arabian Development Strategy, Washington, D.C.: American Enterprise Institute for Public Policy Research, 1976.

boom in oil prices, the ratio of capital expenditure increased rapidly from 46.00 per cent in 1979 to 64 per cent in 1981, 63.3 per cent in 1983 and finally declined to 50.50 per cent in 1984.

Table 2.14: Annual Rates of Growth of Government Revenues and Expenditures (1964-84 and in %)

Year	Oil Reven.	Other Reven.	Total Revenues	Total Recurring	Project	Total Expen.
64-70	16.8	15.4	17.9	7.9	52.4	18.0
1971	38.3	25.5	38.5	3.5	5.9	4.4
1972	35.7	15.9	39.8	19.2	46.4	29.2
1973	37.0	41.5	37.9	18.9	33.5	24.9
1974	189.6	87.3	164.9	49.8	124.9	83.1
1975	131.2	398.9	146.6	79.5	95.9	88.4
1976	14.2	-38.6	3.3	153.0	118.4	133.4
1977	27.7	47.8	31.5	35.4	26.2	30.5
1978	-6.3	19.7	-2.7	35.3	22.0	28.5
1979	6.5	-31.1	-0.6	16.0	-3.2	6.7
1980	62.3	37.3	60.6	17.7	38.8	27.0
1981	63.7	75.7	64.8	-13.2	64.1	24.1
1982	2.7	22.4	5.7	34.3	16.5	22.9
1983	-42.5	38.1	-33.0	-12.1	-15.1	-13.9
1984	-31.3	4.9	-22.5	-7.9	-22.4	-8.5

Source: Ministry of Planning, Achievement of Development Plans (1970-1982), 1984, p.74.

As far as the rate of growth of this sector is concerned, it is important to mention that until 1975 spending on projects exceeded recurrent expenditures. Beginning in 1976 and until 1983, this trend had bee fluctuated . In 7 years out of 19 (Table 2.14), recurrent expenditures exceeded that of capital expenditures. This fluctuation in the behaviour of government spending reflects the strategies of the government towards increasing the absorptive capacity for each sector and to diversify these resources into more important spending. The development objectives of the kingdom are shown by investigating the National plans. This will be the focus of the next section. As regards the volume of government expenditure, Table 2.14 shows that prior to 1971, total expenditures were in excess of total revenues which resulted in a budget deficit which was financed through allocation from reserve and development funds. A new era started by 1971 when government deficits turned into surplus for the whole period (1971-1984) except for three years (1978, 1979 and 1984) . This surplus reached 117,703 million RS in 1981.

2.7.0 Planning and the absorptive capacity in Saudi Arabia

As we said previously, the Saudi government generates the greater part of the Kingdoms economic activity. Most of these activities are financed by the continuous large oil revenues that have been accruing at faster rates than planned expenditures.

The first attempt for economic planning was made in 1960 when King Fisal Ibn Abdulaziz asked the International Bank for Reconstruction and Development to visit the country to study its economic problems and made recommendations which could help the development of the Kingdom. As a result, different forms and councils have been established. [24] In an attempt to stimulate economic growth and increase the absorptive capcity of the country, the Kingdom established the Central Planning Organization (CPO). In this section the four national plans will be carefully investigated.

2.7.1 The First Development Plan (1970-1975)

The first plan was implemented in August 1970. It aimed to achieve an accelerated development of human resources through manpower planning and investment within the social infrastructure and to bring about a diversification of the

---

[24] El Mallakh, R.: Saudi Arabia: Rush to Development. London, Croom Helm, 1982, p.142.

structure of production, thereby reducing the country's future dependence on oil production as its primary source of revenue.[25] There are two arguments about the nature and scope of this plan. El-Mallakh mentioned that this plan was prepared under financial constraints which faced the country after the Middle East War in 1967. Therefore, the total projected expenditures for this plan was estimated at 41.3 billion RS. Due to the drastic increase in oil revenues after 1973, this amount was raised to 98.9 billion RS and the actual amount spent during the plan period was 78.2 billion.[26] The second argument reveals that the estimated budget was 32.30 billion then increased to 41.3 billion RS by the last year of the plan (after the oil boom). This argument seems to be more reasonable and acceptable.[27]

---

[25] Ministry of Planning, First Development Plan 1970-1975. Riyadh, Ministry of Planning, Saudi Arabia, 1970.

[26] El-Mallakh, R. op.cit. p. 152.

[27] Nyrop, Richard: Area Handbook for Saudi Arabia. Washington D.C. Foreign Area Studies of American University, 1977 p.240.

Table 2.15:

Allocation by Sectors for the First Five Year Development Plan 1970-1975 (millions of S.Ryial)

Item	Recurrent	Project	Amount	%
Administration	6,794.6	922.8	7,717.4	18.6
Defense	3,980.0	5,575.0	9,555.0	23.1
Education, vocational training, and cultural affairs	6,150.2	1,227.5	7,377.7	17.8
Health and social affairs	1,612.9	308.2	1,921.1	4.7
Public utilities and urban development	1,246.9	3,325.4	4,572.3	11.1
Transport and communication	1,767.3	5,709.2	7,476.5	18.1
Industry	321.8	776.7	1,098.5	2.7
Agriculture	973.8	493.9	1,467.7	3.6
Trade and services	83.5	43.8	127.3	0.3
Total	22,931.0	18,382.5	41,313.5	100.0

Source: Central Planning Organization, Development Plan (1970).

The sectoral allocation of this plan shows that 45.00 per cent of the total amount was to be spent on capital projects. Defense, administration and communication were the largest, reflecting the political situation following 1967 war, and indicating that this was, in essence ,the budget for five years in an economy that relied primarily on private investors for development. The plan called for overall economic growth (real GDP), to occur at 9.80 per cent per annum.

One phenomenon which stands out from this Table (2.15) and which is surprising, is that the total appropriation for industry and commerce for the plan period was only 7.30 per cent of the total amount. One conclusion could be derived from such analysis is that the first development plan did not give sufficient emphasis to the most important sectors (commodity producing sectors) such as agriculture, and industry. This might be in contrast with the declared objection of the plan vis-a-vis diversification policies and increasing the absorptive capacity of the non oil sectors in order to reduce the kingdoms dependence on oil revenues.

2.7.2 The second development plan (1975-1980)

In 1975, the council of ministers approved the Saudi Arabian second development plan. The total cost was estimated at 498 billion RS, approximatly nine times that of the first one. The main objectives of this plan could be summarized as follows:

1) Rapid development of human resources, through preparatory training programs. The planners hoped to increase the country's total labour force (local and foreign) from 1.6 million to 2.38 million by 1980, partly by importing a labour force from friendly countries. Actual figures show that by 1980 the total labour force was 2.47 million indicating the success of the plan . There was also a change in the structure of the labour force with more labour directed to services and construction.

2) In contrast to the first development plan, this plan aimed to diversify the economic base through an emphasis on increasing agricultural and industrial production. Agricultural output would be stimulated through government research and extension services. Also large amounts of capital would be directed towards industrial ventures on natural gas and mineral resources.

3) Financial allocation for the second plan may indicate a new trend since infrastructure and productive investment plans took the lions share accounting for 113 million RS and 92 million RS(22.70 per cent and 18.50 per cent of total allocation) respectively. These figures are followed by education and defence which received 16.10 per cent and 15.70 per cent respectively (compared to 23.10 per cent in the first plan).

Table (2.16)

Financial Requirements "Second Development Plan

(in million of RS) 1975-1980

Item	Amount	%
Economic Resources Development	92,1350	18.5
Human Resources Development	80,123.9	16.1
Social Development	33,213.9	6.7
Physical Infrast.Development	112,944.6	22.6
Subtotal Development	318,416.3	63.9
Administration	38,179.2	7.7
Defense	78,156.5	15.7
Others	63,478.2	12.7
Subtotal Others	179,813.9	36.1
Total Plan	498,230.2	100

Source:Central Planning Organization, <u>Second Development Plan(1975-1980</u> (in million of RS)

In summary, we can conclude that due to different situations (after the oil boom in 1975) the planners recognised that financial constraints are not binding for the development process. They now focus on a new sort of constraint, infrastructure and labour force.[28] Therefore, the absorptive capacity and inflation was the major concern in this period especially in 1976-77. Port bottlenecks and the relatively inelastic supply of essential goods particularly agricultural products. As these constraints were relaxed in 1978 the bottlenecks moved elsewhere to roads and transportation systems.

We can also say, that the second development plan was one of considerable progress in Saudi Arabia. Infrastructure was improved, and absorptive capacity constraints were relaxed. The diminution of particularly glaring problem areas, however brings to the fore new areas of concern. The third plan have intended to deal primarily with the area of manpower, efficiency and participation.

2.7.3 The Third development Plan (1980-1985)

The third plan was launched in 1980. While major physical constraints to development had not been completely eliminated . Absorptive capacity was much improved at the beginning of the plan compared to the five years prior to it as imports rose dramatically during the span and government expenditure exceeded allocated amounts by the end of the second plan.

While the second plan concentrated on infrastructure expansion and in increasing absorptive capacity by eliminating physical constraints, the third plan aimed at selective utilization of domestic and foreign skilled manpower. The purpose still focused on how to choose the

---

[28] To alleviate such constraints the Government recruited 1.2 million workers.

best skilled manpower in contrast to previous plans. The plan also focuses upon establishing capital intensive hydrocarbon industries and other manufacturing industries in both agriculture and in mining with the aim of further diversification of the economy. Another major objective is to increase the economic and administrative efficiency as a tool to accelerate growth in the producing sectors.

The total allocation of the third plan was estimated at 701.7 billion RS. Table 2.17 shows that expenditure on economic resource development was increased to 261.8 billion RS or 31.30 per cent of the total allocation of this plan compared to 25.10 per cent in the previous one. Human resources development were given much more importance and its allocation mounted to 21.30 per cent compared to 15.90 per cent in the second plan. This objective can be fulfilled by improving the quantity and the quality of education and to make the education and training system more responsive to the needs of the economy. On the other hand expenditure on physical infrastructure was reduced (as planned) from 49.60 per cent in the second plan to 37.40 per cent in the third plan. This is related to the completion of most of the infrastructure projects.

Table 2.17:

Government Allocations on Development

'The Third Plan'

(1980-85 and in Billion of RS)

Function of expenditure	Volume	Percentage
Economic Resource Development	261.8	37.3
Human Resource Development	124.6	18.5
Social Development	61.2	8.7
Physical Infrastructure	249.1	35.5
Sub total: Development	701.7	100.0

* Billions of Saudi Riyals.
Source: Ministry of Planning, Third Development Plan,1980-85 Riyadh, Saudi Arabia,1980

In sum, we can say that in the third plan more emphasis was given to the producing sectors (agriculture and industry) with less expenditure on physical infrastructure. The aim is to direct the oil revenues to new streams and accomplish the strategy of diversification.

2.7.4 The Fourth Development Plan (1985-1990)

As the third five year development plan drew to a close in 1985, the new fourth plan set development priorities for the next half decade. In comparison with its precedent this plans total allocation is estimated to be 500 billions RS. This reflects the recent international economic situation with lower oil prices (i.e. lower oil revenue to the Saudis) and oil dumping in the oil market.

In our view this plan has cautious targets and its allocation reflects the need for huge reductions in spending on some projects which are not considered to have first priority in the future national plans.

The fourth plan departs from its predecessors in several areas. We will summarise the main issues as follows:

1) The labour force structure will change in this period. Foreign labour is planned to decline by 22.60 per cent i.e. from 2.66 million to 2.06 million. This is regarded as one of the most important purposes of the fourth plan.

2) Subsidies programs will be reviewed carefullly. As the reader knows the Saudi society has enjoyed for many years a relatively fixed price for most essential goods. Consumers may pay more in the future as the plan predicts since the subsidies system will be rationalized.

3) Education programs will be reviewed carefully. Falling exams rates and school drop-out numbers will be studied since human resources are most important for future development. Vocational, educational and training is a major focus in this plan.

4) Housing programs in the third plan resulted in excessive housing units in urban areas. It is noticed that many rural areas are suffering from housing shortages, and therefore, the planners will divert the effort to satisfy the Saudi urban needs.

5) Health services in Saudi Arabia have grown significantly, but as we saw when we reviewed social indicators (section 1.2), there is still a lot of room for

improvement. It is found that the traditional system of providing health services within hospitals caused pressure on the authorities. A new system of primary local health centres with the introduced where by citizens will be required to see these centres before being accepted by the hospitals.

Table 2.18: Government Allocations on Development The Fourth Plan (1980-85 and in billion of RS)

Function of Expenditure	Volume	Percentage
Economic Resource Development	130.7	26.1
Human Resource Development	135.3	27.1
Social Development	89.7	17.9
Physical Infrastructure	144.3	28.9
Subtotal: Development	500	100.0

Source: Ministry of Planning, Fourth Development Plan 1985-1990. p.103.

Table 2.18 shows that physical infrastructure still holds the leading position in the eyes of the Saudi planners. One then feels there is a certain amount of contradiction between the third development plans's claim to have finished the build up of the infrastructure requirements and the high share of its allocation in this plan. However, this state of confusion can be eased by indicating that the huge infrastructure build up during the last decade is the country's real assets , and unless consistent suitable allocation is directed to maintain it, and made sure of keeping it in its best condition, the result is clearly a waste of the countries real development. In absolute value, the allocation declined to 144.3 billion RS (249.1 billion RS in the third plan) a negative growth rate of 72.60 per cent compared to the third plan. But the ratio within the plan holds the highest ratio.

Our main interest in the sharp decline in the amount allocated to the producing sectors. This amount declined to 130.7 billion RS in the Fourth Plan compared with 261.8 billion in the third plan. [29] However, we argue that the current international recession, the huge current account deficit, the Kingdom has faced since 1984, (second only to U.S.A government deficit) with the ever continuing Iraq-Iran war, the fear of future protection on petrochemical products, and the time factor in eliminating absorptive capacity constraints could be listed as factors responsible for this reduction in the share of the producing sectors in the Fourth Plan compared to previous ones. [30]As far as the other sectors are concerned , the plan allocation for human resource and social development has increased slightly to 135.3 million of RS for human resources and 89.7 million RS for social development compared to 124.6 and 61.2 million RS respectively in the previous plan.

What are the elements favouring realization of the fourth plan goals? Firstly flexibility and experience in implementation. Secondly, high quality infrastructure and

---

[29]Ministry of Planning, <u>Fourth Development Plan 1985-1990.</u> p.102.

[30]The EEC group slapped duties on plastics imported from Saudi Arabia. They imposed 13.4 percent sur charges on Saudi exports of polyethlene, claiming that Saudis have exceeded their share (general system of preferences). For more details see The Economist, Plastic Protection, August, 3, 85, 1985. p.66.

good programmes to maintain it, and finally an immense effort to show the experience to the third world.

2.8.0 Conclusion:

The above analysis shows that oil acts as the principal source of revenue for the Kingdom. It could be argued that an oil-based economy, such as the Saudi's, which depends almost exclusively on one source of income, would invite a long-term risk. The obvious risk in the country's dependence on oil revenues is the incongruity that may emerge in the long run between the huge requirements for development and the risk that if anything should reduce oil revenues, this would affect country's inability to generate sufficient alternative sources of income. It is the aim of this study to investigate the extent to which the country has been successful in utilizing present oil surpluses in order to generate sufficient alternative sources for the future. Before we investigate these issues, we need to introduce the reader to the concept of absorptive capacity. This concept and the alternative different approaches used in discussing and measuring absorptive capacity of oil economies are reviewed in the next chapter.

CHAPTER THREE

ECONOMIC LITERATURE ON ABSORPTIVE CAPACITY

3.1.0 Introduction

Recent literature on economic development and foreign aid is replete with reference to absorptive capacity. However, despite the enormous studies that review the concept, one still has the impression that absorptive capacity is a novel idea, not only in theory but also in practice.

During a conference on 'Capital Movements and Economic Development'[1] organised in 1965 by the International Economic Association, more than seven different definitions of the term were identified. More recently we find, in a study by Mr. P. Burnell, [that inquiries of the notation] absorptive capacities have ,'no uniform meanings understood by economists in connection with certain restrictive assumptions about what matters fall within and what fall outside their main focus of attention and investigation'.[2]

---

1 International Economic Association, 'Capital Movements and Economic Development', edited by John H. Adler and Paul W. Kuznets. St. Martin's Press, New York, 1967, pp. 213-215, 245-254, 264-267.

2 Peter Burnell, 'Absorptive Capacity and Development'. University of Warwick, Department of Politics, Working Paper No. 14, July, 1977, p.19

Mr. Al-Awadi seems to confirm this by expressing that 'the concept is still elusive, suffers from conceptual vagueness and therefore lacks operational value'.[3] It is interesting that the absorptive capacity concept has enjoyed such voluminous research yet still suffers from vagueness and a tenuous base.

In our opinion, this problem has risen because that form has been transferred across different disciplines; where the same conditions were not taken but results were unconsciously granted. This problem makes it necessary to analyse the term and seeks its evaluation.

The purpose of this chapter is to introduce the reader to the concept of absorptive capacity. Section 2 will trace the evolution of the concept, while Section 3 will present the various definitions, and explore their foundation in economic theory. While section 4 will look at the measurement of absorptive capacity, section 5 will investigate its constraints. Finally, and because of the special characteristics of Saudi Arabia(oil-based economy),section 6 will investigate the nature and foundation of absorptive capacity in the oil-based economies, in general.

3.2.0 The Evolution of the Concept

The phrase capital absorptive capacity is much older than thought to be. J.M. Keynes was interested in the topic. Without using the term itself, he used the notion implicitly when he wrote on the investment capacity of the economy. The

---

3 Yousef Abdullah Al-Awadi, "OPEC Surplus Funds and the Investment Strategy of Kuwait'. Ph.D. Dissertation, University of Colorado, 1974, p.78.

decision whether to make an investment or not depends upon the prospect of making a profit, which intern depends, says Keynes, 'on relations between the rate of interest and returns which the capitalist expects from his investment of capital'.[4] As the reader can see, this is nothing more than Keynes' 'marginal efficiency of capital'. This means that the absorptive capacity becomes a schedule relating the amount of capital to be invested to the expected rate of return.

The pioneer institution which mentioned absorptive capacity explicitly was The International Bank for Reconstruction and Development.[5] In its fourth annual report, the World Bank recounted the history of development in clear and precise terms. After examining the nature of the problem, the report stated:

> 'The bank is convinced that through its loan and its efforts to stimulate the flow of capital from other sources, it can help substantially to speed the rate of development. But it must be emphasised that it is only the amount of productive investment which takes place, and not the mere availability of money which is important. Money alone is no solution; in fact, loans for unproductive purposes or for projects which are poorly planned or executed can be a positive detriment. Perhaps the most striking single lesson which the Bank has learned in the course of its operations is how limited is the capacity of the underdeveloped countries to absorb capital quickly for really productive purposes'.[6]

---

4 J.M. Keynes, '<u>The General Theory of Employment, Interest and Money'</u>. London, Macmillan & Co. Limited, 1948, pp. 135-147.

5 Hereafter cited as the World Bank.

6 The International Bank for Reconstruction and Development, <u>Fourth Annual Report: 1948-1949</u> (Washington, D.C. IBRD, 1950).
(Footnote continued)

The report did not define absorptive capacity, but rather listed its major determinants, for examples skilled manpower, technical assistance, education, and also stated that:

> 'Development is not something which can be sketched on a drawing board and then translated into reality simply through the provision of finance ... If money were all that was required to bring those projects to fruition, the Bank's primary task would have been the relatively simply one of allocating its resources among various claimant schemes. In point of fact, however, the principal limitation upon bank financing in the development field has not been lack of money but lack of well-prepared and well-planned projects ready for immediate execution'.[7]

Millikan and Rostow elaborated on the concept and regarded the low absorptive capacity as a symptom of state backwardness directing their comment as they did at the less developed countries (LDC's). They emphasised that absorptive capacity must be developed and confirmed the World Bank's feeling that the issue is not the one of availability of capital but of its productive use.[8] For them, it means that a particular country must go through the 'pre-conditions for the take-off stage' to the 'take-off state' itself. Millikan and Rostow do not offer a definition of absorptive capacity but identify it by its determinants.

---

6 (continued)

7 Ibid., p.9.

8 M.F. Millikan and W.W. Rostow, A Proposal: Key to an Effective Foreign Policy. New York: Harper and Brothers, 1957, p.45. also W.W. Rostow, The Stages of Economic Growth. Cambridge, England: The University Press, 1971, p.144.

3.3.1 The Search for Practical Definition

The concept of absorptive capacity was first used by Branco Horvat. His definition was a by-product of his attempt to determine 'the optimum rate of investment'. His dissatisfaction of F.P. Ramsey's and J. Tinbergen's[9] work reproduced a new approach. Horvat defines absorptive capacity as 'the ability of individuals and the society as a whole to manipulate the stream of output increments'.[10] Instead of dealing directly with the application of additional capital as had Millikan and Rostow, Horvat chooses to reduce the concept to one of its determinants, i.e. the capabilities of the human factor. He believes that this ability is limited because of the limitation of skilled workers, institutional readjustment, the state of health and the will to work.

Among the early contributors to the concept was Benjamin Higgins.[11] He states that absorptive capacity is the amount of investment that can be undertaken within, say, a five-year programme, without reducing the marginal contribution of the last block of capital below "X". This is to say, it is the amount of investment that can be undertaken without raising the incremental capital output ratio (I.C.O.R.) of the last block of investment above 1/X.

Higgins analysed the relationship between 'the rate of

---

9 F.P. Ramsay, 'A mathematical theory of saving'. Economic Journal, 1928. J. Tinbergen, 'the optimum rate of saving'. Economic 1956.

10 Branco Horvat, 'The optimum rate of investment'. Economic Journal, December 1958, p.748 (emphasis added).

11 Benjamin Higgins, Economic Development: Problems, Principles and Policies. New York: W.W. Norton & Co. Inc., 1968, pp.579-582.

return on investment (X)' and the cost of capital (I). He wrote an excellent analysis of planning, absorptive capacity and foreign aid. The above definition deserves some analysis. The reader will notice that Higgins' definition embodies an operational flaw in making any kind of forecast so far ahead. He also suggests that absorptive capacity limitations cause the marginal productivity of new investment to decline steadily but not necessarily in a discontinuous or accelerating manner as the rate of investment increases.

Paul Rosenstein-Rodan introduced the absorptive capacity idea in his famous gap computation on rates of growth in LDC's. He specified the term as one which , 'Relates to the ability to use capital productively ... total investment must not only cover its costs but must also yield a reasonable increase in income'.[12] He also shared the idea with W.W. Rostow that 'absorptive capacity is more limited in a low stage of development'. Rosenstein stated that there are different target rates of growth and different incremental capital output ratios for the various developing countries, he then matched the different growth rates to the different I.C.O.R. in order to account for a productive capital use.

Rosenstein-Rodan's view was that absorptive capacity has three components:

1) The capacity to organise and mobilize savings.
2) The capacity to produce and invest.
3) The capacity to influence the balance of payments.

It is our view that these components are too wide to

---

12 Rosenstein-Rodan, 'International Aid for Underdeveloped Countries', P,N,The Review of Economics and Statistics, Vol. 14, No.2 (May, 1961), pp.107-108.

contain the concept. However, we would agree that the second component fits well into the concept.In sum, we may fairly say that what distinguishes Rosenstein-Rodan was that he linked the concept to the investment in human capital. Such linkage will widen the scope of absorptive capacity and present it in a multi-dimensional context.

Mikesell defined the concept of absorptive capacity as: '... the ability of a nation or economic community to transform financial capital into an equivalent amount of real productive capital (as measured by the discounted value of net outputs).[13]He emphasised that Higgins did the relationship between the cost of capital and the rate of return on investment .

A. O. Hirschman tailors his argument of investment ability and absorption in his application of the growth theory. He was the pioneer economist who distinguished the case of LDCs. He pointed out that none of the factors on which the developed countries focus are available in the developing countries, i .e. (a) the generation of savings and (b) the availability of investment opportunities.

He argues that:

> 'The ability to invest ... is held back primarily by the difficulties of channeling existing or potentially existing savings into available productive investment opportunities, i.e. by a shortage of the ability to make and carry out development decisions ... The ability to invest is acquired and increased primarily to practice, and the amount of practice depends in fact on the size of the modern sector of the economy'.[14]

---

13 Raymond F. Mikesell (ed.), U.S. Private and Government Investment Abroad. Eugene, Oregon: University of Oregon Book, 1962, p.360.

John Adler produced the first comprehensive analysis of absorptive capacity and its determinants. In his monograph, he defined the concept as:

> 'That amount of investment that can be made at an acceptable rate of return, with the supply of co-operant factors considered as given'.[15]

Setting absorptive capacity as a device signalling the maximum possible rate of productive investment was Pincus' idea. He stated that:

> 'If no explicit target is set, the same result is achieved by introducing the idea of absorptive capacity: setting a maximum beyond which increases in investment would not bring increases in output'.[16]

In sum, he regarded the concept as a warning device of achieving the target rate of growth.

Chenery and Strout regard the concept as a performance concept. Their definition was;

> 'The observed increases in total investment that can be carried out at an acceptable minimum level of productivity over a certain period'.[17]

---

14 Albert Hirshman, The Strategy of Economic Development. Yale University Press, New Haven and London, 1958, pp. 35-36.

15 John H. Adler, Absorptive Capacity: the Concept and its Determinants. Washington, D.C.: The Brookings Institute, June, 1965, p.5.

16 H.P. Chenery and A.M. Strout, 'foreign Assistance and Economic Development'. Policy discussion paper No. 7, Agency for International Development, 1964.

17 Ibid.

Gulhati's analysis focused on the non-financial constraints. He states that:

> 'In any period of time, or within a specific period of say five years, there exists a limit beyond which investment cannot be raised in recipient economies. This limit is set by the non-financial constraints to development, i.e. by the physical unavailability of other factors of production necessary for further investment'.[18]

In Gulhati`s distinctive paper,the notion was that the real problem is not the availability of capital, but the ability to execute viable projects productively. One will understand such a feeling from a major member of the World Bank. He connected investment and absorptive capacity in a rather practical way and suggested investment activity in three phases. In phase one, development opportunities are identified, projects are formulated, their technical feasibility are tested, and their economic merit assessed. During the second phase, projects are executed , physical structures take shape, and equipment installed.

Finally,phase three will start as the second phase ends, and the newly constructed facility starts production.

Singer and Sohavio-Campo paraphrased the term and widened its meaning. They included in it economic, social, political, cultural, institutional and psychological factors which might affect economic growth. The major emphasis was that beyond a

---

18 R.I. Gulhati, 'The need for foreign resources, absorptive capacity and debt servicing capcity', in J.H. Adler and P.W. Kuzents (eds) Capital Movement and Economic Development - Proceedings of a Conference held by the International Economic Association. New York: Macmillan, St. Martins Press, 1967,.

certain level that the rate of growth cannot be increased by acquiring more capital and other factors of production. They made it clear that any country may fail, 'because the country runs up against the limits of its social, institutional and political capacity to absorb the increased capital and labor'.[19]

The most comprehensive study of absorptive capacity was composed by W.J. Stevens. He was the first writer who devoted a whole book to the subject and who evaluated the ideas of other writers and showed a remarkable understanding of the econometric and analytical problems involved. Stevens was disappointed by the lack of studies that focused on the aggregate dimensions of the concept. He therefore, aimed to fill this gap and in so doing produced the following aggregate formula of the concept: This is his major contributions. In his view absorptive capacity is:

> '... The optimum aggregate amount of private and public investment opportunities that within a given time span of three to five years can be undertaken, successfully implemented and subsequently productively operated under the assumption that adequate domestic and foreign savings are forthcoming and that the most appropriate choice of techniques are being used'.[20]

T. El-Jehami in his long but creative and well written

---

[19] Salvatore Schiavo-Campo and Hans W. Singer, Perspective of Economic Development. Boston; Houghton Muffline Company, 1970, pp. 34-35.

[20] W.J. Stevens, Capital Absorptive Capacity in Developing Countries. Leiden, Netherlands:A.W. Sijthoff, 1971, p. vii & pp. 51-52.

dissertation reviewed the literature and found that the measurement techniques available are not suitable for the special conditions of LDC's. He also was dissatisfied with the measurement techniques and therefore proposed a new formula based on the view that absorptive capacity is an expenditure determined magnitude subject to planning guidelines and a maximum tolerable rate of inflation over a relevant period of time.

His definition of absorptive capacity is as follows:

> 'Absorptive capacity is an expenditure -determined concept measurable by the size of actual development expenditure'.[21]

This approach did not test the impact of the oil sector on the absorptive capacity of the economy, and hence,did not include any variable for that sector . Our definition intends to fill this gap.

A more recent study was conducted by Y.A. Al-Awadi. Although no definition was presented, he agreed with Rosenstein-Rodan that the idea must include investment in both material and human resources within a regional framework. He stated that:

> 'If this definition is employed, the aggregate absorptive capacity of the developing nations of OPEC is believed to be much greater that many observers have suspected.'[22]

---

[21] T.El-Jehami, Absorptive Capacity and Alternative Investment Policies: A Case Study of Libya. Ph.D. dissertation, University of Colorado, 1975, p.62.

[22] Al-Awadi, p. 78.

In another recent project,Farid Abolfathi and others estimated the absorptive capacity of all members of OPEC countries. They contend that absorptive capacity is; 'the ability of members of the Organisation of Petroleum Exporting Countries (OPEC) to absorb real goods and services, particularly imported goods and services.[23]

In another paragraph, the authors state that:

> 'The key word in an economic definition of absorptive capacity is EFFECTIVE UTILISATION OF CAPITAL ... As long as the economy is able to generate a rate of return at least equal to an alternative use, the economy has not reached its absorptive capacity'.[24]

Abolfathi's study will come under focus again in the following chapter when we discuss 'Quantitative analysis of Saudi absorptive capacity', but it is relevant to mention here that the main focus of Abolfathi's book was to estimate OPEC imports over the coming decade.

Salah El Serafy's article on absorptive capacity dealt mainly with the supply side of the petroleum market.i,e.,the oil producers countries. In his view, this side 'has remained underanalysed, or still, misrepresented and misunderstood'. This is so because most of the analysis was considered mainly through demand-side spectacles.i,e.,the oil consumers countries. His contribution may be summed up as follows: it is not absorptive capacity that matters any more, but rather it is absorption that has gained the focus in recent literature.

---

23 Farid Abolfathi, Gary Keynon, Leo A. Hazelwood, Robert Crain and Margaret Daly Heyes, The OPEC Market to 1985. Lexington, Mass.: Lexington Books, 1977, p.23.

24 Ibid., p.23.

The difference is that absorptive is defined to mean ,'disposing petroleum earning so as to preclude the emergence of any surplus'. Following such views he primarily defined absorptive capacity as:

> '... the ability of the country concerned to dispose of its petroleum earnings so as to preclude the emergence of any surplus. Here there is no probing of the level of the earnings and whether they could be reduced, and no questions are raised about how indiscriminate the spending. The definition avoids all consideration of the utility - to the petroleum exporters - of the various things they can buy with their revenue. It abstracts from the problem of optimal allocation of expenditures between capital formation and consumption. It ignores the productivity of domestic investment. It avoids considerations of optimal extraction rates either to maximise short-term revenue or long-term returns. It focuses only on a practical aspect of the problem, namely, whether or not imports by these countries can be expanded until the financial surplus is eliminated'.[25]

El Sarafy's role was to reject such popular misconceptions and he proved that the persistence of such misconceptions delayed adjustment, misdirected policies and enhanced conflict rather than fostering interdependence between sellers and buyers. Then he redefined the concept to mean: 'The ability of an economy to absorb capital productively'. In sum this short simple definintion, although adding nothing, put the track on the right path. He also succeeded in discussing the other side of the coin, i.e. the supply side of the petroleum market.

---

25 Salah El Serafy, 'Absorptive Capacity, the demand for revenue and the supply for petroleum'. Journal of Energy and Development, Vol.7, 1981, p.75.

The last and most recent study on absorptive capacity is the joint writings of Mr. Yousefi and Mr. Joy. In their article 'Absorptive Capacity Reconsidered', they argue that most of the previous definitions are inappropriate and defined the concept as follows:

> 'The rate of capital accumulations such that the marginal social costs of investment are equal to marginal social benefits'.[26]

In this section , we have considered the various definitions of absorptive capacity. One may wonder, then, if we could use one of these definitions for the purpose of our study. If so, which one would be the most appropriate? If not, what is the alternative?

The following section will introduce and analyze our proposed definition. Here, we will clarify why all the previous definitions are not suitable for our present study. We will also present our criteria and what arguments which support our approach.

---

26 Yousefi, M. and Joy, J., 'Absorptive Capacity REconsidered'. Rivista Internationale di Science Econo E Commerciali, Vol. 29, 1982, Pt. No.5, pp. 465-476.

3.3.2 Our Proposed Approach:

Our approach for investigating the absorptive capacity of S.Arabia will take into account the following considerations:

1) It incorporates the basic idea that Saudi Arabia has its own special characteristics, and any definition which does not reflect these characteristics will not be suitable for the purpose of our study.

2) The recent changes (in 1973 and 1979) with regard to oil prices and oil-production put S.Arabia in a unique position(petro-doller surpluses), and hence, traditional analysis in defining absorptive capacity as ;'the optimal rate of investment' and the contention that LDC`s are suffering from acute capital shortage does not fit S.Arabia and, therefore, a modern and efficient techniques are required.

3) The new techniques we propose recognize that the Saudi economy has no problem with the supply side i.e., capital accumulation, but rather with the demand side. This needes to be developed, as do,the formation of capital and investment opportunities.

To sum up, we may say, that the Saudi economy, with its unique features represents an interesting development pattern, where the problem is not capital scarcity but capital abundance. We believe that this criterion alone mandates a new development model. But, before we elaborate upon our approach and the arguments which support it , it is necessary to list why the investment approach cannot be tailored to fit our purpose.

1) This approach focuses on the marginal productivity and interest rate concepts . The equilibrium level, and thus, the maximum absorptive capacity, will dictate when investment returns are equal to the price of capital . We reject this analysis on the ground that no interest rate system, or marginal rate of return concepts are applicable when making the investment decision in S.Arabia. These factors will be analyzed and discussed thoroughly when we deal with the investment equations in Chapter 5.

In addition, the analysis assumes that a positive rate of return is surely available , an assumption far from reality in the developing countries.

2) The investment approach assumes a private enterprise economy, where there is a very limited role for the government. This is the opposite situation which perteine in the Kingdom`s economy. In Saudi Arabia the private sector has until very recently played an insignificant role in the economic development process, whereas the government sector, was and still is the leading force in the economy`s progress. Therefore,the application of this approach in the Saudi environment could produce a biased analysis.

3) The investment approach focuses on investing capital resources, and thus, assumes that human investment has been satisfied in the context of developing countries. This state might be relevant to a few developed economies where human investment has been accomplished for many past generations. The situation in LDC`s and specially in S.Arabia,where the question of absorptive capacity is particularly relevant, is just the opposite. These countries suffer from high levels of illiteracy,poor health,malnutrition, a high level of infancy

death, and a low average of life expectancy and so on..., and hence,make human investment a first requirement one prior to any other investments.

4) The demarcation line between what constitutes consumption and what constitutes investment is not easily identified. [27]

Not only that these countries (LDCs) lack social overhead capital, but also the basic means for a proper life style are unsecured.As soon as financial means are made available(through either aid or national resources), authorities find that it is desirable,socially,economically,and politically, to provide such basics especially in the early stages of the development process. To regard their expenditures on food,education, health, and housing as consumption and not investment will limit their absorptive capacity.This is why we see that any model which does not include a consumption function can not reflect the dramatic changes which the oil sector has had on the consumption patterns and behaviours of the different social groups in S.Arabia.Also , we could argue that these factors, in one way or another,have some positive effect on future production. This is not to say that all expenditures on consumption in LDC`s should be regarded as productive spendings ,because vast amounts of money was spent on unproductive channels .

It is our view that any future spending should be based on

---

[27] For more analysis see:

Mirrlees, James A."A Pure Theory Of Underdeveloped Economies" in Llyod G. Reynolds ed. Agriculture in Development Theory. New Haven, Yale University Press,1975. PP.84_106.

rational decisions and should consider the social future returns.

Given these considerations, we will now turn to the task of proposing a realistic and suitable definition for absorptive capacity. As indicated earlier, our definition will take as its base the following special characteristics of S.Arabia:

1) The Saudi economy is a single-based economy. Oil is produced and sold in the international market to exchange for the country`s imports(almost everything is imported from abroad). This means that any sector in the economy is related to fluctuations in oil revenues.While specifying either the consumption equation or formulating the imports equation, oil revenues play a significant, positive role in shaping the characteristics of the economy`s sectors.

2) The government is the sole recipient of the oil revenue, therefore, the government sector, as expected, must play a dominant role in accelerating the development process.

Accordingly,our proposed definitions reads as:

"The ability of the economy to absorb and
utilize oil revenues effectively, within
a given period. Such utilization will be for
the purpose of : total consumption,total
investment and the international trade."

3.4.0 Measurement of Absorptive Capacity:

Having reviewed the above literature on absorptive capacity in general, the message conveyed clearly was the idea that there is an absolute limit to the amount of capital that that can be used productively. Explicitly or implicitly , one feels that the measurement of absorptive capacity must be somewhat related to the effectiveness of capital. In another words, most of the above literature assumes that the major concern of the analyst should be focused on the results of increasing capital investment .

As far as the capital investment and its relation to absorptive capacity is concerned, Adler states that:

> "Absorptive capacity thus becomes a schedule relating an amount of capital to be invested to the expected rate of return.The lower the rate of return on capital which the investor-the economic unit making the investment decision-is willing to accept as satisfactory, the higher the absorptive capacity is.[28]

3.5.0 Absorptive Capacity Constraints

Once we recognise that the problem of limited absorptive capacity rests on the existence of specific bottlenecks, the rational response must be: '<u>How do we break up such bottlenecks?</u>' However, before doing so, the constraints need to be explored and analysed. We found that

---

[28] Adler , <u>op,cit.,</u> <u>p.2.</u>

the constraints fall into four main categories:

1) Demand and market restrictions.

2) Inadequate infrastructure and shortage of complementary factors of production.

3) Planning and implementation constraints.

4) Political, institutional and socio-cultural limitations.

In the following we discuss these categories briefly and separately, but the reader should note that in reality, they are not so distinct.

3.5.1 Demand and Market Restrictions

The reader will have noticed that many researchers distinguish between the supply and the demand side of the problem. For instance, Hirschman[29] and some others contend that absorptive capacity is not exclusively a supply problem and that real demand is an important and significant determinant. This argument implies that capital demand is a derived demand, originated from demand for output. In sum, we may say that for investment to be productive, it must be matched by adequate effective demand.

The fact that sales outlets, both domestic and foreign, are important in this context, is due to the direct relationship between sales and investment opportunities. It is known that productive capital formation is determined by the volume of demand. This means that capital absorption is linked strongly to the size of the market. But many LDC's suffer from demand size, market restrictions and the lack of regional integration to the extent that it would be economically

---

29 Albert O. Hirschman, op. cit., pp.35-36.

inefficient for them to create their own production potential for durable consumer goods, manufactures of raw materials, machinery etc. To tackle this problem we will divide it into (a) domestic demand restrictions and (b) foreign demand restrictions.

(a) Domestic Restrictions: Factors limiting demand relate to the lack of private and public purchasing powers, 'internal economic boundaries' such as high transportation costs, unequal income distribution and unbalanced development. In our case study, the Saudi economy, the lack of private and public purchasing power is not a problem, but what should constantly be borne in mind is the need to transfer adequate amounts of oil revenue to the private sector and for individuals to stimulate domestic effective demand without being inflationary. It is in this context that Nurkse warned that private and public purchasing power must be viewed in real and not in monetary terms.[30] The demand restrictions imposed by an unequal distribution of income and high transport costs are self-explanatory.

An unbalanced development of complementary production process, especially in industries with forward linkages (such as petroleum, iron, paper products, etc.) may have some unfavourable effects by limiting derived demand. The main cause of such a problem is the absence of an improper development strategy in the sectoral and overall economy. To overcome such a problem both public and private sectors need

---

30 Ranger Nurkse, Problems of Capital formation in Under-developed Countries. New York: Oxford University Press, 1962, p.6.

comprehensive planning and better co-ordination.

(b) Foreign Demand Restrictions: Foreign restrictions are generally of a cumbersome nature. The exporting agency, other sectors or government will find less avenues for operational intervention. Because of this and together with their limited domestic markets, they recognise the importance of sales outlets. Accordingly, they have appealed to all industrialized nations, through international organisations to grant them non-reciprocal preferences so as to promote their exports. As another avenue they have also constructed free trade areas and customs unions in an attempt to promote their local markets.

Foreign trade restrictions may take two forms. The first form may be retrictions on the demand side. The second one will be on the supply side. From the demand side tariff and non-tariff barriers could be the tools. Importing countries impose tariffs that increase with the degree of processing, so as to deter the import of more processed goods. However, raw materials are normally subject to low tariffs. Other non-tariff restricting devices are quotas and administrative practices. Exchange rate manipulation and undervalued currencies are well known devices. On the supply side, impediments limiting access to foreign demand are likely to exist when the domestic exporter is a subsidiary of a foreign multinational company and confined only to domestic marketing, specifications on products or confined to a specified trade mark.

3.5.2. Inadequate infrastructure and shortage of complementary factors of production.[31]

Infrastructure refers to economic activities which enhance, either directly or indirectly, output levels of efficiency in production. It is well known that all the essential elements of such an infrastructure are lacking in most LDCs Hence most development economist authors regard the lack of infrastructure facilities as symptoms of transportation, power generation, communications, banking, educational and health facilities and a well-ordered government and political structure. The term was introduced in the early 1950s by NATO in its studies on war mobilization, but afterwards became part of the literature on economic development. 'Social overhead capital' and infrastructure are used synonymously whereas the first is divided into economic and social overhead capital.

A common feature of economic infrastructure is its high initial fixed cost and low variable costs of operation. As its benefits go to many different groups, its value is difficult to measure precisely. It is wrong to apply the normal market investment analysis because of the special circumstances it evolves with. For the purpose of our analyses, this section will be divided into the following sub-sections:

31

For more detailed references please consult: Fiedoreticx, K., Planning of Economic Infrastructure'. Eastern European Economics, Vol. 15 No. 1, Fall, 1977, pp. 48-73; Hirschman, Albert U., The Strategy of Economic Development. Yale University Press, New Haven, Conn., 1958; Kindleberger, Charles and Bruce Herrick, Economic Development, 3rd edition., McGraw-Hill, New York, 1977.

(a): Inadequate Infrastructure.

(b): Inadequate labour supply.

(c): Lack of Entrepreneurial and Managerial Abilities.

(a) Inadequate Infrastructure

In general, we may say that the efficiency schedule of capital shift to the right as infrastructure facilities developed. Although there are many different views regarding this concept there is at least a unanimous acceptance of its necessity. It is regarded as the element which provieds outputs and services necessary to generate higher levels of national output by linking and subsidizing its diverse users. Economic planners have yet to agree about the timing of these facilities. Some have seen it as a precondition of production whereas the more recent school of thought argues that surplus infrastructure does not generally attract investment and may safely be left till later.[32] Lewis, however views rejects both views. He states:

> 'Both generalizations are untrue; it is wrong to let infrastructure lag behind demand, but surplus infrastructure does not possess much power to attract investments. Here, as in other sectors, demand and supply should keep in step.[33]

To have adequate infrastructure facilities always has a cost-reducing effect for a new investment project. This is so because it may affect the investment decisions. Though its

---

32 For more detailed information on the argument and the two theories see W. Arthur Lewis, <u>Development Planning, The Essentials of Economic Policy.</u> London: George Allen and Unwin Ltd., 1966, pp. 97-100.

33 <u>Ibid. p.98.</u>

importance will differ with the scale of the project. For a small project, the lack of infrastructure may inhibit the investment altogether. For example the inability of a group of Belgians to secure the establishment of a timber industry in the south of Chile is an illustration. The lack of a feasibility study determined the failure of the whole project. As did the absence of streams suitable for timber transportation and a suitable and passable roads network. An inadequate supply of raw material can be analysed along the same lines. Classical growth theorists have shown much interest in the issue and detailed analysis of their views is not necessary here. The inadequacy of the supply may be a matter of quantity, quality and price. The viability of production units may be hampered either by technical unsuitability or by irregular, insufficient and unreliable supplies. For instance, the Usak Sugar Plant in Turkey could not survive because of the shortage of sugar beat. But this problem may be soluble as imports may offset the inadequacy as they did in Japan and Switzerland. Both countries have a remarkable record and prove that with proper planning and rational strategy the problem can be confined.

(b) Inadequate Labour Supply

Economists have no doubt that labour supply is a vital constraint to economic planning. The Saudi planning experience in the second development plan (1975-1980) was a clear example. It is not surprising that it required 1,522 million workers to support and implement the Plan.[34] A quick review of

---

34 El Mallakh, R., <u>Saudi Arabia: Rush to Development.</u>
(Footnote continued)

micro-theory demonstrates that untill recently economic theory has failed to focus attention on labour as a heterogeneous input. The existence of structural unemployment in many developed countries, and the inability of many LDC's to achieve a competitive level of productivity has helped to incorporate labour as a heterogeneous input in the production function.

Despite the assumption of either zero or low marginal productivity of labour in most LDC's, unskilled labour can usually be listed in market prices. However,market prices seriously exceed the marginal contribution of labour, a matter that will mislead the analysis. The optimistic theories of the early 1950's , for example of Nurkse and Lewis claiming that redundant labour can be transferred to more productive sectors proves to be ill-based and has been challenged by D. Warriner, T.W.Schultz and G. Harber. Nowadays, there is little empirical evidence supporting the idea that unskilled labour can be moved to another productive sector.

In relation to absorptive capacity, we will now discuss the role of skilled labour in increasing the absorption phenomena. This role can be summed up in the following points. Skilled and expertise labour are required to:

1. Design investment projects, conduct the engineering, economic and financial feasibility studies.
2. Execute the feasibility proved projects.
3. Supervise the manufacturing and clerical tasks.

So we may say that the capacity of an economy to handle modern technology basically depends upon economic attitudes

---

[34] (continued)
Boulder, Colorado: Croom Helm Ltd., 1982, p.183.

such as productivity consciousness, labour discipline, experience and long-term habit.

(c) Lack of Entrepreneurial and Managerial Abilities

If one can see clearly that importance of skilled labour to do the job properly, no doubt it will be about those who are supervising them. Their task will be to take advantage of the investment opportunities, plan and implement capital formation, and operate them profitably. These needs are as urgent as capital needs if not more so, because you may build a dam in 2-3 years, construct a road in 1-2 years but to invest in human resources you need a minimum of 10-15 years to develop managers, engineers and highly skilled administrators.

We have no doubt that in the short run this expertise could be imported but we must recognise that it is very expensive and can be afforded only by large enterprises.

3.5.3. Planning and Implementation Constraints

The basic objective of development planning is to introduce a major structural change in an economy rather than to expand the entity in existence. This rather general rule has to be curved especially in most LDC's to the need for maintaining the social objectives of development.

No one doubts the importance of planning as a media for capital formation. The amount of capital that can be productively invested is, at least in the short run, directly related to the availability of well planned projects ready for immediate execution. But the availability of a project and its successful implementation are two different stories. Planning efforts are hampered by many constraints, the lack of reliable data is only one of them. The major cause is the absence of a competent administrative staff.

Aggregate planning problems are only one side of the coin. Evidence suggests that the mere availability of capital for productive absorption is not constrained by the lack of aggregate plans as much as by the imbalanced execution of these plans. However, from the 1950's - 1970's the World Bank made it conditional that foreign aid was only attainable after the provision of very detailed plans of the economy in question, and hence competition was in its heights. What the World Bank intended to demonstrate was that individual projects seldom stand on their own, but are linked backward and forward with other projects, i .e. the failure to realise key projects may have more effect in limiting absorptive capacity than was initially thought.

The experience in many LDCs shows that certain projects fail to be carried out. The analysis shows that either rewards are generally low or that such projects are replete with difficulties and uncertainties. The successful experiences of Saudi Arabia show that governments should take steps to make their projects look more attractive through local and/or foreign incentives.

To sum up, it is our advice here that all LDC's should concentrate on filling the strategic missing links and prepare detailed projects ready for immediate investment.

3.5.4. Political, Institutional and Socio-cultural Constraints.

It is well known that a stable, honest, sufficient political system will to play a strategic role in transforming liquid money to productive capital formation. Capital,either local or foreign, tends to search for security,and societies which suffer insecurity, disorder, injustice, corruption tend to deteriorate and lose prosperity.

It is a necessity that security is granted for productivity. Corruption does not only constitute an informal system to the cost structure but also leads to the misallocation of scarce resources. Political disorder create more serious effects in society and history has proved that this resulted in much suffering in the developing countries.

Institutional constraints are a major cause limiting absorptive capacity. This factor differs from others in a very unusual way. Its effects are felt throughout the economy and make it difficult for economic units to function with the prospects of adequate rates of return on capital. Adler said:

> 'Inadequate measures to maintain law and order are an example of such institutional limitations. The threat of riots, disorder, banditry or other forms of lawlessness not only limits the absorptive capacity for foreign private investment, it also makes it difficult or impossible for domestic investment to proceed'.[35]

Culture and social constraints are unique in that they are not amenable to technical development and can only be brought into line by the process of development itself. Many development economists regard the cultural and the social systems of developing countries as a constraint. We believe that opposing the system will not work but that using it as a tool will produce fruitful results. Behaviour in such societies is a build-up process. Rejection and unconstructive criticism means only irrational opposition. Resistence in these societies

---

35 Adler, op. cit. p.33.

represents the unwillingness of the population to accept the rigid discipline of an industrial society, a discipline that took the Western world, itself, a long period to accept.

It is very useful to look at two aspects of the this problem:

1) the time dimension of absorptive capacity.

2) Sectoral versus overall absorptive capacity.

3.6.0 The Time Dimension of Absorptive Capacity

It is rather meaningless to discuss absorptive capacity if no reference is made to the length of the absorption period. Time can work either for or against absorptive capacity. The role of time is that it allows for adjustments in factors affecting absorptive capacity. For instance, over a period of time the infrastructure of a society will improve; a situation which might also increase the profitability and feasibility of particular investment projects.

One may also think that in the long run the chances will be greater for favourable changes in political, institutional, cultural, and social factors, i.e. the more time allowed to overcome the lack of co-operant factors - to set-up better plans - the greater the absorptive capacity becomes. But more time may also have negative effects. In some cases absorptive capacity may deteriorate over time. Political disturbance, loss of depleteable resources, international market disturbances, new technology, etc., all may mean lower levels of absorptive capacity. Hence,we may conclude that the time span should be long enough to allow for the necessary shifts in the development process, but not too long to avoid any unfavourable factors.

3.7.0 <u>Sectoral versus Overall Absorptive Capacity</u>[36] Since we are discussing absorptive capacity, it is rational theoretically, to think of it in terms of overall absorptive capacity. However, the economy as a unit contains different sectors, varying in size, input requirements and stages of development. So it is logical to believe that some sectors will have a smaller absorptive capacity than others, and that one sector will have a lower absorptive capacity than the overall economy, i.e. one sector will reach capital saturation limit before the others. This may be so because the absorptive capacity of any specific sector depends, among other things, on the availability of some specific complementary inputs.

The above issues are important and we will return to them when we analyse the absorptive capacity of the Saudi economy in particular.

---

36 For more detailed discussion, see Omair, Saleh Abdulaziz, pp. 157-159. He compares absorptive capacity in the housing with that in the health sector.

3.8.0 Absorptive Capacity and the Oil-based Economies

The theory of absorptive capacity in the developing economies is one of the new areas to which theoretical and econometric analyses are being applied. It is natural that the term has frequently been used vis-a-vis its impact on Western prosperity and security. To support our argument, it is useful to take another point from El Serafy:

> 'Much concern, understandably, has been expressed on behalf of the petroleum buyers and importers over their current accounts deficits, the depressive effect on their economies of their worsened terms of trade, the inflationary impact of energy prices on their prices, and the various related problems'.[37]

Gebelein puts it more frankly. He contends that:

> 'This concept is important for long range oil supply planning in the U.S. and other countries, because production levels in excess of those yielding the maximum revenue that can be spent domestically will depend more on political than on economic decisions by the producing countries'.[38]

The basic problem facing oil exporters such as Saudi Arabia, where oil revenues are in excess of its ability to spend domestically, is normally called the 'absorptive capacity problem'. It is very interesting to notice again that the

---

37 Saleh El Sersfy, op. cit. p. 73.

38 Christopher A. Gebelein, 'Estimation of Saudi Arabian capacity to absorb oil revenues'. Economic and Social Forecasts, Planning and Economics, May, 1974 (Shell Oil Company) p. 1.

definition of domestic absorptive capacity for oil revenues has been the subject of much controversy. It is useful in this sense to give a short description of the cause of the problem. El Mallakh and Kadhim have mentioned that:

> 'In these economies, capital is essentially accumulated outside the national economy proper; it originates in the enclave oil sector with its few and ineffective direct linkages to the rest of the economy. Moreover this huge liquid capital is thrust on a domestic economy characterised by a narrow resource base and structure, precluding the operation of the normal relationship between supply and demand in the capital market'.[39]

Despite the importance of the concept and its possible effect on international economies, few attempts have been made to estimate quantitatively the present and likely future limits to absorptive capacity.[40]

---

39 Ragaei El Mallakh and Mihssen Kadhim, 'Absorptive capacity, surplus funds and regional capital mobility in the Middle East'. Estratto dalla Rivista Internationale di Scienze Economiche e Commerciali, Vol. 14, No. 4, 1977, p.310.

40 The last computer search was done in 1.3.83 with the help of University of Leicester library.

CONCLUSION :

The purpose of this chapter has been to introduce the reader to the concept of absorptive capacity. From our analysis of the literature the following observation can be made:

1) We noticed that the concept suffers confusion,controversy, and unconsious transference into different discplines . As a starting point, the concept grew in popularity during the 1950s as economists sought to define conditions under which foreign aid could be effective in assisting development. Foreign aid was felt to be a helpful infusion of capital, in so far, as co-operant economic and social productive factors of production are secured. The concept was then given a new reference (the optimum rate investment), and defined as: " The rate of investment beyond which any further increment in capital would result in a waste". This new direction continued until the end of the 1970's when oil-boom prices and the vast quantities of capital petro-dollars in oil-producing countries turned the analysis full circle from capital accumulation and demand to capital formation and supply. Within the concept of development , it was then recognized that the abundance of petro-dollars was not the solution and that the mere availability of capital will not, instantly, enable the oil-based economies to join the developed economies club.

2) Within this period(1973-1985), it was noticed that the discussion of absorptive capacity appeared to gain popularity pari passu with the size of financial surpluses. When these surpluses gradually receded in the later half of 1970s, so did

interest in absorptive capacity. In the wake of the Iranian Revolution, and the new wave of price explosions as from 1979-1980, the subject is being reversed and financial surpluses have once again emerged . In the last period 1980-1985, and with the oil- glut and the fall in prices,the discussion on absorptive capacity stagnated.

3) Another aspect related to the dynamics of the topic is the time horizon. Since the development process and productive utilization of revenues require time, time was analyzed and we saw that time has a positive and negative effect. Time must be long enough to allow for necessary shifts , in the development process, but not too long to avoid any unfavourable consequences.

In the next chapter, quantitative studies concerning the S.Arabian absorptive capacity will be investigated ,and the special economic considerations for choosing an appropriate model for absorptive capacity will be examined.

CHAPTER FOUR

QUANTITATIVE ANALYSES OF THE SAUDI ABSORPTIVE CAPACITY

Introduction

The absence of a long-term econometric model, capable of depicting the main forces working in the Saudi economy, is increasingly recognized. We have no doubt that the economy has lagged significantly in developing a model of this type. Therefore, most of the discussion associated with growth policies and development plans has taken a theoretical vacuum format. Modelling is ,"a tool which is used to construct and then test mathematical representations of portions of the real world".[1] The attraction of model building came from the fact that the pursuit of national policy goals requires some sort of logical basis for examining and critically analysing alternatives. The pioneer and only published work in this area is F.S. Al-Bashir's study.
[2]

Others like Hafiz, El-Mallakh, Gebelein and Abolfathi were interested in investigating a specific sector or studying a

---

[1] R.S. Pindyck and D.L. Rubinfeld, Economietric Models and Economic Forecasts New York: McGraw-Hill Book Company, 1981, p.xiii.
[2] F.S. Al-Bashir, A Structural Econometric Model of the Saudi Arabian Economy: 1960-1970 (New York: John Wiley, 1977).

phenomenon rather than analyzing the economy as a whole.

For the purpose of this study, this chapter intends to examine special considerations for choosing an econometric model for the economy of Saudi Arabia. Before we suggest any model, which must be tailored to fit the eco-political and social consideration mentioned in Chapter III, we need to identify and investigate the existing quantitative studies of the Saudi Absorptive capacity. In the course of such analysis, we will study the rationals for different methods, comment on methodology and examine to what extent this suits the Saudi economy. In Section 2, we will review the current ,different methods to measure and analyse the absorptive capacity for an oil economy. Section three analyses and criticises the previous studies on absorptive capacity for Saudi Arabia to asses whether these hypothesis are relevant to Saudi Arabia (especially after 1973).

4.2.0 <u>Alternative Methods for Absorptive Capacity Measurement.</u>

To measure absorptive capacity, there are many different methods. Revisions of these methods will help us understand the rationale for the different estimates of the Saudi absorptive capacity.

These methods are:

1) The standard method.

2) The input-output method.

3) The optimization method.

4) The regression analysis method.

4.2.1. The Standard Method

The economists' yardstick for measuring the absorptive capacity of a country is given by the following formula:[3]

$$AC = Y + M - X + \Delta I$$

where

AC = absorptive capacity

Y = gross national product generated in the economy.

M = level of imports

X = level of exports

ΔI = change in inventory.

Accordingly, the absorptive capacity of any economy at a given point can be calculated by adding the GNP to inventory change, plus imports minus exports.

A similar formula, with minor modification , can also be used :

$$AC = Y^* + C_k + M - X + \Delta I$$

where

Y^* = net national product

C_k = capital consumption.

Although one might be taken by the simplicity of the formula, it has been recognized that this formula fits the developed economies, for example,those of Japan, W. Europe and the U.S.A. This is so because the formula assumes: f(a) free mobility of factors of production and (b) full employment. In addition the formula uses the past to

[3] A. Alchian and W. Allen, University Economics (New York: Wadsworth Publishing Company, 1964) pp. 575-577.
Also see : Alexander Sidney " Effects of a Devaluation on a Trade Balance", IMF Staff Papers, 1952 ,pp:263-278.

forecast the future. Although this is true in any model, what we mean here is that instant and rapid changes occur in oil economics and this makes it a distinct case. This is possible in the developed countries where the economy is more stable. However, the recent and continuous change in energy prices and their effect on future spending potentials cannot be inferred from the past.

4.2.2. The Input-Output (I-O) Method

A new approach can be developed to estimate absorptive capacity in oil-based economies. The proposed method is based on defining absorptive capacity as "the limits of foreign exchange earnings that can be spent on imported goods and services"[4]

This definition uses absorptive capacity as a planning tool where future imports is a function of the effective utilization of current imports. To make this definition operational an input-output table is required. This is so because the volume and composition of intermediate imports is a function of the structure of the economy and inter-industry flows rather than total net output. Oil-based economies, many of which are LDCs, lack the necessary statistics for compiling full input-output tables, and inter-industry flows are quite limited. For this reason we recommend the use of Seers[5]

---

[4] Farid Abolfathi, Gary Keynon, Leo A. Hazelwood, Robert Crain and Margaret Daly Hayes, The OPEC Market to 1985. Lexington, Mass.: Lexington Books, 1977, p.23.

[5] Dudley Seers, "The use of modified input-output system for an economic program in Zambia", in Irma Adelman and Erik (Footnote continued)

input-output tables because we feel it could provide better quality forecasts, and the optimum allocation of resources.

Seers and Prest[6] views evolved in their search for the best statistical policy for LDCs. Their focus was whether statistical resources should be devoted either to national income accounts or to sector (regional) accounts which could be cast into the form of an I-O table. Seers' argument for the sector approach is based on identifying inflation as the most serious problem in LDCs, and he uses the sector approach as a tool to measure its significance. Prest's view is that national accounts is a primary task. To support this he mentioned that the equity question in taxation, and grant distribution were as important as inflation .Now, it is common to use I-O tables for forecasting and

planning purposes. S. Ghatak stated that :

> "...I-O tables are used for comprehensive development planning in many sectors, to find out total output in different sectors, to obtain certain demand targets, the size and direction of inter-industry flows, the amount of imports, and the level of use of different inputs like capital and labour."[7]

It is here that I-O analysis is related to the absorptive

---

[5] (continued)
Thorbecke (eds.) The Theory and the Design of Economic Development. Baltimore: John Hopkins Press, 1966. Also in the same line, see Peacock, A.T. and D. Dosser, "Input-Output analysis in an underdeveloped country", Review of Economic Studies, Vol. XXV, No. 66, July, 1957, pp. 21-24.

[6] Prest, A.R.: "The role of national income estimates in the statistical policy of an underdeveloped area: a comment". Review of Economic Studies, Vol. XXI, No. 61, 1953-54, pp. 223-228.

[7] S. Ghatak, "Development Economics", Longman Group Ltd., London, 1978, pp. 131-132.

capacity concept, i.e. to forecast import requirements. To do so we will follow Professor A.P. Thirlwall's approach.[8]

There are three major steps to be fulfilled before I-O relations can be used practically. The first step is the construction of the I-O Table for imports recording all import transactions. The second stage is to derive the input coefficients, and finally the inversion of the Leontief matrix to obtain the general solution. For the forecasting process we also need to specify the final demand. The exercise is then to answer the question: what will happen to imports and the Balance of Payments (BOP) with a change in final demand?[9]
The following assumption is also made:

1. Exports are assumed to be exogenous. This fits oil economies very well with a single leading export sector; production and prices are determined in the international market through supply and demand forces.
2. Imports are endogenous. Both current intermediate industry imports and changes in import requirements will be calculated as follows. Changes in import requirement = required change in each industry's output x industry import coefficients. This has to be repeated for every industry, and then it is necessary to sum up all import requirements for each industry in every sector.
3. Final demand must be given. Changes in final demand

---

[8] A.P. Thirlwall, Growth and Development, The Macmillan Press Ltd., London, 1983, pp.241-242.
[9] The following discussion drew heavily on A.P. Thirlwall (1983).

could be calculated as follows: Changes in final demand = changes in each component of final demand x import coefficient of final demand.

4. To disaggregate imports into each industry showing which activity they belong to.

When dealing with imports in I-O tables, it is common ,according to this approach to include them into the primary input row. This common practice has the disadvantage of concealing the nature of imports. New methods have to deal with this problem to distinguish between competitive and non-competitive imports. A competitive import is defined as a commodity which is a close substitute for one domestically produced. A non-competitive import is one that has no domestic counterpart. In any case it is possible to calculate the effect of such division through the system of import substitution. If we have the case of competitive imports, each of the column cells have to be adjusted and new related coefficients to be calculated. In the non-competitive imports case, a new column and row must be added to the inter-industry matrix, and the Leontief inverse recalculated to reflect the likely impact.

Hence, we can say, within the context of the definition of absorptive capacity indicated above that ,I-O tables can be used as a vehicle to estimate absorptive capacity.[10] ~~of this~~ Unfortunately, we can't use this method to forecast the Saudi capacity to absorb oil revenues because

[10]For more details about this method see: McHilvray, J. " The Stability of Coefficients in an Irish Inter-Industry Model", Journal of Statistical and Social Inquiry, Society of Ireland, vol.XXI, Part III,1964-65.

no I-O table is available yet. We hope that more research will be directed to construct an I-O table for the Saudi economy. This should help Saudi policy makers to use such tables for the following:

1. It will help economists to gain insights into the structure of the economy, how the economy is working, future potentials, and to focus attention on key issues of policy.
2. It will be a forecast sheet for the government budget and the balance of payment activities.
3. I-O models are the only way to insure consistency between the expansion programs in the various sectors. This tool is excellent means of blending the sectors policies, final demand and the government policies to endogenous and exogenous factors.
4. It would then be interesting to compare the results of all the different methods using the same data.

This method might be criticized because it assumed full employment. This is not the case in the Saudi economy.

Finally, this method requires detailed data for many different variables, as is the case in many developing countries, such data is either not available or is inconsistent. Now that we have analysed this approach, and recognized that many LDCs might not be able to utilize it due to the data requirement, we think that the optimization approach with its minimal data requirement may be more appropriate.

4.2.3. The Optimization Method

Economics by large is a science of choice. It is the choice of a state of equilibrium, a state of optimum position for a given economic unit. When applying this concept in either macro or micro economics, there are usually a number of alternative ways to accomplish it. However, one of these alternatives will be more desirable than other from the standpoint of the same criterion, and it will be called the best alternative available. The best criteria is called the maximum. As an example ,the researcher may want to maximize the firms profits, or the consumer utility, or the rate of growth of a specific country, or the government expenditures, etc.

This method for estimating the absorptive capacity of a country in a specific year is a straightforward maximization problem.[11] All the researcher has to do is to maximize government expenditure on <u>economic</u> <u>services</u> for a specific year. This should construct what is called the objective function. For countries with sparse populations, like Saudi Arabia, the main constraint is labour force availability. Then another maximization of the government expenditure on <u>general</u> <u>services</u> is conducted. Finally government expenditure on <u>community</u> <u>services</u> is maximized. By adding the results from these three sectors, total government expenditure, or absorptive capacity, is obtained.

The reader may by now be guessing the basic definition of this method. Azzam defines absorptive capacity here as:

---

[11]This method was proposed by H.T. Azzam, "The Middle Eastern oil exporting countries: absorptive capacity, market sharing and investment strategies". Ph.D. dissertation, University of Southern California, 1976, pp. 81-112.

> "...The maximum annual of government expenditure on domestic investment and consumption channels that can possibly be executed given the constraints on the availability of manpower, less any non-oil revenues."[12]

To clarify his method , he divided the economy into three sectors:

1) general service sector;

2) economic sector;

3) social and community service sector.

Each sector includes sub-sectors. As an example, let us take the general service sector. This sector includes defense, police and administration. It is through these sub-sectors that the government channels oil revenues. hence, an equation should be constructed for each sub-sector. Upon aggregating government expenditure in each of the sub-sectors, we get the government expenditure in one sector. Then adding this to all others, we obtain the absorptive capacity of the economy for the specific year.

The major criticism of this method, we believe, is that it excludes the role of the private sector. This could produce a biased result in the aggregate size of the Saudi absorptive capacity. A second and more important point is that this method ignores foreign aid. In the Saudi economy, The share of foreign aid in total government expenditure was equal to 14.00 per cent of its GNP in 1977.[13]

This ratio is expected to decline to only 5.00 per cent in

---

[12] Azzam, op,cit.

[13] "Foreign Aid", Middle East Economic Digest, August, 1978, p.67.

1985. It is clear, therefore, that the absence of foreign aid in the analysis would introduce some bias.

4.2.4. Regression Analysis Method

Regression analysis is a set of statistical techniques to quantify the relationships between two or more variables. Its purpose is to predict, forecast or simply statistical inference of the strength of the variables in question.

The regression equation fitted to historical data is the basic means to forecast the absorptive capacity of any economy.The techniques are the same whether the choice is to forecast the absorptive capacity of the entire economy or its different sectors. In selecting any particular equation the following are necessary:

1. The equations must fit the historical data, otherwise the coefficients will not be suitable for forecasting.[14]

2. The equations must be capable of capturing the effects of government spending to promote development.

3. The equations should constitute a set of behavioural equations that can describe the overall economic activity under different spending levels and/or patterns.

---

[14]What is meant here is if we are using ordinary least squares (OLS) with a linear functional form, and our historical data represent a different statistical form, i.e. "reciprocal, log or semi-log" our tool will not be suitable for forecasting.

Regression equations can be estimated by different techniques, depending upon the purpose of the researcher. The method is either using single equation or simultaneous equations. In the single equation we have "the classical least square" or the "generalized least square". For the simultaneous equations we have two and /or three stage least square and either limited or full information maximum likelihood. The researcher also has two choices in working with regression analysis. He can construct either a macro or a micro econometric model.

4.3.0. Summary of the existing quantitative studies of the Saudi Absorptive Capacity

Although the literature is replete with qualitative analyses of the absorptive problem, there have been few attempts to forecast the Saudi Absorptive capacity quantitatively. What is astonishing is that these estimates vary markedly across the studies.

The following quantitative studies of Saudi aborptive capacity came to our attention. In the following pages, each is analysed, criticized and commented upon. These studies will be dealt with in chronological order. They are:

1) A U.S. Department of Commerce Study, reported in the National Journal Reports entitled "Petro dollar surpluses as a problem for the monetary system, U.S. energy crisis". written by Frank V. Fowlkes (August, 18, 1973).

2) A study by Royal Dutch/Shell. This was an internal

study entitled 'Production at Risk' (September 6, 1973). This study is not available. The summary reported here is available in Gebelein's study, "Estimation of Saudi Arabian capacity to absorb oil revenues" (May, 1974).[15]

3) An analysis contained in a testimony by Thomas R. Stauffer of Harvard, before the Joint Economic Committee of the U.S. Congress (November 6, 1978).

4) A study by C.A. Gebelein of Shell Oil Company, entitled '<u>Estimation of Saudi Arabian capacity to absorb oil revenues</u>'. A Shell Oil Company Study (May, 1974).

5) A thesis by Henry Toufic Azzam, 'The Middle Eastern Oil Exporting Countries: absorptive capacity, market sharing and investment sharing". Ph.D. dissertation, University of Southern California (June, 1976).

6) A study by R. El-Mallakh and others, entitled "Domestic absorptive capacity of the oil producers", reported in <u>Capital investment in the Middle East: the use of surplus funds for regional development</u> (December, 1976).

7) Another study of El-Mallakh and Kadhim, entitled "Absorptive capacity surplus funds and regional capital mobility in the Middle East", <u>Estratto dalla Rivista Interantionale di Scienze Economiche e Commerciali</u> Vol.24, No.4 (1977).

8) A study by Farid Abolfathi and others, entitled "The OPEC Market to 1985", Chapter 13 and Appendix B

---

[15] Please note that both studies (2+4) are classified documents and as such are not available.

(1977).

9) A study by the Financial Times, entitled "Saudi Arabia" reported in 'Middles East Annual Review', Special Edition (1979).

4.3.1.'Petro Dollar' Surpluses: Boom as Problem for Monetary System, U.S. Energy Crisis (18.8.73)

This trade report was the pioneer study of the Saudi absorptive capacity. Its real purpose was not to forecast absorptive capacity, but to report on a hot issue at that time (18 August, 1973) i.e.,- what the Arbs are going to do with their petro-dollar surpluses? [16]The basic idea of the report and of others was the worry of the effects of the petro dollar surpluses. This report was another example of focusing on the demand side of the petroleum market, i.e. the petroleum buyers and importers concern over their current account deficits, and the depressive effect on international trade, etc. What distinguished this report was its claim that unexpected revenues mounted to $50 billion annually by 1980 will be enough to buy all the stock of General Motor Corp. ($23 billion) and the Ford Company ($8 billion) or more [17]simply that the Arabs are taking over the American industry.

Mr. Frank V. Fowlkes began his analysis assuming that

---

[16]Similar reports and articles that discuss the same idea are:
(1) Pollack, Gerald A., "The economic consequences of the energy crisis", foreign Affairs, Vol. 52, No.3, (April, 1972, pp. 452-471).

(2) Little, I.M.D. and Mabro, R.E., "Coping with the Arab billions", The Financial Times, December 27, 1973, p.21.

(3) Hirsch, F. and Oppenheimer, P., "Selling Gold to the Arbas", The Financial Times, January 15, 1974, p.13.

(4) Mabro, R. and Monroe, E., "Arab wealth from oil: Problems of its investment. International Affairs, Volume 50, January, 1974, pp.15-27.

[17]National Journal Report, August 18, 1973, p.1211.

"oil revenues" over the next decade would yield the exporting countries far more revenue than they could absorb effectively. This would create large payment imbalances and would impose a severe strain on the international monetary system. Consequently, there would be the threat of take-over of major U.S. industries by the oil-exporting countries. [18]Though interviews and discussion of this problem in two major groups emerged. The first one contends that the petro-dollar problem will never develop, because the producers, either for political or economic reasons, will hold production at current levels and thus avoid major reserve accumulations. A more widely held view is that the problem can only be resolved by persuading oil-exporting countries to reinvest their surplus funds in the deficit developed countries in the form of direct portfolio investment. It was feared that although the U.S. would get a substantial share but some might go to the Euro-dollar bonds in some Western European countries.

The scope of the problem, in the view of the Department of Commerces' studies was that there was a strong correlation between the size of the balance of payments surpluses in the oil-exporting countries and the petro-dollar problem. These surpluses are the result of:

1. The volume of oil exports.
2. The price of exported oil.
3. The absorptive capacity of the oil-exporting countries.

To put the figures right the Department of Commerce

---

[18]For response to this claim, please see: Nan, M.S. "Putting the record straight", OPEC Bulletin, July, 1983, p.1. Plaza, Gonzalo, "Camping against OPEC", OPEC Bulletin, May, 1983, p.1.

interviewed individuals and agencies to find out:

-What will the volume of US oil imports be by 1980?

-What will the price of the imported oil be?

-What will the volume of future US deficits be?

The findings of the Department of Commerce study are as follows:

The Department of Commerce restimated that the unexpanded revenues of the producing countries could exceed $50 billion annually by 1980. In its report, it constructed a table based on a projection made by the former (1972-1973) Commerce Secretary, Peter G. Peterson and his staff (see Table 4.1) as a proof for their argument, i.e. that the petro-dollar was a problem for the monetary system.

Table 4.1: Peterson projection of Saudi absorptive capacity*

Population	5.6 million
1980 oil revenues	28 billion
Imports**	3-4 billion
Military expenditures**	1.0 billion
Foreign Aid**	2-3 billion
Surplus Revenues	21 billion
Cumulative surplus**	
Revenues, including 5% interest on receipts (1973-1980)	90 billion

Source:Petro Dollar Surpluses, op, cit., 4.3.1.a Critique and comments

Despite the fact that the Department of Commerce did not report its methodology for forecasting absorptive capacity, it is our feeling that the cost of imports, military expenditure and foreign aid were used as a measure of absorptive capacity for oil revenue. We think that the simpler form of our proposed optimization method would have been better. However, Peterson added the foreign factor which we think is important.

The scenario that the forecast represented either to surpluses or reserves never materialized in the way it was predicted. Peterson estimated in May 1973 that by May 1980 the oil-exporting countries surpluses would be $100-300 billion, indeed by 1980 the oil-exporting countries surpluses were $111 billion just about the lower limit of his prediction, but by 1981 it was $53.4 billion, in 1982, it declined to $-12 billion, to $-16.2 billion in 1983 and to $-8.0 in 1984. So we might say that the commission of the oil wealth is not valid, not any more.

Price projections for oil imports are quite difficult to estimate. The report said that government and industry exports suggested a price range of $4-7 a barrel by 1980. This is clearly much less than the actual 1980 prices of $29-32, but indeed as mentioned above oil prices have fluctuated continuously with +70% increase between 1979-84.

---

[19] IMF, International Financial Statistics, volume 35, 1982,
(Footnote continued)

[19]However, afterwards, and with the market glut prices tended to stabilize. The danger here is that miscalculating oil prices tends to affect oil revenues, reserves and imports (absorptive capacity). It is quite clear here that the forecast was not successful.

Forecasting the volume of oil-exports was another major short fall in the forecast. The projection of 20 million barrels per day(mbd) by 1980 for Saudi Arabia alone was a much inflated figure. Understandably the volume of oil exports is affected by many economic and political factors. The actual volume of oil exports by 1980 was 9.5 mbd. so only 47.5% of the forecast was realized by 1980.

In contrast to most other oil-exporting developing countries, Saudi Arabia increased its oil production in 1980 by 5.50 per cent. In 1972 it had risen to 14.50 per cent , but by 1982 the production declined to 6.47 million of barrels per day.

Peterson's projections of surplus funds for 1980 were $21.00 billion, but the actual Saudi account surplus was $34.00 billion. The effects of oil export fluctuations are clearly seen here with $11.00 billion as current account surplus in 1979. However, by 1981, the current account was in deficit by $-4.3 billion, and increased up to $-4.7 billion in 1982. [20]It is our expectation that the 1984-1985 current account deficit will be worsened due to the reduction in the OPEC oil ceiling.

---

[19](continued)
p.58.

[20]General Agreement for International Trade and Tariffs (GATT). International Trade 1980, 1981, p.168 and 1982/3, p. 153.

[21] As it is concerned with absorptive capacity, this study estimated Saudi absorptive capacity to be $6-8 billion. However, actual government spending for imports, defense, and foreign aid reached $116.0 billion. The reason for this huge difference was due to special economic and political conditions that affected oil prices and production and caused the abnormal boost to the economy.

In summary, the main concern of this report was the effect of oil price increases on the U.S.A. and Western economies. The report did not indicate its methodology in measuring absorptive capacity. the projections of oil exports volumes, prices, surpluses and absorptive capacity did not materialize due to the continuous fluctuations in oil prices. The complex nature of the oil supply and the economic-politic nature of Saudi Arabia cause many variables to change.

---

[21]On 29.10.84, OPEC oil ministers decided to lower "the production oil ceiling from 17.5 million barrels per day (mbd) to 16.00 mbd. This no doubt will affect the members' shares of productions.

4.3.2. "Production at Risk" Royal Dutch/Shell Study, September 6, 1973 [22]Gebelein found that: "The Shell Study is based on a premise of maintaining an equilibrium in the Saudi balance of trade plus a 'manageable' surplus". [23]More precisely, the Shell study defined absorptive capacity as the "sum of government expenditure on imports for that year plus an equal amount as a manageable surplus". [24]To determine the level of imports they assumed a maximum reasonable growth rate for real GNP in the non-oil sector and a maximum income elasticity of imports of 1.5 (see Table 4.2).

Table 4.2 Absorptive capacity - Shell estimates in billions of 1974 U.S. Dollars

Revenue Needs	1976	1980
Imports	3.3	7.3
Managable Surplus	3.3	7.3
Absorptive capacity	6.6	14.6

Source:Gebelein , op, cit., p.2

[22]This study was not available, because it was classified document , not for general use, so Gebelein's analysis of the Shell Study was used here. This was the only way to include the study in our analysis.

[23]C. A. Gebelein (Shell Oil Company), Estimation of Saudi Arabian capacity to absorb oil revenues, a Shell Oil Company Study May, 1974, p.2.

[24]Ibid., p.2.

Due to the fact that this study was a classified document, we used Gebelein's critique here.

> "The principal criticism of the approach used in this study is that the forecast of maximum import levels is based on a single, highly aggregated variable namely, the income elasticity of imports. This variables is determined by a host of factors related to consumers' attitudes, manpower and resource availabilities in the Saudi economy, the institutional and administrative constraints on the spending of oil revenues. The relationship between these factors and the income elasticity of imports is very complex. In addition there is a large degree of uncertainty about the future status of these factors. Hence credible forecasts of the single variable, income elasticity of imports, are very difficult to make without analyzing these underlying factors".[25]

We also could add one more point to Gebelein's critique and that is that Shell forecasted that the absorptive capacity would be 14.6 billion dollars for 1980. However, actual government expenditure on imports alone was 100.3 billion dollars, much higher than the forecasted value. As we said above, economic and political considerations caused that forecast to be unrealistic.

---

[25] *Ibid.,* p.2.

4.3.3. Thomas Stauffer's study (november 6, 1973)

It is our feeling that Stauffer's study has turned the focus of economic analysis full circle. Previous studies have concentrated on capital accumulation and supply, but following this study entitled "Energy Imports and the U.S. Balance of Payments", the focus turned to capital formation, demand and investment opportunities in the process of economic growth. Mr. Stauffer said:

> "There are a number of serious drawbacks from their point of view to creating these surpluses. And I think that the question which we in the consuming countries must ask ourselves now is: what compensating benefits can we offer to induce them to produce rather than to invest in the oil in the ground?"[26]

Stauffer's report before the Joint Economic Committee of the U.S. Congress focused on the following issues:

1) Forecasting dollar deficits in the oil account.
2) Financial absorptive capacity of the oil-exporting countries.
3) Financial security of the oil-exporting countries' portfolio investments.
4) Desirability of oil-exporters' investments as counterflows to oil imports.

For our analysis, the second point seems to be the most relevant. Stauffer started his discussion by analysing the question of petro-dollar surpluses. He thought that this is a secondary issue and that the main important question is, "whether these countries will be willing to produce oil

---

[26] An analysis by Thomas R. Stauffer before the Joint Economic Committee, November 6, 1973, p.13.

and generate financial reserves well in excess of their foreseeable needs". [27] In reviewing Stauffer's analysis, we can use the following forecast.

Table 4.3: Stauffer's forecast of financial absorptive level - (1973-1975 and in $million)

Years	1973-1975
Population	5 million
Total imports (absorptive capacity)	850X 5m = $4.25 billion
Imports (amount per capita)	$850 annually
Surplus revenue	$8.25 billion

m: population by million.

Source: Thomas R.Stauffer , op,cit., p.13

From the above table, we see that his methodology was calculating total government expenditures on imports. However, he added a very interesting element: he used the Kuwaiti experience with oil surpluses as an analogy for determining the Saudi absorptive capacity. He noted that the Kuwaitis were unable to increase their per capita annual expenditure on imports beyond $850 in the 1965-1970 period.

Although we agree with such an analogy, but we think that there is some basic differences which would make the Kuwaiti experience completely biased. These are the

[27] Ibid., p. 17.

population factor, area size, the fact that Saudi Arabia needs the basic infrastructure for development, and Saudi Arabia as Holy Land with two holy cities made it the direction for help and support. Stauffer then listed some constraints that would restrain absorptive capacity in Saudi Arabia (these co-factor determinants will not be repeated here). The interested reader is referred back to Chapter Three.

In summary,one should not expect more when we read Stauffer saying "while I can't offer any precise estimates, several rough measures indicate this effect" [28]so the estimate were general rough measures depended on Kuwaitis estimates. The oil production estimate was inflated (20 mbd) by 1970, the price level was difficult to predict, hence it is needless to say much about the absorptive capacity figure.

The use of the Kuwaiti model seems to be proper, provided the analyst makes the necessary qualification. We think that the data problem may encourage Mr. Stauffer to use the Kuwaiti figures.

---

[28]<u>Ibid.,</u> p. 17.

4.3.4 Christopher A. Gebelein's study, "Estimation of Saudi Arabian Capacity to Absorb Oil Revenues" (May 1974) [1]

Gebelein' study can be regarded as the most comprehensive analysis of the Saudi absorptive capacity. His dissatisfaction with the definitions and methodologies, then used in the literature, encouraged him to review the problem, produce a new definition, and forecast Saudi absorptive capacity through to 1990. His study was divided into five parts. In part one, he reviewed previous studies. In part two he presented a new definition, and described its key determinants. The methodology and general structure of the model was presented in part three. Part four, described the economic model he used to forecast the Saudi absorptive capacity. Finally, estimates of the maximum Saudi absorptive capacity and modifications, due to practical constraints, were presented in part five.

The purpose of this study was to gain a quantitative understanding of the important parameters that are likely to influence the magnitude of oil revenues that could be

---

[1] The study by Gebelein has appeared in different forms. The original form, we reviewed in this section, and the most detailed study is the one contained in Estimation of Saudi Arabian Capacity to absorb Oil Revenues (Economic and Social Forecasts, Planning and Economics, Shell Oil Company, May, 1974). The study then appeared again in an abridged form [but extended to cover some other oil-producing Arab countries (Iraq and Iran)] in Forecasting Absorptive Capacity for Oil Revenues: Practical Techniques for Policy Analysis; A paper presented to the Annual Meeting of the Western Economic Association, San Diego California, June 1975. Then it was subsequently published in El-Mallakh and McGuire, C. (eds) U.S. and World Energy Resources, ICEED, Boulder, Colorado, 1977, under the same title

absorbed domestically by the Saudis over the period 1974-1990. To accomplish this purpose, he had to redefine the concept of absorptive capacity:

> "The domestic absorptive capacity for oil revenues is defined as the maximum annual level of government current and capital spending possible, subject to constraints on the availability of skilled labour, knowledge of natural resources and technology, management and entrepreneural experience, institutional capabilities, and social and cultural factors."[2]

The focus of the above definition was to confine absorptive capacity in terms of total expenditures by the Saudi's Government and try, as much as data would permit, to identify the factors which limit the growth of these expenditures and quantify them.

Gebelein's methodology was the classical case of maximizing the objective function subject to a set of constraints. The objective function is the total expenditures identified which is a summation of the different expenditure categories of the government. The constraints, in the model are (a) skilled labour (b) technical knowledge (c) managerial and entrepreneurial expertise (d) adequate financial and planning institutions and (e) socio-cultural and political factors.

To apply the above methodology, the channels to which oil-revenues are to be directed must be identified. He chooses to define three types:

1) Domestic spending: this contains current expenditure on administration, health and infrastructure.
2) Defense spending: this type includes military personnel

---

[2]Gebelein (1974) <u>op.cit.</u> p.6.

spending, supplies and arms spending.

3) Oil participation costs which contain expenditures for acquiring participation shares and final full ownership of oil and gas production.

To implement the above definition within the assigned methodology, the following model was proposed.

$$AC = G_a + I_i + G_d + I_d + P_r \qquad (1)$$

where

AC = government absorptive capacity

G_a = current expenditures on administration, education and health

I_i = capital expenditures on infrastructure (roads, schools, hospitals...etc)

G_d = defense current expenditure

I_d = capital expenditure on arms

P_r = payments to oil companies for acquiring participation shares.

There are two important provisions:

(a) Unless otherwise specified, all variables in the equation correspond to a particular year in the forecast period.

(b) All money variables are expressed in millions of U.S. dollars.

Equation One can be rewritten to highlight the fixed and variable components.

$$AC = G_a + I_i + \text{fixed components} \qquad (2)$$

The fixed component estimation was manipulated in a different section. The procedure for estimating the variables components (G_a and I_i), subject to the availability of labour $\hat{L}$ will be stated as:

Max AC

subject to:

$$L_a + L_i < \hat{L} \qquad (3)$$

where L_a = labour employed in public administration, education and health

L_i = labour in infrastructures projects.

The above paragraph presents the main point in the Gebelein model. To use the model, the author has to make numerous assumptions and detailed calculations for many variables. [3]

Due to the lack of data on labour in Saudi Arabia, the author proposed the use of Kuwaiti labour data as a proxy for the Saudi case. In doing so he recognised the similarities and the differences and proposed solutions to justify his choice. However, this proposed solutions seem to be unacceptable in the Saudi case due to differences in the composition of the labour forces in each country.

To simplify his approach, Gebelein suggested a schematical model to represent the overall process of absorbing the oil-revenues. The following figure (4.1) sketches Gebelein's plan.

---

[3] To review the complete model, refer to: Gebelein, 1974 op.cit., p.14-35.

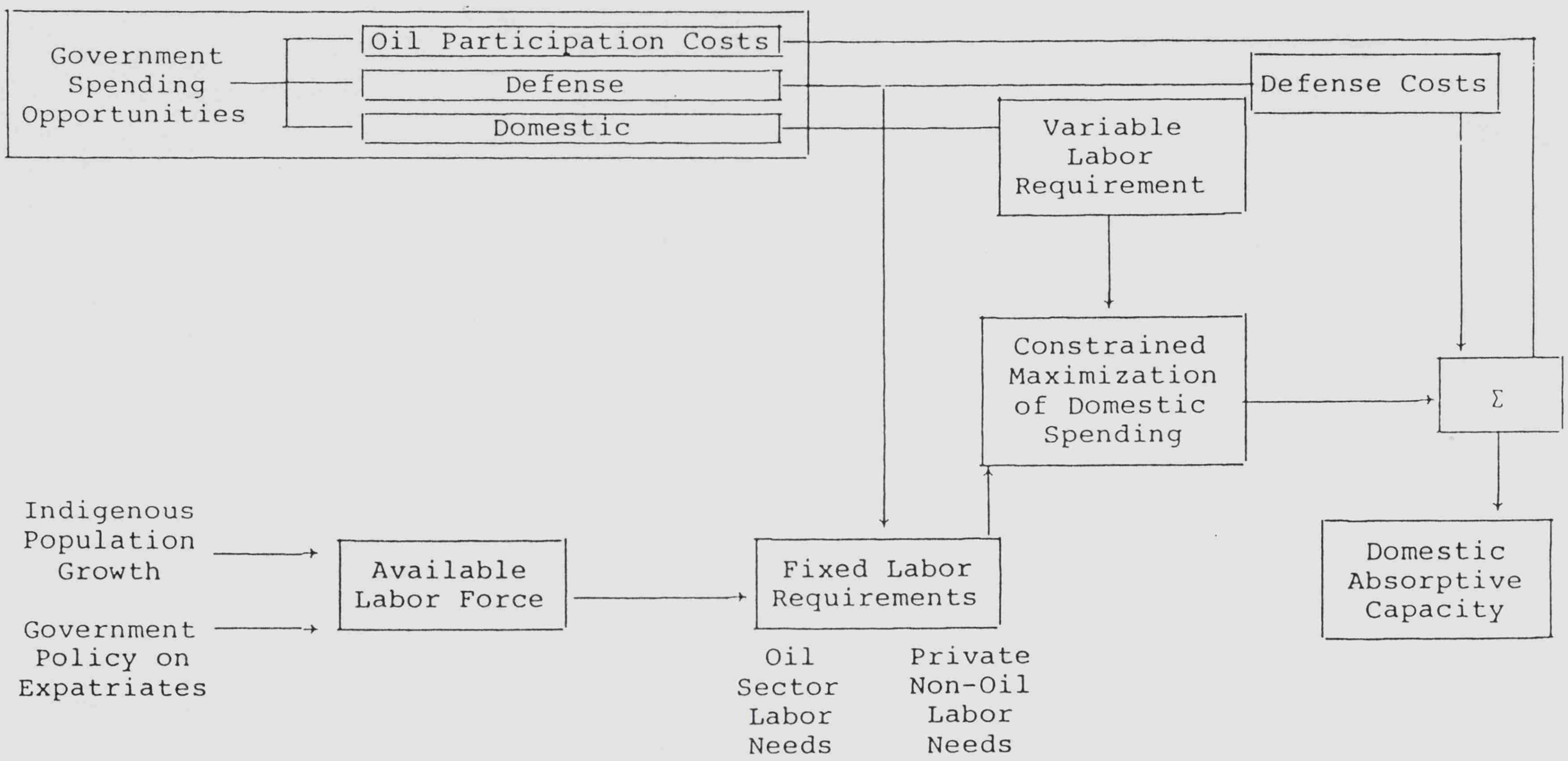


Figure 4.1. Method for estimating domestic absorptive capacity (from Christopher A. Gebelein (Shell Oil Company), "Estimation of Saudi Arabian Capacity to Absorb Oil Revenues," A Shell Oil Company Study (May 1974).

Applying the above system (formula 1,2,3) to each year from 1970 through 1990 yielded the estimates of absorptive capacity which are depicted in table (4.4).

As the Table (4.4) below shows , it is clear that the absorptive capacity of the Saudi economy will increase more than five fold from 1980-1990.

Table 4.4. Domestic Absorptive Capacity of Saudi Arabia, 1974-1990

Year	Current Administrative	Current Defense	Infrastructure	Arms	Participation	Absorptive Capacity	
						Dollar	Index
Millions of 1970 Dollars							
1974	614	418	3,088	416	700	5,236	100.0
1975	682	496	3,396	422	140	5,156	98.5
1980	943	1,010	9,834	594	100	12,481	238.4
1985	1,304	1,805	14,769	700	0	18,577	354.8
1990	1,804	3,256	22,931	832	0	28,822	550.5
Millions of 1974 Dollars							
1974	836	569	4,201	566	952	7,124	100.0
1975	1,002	729	4,990	650	206	7,576	106.3
1980	2,036	2,181	21,231	1,282	216	26,946	378.2
1985	4,137	5,727	46,849	2,219	0	28,931	827.2
1990	8,407	15,175	106,881	3,876	0	134,339	1885.7

SOURCES: Tables IX and X of Christopher A. Gebelein (Shell Oil Company), "Estimation of Saudi Arabian Capacity to Absorb Oil Revenues," A Shell Oil Company Study (May 1974), pp. 32, 33. R. El Mallakh, Saudi Arabia: Rush to Development (Boulder, Colo.: International Research Center for Energy and Economic Development, 1980), Appendix, p. 21 (forthcoming).

4.3.4.a Critique and comments

Despite Gebelein's comprehensive effort, we have much doubt in his results. This is due to the unnecessary sophistication of his model and its unrealistic assumptions. There is no doubt that the study was a brilliant mathematical exercise but it is of limited actual use.

The application of Kuwaiti data and the use of U.S. sources to estimate defense expenditure seems inappropriate. We found it hard to accept his argument for the use of the Kuwaiti data, due to the huge expatriate labour size in Kuwait (over 70.00 per cent). This was supported by his tests of the sensitivity analysis of many parameters used in forecasting the Saudi absorptive capacity.[4]

However, we have no doubt that Gebelein presented a useful document that reviewed the literature, proposed new definitions, identified the absorptive capacity constraints, and more importantly suggested a new approach. It is also ,interesting to notice his emphasis on participation costs, due to his link with oil companies (Shell), and his projections about the infrastructure development in the Saudi economy.

Finally, it is worth noting that the study has neglected the role played by the private sector in increasing the absorptive capacity of the economy, or the direct impact which oil revenues might have on this sector (in consumption and investment) since no variable for the private sector is

---

[4]See Gebelein, 1974, op,cit .,Index, pp. 56-59.

explicitly included in the model. Also no one could ignore the impact of the foreign sector, and in particular imports in the case of Saudi Arabia on the overall performance of the economy. Unfortunately, no variable for imports is included in Gebelein's suggested model. For the above reasons we can conclude that this model will not fit the Saudi's case and therefore it is refuted.

4.3.5 The Middle Eastern Oil Exporting Countries: Absorptive Capacity, Market Shareing, and Investment Strategies. June 1976

The focus of this research study is the formulation of an optimal price, market sharing, and investment strategy for the Middle Eastern oil exporting countries (Saudi Arabia, Kuwait, and Libya) through the planning period 1976-1985. In formulating this strategy, the various factors believed to affect the future oil policies of OPEC members were taken into account. These include future prices and prospects of alternative energy resources, the domestic absorptive capacity of oil revenues in the different oil exporting countries, the size of oil reserve, the different future discount rates of OPEC members, the structure of the western world's demand for oil, and the profitability of the different channels available for investing the surplus of oil revenues.

As we stated above (in section 4.2.3) , Azzam study represents another approach for forecasting the abosptive capacity. In his revision, he criticized the ambiguity of the real meaning of "effectively utilized" a term that has been used exessively in defining absorptive capacity. Then he took it upon himself to clarify this and concluded that if the standard of living in any country is raised, then it may be possible to say that oil revenues have been used effectively.[5]

According to Azzam's study, the domestic absorptive capacity for oil revenues is defined as "the maximum annual level of government expenditure on domestic investment and consumption channels that can possibly be executed given the constraints on the availability of manpower, less any non-oil revenues". 6

Azzam listed the various categories of Government expenditure to which oil revenues could be channeled as follows:

1. General sources: these include government expenditure on administration, defense and police.
2. Social and community sources: These cover public expenditure on education, health, labour and social affairs.
3. Economic sources:These include government expenditures on development projects in agriculture, industry, public works, transport, communication, and commerce.

Since this approach is basically concerned with domestic expenditures to which oil revenues can be channeled, expenditure on real and financial assets in the rest of the

---

[5] Azzam, H.T., "The Middle Eastern Oil Exporting Countries: Absorptive Capacity, Market Sharing, and Investment Strategies" (Ph.D dissertation, University of Southern California, June 1976), p.67.

[6] ibid, p.84

world, together with aid given to the developing countries are excluded.

The procedure for estimating the domestic absorptive capacity of a country in a given year is the maximization of government expenditures in that year on economic services subject to constraints on the availability of labor, and consistent with the planned growth targets, plus the projected government expenditures on general services plus its expenditure on social and community services (i.e., sectors 1 to 5). The following maximization problem was solved for each year of the planning period 1976-1985;

$$\text{Max}_{li} \frac{92.8+.25[2.693L_1+22.104L_2+12.183L_3+32.200L_4+14.530L_5]}{(1+0.02)^t} \quad \text{subject to} \quad L_1+L_2+L_3+L_4+L_5 < 775(1+0.03)^t$$

and

$$L1 \leq 0 \; \forall i=1, \ldots, 5$$

where t=0 correspnds to the base year 1966.

L_1 : government expenditure on agriculture.

L_2 : government expenditure on manufacturing and mining.

L_3 : government expenditure on construction.

L_4 : government expenditure on transportation, communication and public word.

L_5 : government expenditure on commerce.

Table 4.5 Estimated Domestic Absorptive Capacity of Saudi Arabia, Through 1985

(millions of S.R. in constant 1974 prices)

Year	(1)	(2)	(3)	(4)
1976	10,199	3,652	15,705	29,556
1977	10,913	3,908	16,801	31,622
1978	11,678	4,181	17,977	33,836
1979	12,495	4,473	19,237	36,205
1980	13,369	4,787	20,584	38,740
1981	14,306	4,122	22,022	41,450
1982	15,307	5,480	23,565	44,352
1983	16,379	5,864	25,212	47,455
1984	17,525	6,275	26,974	50,774
1985	18,752	6,714	28,862	54,328

Source: Azzam, ibid. p.99.

4.3.5.a Comments and critique

1. In estimating absorptive capacity, the study excluded the role of the private sector (p.84) a role that is modest now, but will increase over time, and a role that contributes to the formation of a "middle-income class" through its services.

2. The study also excludes a significant part of foreign aid spent by the Saudi's government to support some Arab countries, and other institutions. This aid represented about 14% of Saudi GDP in recent years (1980).

3. The suggested equation (Max_{ti}) seems to be unclear, since

he did not specify how he obtained the numbers underlined in the above mentioned equation, nor were any clues provided as to their source.

However we believe that this study in spite of these critiques has contributed fairly well to the stream of thinking regarding the concept and its application.

4.3.6. El-Mallakh's studies

R. El-Mallakh is regarded as one of the few economists who has a keen interest in the concept of absorptive capacity.We intend to examine two studies which he conducted in 1976 and 1977 respectively.[7]

4.3.6.a The first study (1976)

In this study, the authors used the concept of absorptive capacity as a tool for analyzing the role of investment in regional development. They applied Adler definition to provide[8]

---

[7] El-Mallakh has presented four studies. As mentioned above, the first two were for a group of countries, they are:

i) El-Mallakh, R. and others, Capital Investment in the Middle East: The use of surplus funds for regional development, 1976.

ii) El-Mallakh, R. and Kadhim, M. "Absorptive capacity, surplus funds, and regional capital mobility in the Middle East", Estratto dalla Rivisita Intrnazionale di Scienz Economiche e Commerciali, Vol. 24, No. 4 (1977).

The last two studies took a regional form and they are:

iii) El-Mallakh, R. and Atta, J. The Absorptive Capacity of Kuwait, Lexington, Massachusetts, Lexington Books, 1981.

iv) El-Mallakh, R. Saudi Arabia: Rush to Development London, Croom Helm, 1982.

[8] Adler, J.H., Absorptive capacity: the concept and its determinants, Washington, D.C. The Brooking Institution, 1963.

a setting for reviewing the concept of absorptive capacity within the investment approach framework.

During this process they found that previous absorptive capacity studies fell within two approaches; the government expenditure approach or the investment approach. The studies, as they mentioned, used different methodologies which varied from the simple extrapolation of recent import figures to the relatively sophisticated general equilibrium econometric modelling.[9]

The purpose of their study was to examine the impact of[10] regional cooperation on absorptive capacity within some of the OPEC countries. In our view, this study belongs to the group of studies concerned with "How OPEC countries will be paid".

The authors suggested that earlier studies can be categorised as:

1) Models emphasizing government expenditure.

2) Models emphasizing investment.

The first approach (government expenditure) was discussed previously and applied (Gebelein 1974) to the Saudi Arabian case.[11]

To forecast absorptive capacity using the investment method the following model was proposed

---

[9]The absorptive capacity estimates for United Arab Emirates calculated by the International Research Centre for Energy and Economic Development (ICEED) Boulder, Colorado.

[10]Vakil, F. <u>A macro economic projection for Iran 1973-1992</u> (Tehran, Iran (1974) p.174.

[11]For more details see the previous section.

$$G_i = a1 + b1R_i + b2D_iR_i + U_i \quad (1)$$

$$P_i = a + bG_i + U_i \quad (2)$$

where:

G_i = government investment

P_i = private investment

R_i = Annual oil revenue

D_i = Dummy variable

i = Year normally starting with 1963 and ending 1974

U = disturbance term

According to this model, the Saudi absorptive capacity is defined as: the sum of government domestic investment spending and private domestic investment expenditure. [12]The model, we believe, is realistic and describes the true situation in all oil-based economies (within OPEC). It is constructed so as to draw the historical relations of oil-revenues to public and private investment, from which one could deduct some implications to absorptive capacity.

Due to the erratic nature of oil-production and prices, government investment and spending are assumed to be a linear stochastic function of the country's oil revenues. This nature will cause structural changes in the investment spending pattern. To capture such fluctuations a dummy variable was introduced as shown in equation (2). The statistical results of the model are presented as:
[13]

(a) $Gi = 2059.97 + 0.1389Ri$

---

[12]El-Mallakh, 1976. p.39.

[13]El-Mallakh, R. (1976) Table 2.10 p.40.

(6.0997)

$R^2 = 0.78$ DW = 1.1734 N = 12

(b) Gi = 621.71 + 0.6411Ri - 0.4822Ri

(23.99) (18.9)

$R^2 = 0.49$ DW = 2.1177 N= 12

Equation (2) recognized two sub-periods 1963-1973 and thereafter. The coefficient of the dummy variable, b2, is relevant to the second period only. [14]

Notes:

The results support the well known hypothesis that government investment variations may be attributed to fluctuations in oil-revenues.

The absorption ratio defined as b1/b1-b2 was used to measure the required structural change which was much larger in Saudi Arabian (4.03) than in Iran and Kuwait (1.5 and 2.73) respectively.

[15]

Realising the shortcomings of the investment approach, the authors sounded apologetic in presenting a new section to estimate the import capacities from cross-sectional regression data. They defined absorptive capacity as "the country's ability to import". To make this definition operational they produced the following formula

---

[14] The study covers the period between 1963-1974.

[15] For more details about Iran and Kuwait's results see: El-Mallakh and others, op.cit. El-Mallakh (1976) p.40.

$$M/P = a + b\ GNP/P$$

where

M = Total imports

P = population

GNP = Gross National Product

a & b = coefficient parameters

The above formula expresses per capita imports as a function of per capita GNP. No specific results to fit the Saudi economy were available, and hence we cannot comment on the validity of the method. In addition, the model seems to be rather naive since the oil sector is completely neglected in the equation. Using the above methodology, the study produced a projection of the Saudi absorptive capacity. The absorptive capacity results are summarized in the following table with a projection of oil revenues;

Table 4.6 El Mallakh projection for the Saudi Absorptive Capacity (1975-1985 and in $ billion)

Year	Population millions	Oil revenues	Non-oil GNP	Total GNP	Ab.Cap
1975	6.050	27.0	2.875	29.875	5.20
1980	9.744	27.0	5.783	32.783	6.10
1985	15.692	27.0	38.631	38.631	7.70

Source: R. El- Mallakh and others, Capital Investment in the Middle East: The use of surplus fund for regional development, 1976 pp.44 and 46 (Tables 2.12 and 2.15).

4.3.6.b The Second Study (1977)

In this study the authors examined the capital absorptive capacity in the oil-based economies in the Middle East. The contention is that due to their limited absorption public expenditures in their countries has lagging considerably behind oil-receipts , leaving a huge capital surplus. This surplus is largely directed towards economies outside the regions despite the existence of acute capital shortages in many regional oil-poor countries.

Their critical problem, meant that the Arab oil exporting countries channel their surplus capital to Western financial and money markets, and contributed to many international organizations such as the World Bank and the International Monetary Fund. Hence, the regional capital mobility within the Arab Middle East needs to be focused upon. The purpose of this paper is to examine the utilization of surplus capital within the Middle East, and to assess the obstacles in regional capital mobility.

To implement the above, the study is divided into three sections. Section I analyses the regional absorptive capacity in the Arab Oil-Middle Eastern countries, and offers quantitative estimates of capital surplus, expected oil revenues, and the domestic capital absorptions. Section II and III deal with utilizing surplus capital and the obstacles in mobilising the surpluses within the region.

For the purpose of our study the focus will be centred upon Section I which presents an econometric model based on the investment approach in measuring the absorptive capacity of Saudi Arabia, Kuwait and Iran. The model was copied from their previous study (El-Mallakh, and others, 1976) already analyzed . Our comments on the 1976 study also apply on Section One of this study.

4.3.6.c Critique and comments

The study seems to be rather elusive. At the beginning, the paper claims its purpose is to use the absorptive capacity concepts as a tool for analyzing the role of investment in regional development. No policy implications or recommendations to fulfill its purpose were presented in the study and hence the study failed to accomplish its purpose.

It can be shown that the authors were suffered from ambiguity, in defining the absorptive capacity. Initially, they suggested a model to measure and forecast absorptive capacity within the investment approach, although realizing its pitfalls, they presented a new model to estimate the import capacity for an oil-based economy. In our view, this was due either to the failure of presenting a new definition or in supporting the existing one which they regarded as satisfactory.

In addition to these problems, the study failed to formulate a proper model in both cases. For instance, even with our reservations in accepting the investment approach, the author did not assess the role of private savings, banks credit, and government expenditure on private investment. For the government investment side the contribution of non-oil GDP, the inflation rate and exports earning should have had a significant impact on government investment. The singularity of oil revenues as the sole source affecting government investment may produce biased and inconsistent analysis.

The second model used imports as a proxy for absorptive capacity ignoring the Saudi aid role in regional development, the size of the defense expenditure, and focuses only on the supply side, i.e. how much the Saudi's can import? And not by how much they could utilize their oil-revenue effectively. Within the model, we noticed that El-Mallak's study (1977) used GNP per capita which , in our opinion, and due to the special characteristics of the Saudi's economy (as mentioned in Chapter Five, PP: (179-80), is likely to produce biased estimates.

Finally, their observations only covered a period of 12 years and this is another of the study's downfalls .This could impose some restriction on the degree of freedom of the model.For these reasons, the above methods will not give a good result in measuring and forecasting the Saudi's absorptive capacity, and therefore, another model needs to be formulated.

4.3.7 : Farid Abolfathi and others study: The OPEC Market to 1985 [16]

As we mentioned previously this study fits into the group of research efforts investigating "How OPEC countries will be paid?" The purpose of this study is ,"estimating future imports of real goods and services by OPEC members". This was done as part of the continuing efforts to discover and assess the implications of higher energy prices for the coming decade.

---

[16] Farid Abolfathi and others The OPEC Market to 1985 Lexington, Mass: Lexington Books, D.C. Heath and Co. 1977.

This study has the naive concept of focusing on imports by OPEC nations as a proxy for their absorptive capacity. Only one payment mechanism was considered here and that was offsetting trade flows. No other payment mechanism was considered such as short or long term capital flows, direct or in-direct investment, and/or official settlement transactions. In sum, the study abstracts from all topics relating to how much will be paid to OPEC.

This study falls within the regional approach research form, where, the author, or authors concentrate on a group of nations. The study focuses on the absorptive capacity of OPEC nations and clarified the similarities and variations of each member. Once this general view is given it focuses on each OPEC country and specifies its own features and how and why different measures were used for that particular country.

The working interpretation adapted here emphasizes absorptive capacity as the amount of capital that can be installed in the different sectors of the economy.As we mentioned previously ,in chapter 3,sectoral absorptive capacity is quite important,but what is amazing is the quality of variables explaining the behaviour of the specific sector. As table (4.7) indicates, the most important variable(oil revenue) which, we assume to have a dominant effect on the behaviour of each sector included in Abolfathi's model,is neglected completely .Also we found that the model is based on a single variable formula which ,we feel is biased and misleading.

Table 4.7 Abolfathi's Regression Equations For S.Arabia*

AGRICULTURAL	=	929.028 +	3.301X (0.915)	F=13.003 N=8 R= 0.929 X=change in government spending for agricul.
PETROLEUM	=	817.743 + (0.011)	0.759X	F=5290.115 N=9 R= 0.999 X=petroleum exports
REFINING	=	0.0 +	1.140X	Equation forced through origin R= 0.93 X=lagged output
INDUSTRY	=	191.218 +	0.075X (0.032)	F=5.564 R=0.582 X=total fixed capital formation
UTILITY	=	108.127 +	0.017X	F= 26.063 N=9 R= 0.867 X= total consumption
CONSTRCT	=	375.315 +	0.199X (0.025)	F= 62.345 N=9 R= 0.912 X=total govt. dev. spending
COMMERCE	=	-137.186 +	0.125X	F= 159.072 N=9 R= 0.975 X=total consumption
TRANSPORT	=	186.875 +	0.067X (0.008)	F= 65.284 R= 0.942 X= lagged GDP
B.&R.E.	=	346.337 +	0.041X	F= 127.555 N=9 R= 0.970 X= lagged GDP
SERVICES	=	0.784 +	0.026X (0.003)	F= 91.000 N=9 R= 0.958 X=TOTAL consumption
PUB.SERV	=	925.099 +	0.137X (0.014)	F= 93.290 N=9 R= 0.979 X=total govt. spending

*Dependent variable is always the sector's contribution to GDP. Estimated standard errors are reported in parenthesis.N is the number of observations for the equation. All values are in local currency units.period of data:1965-1973.

In exploring the concept ,the critical argument of "EFFECTIVE UTILIZATION" was dealt with.The question of economic viability was discussed in realistic way. Abolfathi decided that as long as an investment program does not contribute to the economy's performance,the program will be terminated,unless non-economic factors are realized (social utilities).This approach ,we feel,may generate results of the absorbtive capacity which diverge from the marginal productivity criteria.

Abolfathi's study used the regression approach to estimate and forecast the absorptive capacity of the OPEC countries. For the Saudi case, the study yielded a range of estimates rather than a single estimate as many previous studies had done . Based on this technique, Abolfathi constructed a forecasting table for the S. Arabian absorptive capacity as follows:

Table 4.8 Constraints used to forecast Saudi Arabia's Absorptive Capacity[a]

FORECASTS

Constraints	Low	Best	High
Govt. Spending			
Growth	historical pattern	historical pattern	historical pattern
Distribution	historical pattern	historical pattern	historical pattern
Govt. Receipts			
Oil	Appendix B	Appendix B	Appendix B
Non oil	historical tax rates	historical tax rates	historical tax rates
Population growth rate	2.5% annual	2.5% annual	2.5% annual
System of labor allocation to economic sectors	by demand proportion	by demand proportion	no labor constraint
Labor Force participation rate	historical pattern	historical pattern	no labor constraint
Immigration rate maximum as a % of labor force	None	1.6 % annually	no labor constraint
Range of yearly increase of labor productivity	1-3%	1-35	no labor constraint

[a] Government spending growth refers to total expenditures. The method used to calculate the historical pattern and the level of total spending is described in Chapter 2. Distribution of spending refers to the functional breakdown of expenditures for the hierarchies of spending as described in Chapter 2. Nonoil receipts are computed from a "tax effort" ratio (an impled tax rate) of nonoil receipts to nonoil GDP.

[b] Population of 4.5 million in 1974 was employed in the projections.

Source: Abolfathi and others, page 259.

The forecasts were labelled "high", "low" , and, "best" estimates, all the three were generated by the same forecasting system. The hypothesis behind such different estimates is the different assumptions constraints to economic performance (Table 4.8).

The forecasting system permits different modifications and resulted in different scenarios. It is our feeling that this is realistic in Abolfathi's study. The eco-political nature of the oil market with continuous fluctuations meant that different scenarios must be considered to be able to reach some realistic forecasts.

Finally, the quantitative results of Abolfathi's approach is presented in the following table. The results of Abolfathi's projection are summarized below:

Table 4.9 Projected values of total Saudi Imports (Absorptive capacity) billions of 1975 $U.S.

Year	Total Imports Absorptive Capacity
1975	5.130
1976	5.930
1977	6.480
1978	7.330
1979	9.140
1980	9.140
1981	9.140
1982	11.020
1983	11.020
1984	11.020
1985	11.020

Source: Farid Abolfathi and others, The OPEC Market to 1985 (Lexington, Mass.: Lexington Books, D.C. Heath and Company, 1977 p.263.

The projected values in table 4.9 seem to be inconsistent with the reality of the Saudi absorptive capacity as defined here (total imports). However, it is consistent with total imports for the first few years, and with most of the other studies. In our view, this was due to the unrealistic approach in constructing the equations of the sectoral absorption technique as presented in Table 4.7. Because of the inconsistencies in the statistical results of the projections and because this approach ignores the other variables (such as government expenditure, private investment etc) and the impact which they might have on the total absorptive capacity, we suggest that this approach could not be an appropriate method in dealing with measurement and forecasting the absorptive capacity of the kingdom.

4.3.9. The Finacial Times Report[17]

As this paper was directed to the general public, one would understand its natural simplicity. The purpose of the paper was to give a general description of the Middle Eastern oil-based producing countries.

Under the sub title "Investment in the Arab World" Michal Heady analyzed the limited absorptive capacity of "Saudi Arabia, Kuwait, UAE, and to a lesser extent Qatar" and discussed the possible regional capital mobility.

The methodology used by Financial Times to calculate absorptive capacity for the Middle East oil-exporting states was not reported. However, our feeling is that it is the sum of merchandise imports, net service payment and grants/aid

---

[17] A study by The Financial Times, dated July 5, 1977 pp.21-28. The study was also reported in the Middle East Annual Review 1979, Special Edition on Saudi Arabia, pp. 315-338.

disbursed. This can be shown from table 4.11.

The study fits within the regional approach mentioned previously and discussed many nations for example , Algeria, Iran, Iraq, kuwait, Libya, Qatar, Saudi Arabia, and UAE.

Table 4.11 Absorptive Capacity of the Saudi Economy

(1974-1976 and in $ billion)

Sector	1974	1975	1976
Merchandise Imports	3.8	6.5	8.5
N. Serv. payments	0.9	0.6	0.3
Aid	2.2	1.9	2.0
Absorption	6.9	9.0	10.2
Total surplus	17.6	17.8	23.1

Source: Financial Times July 5 1977, p.16.

4.3.9.a Comments and Critique

The use of import costs, aid, and net service payments as methodology to calculate absorptive capacity is subject to the same criticism as cited for the previous studies.

The forecast period 1974-1976 was very short to suggest specific policies but and as mentioned above it was a report directed to the general public and not in an academic analytical study.

Conclusion.

Having reviewed the literature on the absorptive capacity concept , and examined the quantitative studies related to the Saudi's absorptive capacity, the next chapter will intend to formulate an econometric model for the Saudi's absorptive capacity bearing in mind all the deficiencies and criticism mentioned in the above analysis .

CHAPTER FIVE

The Absorptive Capacity of the Saudi Economy

MODEL FORMULATION

5.1.0. Introduction

In chapter three, we discussed the absorptive capacity concept in general, and argued that the definition of domestic absorptive capacity for oil-based economies has been the subject of much controversy. It is also important to assert here that the special characteristics of the Saudi economy requires that any definition of the absorptive capacity should include all economic variables that are directly linked to the oil sector. Unfortunately, most of the empirical investigations about absorptive capacity for oil countries do not satisfy this pre-requisite. Our study aims to fill this gap. We suggest that the appropriate model to fit the Saudi economy's reality should be based on a Keynesian aggregate model .

In choosing a model based on realistic assumptions, this ,to the best of our knowledge, will be the first model to utilize a macro-econometric approach to measure and forecast the Saudi-Arabian absorptive capacity.

In the following section the classification of variables of the model presented, while the problems of empirical studies are discussed in section 3. The structural equations for the consumption functions (for both private and government) are investigated in section 4, while section 5 is devoted to the structural equations of the investment functions. The international foreign sector is investigated in section 6. Finally, the chapter will end with an appendix for the statistical results of the complete model.

5.2.0 : CLASSIFICATION OF VARIABLES

Variables in the model are classified as endogenous, exogenous and lagged . Lagged variables are those which enter some of the model equations within a time lag, usually of one year.

5.2.1 A. Endogenous Variables

PC = Private consumption

GC = Government consumption

TC = Total consumption

PI = Private investment

GI = Government investment

TI = Total investment

M = Imports

MCONS = Consumer imports

MPROD = Producer imports

YD = Disposable income

OILGDP = GDP from oil sector

NOLGDP = GDP from all other sectors except oil

GNP = Gross national product

GEXPN = Government expenditure

PEXPN = Private expenditure

CBCPS = Commercial bank claims on private sector

PS = Private savings

KDUTY = Custom duty

ODUTY = Other duty

INCTAX = Income tax

NOLREV = Non-oil revenue

5.2.2 Exogenous and Predetermined Variables

X = Exports

TOT = Terms of trade "Defined as export unit value/ import unit value"

OILREV = Oil revenue

INDEX = Consumer price index

XUV = Export unit value

IUV = Import unit value

SINDEX = Crude petroleum Saudi index prices

WGDP = World GDP

IPETPR = Index of petroleum prices

WCPI = World consumer price index

WINDEX = Crude petroleum world index prices

OILRYL = Oil royalty(the share of the government from oil companies revenues).

NFA = Net foreign assets

INF = Inflation rate(or INDEX in some equations).

TOT_{t-1} = Terms of trade (lagged)

PC_{t-1} = Lagged private consumption

GC_{t-1} = Lagged government consumption

GI_{t-1} = Lagged government investment

M_{t-1} = Lagged total imports

X_{t-1} = Lagged exports

$OILREV_{t-1}$ = Lagged oil revenue

5.2.3 Identities

TC = PC + GC

TI = PI + GI

OILREV = OILRYL + INCTAX

NOLREV = Custom duty + other duty

TDA = TC + TI + (X-M)

PEXPN = PC + PI

GEXPN = GC + GI

GDP = OILGDP + NOLGDP

M = MCONS + MPROD

YD = NOLGDP + GEXPN

5.3.0 The Problems of Empirical Studies

This section is devoted to the main problems related to model building . It is divided into the following sub sections:

i) Data sources and problems.

ii) Sample period and data limitations.

iii) Statistical specification. The OLS : The Technique.

iv) Functional Form.

In the following we tackle these problems, analyse them, and suggest the best possible solutions .

5.3.1 Data Sources and Problems.

The model was designed by taking into account data availability, consistency, and the characteristics of the Saudi Arabian economy. Murthy, M. described the situation in many LDC's and concluded that the position is quite alarming. He said "It is not only a question of lack of data; in many cases; the position is more a case of poor quality of data than of no data".[1] In our case the data problem was the most intricate one. The difficulty encountered in finding no data for some variables, forced us to use some proxies. Fortunately, however, this was a very limited problem.[2] Despite the fact that substantial progress has been achieved in developing a statistical and informational base for the Saudi Arabia under the Central Department of Statistics (CDS), and the Ministry of Planning, the collection of data is, nevertheless, still considered a recent phenomena.

The series, which are annual, cover twenty one years, 1963-1983. With one year lagged variables in some of the equations, the sample size in the regression is twenty years. It is quite important to mention here that the choice of 1963 was not accidental. With the oil boom in prices in 1973, such a choice will allow us to analyse the economy one decade before and after the oil-prices escalated.

---

[1]Murthy, M.N.: 'The use of sample surveys in national planning in developing countries', in Namboodiri (ed) Survey, Sampling and Measurement. Academic Press, 1978, p.231-253.

[2]In this case we clearly defined the variables and their proxies.

Our data were obtained from different issues of the following publications:

Saudi Arabian Monetary Agency, Annual Report, several issues 1963-1984.

Saudi Arabian Monetary Agency, Statistical Report, various issues 1963-1984.

International Monetary Fund (IMF) International Financial Statistics, various issues.

IMF Yearbook 1983.

IMF Supplement on prices 1981.

United Nations: National Account Statistics, various issues.

United Nations: International Trade Statistics, Vol.1, Trade By Country, 1982.

United Nations Conference on Trade and Development: Handbook of International Trade and Development Statistics, UN 1983.

United nations: Statistical Papers Series J - World Energy Supplies, several issues.

The variables which are used in our model have been listed in section 2. The major problems faced in collecting the data are summarized below.

We encountered an inconsistency in data collection: prior to 1967 data for some variables were originally calculated on actual and previos year bases (eg.1962/1963). To solve such inconsistency, we decided to take the second year (eg.1963 for the year of 1962/1963). Since this was just for only three years (1963,1964 and 1965) we do not anticipate any significant effect on our estimated results.

Another form of inconsistency exists in pre and post 1963-1966 series on national income accounts. It appears that a new modified approach of data calculation were used in 1967. The new approach makes the values of GNP and its components lower for 1966-67 than the values computed earlier. Indeed the U.N. National Accounts Statistics (1973) noted that the two series are not fully comparable and represent both figures for the same years. The difference between the two methods (factor costs and market prices) is the import duties figures. Unfortunately U.N. National Accounts Statistics[3] made the mistake of adding import duty values at constant prices in place of current prices. Therefore, their obtained results are not very accurate. The difference between the two series is very minor, and since no alternative source is available we have to accept this statistical discrepancy.

All earlier studies for the Saudi international transaction sector, and for the purpose of calculating the terms of trade, found that no data was available for import and export unit values. Hafiz decided to calculate[4] his own indexes, which we surprisingly found to be accurate. Looney decided to use some proxies.[5] In our initial stage of building the model, we tried to use these proxies which gave poor results, and the wrong

[3] United Nations, National Accounts Statistics, 1973, volume 2, County Data pp.362-363.

[4] Hafiz, O.Z. 'A foreign trade model for Saudi Arabia: An Econometric Approach' unpublished Ph.D. Thesis, University of Indiana, Bloomington, 1981.

[5] Looney, R. E. Saudi Arabia's Development Potential. Toronto: Lexington Books, 1982.

statistical signs . Finally, we were fortunate enough to find that the U.N. Conference on Trade and Development (1983) has formulated an index for export and import unit values for Saudi Arabia and this is the one we used in our model.[6]

In the international transaction sector, we disaggregated the imports equation to consumer and producer imports. Our purpose is to analyze the trend and direction of the Kingdom's imports, and to assess the impact of the oil sector on the absorptive capacity of the import components.

Since no data is available for the absolute value of each component, an extrapolation exercise was applied, to calculate the values of both consumer import goods and producer import goods in absolute terms instead of ratios.

5.3.2 Sample period and data limitation

As previously mentioned, our estimates are based on twenty one annual observations, covering the period 1963-1983. By introducing lagged variables into the model, we are left with twenty years. Although this limited number of observations may impose some restrictions on the size and the quality of the work undertaken[7] , we have unfortunately, no alternative due to the lack of data for the Saudi economy prior to 1960 and the difficulties

---

[6] U.N. Conference on Trade and Development "Handbook of International Trade and Development" U.N. 1983.

[7] For more details see: Wanacott & Wanacott: Econometrics, John Wiley & Sons, New York, 1979. Chapter 20 (Distributions and Estimators: Analytical and Empirical (Monte Carlo) Studies, p.517.

encountered in collecting data for the first three years of our sample. Although, we think that the available number of observations is quite enough to give satisfactory results, we still feel that this limited size may affect the empirical results of our model. For example, the structural relationship as represented by the parameters estimated could be distorted by certain "abnormal" circumstances; the years 1973, 1979 and 1982 witnessed a new pattern (fluctuations in oil prices, oil revenues, government expenditures, imports and exports) which could be distinguished from the other years where a relatively stable pattern was witnessed. Therefore, we can say that during the sample period, there was a strong upward trend: this reduces the accuracy of measuring the effect of changes in explanatory variables on the various endogenous variables.

Another drawback of the available data is that due to the applied statistical techniques in measuring output, income and expenditures (largely based on value added) in S. Arabia, it may be very difficult to distinguish correlations representing a true economic relationship from correlations through common statistical errors. It is worth mentioning that this is mainly true for the estimates of the consumption function and the imports of producer - consumer goods or more precisely invisible goods.

5.3.3 The OLS : The Technique

The OLS method is used in each sector, as a research procedure to choose the appropriate specification of the different equations of the econometric investigations.

It is well known , that for a simultaneous equations system, the OLS will not be appropriate and the estimated parameters could be biased, inconsistent and may be unstable. As far as our model is concerned , the structure of the model displays a considerable degree of recursiveness and there is no interdependence among any of the variables. Accordingly,the OLS method may be used. This technique generates consistent estimates, which is less sensitive to the problem of multicollinearity and misspecification , and thus a minimum mean square error. However, the statistical results of the OLS is presented at the end of the next chapter.

5.3.4. Statistical specification

As indicated earlier, the model is estimated using annual time series data for the period 1963-1983. All the data in the original sources were in nominal terms, but converted into 1975 Saudi Riyal using the cost of living index.

The estimated results for the complete model are presented at the end of the next chapter. The (t statistics) are given in the parenthesis below the parameter estimates. $Rbar^2$, the coefficient of determination, which is used to measure the explanatory power of the regression equation, is adjusted to take into account the number of explanatory variables in relation to the number of observations. The explanatory power for the coefficient is determined by the degrees of confidence by which the test will be accepted; * denotes the 10.00 per cent level of confidence; ** the 5.00 per cent level of confidence; and *** the 1.00 per cent level of confidence.

Finally the Durbin-Watson and (H) tests applied to see whether there is a serial correlation among the variables This will be denoted by D-W and when the equation includes a dependent lagged variable, the (h) test will be applied.

5.3.4. Functional form

For the purpose of our model, we have used the following functional forms:

1) The Log Function.

2) The Non-log Function.

When choosing our statistical results, we took the form which yields the best statistical results regardless of whether they were log function or non-log function. Our main criteria is statistical significance, since any one of these functional forms will have the same policy implications.

Another issue which deserves discussion while looking at the functional form is the problem of lags. Although this form (i.e. "the lag form") will create more problems when the stability and validity of the model is tested (the simulation exercise), we cannot, however assume implicitly that the desired variables are equal to the actual ones. The statistical results of our model (including the lag variables) indicates that in Saudi Arabia, as in many other countries (developed or less developed), people in one sector do not respond immediately to changes which occur in another. Their adjustments mechanism requires a time lag, which is determined by economic and non-economic factors. The length of such a lag is a matter of great interest to us. This is we believe quite important especially in the investment functional form, and we hope that researchers will focus more attention in measuring the lag period required in making such decisions. All the above factors are necessary when the functional form of the model is chosen if a good result for the policy implications of the model are expected.

5.4.0 Specification of Equations:

5.4.1. Absorptive capacity equations:

As we already defined the concept of absorptive capacity in chapter three, our model will use the same hypothesis to specify its equations. Our suggested definition was "the ability of the economy to absorb and utilize oil revenue effectively, within a given period". Such utilization (according to the Keynesian identity) will be for the purpose of consumption, investment and foreign trade sector.

Our hypothesis is that absorptive capacity constraints could restrict economic development, and therefore, once the Saudi economy alleviates such constraints it will accelerate real growth.

Accordingly, total absorptive capacity (TAC) is defined as :

$$TAC = TC + TI + BOP$$

where TC is total consumption; TI is total investment; and BOP is the balance of payments.

For the purpose of our model, consumption expenditure is disaggregated into private consumption and government consumption. This distinction also follows the Saudi Arabian Central Department of Statistics, National Accounts, which distinguishes between private and government consumption. Private consumption consists of fourteen catagories.[8] Now we will analyse private consumption and

---

[8] For more elaboration on private consumption classification see Central Dept. of Statistics, National Accounts of S. Arabia, 1967-1972.

then follow it with government consumption.

5.4.2 Private consumption (Model formulation)

Ideally we wished to disaggregate private consumption into durable and no-ndurable goods. We also attempted to estimate two consumption functions, one for Saudi nationals, and one for foreigners. The hypothesis behind such disaggregation, for the first case, was to test and link the absorption of the economy to durable and non-durable goods and to identify whether or not the society is involved in luxurious or basic consumptions. For the second disaggregation, the hypothesis here is the unique circumstances of the Saudi labour market where the foreign labour percentage is very high.[9] Unfortunately we could not build an equation(s) which satisfies our previous hopes; because of the absence of data. Alternatively our consumption function took the following form

$$PC = a_o + b_o YD \qquad (1)$$

where b_o denotes the marginal propensity to consume; YD is the real disposable income .

This equation seems rather naive and could not support our hypothesis since YD is the only determinant variable for consumptions. Therefore, a modified version of the Keynesian function which was suggested by Brown-Klein was used.[10]

---

[9]There are no official figures for foreign labour in S. Arabia. Some modest sources put it to be equal to 1.5 million workers. For more details see: Kubursi, Atif 'The Economies of the Arabian Gulf', London, Croom Helm 1984 pp.94.

[10]Brown-Klein in M.K. Evans: Macro Economic Activity:
(Footnote continued)

Following this modification a lagged dependent variable was introduced to the model and equation (1) becomes:

$$\text{Log PC} = a_1 + b_1 \log \text{YD} + c_1 \log \text{PC}_{t-1} \qquad (2)$$

where PC_{t-1} denotes one year lagged consumption. This equation is sometimes referred to ,in the literature ,as the Brown-Klein consumption function. This is just a modified version of the Keynsian consumption function.

Its main hypothesis is that "consumer reactions to changes in income are gradual". Consumers, according to Brown-Klein's assumptions, try to observe the level of consumption they are used to. We believe that this version could not fit the Saudi case, and would not support our hypothesis vis-a-vis the impact of oil revenue on private consumption absorptive capacity. This is because a non-oil variable was built into the model and hence we felt the necessity to introduce a new variable, to make the above equation more realistic in specifying the Saudi economy characteristics. The new form is:

$$\text{Log PC} = a_2 + b_2 \log \text{YD} + c_2 \log \text{PC}_{t-1} + d_2 \log \text{OILGDP} \quad (3)$$

where OILGDP denotes GDP from the oil sector.

It has become traditional to specify the private consumption function in terms of disposable income which is usually defined as GNP - taxes from income. Owing to the special features of the Saudi economy, which are already mentioned in Chapter Two, this definition is not appropriate in estimating our consumption function. Accordingly a modified version for disposable income was suggested and equation (3) becomes:

$$\text{Log PC} = a_3 + b_3 \log (\text{NOLGDP}+\text{NGI}) + c_3 \log \text{PC}_{t-1} + d_3 \log\text{OILGDP} \quad (4)$$

---

[10] (continued)
Theory Forecasting and Control. New York: Harber & Row, 1969, p.23-4.

where NOLGDP represents GDP from non -oil sectors; net government injections (NGI) defined as government expenditure + government subsidies.

Since no data is available for government subsidies, we identify disposable income as government expenditure plus non-oil GDP.

There are two reasons for rejecting equation (3). First, more than 63.00 of the total Saudi GDP is attributed to oil, a high portion of which is invested abroad.
[11]Hence, GNP will not be a good proxy for the purchasing power of the Saudis, and any estimated results will tend to inflate the marginal propensity to consume (mpc) and give biased results. Second, the Saudi tax system is quite simple.[12] There are no taxes at all on either wages or salaries (whether the employee is a Saudi national or a foreigner). In addition the remittances of foreign labour in Saudi Arabia are huge, making GDP larger than GNP in many years. So, using disposable income in its traditional form (as defined in equation (3)) will overestimate disposable income. This makes the new definition of disposable income (non- oil GDP + government expenditure) more appropriate.

---

[11]For more detailed analysis see: Ballool, M.M., Economic Analysis of the Long-Term Planning Investment Strategies For The Oil Surplus Funds. An optimal control approach. Unpublished Ph.D. thesis, University of Houston, 1981, p.88.

[12]Abdulsallam, M.S. & Henadi, H.M.; Taxation Accounting, Jeddah, Dar Al-bian Al-Arabi, 1982, p.193-236. Also see : Wilsom R " Islamic Business : Theory and Practice" , The Economist Intelligence Unit. October 1984 chapter 7.

5.4.4. Government consumption

Saudi Arabia is an exceptional case study when compared with most LDCs. This unique characteristic is related to the sudden wealth caused by the oil prices boom in the seventies. This wealth is derived from oil income which is owned exclusively by the Saudi government. As far as government expenditure is concerned,government consumption expenditures (GC) consist of government purchase of goods and services to provide social, administrative, and military services, and therefore are not subject to the same type of behavioural constraints as private consumption.

We may, for a moment, focus on government expenditure behaviour, in general, in order to find explanations for government consumption in particular. To the best of our knowledge no previous study disaggregates government consumption and studies its relation to the oil sector except Looney's study (Looney, R. 1982). F. Al-Bashir , included in his study[13] and , analysis of the behaviour of government consumption using an aggregate consumption function. He found that government consumption is significantly a positive function of government revenue, and lagged government consumption expenditures. The weakness of this study was related to its approach in estimating budget expenditures. He used appropriate and not actual budget expenditures and revenue figures and hence, we think that his results were biased and did not reflect the exact relationship between actual expenditure and revenue figures.

---

[13]Al-Bashir, F.: A Structural Econometric Model of the Saudi Arabian Economy: 1960-1970. New York: John Wiley, 1977.

Looney in his empirical study of the Saudi Arabian Development Potential (1982) [14] mentioned the data problems and suggested that owing to the absence of disaggregated time series data (according to the type of factor purchases), the suggested model should focus on oil and non -oil revenue.

In formulating the government consumption equations we will test the relationship between oil revenue, non-oil revenue and government consumption. Because of the special characteristics of the Saudi economy and since the government is the sole recipient of the oil revenue , it seems logical to test the effects of oil revenue on the government consumption behavior. Therefore, the equation could take the following form:

$$\text{Log GC} = a_1 + b_1 \log \text{OILREV} \qquad (1)$$

where GC denotes government consumption; OILREV denotes oil revenue .

The second variable that needs to be included is the dependent lagged variable of government consumption. There are some factors which enable the importance of these lagged variables in the consumption function, to be brought about. It should not be surprising that a government consumption in a given year (t) depends on the previous year's consumption expenditure. Thus government project expenditure tends to have a cumulative impact on recurrent expenditures. Accordingly equation 2 becomes:

$$\text{Log GC} = a_2 + b_2 \log \text{OILREV} + c_2 \log GC_{t-1} \qquad (2)$$

where GC_{t-1} represents government consumption lagged one

---

[14] See Looney, R.E. op. cit., p.218.

year.

In order to represent the impact of non-oil revenue on government consumption, the government budget must be introduced in the model. Government revenues consist of oil and non-oil revenues. Since a direct tax scheme is absent, non-oil revenue is generated by custom and other duties.[15] Therefore equation 3 becomes:

$$\text{Log GC} = a_3 + b_3 \log \text{OILREV} + c_3 \log \text{NOLREV} \qquad (3)$$

where NOLREV denotes revenues from customs and other duties.

5.5.0: INVESTMENT FUNCTION

The Saudi Central Department of Statistics, National Accounts, defined investment as: 'the sum of imported and localy produced of machinery together with expenditure for new structure and rapid outlays'.[16] Imported capital represents a channel through which new technology from abroad may enter the system. In developing countries there are several choices available for allocating investment resources which affect the different sectors of the economy and these need to be studied carefully before any decision is made.

Various hypothesis and suggestions have been developed regarding these choices, but unfortunately ,in developing countries it is a very complex decision because of the inadequate workings of the market system and partly because of the structure of developing economies.[17] As far as the

---

[15] Central Department of Statistics, op. cit., p.32

[16] Central Department of Statistics, op. cit., p.32.

[17] El-Mallakh, R.: Saudi Arabia: Rush to Development.
(Footnote continued)

structure of the Saudi economy is concerned it is necessary here to mention that total investment increases from 13.00 per cent in 1963 to 28.00 per cent of GDP in 1983. During the period of 1963-1973 the rate of growth of total investment was at an annual rate of 2.40 per cent in 1964 compared with 67.30 per cent in 1973 and 15.00 per cent in 1982.[18] This indicates that oil revenue, after the oil boom, had a significant impact on Saudi investment.

Analysis of investment structure in S. Arabia shows that most investment in the country, private as well as public, is directed to construction activities, and a small portion channeled to the manufacturing sector. This unique characteristic of investment behaviour, and the major role which the government plays in the development process make traditional economic theory irrelevant and makes little sense in constructing an investment function for Saudi Arabia.

The interest rate specification and profit maximization behaviour cannot be considered as an important factor in explaining the investment in S. Arabia because none of these variables are relevant to government investment and possibly even to that of the private sector.

It is oil revenue abundance and the confidence which this generates in the minds of decision makers, in most oil based economies, that plays the major role for investment

---

[17] (continued)
London, Croom Helm, 1982, p.263.

[18] This ratio decreased to -4.00 per cent in 1983. All ratios are calculated from SAMA Annual Reports, 1963, 1974, 1983.

implementation. In these countries government decisions are not implemented on purely economic criteria, therefore, we are dealing with government investment decisions which derive their justification from the country's current needs, regardless of the potential profitability.

Given the above considerations, and owing to the lack of data for sectoral investment in S. Arabia, a break down either by ownership or by sector, is unfortunately,not possible. We are left with second best i.e. the disaggregation of total investment into its components (private and government investment).

5.5.1 Private Investment Model Formulation

The third plan issued in 1980 aimed at economic diversification and reducing the degree of dependency on the oil sector.[19] The private sector was to be encouraged to participate in capital investment and only, when the size of investment is large enough and beyond the capacity of private individuals, would the government ,itself, undertake capital investment.

In order to examine the impact of oil and non-oil GDP on the absorptive capacity of the private investment, both variables were included in our model and the private investment function was formulated as follows:

$$\text{Log PI} = a_1 + b_1 \log \text{NOLGDP} + b_2 \log \text{OILGDP} \qquad (1)$$

Due to the absence of capital stock figures, private real investment was regressed on various factors that are

[19] Ministry of Planning, Third Development Plan 1980-1985. Riyadh, Ministry of Planning, Saudi Arabia, 1980, p.78.

likely to have affected to one degree or another the profitability of investment. One of these factors is thought to be domestic credit creation and total credit extended to the private sector. The relationship between bank credit and the private sector in Saudi Arabia is still a controversial issue.[20] Some scholars argue that there is evidence that private saving may be the dominant factor in facilitating private investment. Al Bashir in his study[21] mentioned ,the Saudi Industrial Development Fund (SIDF) (a government agency found in 1969) , after surveying almost all manufacturing establishments in the Kingdom, concluded that most of the factories in production were managed and financed by the owner (usually a family); 80.00 per cent of invested capital in all surveyed factories belong to the owner (i.e. no borrowing). On this basis one is inclined to discount the interest rate in particular as a determining factor in investment decisions.

The conclusion stated above, about the commercial bank claims role on the private sector (CBCPS) is challenged by the last issue of the Annual Report of SAMA. The report indicates that CBCPS rose by 2.83 billion of RS.[22] or 6.10 per cent , to 49.40 billion riyals during 1982/83 as compared with the increase of 6.32 billion riyals or 15.00 per cent in 1981-82.[23] Which of these arguments is

---

[20]The controversy is related to the nature of domestic interest rates policy in Saudi Arabia. For more information see: Darrat, Ali, 'The Money Demand Relationship in Saudi Arabia: An Empirical Investigation' Journal of Economic Studies, Vol.11, No.3, 1984, p.43.

[21]Al-Bashir, F. op. cit. p.75

[22]SAMA, 1983 op. cit. p.39

acceptable will be confirmed by the statistical results of our empirical tests.

Accordingly equation (1) becomes:

$$LogPI = a_2 + b_2 \log NOLGDP + c_2 \log OILGDP + d_2 \log CBCPS \quad (2)$$

where: CBCPS is commercial bank claims on the private sector.

Another variable which might have some effect to a certain degree on the profitability of investment is the inclusion of a lagged dependent variable. The decision to invest by its nature, not only takes time but also is based on past experience. In our model we choose a one year lag period. This is due to the nature of the private business in the kingdom. As for the length of the lag it is quite difficult to assess. We tried to apply the Almon distribution lag technique for time series data for Saudi Arabia but, unfortunately, no satisfactory results were obtained for the second year lag(negative sign).[24]

The criteria in choosing a one year lag is based on several reasons. First, it is noticed that Saudi Arabian entrepreneurs are still reluctant to undertake investment in heavy industries. Second, because of the general high profitability of investment, the administrative lag i.e. the execution time desired, should be much lower in Saudi Arabia than in many developed countries. Third, government encouragement and support and the knowledge that the

---

[23]Exchange rate for the Saudi riyal (SR) as on 22/5/1985 is 1SR = 0.363 US dollar & 0.465 stirling pound.

[24]

$$PI = \underset{(1.34)}{.008\,OILGDP} + \underset{***(7.9)}{.08\,PI_{t-1}} - \underset{(-.37)}{.09\,PI_{t-2}}$$

$\bar{R}^2$ =.99 H=.0046 F=960.

government will finance the losses or the deficits shortened the lag time required to start a business and to make a decision. Given these considerations, our model with lagged dependent variable will be:

$$\text{Log PI} = a_3 + b_3 \log \text{NOLGDP} + c_3 \log \text{OILGDP} + d_3 \log \text{CBCPS}$$

$$+ e_3 \log \text{PI}_{t-1} \qquad (3)$$

where PI_{t-1} is private investment lagged one year.

The government expenditure variable (GEXPN) deserves to be tested in our model. The inclusion of this variable is based on the underlying theory that in the case of an oil based economy, government expenditures on infra-structures (which is very high) and on other public utility investments could stimulate private investment. To test this association, private investment was regressed against total government expenditure in the following manner:

$$\text{Log PI} = a_4 + b_4 \text{ Log GEXPN} \qquad (4)$$

where GEXPN is the total government expenditure.

Finally, the domestic saving variable (PS) was tested as an independent variable in the private investment function. This variable was included with bank credit to show the effect of private saving in financing private investment. We expect this variable (PS) to play a positive role while CBCPS (bank credit) might not be statistically significant, but the statistical results will be the judge of both. With the inclusion of this variable the private investment equation will be formulated as:

$$\text{Log PI} = a_5 + b_5 \log \text{PS} + c_5 \log \text{CBCPS} \qquad (5)$$

5.5.3 Government Investment

As already mentioned (Chapter Two) Development plans[25] in Saudi Arabia emphasize the importance of public spending in the economic development process of the Kingdom. In Saudi Arabia as in most oil based economies, public spending depends largely on total revenues as the main source of finance. Since oil revenues have been more than adequate (33.40 billion RS in 1982) for government needs in the past few years,[26] it is the country's absorptive capacity that appears to set up an upper limit on the amount that can be allocated for investment. Because of its major role in the oil market, and because of the inelasticity of oil demand, Saudi Arabia does have the ability to achieve a flow of revenue to finance government expenditure. The target growth rate is certainly established by the planning authorities on the basis of realistic estimates of expected revenues from the oil sector, assuming that the government could control inflation and keep it at a reasonable level.

It is very important when formulating our model to consider that the bulk of investment in the oil based economies is undertaken by the government, which is also the sole recipient of oil revenues. The share of government investment in total investment in Saudi Arabia reached 54.00 per cent in 1983 compared with 35.00 per cent in 1973. This volume represents 15.00 per cent of GDP in 1983 compared with only 5.00 per cent in 1973.[27] Furthermore, government investment must accelerate rapidly during a boom

---

[25] Ministry of Planning, Second Development Plan 1975-1980. Riyadh, Ministry of Planning, Saudi Arabia,1975.pp.431-519.

[26] SAMA, Annual Report, 1983.

[27] SAMA, Annual Reports 1973 & 1983.

period otherwise it could have some side effects. This is supported by El Mallakhs Kadim's analysis that:

> "Higher oil revenues not only permit greater public investment outlays, but in addition exert considerable political pressures on the respective ministers to increase investment expenditure."[28]

Thus, the magnitude of oil revenue appears to be of crucial importance in determining the volume of public investment outlays in the Saudi economy. For the purpose of our model formulation, this variable (oil revenue) will be the first to be tested and our first equation will be

$$\text{Log GI} = a + b_1 \text{ Log OILREV} \qquad (1)$$

where GI denotes real government investment and OILREV represents real oil revenue, assuming a linear relationship between the variables.

It is important to mention here that various studies about absorptive capacity for Saudi Arabia and other oil based countries do not include any other non-oil variable in their model.[29] An attempt was made in this model to fill this gap by testing the effect of non-oil GDP on government investment.

This variable was determined by the established target rate of growth for non-oil GDP as it was defined in different national plans. This also might show the nature of the association between previous investment and actual absorptive capacity of this sector (non-oil GDP) on the one hand and its effect on financing government investment on

---

[28] El Mallakh, R. and Kadim; <u>op. cit.</u> p.312.

[29] El Mallakh, r. & Kadim, <u>op. cit.</u> p.312 See also El Jehaimi, T. <u>op. cit.</u> pp.169-183.

the other. Therefore equation 2 becomes:

$$\text{Log GI} = a_2 + b_2 \log \text{NOLGDP} + c_2 \log \text{OILREV} \qquad (2)$$

The lagged oil revenue variable ($OILREV_{t-1}$) deserves to be tested in the model. This variable could highlight the importance of this sector in the Saudi economy as a whole. If significant statistical results are obtained, it might allow the authorities to take a short run view of the development process without affecting the long run stabilization programs.

To test for the short run stabilization effect the inflation rate was included in the government investment equation. The inclusion of this variable is very important in determining the direction of monetary policy in S.Arabia. As mentioned above about the interest rate policy and the country's banking structure and the lack of government debt, through which central bank market operations normally implement monetary policy, the only instrument which can be used as a stabilization policy is the government expenditure movements. The insignificance of this variable indicates that the huge volume of government expenditure did not create any inflationary effect on the other sectors of the economy. A screening of the tax trend and behaviour could help in explaining the government anti-inflationary stabilization program. However, the tax structure rules out such explanations by the nature of the Islamic tax code (Zakat).
[30]

---

[30] For more details about tax structures in Saudi Arabia see: (1) Ministry of Finance and National Economy, Zakat & Income Tax Department, Regulations For Income Tax, Road Tax, and Zakat. Riyadh Safir Bureau Printing Co., 1978 p.419-440.

(Footnote continued)

On the other hand a negative sign for this variable will provide signals to the authorities for the need to reduce investment to combat inflationary pressures. the hypothesis is finally accepted in our study is determined by empirical results. According to our hypothesis, equation(3) which indicates inflation fluctuations is:

$$\text{Log GI} = a_3 + b_3 \log \text{NOLGDP} + c_3 \log \text{OILREV}$$

$$+d_3 \log\text{INF} \qquad (3)$$

31

5.6.0 International Transaction

In the field of international trade, import and export relationships have been the subject of a considerable empirical studies. The focus of most of these studies was to estimate the relationship between the dependent variables i.e. imports and/or exports and the independent variables such as prices, GDP, net foreign assets (NFA) and the like. The purpose of such empirical investigations was to deduct trade policy implications.

Within the context of absorptive capacity, many previous studies have focused on the import sector [32] as the only determinant for measuring the absorptive capacity of the economy. Despite the importance of this sector, but according to our previous methodology which

---

[30] (continued)
(2) Abdul Sallam, M.S. & Henadi, H.M. Taxation Accounting. Jeddah, Dar Al-bian Al-Arabi 1982 p.193-236.
[31] Inflation is defined as the level of prices (P)

[32] - Fowlkes Frank:" Petrodollar Surpluses as a Problem for the monetary system." U.S Department of Commerce .

- Royal Dutch /Shell Oil company:"Production at Risk.,1973.

considers international transaction as an important factor, among others, in determining the Saudi absorptive capacity, this section will investigate the impact of oil receipts on the absorptive capacity of the international transaction sector.

As far as the importance of this sector is concerned, the Saudi economy depends mainly on exports receipt as well as on import supplies. Exports represented about 54.00 per cent of GDP in 1963, 82.00 per cent in 1973, and 94.00 per cent in 1980. However, this ratio started to decline after 1980 to reach 38.00 per cent and 34.00 per cent in 1983 and 1984 respectively. On the other hand , the imports/GDP ratio has increased from 14.00 per cent in 1963 to 18.00 per cent in 1973 and finally reached 31.00 per cent in 1984.

The country's total imports (CIF) are 133 billion RS in 1983, compared to 139 billion of RSin 1982. As a result the imports growth ratio declined from 16.80 per cent in 1982 to -4.50 per cent in 1983. The decline was accounted for entirely by the non-oil sector imports. The fall may be attributed to a slow downward trend in the demand for project related imports. Government expenditures, which constitute a fueling force for the Saudi economy, have decelerated recently as a result of the completion of major infrastructure projects and reduced oil receipts.[33] A new policy also started recently in conjunction with oil sector imports. Due to the fact that oil revenue declined, and the sluggish trend in the economy, the authorities implemented a new policy of inducing oil companies to

---

[33] <u>The Economist</u>, Another twist to the story, Feb. 1983, p.19-25.

procure their requirements from the Saudi market instead of importing them from abroad. Whether such a policy will be adopted in the entire economy or whether it will be restricted to a few sectors will be the subject of future expectation. In the meantime, we believe that unless the oil market trend changes, the Kingdom will begin a new era.

For the purpose of our model the international transactions sector will be disaggregated into its major components, imports and exports. The foreign trade model will be formulated to describe the absorptive capacity of the imports and the exports sectors.

6:i Imports : Model Formulation

As stated previously, Saudi Arabia is a single export based economy. The country produces oil and exchanges it for everything else. Imports to the Saudi market reflect a wide range of consumer and producer goods. The country's imports have no local substitutes and the liberal import policy aims to build up a diversified economy base dependent on its recurrent imports.

For the purpose of our model imports will be disaggregated into two main components - consumer good imports and producer good imports. This disaggregation will help us to investigate the import trend during the period under study.

The total value of imports for Saudi Arabia seems to be consistent with the Keynsian hypothesis about the close association between imports and GDP. Imports tend to be very closely related to movements in domestic aggregate economic activity, rising with booms and falling with recessions. This trend could be shown if we compare the ratio of total imports to GDP in different years. In 1963 this ratio was estimated to be 0.17 per cent compared to 37.00 per cent and 41.00 per cent for 1973 and 1980 respectively.[34] The increasing ratio reflects the imports trend during a period of booming economy and rising in world price of oil. This ratio declined to 30% in 1982 when the price of oil began to decline.

As far as the composition of imports is concerned, the mechanism for imports components was related to the

---

[34]SAMA, Annual Reports, different issues.

evolution of oil revenue and to the movements in domestic aggregated economic activity. The first period in our study (1963-1973) witnessed a rapid increase in spending on consumer goods which averaged to 47.00 per cent of total imports in 1963. This ratio declined to 37.00 per cent in 1973 and finally reached 29% of total imports in 1983. On the other hand, the expanded aggregate demand leads to increased domestic investment and concomitantly increased producer good imports from 37% in 1963 to 44% of total imports in 1973. This ratio reached 56% in 1980 but declined to 23% in 1982.[35] In the actual formulation of our import equations the first two variables to be tested are the government total expenditure for both private and government sectors. The inclusion of the government expenditure variable reflects the fact that the public sector is the sole recipient of oil revenues while private expenditures show the propensity of this sector to imports. Therefore, our equation for the imports function will be formulated as follows:

$$M = a_1 + b_1 \text{ GEXPN} + c_1 \text{ PEXPN} \qquad (1)$$

Since we are dealing with a foreign sector, the terms of trade effect should be tested in our model. Our definitions for terms of trade is somewhat different from other previous studies which dealt with the international sector. Looney in his study about Saudi Arabia (1982) defines the terms of trade as: "GDP deflator (or consumer price index) / import prices.[36] The terms of trade used in our model defined as

[35] All these ratios are calculated from SAMA Annual Reports, different issues.

exports unit value / imports unit value. We expect this variable to have a positive sign and high statistical significance. The expected sign for this variable is based on the fact that high import prices relative to export prices could imply a reduced ability to import unless export prices have increased commensurately. The import equation therefore

becomes:

$$M = a_2 + b_2 \text{ GEXPN} + c_2 \text{ PEXPN} + d_2 \text{ TOT} \qquad (2)$$

where TOT is the terms of trade (export unit value / import unit value).

To analyse the partial adjustment mechanism the lagged one year dependent variable was introduced into the model. It could be argued that for the case of Saudi Arabia, the world supply schedule for the country is likely to be infinitely elastic. Although this assumption seems to be valid, the country cannot import all it wishes within a given time period.[37] Therefore, we argue that a partial adjustment mechanism for the import equation seems realistic. We expected this lagged variable to be positive and significant in explaining the gap between the desired level of imports in the current period and the actual level of imports in the previous period.

Finally, the foreign assets variable (NFA) was in

---

[36] An attempt has been made to test for the effect of the terms of trade as defined by Looney, but unfortunately no significant statistical results could be obtained (see Table 5, equation 2).

[37] This might be related to certain bottlenecks such as ports capacity, transport etc.see: SAMA, Annual Report, 1976 p.52

introduced in the model. This variable could be considered as a proxy for oil revenues since any imports are financed by foreign assets and any fluctuation in foreign assets will reflect the situation of the oil market and therefore determine the oil revenue and its implications on the absorptive capacity of import. Our equation including this variable will be formulated as follows:

$$\text{Log } M = a_3 + b_3 \log NFA + c_4 \log M_{t-1} \qquad (3)$$

where NFA is the net foreign assets.

5.6.1a Disaggregation of import function

As we previously mentioned, total imports were disaggregated into their major components: consumer goods imports and producer goods imports. Such classifications are thought to be the suitable in the case of Saudi Arabia. This is because the Kingdom is now in the process of development, thus showing the variable influencing the demand for each of these components can help the policy makers in assessing the influence of the oil sector on the absorptive capacity of each import component. Another advantage of such a classification is that it indicates to what extent the increase in Saudi Arabian imports is due to the process of economic development[38] to shows the extent to which the oil sector has been successful in fulfilling the national plans targets which focus ,for the most part in creating industrial bases for imports substitutions.

For the formulation of our consumer goods imports

---

38 For more details please see: Hafiz, O.Z. "A Foreign trade model for Saudi Arabia: An econometric approach" Unpublished Ph.D. Thesis, University of Indiana, Bloomington, 1981, p.67-68.

equations, the first variable that deserves to be tested is the expenditure on consumption for both the private sector and government; this equation is

$$M_{cons} = a_1 + b_1 \; GC + c_1 \; PC \qquad (1)$$

To test for the oil effect on consumer imports equation (2) was formulated as follows:

$$M_{cons} = a2 + b_2 \; PC \; + c_2 \; OILREV_{t-1} \qquad (2)$$

Finally, credit as a new independent variable is introduced in to the import equation. Credit as an explanatory variable is meant to indicate the availability and terms at which credits are provided to finance private sector

imports. The variable is dropped from the consumer imports function since no significant results are obtained.

5.6.1b The producer goods imports

The producer goods imports have a very important implication on the real development of economy in Saudi Arabia. An increasing share of capital and intermediate goods in imports shows the extent to which the country is implementing its policy of diversification and industrialisation. In building a function for producer good imports, the bank credit and real investment variables were included in the model. The inclusion of bank credit to finance imports (producer goods) means that credit is always available to finance these purchases. We expect this variable to have no major impact on financing this sector. Our assumptions are based on previous investigations on the negative role played by the banking system and the distortive nature of interest rates policy in Saudi Arabia, where people are sometimes reluctant to deal with commerical banks and rely heavily on thier own sources of finance. The second variable (total investment) tests the nature of association between imports (capital goods) and total investment. We expect a positive relationship between these two variables. Based on our hypothesis the producer goods imports equation is

$$M_{prod} = a_1 + b_1 \text{ TINV} + c_1 \text{ CBCPS} \qquad (1)$$

where, TINV is the real total investment and CBCPS is the real bank credit to private sector.

The total investment was disaggregated into private and government investment. We expect a weak association between private investment and imports and a very strong correlation between imports and government investment. This and expectation is based on the previous hypothesis that the development process as a whole in Saudi Arabia is based on the public expenditures. Accordingly, equation (1) becomes:

$$M_{prod} = a_2 + b_2 \text{ GI} + c_2 \text{ PI} + d_2 \text{ OILREV} \qquad (2)$$

where PI and GI denote real private and government investment respectively. The oil revenue was included to test for the impact of the oil sector on the ability of the country to import capital goods for industrial purposes. A positive sign and significant result are expected for this variable.

Having analysed the theoretical and statistical considerations in formulating our equations for the import sector, the next Chapter will analyse the statistical results of our equations.

5.6.2 Exports

Crude and refined oil makes up most of Saudi's exports. Non-oil exports are so small in value and so insignificant in their economic impact that they are deleted altogether from the model. The reason for this situation is that after 1976-1977, non-oil exports began to deteriorate in value and significance. The ratio of non- oil exports to total exports declined to zero after 1978 and the country became fully dependent on the oil sector as the sole and determining factor in financing the economic development of the Kingdom. However, inspite of the deletion of non oil exports from the model, there are policy implications to be derived from the model that will have some bearing on non oil exports.

As far as the importance of the oil sector is concerned it could be argued that the oil sector is not only important to the Saudi economy, but for the world economy too, bearing in mind the special role of Saudi Arabia as a major source of today's energy. The share of Saudi oil exports in the world total oil exports increased from 13 .00 per cent in 1963 to 21.00 per cent in 1973 and finally reached 23.90 per cent in 1983.[39]

In addition the proportion of Saudi's oil production to world total oil production increased from 6.3 per cent in 1963 to 13.60 per cent in 1973 and finally reached 24.60 per

---

[39] Figures for 1963 were obtained from : United Nations Statistical Papers Series J,No,22 World Energy Supplies,1973-1978. New-York, 1979 p.126.
For the 1973,1982 figures see: United Nations Energy Statistical Year Book, New-York , 1984 p.272.
For Saudi Exports see: SAMA , Annual Reports , 1964,1974,1984.

cent in 1980. This important role continued untill 1981. Howver, since 1982 this role has been altered substantially. As a swing producer , trying to stablize an unstable market , the Saudi Arabian policy was to reduce its production share aiming at stablizing the oil price and strengthen the OPEC unity. This is shown in the decline of the Saudi oil production as a percentage of the total world oil which dropped dramatically from 24.60 per cent (one quarter of the international oil production) in 1980 to 8.50 per cent in 1985. Accordingly, We may say that the Saudi traditional stablizing role , mentioned above , ended in 1981, and that the last few years witnessed a new trend.[40] These figures indicate the important role played by Saudi arabia in the supply of oil markets (till 1980) and its reprrcussions on the world economy as a whole.Untill 1980 Saudi Arabia played adominant role in the intrnational oil market as a price maker, however this role has diminished considerably after 1981 due to many factors mentioned above.

For the purpose of our model and as mentioned previously, the disaggregation of exports with the oil and the non-oil sectors will not be accurate for Saudi Arabia because of the small share of non-oil exports. The major issue in our model formulation is whether exports should be

---

[40]It could be argued that between 1973 and 1980, the monopolistics (or precisely oligopolistic) situation was prevailed in the oil world market. After 1980, OPEC began to loose its power as a major determinant for oil prices, and the mechanism of oil markets began to work more effectively. To review the issue and confirm the above trend see:
OIL AND JAS JOURNAL, MARCH,12,1984 AND MARCH 12, 1986.

dealt with as exogenous or as endogenous variables. It is important to make such a decision (i.e. exports are determined outside the economy enclave).

If we treat oil exports as exogenous, then we must decide upon the rate of depletion of oil reserves. Is it optimal to invest in oil in the ground or to invest in its revenues on the international market ? , and how far are substitutions comparable ?.

In our opinion, the decision to treat exports (oil) as exogenous or endogenous variable can only be drawn by inspecting the international oil market. Although the OPEC was successful in increasing oil prices steadily and the Saudi's played a dominant role in decision making, the fact that (OPEC) is not the only power in the oil market and Saudi Arabia is one country among others in this organization, the oil market is beyond the control of Saudi authorities. Therefore, we can argue here that oil exports could better be treated as an exogenous variable if a considerable policy implication for this sector is to be derived. Another important reason is to look at the reality of the oil market since 1981. Were the Saudi's able to control oil exports ,would they allow their economy to suffer to the current extent ?. [41]

Given those considerations, the first variables to be tested in our model are , the quantity of oil produced

---

[41] The situation is so ambigous that the King has to delay the annoncement of the budget for the 1985/86.

(QOILY) and the price of oil(IPETPR) and their association with exports. It is assumed that oil revenues depend on oil exports and the prices charged for this good in the world markets. This relationship is formulated as:

$$X = a_1 + b_1 \text{ QOILY} + c_1 \text{ IPETPR} \qquad (1)$$

where X is real exports; QOIL is the quantity of oil exports and IPETPR is the saudi's petroleum index.

It is expected that exports in Saudi Arabia depend on the quantity of oil produced and the price in the oil market.Since equation (1) does not include any international variables we need to make a link between this sector and the international developments in the oil market . Therefore, the world GDP (WGDP) , and the world consumer price index (WCPI) deserve to be tested here. It is our a priori feeling that WGDP/WCPI (real world GDP) will have a positive affect on the Saudi's total exports. This is because Saudi exports (mainly oil) are sensitive to the changes in the oil markets. Given the above argument,the export equation is formulated as :

$$\text{Log } X = a_2 + b_2 \log WGDP/WCPI + C_2 \text{ LOG } XUV/WCPI \quad (2)$$

where (XUV) denotes Saudi export unit value ; and (WCPI) is the World Cost -of -Living Index. We expect a positive sign for these two variables since the world demand on Saudi exports is inelastic.[42] Having discussed the theoretical consideration related to the formulation of our model, the statistical results of (OLS) and (2SLS) will be presented in the next chapter.

---

[42]This assumption could be valid until 1983. Unfortunately , no data are available after this year .

CHAPTER SIX

THE EMPIRICAL RESULTS OF THE MODEL

Having provided the model formulation in Chapter Five, here we intend to discuss the statistical results and test the specification of the equations.

6.1 The private consumption: empirical results

The statistical results for the private consumption equations were, in general, satisfactory (see Table 1). The goodness of fit for all the equations was excellent. Independent variables, were successful in explaining 95.00 -98.00 per cent of the variation in private consumption expenditures. The absence of serial correlation (tested either by D-W test or D-H test when applicable) and the high value of (t statistics) indicate the significance of the independent variables.

To investigate the relationship between private consumption and income, equation (1) shows the (MPC) out of the disposable income (YD) is equal to 33.00 per cent . This ratio (in our opinion) seems to be quite high in comparison with other oil-based economies. The Kuwati MPC is equal to 14.00 per cent ,[1] however, in Libya it is very similar and equal to 34.00 per cent .[2] Equation (2) was intended to investigate income fluctuations effects on demand over time and one year lagged dependent variable was introduced into the study on the basis of the the adjustment mechanism hypothesis. The coefficient of the lagged variable is statistically significant at the 1.00 per cent level. 63.00 per cent of actual private consumption is adjustable (is made up within one year). Because the country advocates a liberal import policy and due to the recent wealth effect, this finding was not unexpected. This coefficient seems to be lower than Looney's [3] which is 70.00 per cent . This difference may be attributed to the other independent variables which he included in his equation (he included non-oil GDP only instead of YD in our study.

As mentioned before, our interest is the study of the oil effect on the private consumption absorptive capacity. It is implicitly assumed that the oil sector had a major impact on affecting the consumption pattern of the Saudi consumer. The liberal import policy and the sudden increase in wealth created what might be called the demonstration effect. An attempt was made to disaggregate GDP into its main components (oil and non-oil GDP) to test their impact on the private consumption. This was done by introducing the oil and non-oil variables. Since our modified version

---

[1] El-Mallakh, R. "The Absorptive Capacity of the Kuwaiti Economy: Domestic and International Prospectives". Massachusetts: Lexington Books, 1982 p.136.

[2] Al-Gehami, T. "Absorptive capacity and alternative investment policies: A case study of Libya". Unpublished Ph.D. Thesis, University of Colorado, Boulder, 1975, p.184.

[3] Loneey, R. Saudi Arabia's Development Potential. Toronto: Lexington Books, 1982, p.215.

for disposable income is different from the traditional Keynesian one, the non-oil GDP was included in the model. Equation (3) shows that the coefficient of total GDP was positive and significant at the 5.00 per cent level, and the (H test) indicates the absence of auto-correlation among the variables. In equations (4) and (5) GDP was disaggregated to test for its effect on the absorptive capacity of private consumption. It shows clearly that the coefficient of oil GDP was positive, but significant only at the 10.00 per cent level of significance, with an absence of serial correlation as indicated by the D-H test. The same results were asserted in equation (5) but the coefficient of non-oil GDP was significant at the 5.00 per cent level. As equation (5) shows, the non-oilGDP variable performed better than oil-GDP as indicated by the value of its coefficient and its high (t) statistics. This is not surprising since most of oil revenues were channelled into public utilities.

TABLE 1.

I. The private consumption

(1) $PC = 17.30 + 0.33\ yd$
$\qquad\qquad$ ***(20.12)

$Rbar^2 = 0.95$ DW = 1.43 F = 404.67

(2) $\text{Log } PC = -0.26 + 0.36 \log yd + 0.63 \log PC_{t-1}$
$\qquad\qquad$ ***(3.74) ***(5.32) ***(3.80)

$Rbar^2 = 0.98$ H = −0.4000 F = 446.75 SER= 0.11 N= 20

(3) $\text{Log } PC = -0.46 + 0.17 \log GDP + 0.87 \log PC_{t-1}$
$\qquad\qquad$ **(2.08) ***(9.09)

$Rbar^2 = 0.97$ H = − 0.4711 F = 305.22 SER= 0.13 N= 20

(4) $\text{Log } PC = -0.30 + 0.11 \log OILGDP + 0.94 \log PC_{t-1}$
$\qquad\qquad$ *(1.68) ***(11.52)

$Rbar^2 = 0.97$ H = − 0.456 F = 283.21 SER= 0.14 N= 20

(5) $\text{Log } PC = -0.39 + 0.49 \log NOLGDP + 0.55 \log PC_{t-1}$
$\qquad\qquad$ ***(4.00) ***(4.14)

$Rbar^2 = 0.98$ H = 0.720 F = 477.46 SER= 0.11 N= 20

6.2 Government consumption : empirical results

The empirical results indicate that the overall goodness of the fit for all equations is very good. The proposed variables contribute significantly to the explanation of government consumption behaviour. These variables explain between 92.00-98.00 per cent of the total variation in real government consumption.

The Durbin-Watson statistics indicate the absence of auto correlation. Because we have a lagged dependent variable, the traditional D-W test is known to be biased, thus, we also calculated the un-biased Durbin H test. The test again shows the absence of auto correlation. It is not surprising and as it was expected, the statistical results of our equation are consistent with prior coefficients, and have the right signs (Table 2).

In equation (1), oil revenue explains about 92.00 per cent of the variation in real government consumption. This was expected, since it is the main source of contribution to government expenditure in most oil based economies.

Equation (2) was based on (as previously mentioned) testing for the adjustment mechanism. The coefficient of the lagged variable is statistically significant and has an a priori sign. This coefficient implies that 70.00 per cent of actual government consumption is made up within one year. Our results about the partial adjustment mechanism for government consumption are different from Looney's study (R. Looney 1982). The partial adjustment coefficient was estimated by Looney at45.00 per cent compared to 70.00 per cent in our model.

Our findings in equation (3), about the relationship between non-oil revenues and government consumption, seem to be consistent with Looney's study. The coefficient of non-oil revenue was not significant even at the 10.00 per cent level, despite the fact that it has the right sign. Two important conclusions can be derived from these statistical results. First, the oil sector still remains the main source of finance for government consumption for years to come. Second,
[4] this finding could be an indicator to the Saudi government that a tax scheme reform cannot be ignored, and a policy of diversification for government revenue should be the governments primary objective.

[4]The insignificance of the non-oil variables reflects the weakness of the actual tax structure of S. Arabia, since no scheme for income tax is yet available.

TABLE 2

TABLE 2

II. GOVERNMENT CONSUMPTION

1) Log GC = 0.72 + 0.77 log OILREV
(2.26) *** (15.09)

$Rbar^2$ = 0.92 DW = 1.30 F = 227.58 SER=0.26 N =20

2) Log GC = 0.18 + 0.24 log OILREV + 0.70 log GC_{t-1}
(2.88) *(6.34)

$Rbar^2$ = 0.98 H = - 0.343 F = 381.47 SER=0.14 N= 20

3) Log GC = 0.56 + 0.72 log OILREV + 0.11 log NOLREV
***(11.08) (1.13)

$Rbar^2$ = 0.92 DW = 1.77 F = 116.24 SER=0.26 N=20

6.3 The private investment : empirical results

The regression results for a number of alternative formulations are presented in Table (3). The disaggregation of GDP into its components ,i.e. oil and non-oil GDP is justified in the model. Our purpose is to test the effect of each component on private investment.

As it is expected, the non-oil GDP variable seems to be an important stimulous to private investment (equation 1). This coefficient is higher than the coefficient of OILGDP. Our statistical results indicate that the contribution of oil revenues to the private sector's absorptive capacity is positive and highly significant. Our findings support the argument that private investment was not stagnant during the oil boom, and that the government strategy to encourage private enterprise has been successful, to a large extent, in developing the private investment absorptive capacity.

To test the commercial bank credit role in motivating private investment, our statistical results in equations (2) support Al-Bashir's [5] argument that private investment in Saudi Arabia is a family business and businessmen tend to motivate their own wealth and family resources to these activities. We may argue that this situation derives from a religious factors which abondons the interest rate (Usury). This makes people reluctant to deal with commercial banks. It is here where Islamic banks with their main concept of sharing (both profits and losses) tends to appear.

The negative sign of this variable indicates that bank credits do not play any positive role in financing the private investment sector in the Saudi economy. We also feel that a new argument can be added to explain this interesting phenomena. That is the composition of the businessmen structure. We feel that many participants are related either directly or indirectly to the royal family. This association may present the bulk of wealth that is ready for either short or long term investment, a matter that decreases the necessity for bank credits. We will not take the negative sign for CBCPS ,equation 3 & 4 , to reveal a negative relationship ,between PI and CBCPS, but all we

---

[5]Al-Bashir, F. op.cit. p.75-76.

can say here is that the insignificance (t statistics value) of the variable is quite clear.

Another view to support our second point (the recent phenomenon of banking and credit approval) is the insignificant, very low coefficient of the private saving variable (equation (3)). The reason why this coefficient is very low is that the total private saving figures which we used in our regression are the official figures published by the commercial banks. As mentioned above many people in Saudi Arabia are reluctant to deal with commercial banks. This situation has however,drastically changed during the last decade, but the total volume of private saving channelled into commerical banks is still insignificant and the unchannelled savings are difficult to estimate.

Finally, as we previously argued, the coefficient of the dependent lagged variable is consistent with an a priori sign. The statistical significance of the lagged private investment confirms the validity of our speculation about the entrepreneurial behaviour. The one year lagged variable was statistically significant at the 1.00 per cent level of confidence while the two year lagged variable was not sifnificant at the 10.00 per cent level(equation 4). This result seems to support Mayer's hypothesis about a lag period as mentioned by Looney[6] in his study when he comments that lags should be much lower in Saudi Arabia than in the developed countries.

---

[6]Looney, op. cit. p.225. For more detailed analysis on lag periods, required for construction investment and private fixed investment, see: Mayor, Thomas "Plant and equipment lead Times" Journal of Business, April 1960, pp.127-132.

TABLE 3

III. Private Investment

(1) $\text{Log PI} = -1.06 + \underset{***(5.18)}{0.44 \log \text{OILGDP}} + \underset{***(4.65)}{0.55 \log \text{NOLGDP}}$

$\text{Rbar}^2 = 0.98$ DW = 1.68   F = 424.88   SER= 0.13   N=20

(2) $\text{Log PI} = -3.13 + \underset{***(6.02)}{1.22 \log \text{NOLGDP}} + \underset{***(5.25)}{0.37 \log \text{OILGDP}}$

$\underset{(-.35)}{-0.45 \log \text{CBPS}}$

$\text{Rbar}^2 = 0.98$ DW = 1.40   F = 295.5   SER= 0.13   N=20

(3) $\text{Log PI} = .27 + \underset{(1.30)}{.02 \text{ Log PS}} - \underset{(.01)}{.01 \text{ Log CBCPS}}$

$\text{Rbar}^2 = 0.97$ DW= 1.23   F=232   N=20

(4) $\log \text{PI} = 29.86 + \underset{***(20.25)}{0.25 \log \text{GEXPN}}$

$\text{Rbar}^2 = 0.96$ DW = 1.44   F = 409   SER= 0.28   N=20

(5) $\text{PI} = -3.23 + \underset{(1.34)}{.08 \text{ OILGDP}} + \underset{(7.9)}{0.09 \text{ PI}_{t-1}} - \underset{(.43)}{0.09 \text{ PI}_{t-2}}$

$\text{Rbar}^2 = .99$ H=.005   F=960   N=20

6.4 Government investment : empirical results

The statistical results for government investment estimates were, in general, reasonable. The relationship between oil revenue and government investment was positive and statistically significant at 1.00 per cent level of confidence in equation (1) and (2) . These results concerning the importance of this variables seem to support the previous studies which indicate [7] that the magnitude of oil revenues appears to be of critical importance in determining the volume of public investment outlays in particular and the total absorptive capacity of the oil based economies in general.

It is our belief that this strong relation between oil revenue and government investment is at its last stage. The hypothesis behind such a conclusion is that most of the previous government investment was in infrastructure and to establish the basic needs for the society. Recent official declarations confirm that most of these structures have been accomplished.[8]

Hence ,we may predict that the importance and the volume of government investments will decline and that private investment will fill this gap. The highly significant value observed for oil revenues shows once again the importance of oil in the Saudi Arabian economy (see equation 1) . It could be argued that oil has not only played a key element in raising the current magnitude of capital formation, but the stability of these revenues has also allowed the government to take a long run view in the development process. This long run view is articulated in different national plans; the focus of these plans is long terms projects financed through oil revenues.

In contrast to Looney's interpretations for the effect of inflation, the sign for this variable is positive but insignificant (equation 2). This might be explained by government efforts to control inflation and that during the

---

[7]Looney & El Gheaimi & Kadhim.

[8]<u>The Economist</u>: Another twist to the story,feb,1983 p.19-25.

period under study inflation rates fluctuated between 2.00 per cent on average for the period before 1973 and about 7.00 per cent for the rest of the period. This result was natural because starting from 1980, the cost of living index for Saudi Arabia registered 1.00-2.00 per cent changes in consumer prices and this rate (inflation) is expected to be less than 1% for 1984.[9] .Given the country's banking (or monetary) structure and the lack of government debt and other related monetary instruments, it is possible to conclude that the Saudi Arabian Government could operate a short run stabilization policy for the economy through government spending .

Finally,the statistical results obtained from equation (2) also show that the lagged dependent variable was about 74.00 per cent . The lagged variable was significant at 1.00 per cent level and came with the a priori sign.

However, the coefficients of the determinant and goodness of fit were high enough to consider this result.

In general the findings show that the oil sector was the only determinant for both oil and non-oil GDP. Since oil revenues have been more than adequate for government needs in the past few years, the events which took place in 1982 and the huge reductions in 1983-1985[10] seem to act in setting a constraint on how much government investment can

---

[9] SAMA, Annual Report, 1983, op. cit. p.186.

[10] According to a Financial Times survey "Saudi Arabian oil revenues are now a quarter of what they were four years ago. 28 billion $ compared with 110 billion $ in 1980". Financial Times: A Survey on Saudi Arabia April 22, 1985, p.1

be sustained and how much investment must be cut back in periods of declining oil revenues, and what effects this reduction might have on the absorptive capacity of the economy .

TABLE 4

IV. Government Investment

1) $\text{Log GI} = -0.48 + \underset{***(3.11)}{0.31} \log \text{OILREV} + \underset{***(7.64)}{0.72} \log \text{GI}_{t-1}$

$\bar{R}^2 = 0.98$ H= 0.020 F = 386.44 SER= 0.19 N= 20

2) $\text{Log GI} = -0.78 + \underset{***(3.40)}{0.32} \log \text{OILREV} + \underset{***(8.08)}{0.74} \log \text{GI}_{t-1}$

$+ \underset{(.53)}{1.29} \log \text{INF}$

$\bar{R}^2 = 0.98$ H = 0.26 F=276.58 SER=0.19 N=20

IMPORT SECTOR : THE STATISTICAL RESULTS

6.5 The aggregate imports

The statistical results of OLSQ regression techniques were in general satisfactory as the table 5 shows. The independent variable explains about 99.00 per cent of imports variation in the model. The results also show the absence of auto-correlation, as indicated by the value of Durbin-Watson and the (H test) where applicable.

As was expected, the coefficient for all the independent variables in equation (1) have the expected signs and are signficantly different from zero at the 1.00 per cent level. The coefficient for government expenditure was higher (.56) than that of private (.48). This finding is not surprising and is consistent with our previous hypothesis that the public sector plays the major role in the economic development of Saudi Arabia. This result also indicates that many of the individual entrepreneurial decisions are in effect formed by definite government policy objectives and implemented directly by the authorities.

Consistent with our interpretation about the impact of oil prices (represnted here by TOT) on imports , the results is shown in equation (2) and (3). When the terms of trade (lagged on year) were introduced into the model the variable was positive and significant at the 1% level of confidence. This means that previous prices of oil have had a close association with the import trend.[11] Apparantly

---

[11] In equation 2 table 5, we used the terms of trade as
(Footnote continued)

,despite the fact that the world supply schedule of the country is likely to be infinitely inelastic, the result of equation (4) suggests that the country is still facing some bottlenecks in dealing with imports. Despite the high purchasing power and the propensity to import, the country is not able to import all it wishes within a given period. The partial adjustment mechanism was estimated at 0.22 (equation 4) and stresses that about 0.78 of the desired level of imports have tended to arrive within a given period, seems realistic. The equation explains more than 0.99 of the variation in total imports and the coefficient of the lagged variable was significant at the 1.00 per cent level of confidence. The Durbin-Watson seems to be quite high which indicates the absence of autocorrelation among the variables. The foreign assets variable (NFA) seems to perform well as seen from its level of significance.

Finally, credits extended to importers by the banking sector in Saudi Arabia seem to be insignificant. This result seems to be inconsistent with Hafiz's study that bank credits are playing an effective role.[12] It could be argued that foreign assets are a major source for imports finance. This variable is expected to play a major role in the future since oil revenue are expected to decline sharply. This variable (CBCPS) was then dropped from the model.

---

[11](continued)
defined by Looney in his study, the result was not satisfactory.

[12]Hafiz, O.Z. op. cit. p. 104

TABLE 5

Import Function

TABLE 5

V. Total Imports

1) $M = -28.86 + 0.56GEXPN + 0.48PEXPN$
$\quad\quad ***(7.63) \quad ***(5.82)$

$Rbar^2 = 0.99$ DW = 2.14 F = 2031.17 SER= N=20

2) $M = -28.48 + 0.53GEXPN + 0.44PEXPN + 35.68\ TOT$
$\quad\quad ***(7.04) \quad **(5.04) \quad (1.08)$

$Rbar^2 = 0.99$ DW = 2.27 F = 1367.79

3) $M = -21.19 + 0.52GEXPN + 0.38PEXPN + 78.85\ TOT_{t-1}$
$\quad\quad ***(7.99) \quad ***(4.79) \quad **(2.44)$

$Rbar^2 = 0.99$ DW = 2.34 F = 1752.27

4) $\text{Log } M = 0.31 + 0.78 \log M_{t-1} + 0.17 \log NFA$
$\quad\quad ***(10.29) \quad ***(2.29)$

$Rbar^2 = 0.99$ H = 0.854 F = 796.73 SER= 0.11 N= 20

6.5.A Dissaggregation of imports : statistical results

Table 6 represents the statistical results of the disaggregation of imports (consumer goods imports and producer goods imports).

All the specifications have the expected results. The coefficient for the private sector (equation 1) is higher and more significant than that for the government sector (0.28 for private sector compared with 0.19 for government sector). The high D-W indicates the absence of auto-correlation in the equation. The oil revenue lagged one year gave a positive sign and was significant at the 5.00 per cent level. The low value of the coefficient seems to be expected, since consumer imports are expected to be highly insensitive with the oil sector. This low coefficient might be related to the low proportion of total consumer goods imports to oil revenues during the booming oil period.

Concerning the producer goods imports the most effective variable was the total and government investment (equation 3,4). The coefficient for government and total investment was positive and highly significant at (1.00 per cent) while it was less significant (5.00 per cent) for the private investment sector. Aunit increase in TI lead to an equal increase in producer imports (1.01) reflecting the true situation of the Saudi economy.. This might be related to our explanations in previous chapters that the public sector is still the leading sector in the economic development process of the country. This finding also indicates that much attention and the most effective role should be played by the private sector in the industrialization process.

As it was expected the bank credit variable , came with a positive sign (equation 3) , but have no major role in financing this sub-sector. The coefficient was insignificant (.01) and its t value was very low (0.09). This reflects the nature of the banking system and interest rates policy which exists in Saudi Arabia, and the reluctance of people in dealing with commercial banks because of religous feelings.

Finally, the oil revenue was tested to show the impactof the oil sector on the ability of the country to import capital goods for industrial purposes. The results confirm our priory hypothesis of a positive and significant relation.

TABLE 6

Consumer Imports:

1. Mcons = 0.39 + 0.19 GC + 0.28 PC
(0.07) ***(4.26) ***(7.02)

$Rbar^2$ = 0.98 DW = 1.88 F = 750.86

2. Mcons = 0.25 + 0.38 PC + 0.03 OILREV(-1)
(0.04) ***(9.93) ***(2.29)

$Rbar_2$ =0.97 DW = 1.58 F=452.89

Producer Imports:

3. Log Mprod = -0.240 + 1.01 Log TI + 0.0194 Log CBCPS
***(6.55) (0.0984)

$Rbar^2$ = 0.96 DW = 1.84 F = 250.731 SER= 0.211

4. Log Mprod = 0.62 + 0.57 Log GI + 0.43 Log PI
1.40 ***(3.07) **(1.68)

$Rbar^2$ = 0.97 DW = 1.54 F = 276.38 SER=0.20

5. Log Mprod = -0.30 + 0.81 Log TI + 0.20 Log OILREV
*** (4.76) * (1.84)

$Rbar^2$ = 0.97 DW = 1.71 F=277.56 SER=0.20

6.6 Export equation : the empirical results

Table 7 shows the statistical results of the aggregate exports equation for Saudi Arabia. The multiple coefficient of determination is very high (between 92.00 and 99.00 per cent). The high value of the F ratio indicates that the independent variables as a group are significantly different from zero at the 1.00 per cent level. As far as the variable coefficients in the model are concerned, it seems that the quantity of oil produced and the price of the oil market have the major effect on exports. The two coefficients (equation 1) were significant at the 1% level of confidence. It could be argued that since oil is a necessary commodity for all economies, price expectation could play a crucial role in determining the demand for oil and as prices increase, people expect more increase in the future and respond to that by increasing their demand for oil, and this is why the oil price variable has a positive sign.

The relationship betwen Saudi export unit value and the world index (SINDE/WINDEX) was positive and significant in the model (equation 2,3). The export price elasticity was estimated to .88 (equation 2) which looks the same as in Hafiz's study.[13] Hafiz argues that

> "For exports policy, the result of the study indicates that the world demand on Saudi Arabian exports is inelastic e.g. a rise in export prices will not lead to a reduction in exports volume (export price elasticity is

---

[13] See Hafiz, op. cit. p. 162.

> 0.88). Thus if the government likes to get the same level of oil revenues, the exports volume can be reduced, the conservative policy in oil exports will be effective."[14]

This findings support Hafiz's argument that the world demand on Saudi exports is inelastic. This situation seems to be realistic until 1981. The last changes which took place on the oil market suggest that there is always an alternative in oil suppliers for any country dealing with oil imports. The 1985, 1986 events indicate that no country in the OPEC could get the same level of oil revenue if the exports volume were reduced. For these reasons we believe that the positive sign of oil prices in some of the foreign sector equations should be explained with some reservation.

As it was expected the terms of trade variable has the a priori sign and was significant at the 1.00 per cent level of confidence. This means that any increase in the price of exports or any reduction in import prices will have a positive effect on exports.[15]

Finally the GDP variable gave a positive sign and are significant. This might indicate that any change in exports will affect the rate of growth and as a result the absorptive capacity of the economy as a whole

<u>TABLE 7</u>

VIII <u>Exports</u>

1) $$X = -9.56 + \underset{***(2.88)}{0.24\ QOILY} + \underset{***(9.52)}{20.10\ IPETPR}$$

---

[14] See Hafiz, op. cit. p.

[15] Another explanation which could be mentioned is that until 1983,expectation used to play an important role in demand for oil. As price rises, people expect further increases in price, thus they increase their demand for oil.

$Rbar^2$ = 0.92 DW = 1.34 F = 108.48 SER=288.52 N= 20

2) LogX = -1.14 + 1.78 log WGDP/WCPI + 0.88 log XUV/WCPI
(2.10) *(6.43)

$Rbar^2$ = 0.92 DW = 1.38 F = 67.83 SER= 0.316

3) logX = 0.156 + 0.97 logGDP + 0.33 log SINDEX/WINDEX
***(17.01) ***(3.3)

+ 0.15 log M^{t-1}
**(2.16)

$Rbar^2$ = 0.99 DW = 1.20 F = 550.1

APPENDIX : 1

STATISTICAL RESULTS OF THE MODEL

STRUCTURAL EQUATIONS ESTIMATED BY OLSQ

I. The private consumption :

(1) PC = 17.30 + 0.33 yd
***(20.12)

$Rbar^2$ = 0.95 DW = 1.43 F = 404.67

(2) Log PC = −0.26 + 0.36 log yd + 0.63 log PC_{t-1}
***(3.74) ***(5.32) ***(3.80)

$Rbar^2$ = 0.98 H = − 0.4000 F = 446.75 SER= 0.11 N= 20

(3) Log PC = −0.46 + 0.17 log GDP + 0.87 log PC_{t-1}
(2.08) *(9.09)

$Rbar^2$ = 0.97 H = − 0.4711 F = 305.22 SER= 0.13 N= 20

(4) Log PC = −0.30 + 0.11 log OILGDP + 0.94 log PC_{t-1}
*(1.68) ***(11.52)

$Rbar^2$ = 0.97 H = 0.456 F = 283.21 SER= 0.14 N= 20

(5) Log PC = −0.39 + 0.49 log NOLGDP + 0.55 log PC_{t-1}
***(4.00) ***(4.14)

$Rbar^2$ = 0.98 H = − 0.720 F = 477.46 SER= 0.11 N= 20

II. GOVERNMENT CONSUMPTION

(1) Log GC = 0.72 + 0.77 log OILREV
(2.26) *** (15.09)

RB^2 = 0.92 DW = 1.30 F = 227.58 SER=0.26 N = 20

(2) Log GC = 0.18 + 0.24 log OILREV + 0.70 log GC_{t-1}

$^{**}(2.88)$ $^{***}(6.34)$

$Rbar^2 = 0.98$ H = -0.343 F = 381.47 SER=0.14 N= 20

(3) Log GC = 0.56 + 0.72 log OILREV + 0.11 log NOLREV
$^{***}(11.08)$ (1.13)

$Rbar^2 = 0.92$ DW = 1.77 F = 116.24 SER=0.26 N=20

III. Private Investment

(1) Log PI = -1.06 + 0.44 log OILGDP + 0.55 log NOLGDP
$^{***}(5.18)$ $^{***}(4.65)$

$Rbar^2 = 0.98$ DW = 1.68 F = 424.88 SER= 0.13 N=20

(2) Log PI =-3.13 +1.22 log NOLGDP+0.37 log OILGDP -0.45 logCBCPS
$^{***}(6.02)$ $^{***}(5.25)$ $^{**}(-2.40)$

$Rbar^2 = 0.98$ DW = 1.40 F = 295.5 SER= 0.13 N=20

(3) logPI = 29.86 + 0.25 logGEXPN
$^{***}(20.25)$

$Rbar^2 = 0.96$ DW = 1.44 F = 409 SER= 0. N=20

IV. Government Investment

(1) Log GI = -0.48 + 0.31 log OILREV + 0.72 log GI_{t-1}
$^{***}(3.11)$ $^{***}(7.64)$

$Rbar^2 = 0.98$ H = 0.020 F = 386.44 SER= 0.19 N= 20

(2) Log GI=-365.9 + 135.4 Log NOLGDP + 51.9 Log OILREV

$Rbar^2 = 0.98$ DW= 1.74 F=276.58 SER=0.19 N=20

(3) Log GI=-0.78 +.32 Log OILREV +.74 Log GI_{t-1} +1.29 Log INF
*** (3.4) $^{***}(8.08)$ (.53)

$Rbar^2$ H = 0.470 F=276.58 SER=.19 N=20

V. Total Imports

(1) $M = -28.86 + 0.56GEXPN + 0.48PEXPN$
***(7.63) ***(5.82)

$Rbar^2 = 0.99$ DW = 2.14 F = 2031.17 SER= N=20

(2) $M = -28.48 + 0.53GEXPN + 0.44PEXPN + 35.68\ TOT$
***(7.04) **(5.04) (1.08)

$Rbar^2 = 0.99$ DW = 2.27 F = 1367.79

(3) $M = -21.19 + 0.52GEXPN + 0.38PEXPN + 78.85\ TOT_{t-1}$
***(7.99) ***(4.79) **(2.44)

$Rbar^2 = 0.99$ DW = 2.34 F = 1752.27

(4) $\text{Log } M = 0.31 + 0.78 \log M_{t-1} + 0.17 \log NFA$
***(10.29) ***(2.29)

$Rbar^2 = 0.99$ H = 0.854 F = 796.73 SER= 0.11 N= 20

VI. Consumer Imports

(1) $Mcons = 0.39 + 0.19\ GC + 0.28\ PC$
***(4.26) ***(7.02)

$Rbar^2 = 0.98$ DW = 1.88 F = 750.86

(2) $Mcons = 0.25 + 0.38\ PC + 0.03\ OILREV_{t-1}$
***(9.93) ***(2.29)

$Rbar^2 = 0.97$ DW = 1.58 F = 452.9

VII. Producer Imports

(1) $Mprod = 37.91 + 1.31\ TI - 1.94\ CBCPS$
***(4.61) ***(-2.68)

$Rbar^2 = 0.72$ DW = 1.61 F = 25.1

(2) $Mprod = 150.0 + 2.45\ GI - 2.5\ PI$
$\quad\quad$ ***(5.1) $\quad$ ***(-3.1)

$Rbar^2 = 0.79$ $\quad DW = 1.42$ $\quad F = 36.3$

VIII. Exports

(1) $X = -9.56 + 0.24\ QOILY + 20.10\ IPETPR$
$\quad\quad$ ***(2.88) $\quad$ ***(9.52)

$Rbar^2 = 0.92$ $\quad DW = 1.34$ $\quad F = 108.48$ $\quad SER=288.52$ $\quad N= 20$

(2) $LogX = -1.14 + 1.78 \log WGDP/WCPI + 0.88 \log XUV/WCPI$
$\quad\quad$ **(2.10) $\quad\quad$ ***(6.43)

$Rbar^2 = 0.92$ $\quad DW = 1.38$ $\quad F = 67.83$ $\quad SER= 0.316$

(3) $\log X = 0.156 + 0.97 \log GDP + 0.33 \log SINDEX/WINDEX$
$\quad\quad$ ***(17.01) $\quad$ ***(3.3)

$+ 0.15 \log M^{t-1}$
**(2.16)

$Rbar^2 = 0.99$ $\quad DW = 1.20$ $\quad F = 550.1$

$Rbar^2$ is the coefficient of determination, that is, what percentage of variation in the dependent variable is explained by the regression.

F is a measure of the significance of the $Rbar^2$.

DW is the Durbin Watson statistical test for auto correlation.

H test is the test for auto correlation in an equation which includes a dependent lagged variable.

N is the number of observations.

* is significant at the 10.00 per cent level of confidence.
** is significant at the 5.00 per cent level of confidence.
*** is significant at the 1.00 per cent level of condifence.

CHAPTER SEVEN

THE SIMULATION EXERCISE

7.1.0. Introduction

An econometric model for the Saudi Arabian absorptive capacity was formulated in Chapter Five and statistical results of the OLSQ were presented in Chapter Six.

In this Chapter we intend to test for the stability and validity of the model. Model validity presents a minor problem in the case of the single-equation regression, since **special statistical** tests such as (t) statistics and (R^2) can be used to evaluate the goodness of fit of an equation, i.e. of the model. However, in a multiple equation model, although each individual equation may have a perfect statistical fit, but the model as a whole may not succesfully reproduce the historical data. The opposite may also be true, an individual equation of a model may have a quite poor statistical fit, but the model as a whole may reproduce the historical data very closely. In order to overcome this dichotomy we feel that it is quite important to evaluate the model properly, a task that we will overcome on the following sections.

Section 2 will be devoted to examine the statistical criteria and tests the validity of the model. Section 3 analyzes the statistical results of the simulation exercises. In section 4 the overall sensitivity tests (or stability test) are applied using the TSP program. Finally, the Chapter ends with a general conclusion in Section 5

7.2.0 Validity of the model

The real challenge for an econometric model lies in its predictive ability. As Naylor points out:

> "The validity of an econometric model depends on the ability of the model to predict the behaviour of the actual econometric system on which the model is based. In order to test the degree to which data generated by simulation experiments with econometric models conform to observed data, two alternatives are available: historical verification and verification by forecasting[1]."

Both of the above alternatives will be applied in our validity tests. For the first test, the model will be subjected to simulation techniques. Simulation, is simply the "mathematical solution of a simultaneous set of difference equations"[2].

Performing a simulation to obtain a solution may be a simple task for a small model consisting of 2-3 equations and can be performed analytically. For a larger size model, the simultaneous equation must be solved numerically using a computer program.

---

1. Naylor, Thomas, H. ["Policy simulation experiments with Macro-econometric models: The state of art in M. D. Intriligator and D.A. Kendrick (eds).] Frontiers of Quantitative Economics. Amsterdam, North Holland Publishing Company, 1974, ch.6, p.217.

2. Pindyck, R.S. and D.L. Rubinfeld, Econometric Models and Economic Forecasts (McGraw Hill, Inc., 1981), p. 356.

7.2.1 Evaluation of the model performance:

The main issue a model builder has to respond to is, how to evaluate the goodness of the model. This issue is less complex when we deal with a singel equation regression model, as a set of statistical tests such as [R^2, F test, DW or (H test)] can be used to test for the significance and the underlying hypothesis of the model.

However, when applying a multi-equation model the evaluation criteria become more cumbersome. Here we are dealing with a multiple equations model. Consequently that the model as a whole will have a dynamic structure since lagged variables are included in different behavioural equations which, from an econometric point of view, should be simulated in both static and dynamic methods. A comparison of the historical and simulated figures in both static and dynamic simulation did not show a large discrepancy. The figures were very close for most of the equations.* It is worth mentioning here that this simulation is not fully dynamic becuase lagged values of private consumption(PC), government investment(GI) are actual values of the previous period rather than model generated. In order to evaluate the performance of the simulation exercises a special statistical criteria should be applied.

To support this argument Sketler pointed that:

> "A method that utilizes information about the absolute discrepancy between the forecast and the observed changes should be employed,for this also permits comparison of particular models forecast with the accuracy of other forecasting procedures and naive methods."3

---

3. Sketler,H.O,"Forecasting With Econometric Models:An Evaluatiion,36 (July,1968),p.438

*The static simulation results were ignored to avoid repetition.

7.2.2 Performance Test Criteria:

In the econometric literature, there are many criteria to quantitiatively measure the discrepancy between predicted and actual values of the variables. The following are the most important criteria often used to evaluate an econometric model simulation performance. They are as follow:-

1. Root Mean Square simulation error (RMS) and Root Mean Square percent error. (RMSPE)
2. Mean Error (ME) and Mean Percent Error(MPE).
3. How well the model simulates the turning points.
4. Theil's inequality coefficient (U) and its different components.
5. The overall sensitivity of the model.

To elaborate more, each criteria of the above mentioned needs to be discussed.

7.2.2.a Root Mean Square Simulation Error (RMS)

One way to test the performance of a model is to perform a historical simulation and examine how well each variable tracks its corresponding historical data series. The measure that is often used is (RMS) simulation error which is defined for the variable (Y) as:

$$RMS = \sqrt{1/T \sum_{t=1}^{T} (Y_t^s - Y_t^a)^2}$$

Y_t^s = The simulated value of Y_t

Y_t^a = The actual value of Y

T = The numer of periods on the simulation.

7.2.2.b **Root Mean Square Simulation percent error**

This is also a measure of the deviation of the simulated variables from its actual time path, but in percentage terms.

$$\text{RMS percent error} = \sqrt{1/T \sum_{t=1}^{T} (Y_t^s - Y_t^a / Y_t^a)^2}$$

It may be of interest to say that RMS and RMSPE penalize large individual errors heavily and insure that each endogenous variable corresponds to the historical data.

7.2.2.c **Mean Percent Error (MPE):**

It is the same above measure,except in percentage terms. It's formula is:

$$MPE=\sqrt{1/T \sum_{t=1}^{T} (Y_t^s-Y_t^a/Y_t^a)}$$

7.2.2.d Another important criteria for the model performance is to show **"How well the model simulates the turning points in the historical data"**. One can get a low (RMS) simulation error, and low mean error, but the simulated data missed the turning points. To evaluate such criteria, The result of the plotted figures are represented in Appendix (3). We may conclude by saying that the ability of the simulation model to duplicate either the turning points or rapid changes in the actual data is an important criteria for the model evaluation.

7.2.2.e **Theil's Inequality Coefficient Test (U):**

To evaluate the historical simulation, a useful quantitative test which is related to the (RMS) is used. Theil's Inequality Coefficient test (U) can be defined as :

$$U = \frac{\sqrt{1/T \sum_{t=1}^{T} (Y_t^s-Y_t^a)^2}}{\sqrt{1/T \sum_{t=1}^{T} (Y_t^s)^2} + \sqrt{1/T \sum_{t=1}^{T} (Y_t^a)^2}}$$

The scalling of the denominator is such that (U) will always fall between zero and 1. If the (U) value is equal or close to zero, for all (t), we have a perfect fit. However, if (U) is either equal or close to one, the predictive performance is very poor.

The Theil's inequality cefficient test can be composed to perform different quantitative measures as the systematic error proportion, the variance proportion and the covariance proportion. In the following we will elaborate very briefly in each of the above tests:

7.2.2.f The Systematic error proportion:

This test is also called "The Fraction of error due to bias". It represents an indication of systematic error. It measures the extent to which the average values of the simulated and actual series deviate from each other. It can be defined as

$$U^M = (\bar{Y}_t^s - \bar{Y}_t^a)^2 \;/\; (1/T) \quad (Y_t^s - Y_t^a)^2$$

It is worth emphasizing that whatever the value of the "inequality coefficient" (U) is , it is hoped that the Um is minimum and close to zero. As a large value of U^m is an indication of a systematic error, this criteria is troubling and may require a reconstruction of the model.

7.2.2.g The variance proportion:

This measure indicates the ability of the model to replicate the degree of variability in the variables of interest. It is also called error due to different variation. It is defined as:

$$U^s = (\sigma_s - \sigma_a)^2 \;/\; (1/T) \quad (Y_t^s - Y_t^a)^2$$

If the value of U^s is large, this is an indicator that the actual series has fluctuated considerably, while the simulated series has shown little fluctuation, or vice versa. This may also be a troublesome feature causing structural changes in the model equations.

7.2.2.h **The Covariance proportion:**

While U^m measured the fraction of error due to bias and represented the systematic error proportion, U^c represents the non systematic error proportion. It is also called the fraction of error due to difference covariation. This is the remaining error after deviation from average values and average variabilities have been represented by U^m and U^s. Since we expect minor variation between actual and simulated values, this is a minor error to worry about. According to Rubinfeld and Pindyck the ideal distribution of inequality over the three sources is

$$U^m = U^s = 0 \quad \text{and} \quad U^c = 1$$

The Covariance proportion is formulated as:

$$U^c = 2(1-\rho)\ \sigma_s \sigma_a / (1/T) \sum (Y_t^s - Y_t^a)^2$$

7.2.2.i **The Overall Sensitivity of the Model:**

performance of the model is further tested by examinng its reaction to any change in the initial period used for simulation. Actually, if the model approximately represents the real world, then the model should not be very sensitive to any change in the initial period of simulation.

As an example, our model was originally estimated using annual data from 1964-1983, so it should not matter very much whether the simulation began in 1964 or in 1970[4]. For such a test, a number of simulation runs were made with the initial period 1964-1983 of the simulation, then the period is altered to, say ,1964-1973 for another run, and then finally to 1974-1983 for a third run. Each run generates time paths for all the variables included in the model. For each run the time path generated may be compared with the corresponding time paths of the original initial simulation period. Observed differences may be related to the change in the initial period of the simulation that was used. The test will be applied and it is our hope that the model will pass the sensitivity performance test.

7.3.0 <u>The Model Simulation:</u>

In this section we will apply the previous criteria to our simulation exercises as a means of testing the model validity and performance. To do so we applied our previous OLSQ equations in the simulation exercises. For the simulation purpose, the equations which follow were chosen. Our criteria in doing so was the statistical performance of the equations, (high value of t statistics, goodness of the fit, and absence of serial correlation) in addition to the policy implication variables which these equations include. This should not convey that the other equations have statistical errors, but the chosen ones, in our opinion, were the best. The following equations are listed in the following table:

---

4. Pindyck, R.S. and Rubinfeld D.L., <u>op.cit.,</u> p.366.

Table 7.1 The Simulation Equations

$$\log PC = \underset{(-1.50)}{-0.31} + \underset{(1.68)}{0.11} \log OILGDP + \underset{(12.06)}{0.94} \log PC_{(t-1)}$$

R^2 =0.97 DW =2.19 F =283.20 SER =0.14 H=0.003

$$\log GC = \underset{(2.40)}{0.65} + \underset{(2.86)}{0.78} \log OILREV$$

R^2 =0.92 DW =1.32 F =225.11 SER=0.02

$$\log PI = \underset{(-3.27)}{-0.98} + \underset{(5.23)}{0.40} \log OILREV + \underset{(4.49)}{0.53} \log NOLGDP$$

R^2 =0.98 DW =1.67 F =420.37 SER = 0.13

$$\log GI = \underset{(-2.36)}{-0.75} + \underset{(3.37)}{0.30} \log OILREV + \underset{(8.08)}{0.76} GI_{(t-1)} + \underset{(1.53)}{1.4} \log GDPDF$$

R^2 =0.98 DW = 1.74 F =278.90 SER = 0.18 H=0.02

$$\log M = \underset{(2.10)}{0.28} ; \underset{(14.52)}{0.78} \log M_{(t-1)} + \underset{(4.26)}{0.17} \log NFA$$

R^2 = 0.99 DW = 1.54 F = 1000.34 SER = 0.17

$$\log X = \underset{(2.12)}{-1.75} + 1.93 \log WGDP/WCPI + \underset{(6.86)}{0.96} \log XUV/WCPI$$

R^2 = 0.86 DW = 1.31 F =57.62 SER = 1.45

The Identities

TC = GC + PC

TI = GI + PI

TDA= TC + TI + (X-M)

Where:

TC =Total consumption. & TI = Total investment.

PC =Private consumption. & PI = Private investment.

GC =Government consumption. & GI =Government consumption.

M = Imports. & X= Exports. & TDA= Total Domestic Absorption

As we have already mentioned, the ex-post historical simulation, is performed to evaluate the model's ability to replicate the actual data. A comparison of the actual data series with the simulated series for each endogenous variable can provide a useful test of the model validity and performance. However, when all equations are simulated simultaneously, errors may be accumulated and so a bad simulation may result: "Of course, no model is expected to fit the data exactly: the question is whether the residual errors are sufficiently small to be tolerable and sufficiently unsystematic to be treated as random."[5] As far as our model is concerned , the model does not have any interdependence among its variables, and hence it is not simultanious.

To perform the ex-post simulation test the TSP program is adopted. The most powerful procedure in the TSP package to solve the solution of simultaneous equation models, is SIML. SIML uses Newton's method applied to linear and non-linear equation solution. For linear models like ours SIML will converge in one iteration. This testing procedure is accomplished by simulating the estimated model over the sample period 1964-1983 ,period by period,and by comparing the actual values of the variables with the values generated by the simulation. The simulation error measures are presented in Appendix 1.

----

5. Holt, Charles C., "Validation and Application of Macro Macroeconomic Models using Computer Simulation", in J.S. Duesenberry, et. al. eds., <u>The Brookings Quarterly Econometric Model of the United States</u> Chicago, Rand McNally, 1965, p.639.

Table 7.2 shows the results of the historical simulation. These results seem to be good. The table shows that the model specification was quite successful, and could be used to devise the policy implications of the controlled variables. The highest value of (RMSE) was only 0.52 for the export equation and the lowest value of (RMSE) was 0.09 for the import equation. This is a measure of the deviation of the simulated variable from its actual time path. This low value 0.52 and 0.09 denotes a minimum deviation and a stable performance between actual and simulated data.

The mean absolute error test confirms the above finding within the international sector. Again the mean absolute error for the export equation took the highest value (0.32) and (0.07) for the import equation. This test also intended to measure the deviation between the simulated and actual values.

Another important test to evaluate the simulation results (which is related to the RMS test) is the Theil's inequality coefficient test (U). The results show that we have a good fit with (U) values approaching zero in PC and PI (0.0004 and 0.0006). The highest values registered in our simulation was 0.002 for government consumption and imports.

Table 7.2 :

Results of historical simulation 1964-1983

	PC	GC	TC	PI	GI	TI	X	M	TDA
MAE	0.09	0.18	0.24	0.11	0.14	0.22	0.32	0.07	0.51
ME	0.02	-0.01	0.005	0.02	0.03	0.05	0.12	0.02	0.16
RMSE	0.13	0.25	0.30	0.12	0.17	0.25	0.52	0.09	0.65
U	0.0005	0.002	0.0007	0.0006	0.001	0.0007	0.005	0.002	0.008
U^M	0.01	0.002	0.0003	0.02	0.04	0.04	0.05	0.03	0.06
U^S	0.009	0.006	0.03	0.03	0.02	0.02	0.05	0.009	0.27
U^C	0.98	0.99	0.97	0.95	0.94	0.94	0.89	0.96	0.67

KEY:

MAE : Mean Absolute Error
ME : Mean Error
RMSE: Root Mean Squared Error
U : Theil's Inequality Coefficient
U^m : Fraction of error due to bias
U^s : Fraction of error due to different variation
U^c : Fraction of error due to difference covariation

In summary, it is clear from the foregoing discussion that the model's performance and stability was undoubtedly good. In addition, to show the close fit between actual and simulated values for all the variables a statistical package (G2DP)[6a] was used to plot the simulated togother with the historical values (Appendix 3). These plots will also help to show how successful the simulation was in duplicating the turning points.[6]

6. For more details about the simulated result of each behavioural equation, see Appendix (3).

6a. Leicester Polytechnic: Computer Center; User Guide to General 2 D Plot. September,1985.

7.4.0 The Overall Sensitivity of the Model (The Stability Test)

In testing for the sensitivity (stability) of the model two methods can be distinguished.

1. Farley and Hinich test (F-H test). 2. Chow-test.

These two methods are apply the same statistical criteria in testing for the stability of the model and calculating its sensitivity to any change in the period under investigation. The only difference between the two methods is that the first one (Farley& Hinich) does not require a large sample for the test to be run. It does not require breaking the number of observations into 2 or 3 periods and then comparing the simulation results of these periods to see whether the model is stable to any change in the sample period. On the contrary of that, Chow argues[7] that if the model is performing well, any change in the initial period will not cause any disturbance in the obtained result and, therefore ,the model should not be very sensitive to any change in the initial period of simulation. However, the two methods were applied in testing for the stability of our model. First the entire period of the sample was simulated and the results are presented in Appendix (1). Secondly, the Chow-test was applied by splitting the sample into 2 major periods 1963-1973, and 1974-1983, and the result is presented in Appendix(2).

7.Chow. G , Tests in "Time Series Processor" (TSP), Bronwyn H. Hall, July, 1983, P.83.

The performance of the sensitivity test is quite good. This is performed by simulating the estimated model for two different periods; namely consistent with our a priori analysis in the structure analysis (Chapter 2) and in the model (Chapter 5 and 6), we called these periods the initial period (1964-1973) and the final period (1974-1983). These periods are arbitrarily selected despite their actual representation in the Saudi economy, as examples of sensitivity tests. Any other periods could be chosen and similar findings could be estimated. The TSP SIML/Newton method was used again to conduct two simulation results. The results of these runs, period(2) and (3) and the original initial period of simulation and the comparison results are given in table (7.3). The mean absolute error (MAE) and the root mean square simuation error (RMSE) are chosen for comparison since these errors criteria are more relevant.

Table 7.3 :

Sensitivity Results

	PC	GC	PI	GI	X	M	TC	TI	TDA
Total period (1) 1964-1983 (Farley and Hinich Teast)									
MAE	0.088	0.178	0.105	0.146	0.317	0.067	0.236	0.221	0.508
RMSE	0.128	0.247	0.122	0.170	0.523	0.091	0.298	0.254	0.654
Initial period (2) 1964-1973 (Chow-Test)									
MAE	0.054	0.127	0.112	0.191	0.157	0.073	0.178	0.252	0.434
RMSE	0.094	0.140	0.133	0.202	0.300	0.107	0.216	0.284	0.520
Final period (3) 1974-1983 (Chow-Test)									
MAE	0.122	0.228	0.099	0.106	0.478	0.062	0.293	0.191	0.583
RMSE	0.155	0.321	0.110	0.131	0.676	0.070	0.363	0.219	0.765
DIFFERENCES									
Period 1 - Period 2									
MAE	0.034	0.051	-0.007	-0.043	0.160	-0.006	0.058	-0.031	-0.146
RMSE	0.034	0.107	-0.011	-0.032	0.223	-0.016	0.082	-0.003	0.134
Period 1 - Period 3									
MAE	-0.034	-0.05	0.006	0.048	-0.161	-0.005	-0.057	-0.03	-0.075
RMSE	-0.027	-0.074	0.012	0.039	-0.153	0.021	-0.065	0.035	-0.111

Source: Calculated by the author using the TSP programme.

It is clear from this table, that the model in period 1,2 and 3 tracks the historical time path of the variables quite well. To show the degree of insensitivity, we calculated the differences between the original period (the initial) and the final period. Again the discrepancy is minimum. This shows that these variables (as evaluated by MAE and RMSE) seem to be rather insensitive to changes in the initial simulation period.

The differences between period 1 and 2 seem to be very low with MAE for PI equal (-0.007) and the highest value was 0.160 for the export equation. The highest value for RMSE (0.223) for the export equation and the lowest values was -(0.003) for the TI equation. Within the difference for period 1 and period 3 the highest MAE value was (-0.161) for the export equation and the lowest values was (-0.005) for the TC equation. For RMSE the differences were also minor with (-0.153) for exports as the highest value and (0.006) as the lowest value. It is worth noting that F-H test was used to test for the stability of the model for the whole period(1964-1983) and Chow test is used for the 1964-1973 and 1974-1983.

In Appendix II, the residuals calculated for the first period seems to be lower in value than those for the second period, this may be true in some equations only, and hence should not be interpreted as a criterion for better estimates. Even if they so, we still believe that other tests used in evaluating the two periods gave a satisfactory results for both perids. This should not affect the confidance in the forecasts.

7.5.0 Conclusion

Having proved the validity of the model and tested its stability, the next step is to derive the model policy simulation. This will be done through the forecasting exercises which are based on the simulation programme with the help of the time trend. More specifically, the next step is to determine the nature of the effect produced in the model when policies are changed. If the structured relationships are well defined, a change in any of the policy instruments generates predictable reactions in the system. For this purpose, the model is further tested by using a dynamic forecasting analysis. This test involves shocking the entire system with a change in one or more of the policy instruments and forecasting its future impact on the overall absorptive capacity of the economy. Different variables will be used and different scenarios will be applied. This will allow us to forecast for the impact of these changes on the performance of the economy (overall absorptive capacity) during the next decade (until 2000). The policy variables to be forecasted need to be carefully specified and the forecasting exercises require a high technical computer package. The TSP prgramme will be used. This is the aim of the next Chapter.

APPENDIX 1

Table (1):
Private Consumption in BRS_* and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	4.93	4.95	0.02
1965	4.92	4.94	0.02
1966	4.93	4.95	0.02
1967	4.96	4.96	0.00
1968	5.27	4.99	-0.28
1969	5.27	5.27	0.00
1970	5.31	5.28	-0.03
1971	5.35	5.36	0.01
1972	5.39	5.42	0.03
1973	5.37	5.49	0.12
1974	5.40	5.56	0.16
1975	5.69	5.58	-0.11
1976	5.70	5.84	0.14
1977	5.96	5.86	-0.10
1978	6.25	6.09	-0.16
1979	6.37	6.37	0.00
1980	6.90	6.54	-0.36
1981	6.98	7.07	0.09
1982	7.07	7.14	0.07
1983	7.15	7.16	0.01

Root mean square error = 0.1282

Mean absolute error = 0.088

Mean error = 0.0153

Theil's Inequality Coefficient = 0.00049

Fraction of error due to bias = 0.014

Fraction of error due to different variation = 0.0089

Fraction of error due to difference covariation = 0.97677

BRS_* : Billion Saudi Ryials.

Table(2):
<u>Government</u> <u>Consumption</u> (in BRS) and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUAL
1964	4.24	4.32	0.08
1965	4.35	4.40	0.05
1966	4.47	4.53	0.06
1967	4.79	4.69	-0.10
1968	4.75	4.56	-0.19
1969	4.69	4.57	-0.12
1970	4.72	4.64	-0.08
1971	4.83	4.71	-0.12
1972	4.91	5.13	0.22
1973	4.97	5.17	0.20
1974	5.39	5.45	0.06
1975	5.75	6.39	0.64
1976	5.90	6.11	0.21
1977	6.14	6.13	-0.01
1978	6.17	6.26	0.09
1979	6.58	6.16	-0.42
1980	6.62	6.36	-0.26
1981	6.64	6.72	0.08
1982	7.10	6.92	-0.18
1983	6.92	6.75	-0.17

Root mean squared error = 0.25

Mean absolute error = 0.177

Mean error =-0.010

Theil's inequality coefficient = 0.002

Fraction of error due to bias = 0.001

Fraction of error due to different variation = 0.005

Fraction of error due to difference of covariation = 0.99281

Table(3):
Private Investment (PI) in BRS and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	3.65	3.74	0.09
1965	3.92	3.82	-0.10
1966	4.11	3.94	-0.83
1967	4.08	4.07	-0.01
1968	3.98	4.00	0.02
1969	3.91	3.99	0.08
1970	3.86	4.03	0.17
1971	4.03	4.08	0.05
1972	4.12	4.33	0.21
1973	4.61	4.39	-0.22
1974	4.71	4.59	-0.12
1975	5.14	5.23	0.09
1976	5.31	5.22	-0.09
1977	5.59	5.36	-0.23
1978	5.59	4.51	-0.08
1979	5.62	5.55	-0.07
1980	5.83	5.76	-0.07
1981	5.91	6.01	0.10
1982	6.11	6.19	0.08
1983	6.19	6.15	-0.04

Root mean square error = 0.122

Mean absolute error = 0.105

Mean error = 0.018

Theil's Inequality Coefficient = 0.0006

Fraction of error due to bias = 0.021

Fraction of error due to different variation = 0.021

Fraction of error due to difference covariation = 0.95044

Table(4):
<u>Government</u> <u>Investment</u> (GI) in BRS and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	2.92	3.15	0.23
1965	3.34	3.07	-0.27
1966	3.73	3.44	-0.29
1967	3.59	3.78	0.19
1968	3.86	3.66	-0.20
1969	3.89	3.79	-0.10
1970	3.73	3.85	0.12
1971	3.68	3.82	0.14
1972	3.82	3.95	0.13
1973	3.99	4.12	0.13
1974	4.33	4.31	-0.02
1975	4.81	4.75	-0.06
1976	5.40	5.11	-0.29
1977	5.74	5.64	-0.10
1978	6.02	5.85	-0.17
1979	6.20	5.03	-1.17
1980	6.39	6.28	-0.11
1981	6.44	6.54	0.10
1982	6.53	6.57	0.04
1983	6.38	6.38	0.00

Root mean square error = 0.17

Mean absolute error = 0.14

Mean error = 0.033

Theil's Inequality Coefficient = 0.0012

Fraction of error due to bias = 0.03

Fraction of error due to different variation = 0.015

Fraction of error due to difference covariation = 0.950

Table(5):
Total Consumption in BRS and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	9.16	9.28	0.12
1965	9.28	9.34	0.06
1966	9.40	9.48	0.08
1967	9.75	9.66	-0.09
1968	10.02	9.56	-0.46
1969	9.96	9.85	-0.11
1970	10.08	9.92	-0.16
1971	10.18	10.07	-0.11
1972	10.29	10.56	0.27
1973	10.34	10.57	0.23
1974	10.79	11.02	0.77
1975	11.27	11.97	0.70
1976	11.60	11.95	0.35
1977	12.09	11.99	-0.10
1978	12.42	12.35	-0.07
1979	12.95	12.52	-0.43
1980	13.51	12.89	-0.62
1981	13.63	13.79	0.16
1982	14.15	14.06	-0.09
1983	14.07	13.91	-0.16

Root mean square error = 0.29

Mean absolute error = 0.23

Mean error = 0.005

Theil's Inequality Coefficient = 0.0006

Fraction of error due to bias = 0.00031

Fraction of error due to different variation = 0.028

Fraction of error due to fifference covariation = 0.971

Table(6):
<u>Total</u> <u>Investment</u> in BRS and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	7.04	6.90	-0.14
1965	7.26	6.89	-0.37
1966	7.84	7.38	-0.46
1967	7.67	7.85	0.18
1968	7.83	7.60	-0.23
1969	7.80	7.78	-0.02
1970	7.60	7.88	0.28
1971	7.72	7.90	0.18
1972	7.94	8.29	0.35
1973	8.60	8.51	-0.09
1974	9.05	8.90	-0.15
1975	9.94	9.98	0.04
1976	10.27	10.33	0.06
1977	10.70	11.00	0.30
1978	11.33	11.36	0.03
1979	11.61	11.58	-0.03
1980	11.81	12.04	0.23
1981	12.22	12.56	0.34
1982	12.36	12.77	0.41
1983	12.58	12.55	-0.03

Root mean square error = 0.25

Mean absolute error = 0.22

Mean error = 0.05

Theil's Inequality Coefficient = 0.0006

Fraction of error due to bias = 0.04

Fraction of error due to different variation = 0.02

Fraction of error due to difference of covariation = 0.94

Table(7):
Total Import (M) in BRS and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	4.33	4.44	0.11
1965	4.52	4.52	0.00
1966	4.63	4.67	0.04
1967	5.07	4.79	-0.28
1968	5.22	5.11	-0.11
1969	5.16	5.18	0.02
1970	5.14	5.15	0.01
1971	5.14	5.22	0.08
1972	5.29	5.31	0.02
1973	5.41	5.46	0.05
1974	5.83	5.76	-0.07
1975	6.11	6.14	0.03
1976	6.29	6.36	0.07
1977	6.56	6.51	-0.05
1978	6.83	6.70	-0.13
1979	6.97	6.92	-0.05
1980	7.15	7.09	-0.06
1981	7.29	7.24	-0.05
1982	7.46	7.42	-0.04
1983	7.45	7.54	0.09

Root mean square error = 0.09

Mean absolute error = 0.07

Mean error = 0.02

Theil's Inequality Coefficient = 0.0023

Fraction of error due to bias = 0.03

Fraction of error due to different variation = 0.0086

Fraction of error due to difference covariation = 0.962

Table (8):
<u>Total</u> <u>Exports</u> in BRS and in log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	5.59	5.75	0.16
1965	5.69	5.72	0.03
1966	5.80	5.80	0.00
1967	5.84	5.77	-0.07
1968	5.89	5.84	-0.05
1969	5.79	5.85	0.06
1970	5.87	6.06	0.19
1971	6.21	6.16	-0.05
1972	6.44	6.47	0.03
1973	6.70	7.61	0.91
1974	7.55	7.53	-0.02
1975	7.54	7.38	-0.16
1976	7.32	7.31	-0.01
1977	7.37	7.21	-0.16
1978	7.26	7.43	0.17
1979	7.29	7.75	0.46
1980	7.82	7.55	-0.27
1981	8.14	7.23	-0.91
1982	8.09	6.76	-1.33
1983	7.62	6.37	-1.25

Root mean square error = 0.52

Mean absolute error = 0.32

Mean error = 0.12

Theil's Inequality Coefficient = 0.005

Fraction of error due to bias = 0.050

Fraction of error due to different variation = 0.059

Fraction of error due to difference covariation = 0.88958

Table(9):
Total Domestic Absorption in BRS and log function

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	16.99	16.49	-0.50
1965	17.72	17.43	-0.29
1966	18.42	17.90	-0.52
1967	18.20	18.49	0.29
1968	18.53	17.88	-0.65
1969	18.38	18.29	-0.09
1970	18.40	18.71	0.31
1971	18.96	18.91	-0.05
1972	19.38	20.00	0.62
1973	20.22	21.32	1.10
1974	21.55	21.68	0.13
1975	22.65	23.18	0.53
1976	23.33	23.23	-0.10
1977	24.24	23.69	-0.55
1978	24.47	24.44	-0.03
1979	25.08	24.93	-0.15
1980	26.41	25.40	-1.01
1981	27.83	26.28	-1.55
1982	27.43	26.17	-1.26
1983	26.82	25.29	-1.53

Root mean square error = 0.65

Mean absolute error = 0.51

Mean error =0.159

Theil's Inequality Coefficient = 0.0089

Fraction of error due to bias = 0.0597

Fraction of error due to different variation = 0.2678

Fraction of error due to difference of covariation = 0.67

A P P E N D I X

Private Consumption

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	4.92451	4.95852	0.03401	1974	5.39068	5.56268	0.172
1965	4.92191	4.93812	0.01621	1975	5.69306	5.58469	-0.10837
1966	4.92851	4.94825	0.01974	1976	5.70159	5.84439	-0.1428
1967	4.96360	4.95929	-0.00431	1977	5.95772	5.85796	-0.09976
1968	5.26507	4.99988	-0.26519	1978	6.25248	6.08687	-0.16561
1969	5.26529	5.27882	0.01353	1979	6.37346	6.36644	-0.00702
1970	5.30844	5.28003	-0.02841	1980	6.89596	6.53817	-0.35779
1971	5.35148	5.35962	0.00814	1981	6.98278	7.06693	0.08415
1972	5.38513	5.42437	0.03924	1982	7.06783	7.14016	0.07233
1973	5.36577	5.48594	0.12017	1983	7.15202	7.16555	0.01353

Period A (1964-1973)		Period B (1974-1983)	
Root mean square error	= 0.09437	Root mean square error	= 0.154
Mean absolute error	= 0.054	Mean absolute error	= 0.122
Mean error	= 0.0052	Mean error	= 0.023
Theil's Inequality Coefficient	= 0.00033	Theil's Inequality Coefficient	= 0.0006
Fraction of error due to bias	= 0.0031	Fraction of error due to bias	= 0.026
Fraction of error due to covariation	= 0.967	Fraction of error due to covariation	= 0.96

G o v e r n m e n t   C o n s u m p t i o n

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	4.24014	4.32255	-0.08241	1974	5.39444	5.45687	-0.06243
1965	4.35695	4.40302	-0.04607	1975	5.57543	6.38797	-0.81254
1966	4.47099	4.53271	-0.06172	1976	5.89777	6.11176	-0.21394
1967	4.79124	4.69875	0.09249	1977	6.14066	6.13398	0.00686
1968	4.75279	4.55939	0.1934	1978	6.17162	6.26375	-0.09213
1969	4.69356	4.57280	0.12076	1979	6.57792	6.15740	0.4032
1970	4.77039	4.64284	0.12755	1980	6.61831	6.35934	0.02491
1971	4.82779	4.70958	0.11821	1981	6.64435	6.72446	-0.08011
1972	4.90656	5.13462	-0.22806	1982	7.08361	6.92005	0.16305
1973	4.97384	5.17323	-0.19939	1983	6.92461	6.74939	0.17522

Period A (1964-1973)

Root mean square error = 0.139

Mean absolute error = 0.127

Mean error = 0.003

Theil's Inequality Coefficient = 0.0008

Fraction of error due to bias = 0.0006

Fraction of error due to variation = 0.06

Fraction of error due to covariation = 0.933

Period B (1974-1983)

Root mean square error = 0.32

Mean absolute error = 0.228

Mean error = 0.023

Theil's Inequality Coefficient = 0.002

Fraction of error due to bias = 0.005

Fraction of error due to variation = 0.186

Fraction of error due to covariation = 0.808

Total Consumption identity

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	9.16465	9.28106	-0.11641	1974	10.78512	11.01955	-0.23443
1965	9.27886	9.34114	-0.06228	1975	11.26849	11.97266	-0.70417
1966	9.39950	9.48096	-0.08146	1976	11.59937	11.95616	-0.35679
9.75484	9.65804	0.0968	1977	12.09838	11.99194	0.10644	
1968	10.01786	9.55927	0.45859	1978	12.42410	12.35063	0.07347
1969	9.95885	9.84562	0.11323	1979	12.95137	12.52384	0.42753
1970	10.07883	9.92287	0.15596	1980	13.51427	12.89752	0.61675
1971	10.17927	10.06920	0.11007	1981	13.62713	13.79138	-0.16425
1972	10.29169	10.55899	-0.2673	1982	14.15144	14.06020	0.09124
1973	10.33961	10.63916	-0.31955	1983	14.07664	13.91494	0.1617

Period A (1964-1973)

Root mean square error = 0.216

Mean absolute error = 0.178

Mean error = 0.008

Theil's Inequality Coefficient = 0.0004

Fraction of error due to bias = 0.0016

Fraction of error due to covariation = 0.95

Period B (1974-1983)

Root mean square error = 0.363

Mean absolute error = 0.293

Mean error = 0.0017

Theil's Inequality Coefficient = 0.0008

Fraction of error due to bias = 0.255

Fraction of error due to covariation = 0.74

Private Investment Equation

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	3.65305	3.74487	-0.09565	1974	4.71178	4.59125	0.12053
1965	3.92141	3.82505	0.09636	1975	5.14338	5.22941	-0.08603
1966	4.11617	3.93803	0.17814	1976	5.31016	5.21841	0.09175
1967	4.08226	4.06587	0.01639	1977	5.59834	5.36256	0.23578
1968	3.98051	4.00057	-0.02006	1978	5.59438	5.51321	0.08117
1969	3.91058	3.98723	-0.07665	1979	5.62123	5.54955	0.07168
1970	3.86471	4.02799	-0.16328	1980	5.83591	5.75916	0.07675
1971	4.03970	4.08190	-0.16328	1981	5.91502	6.01227	-0.09725
1972	4.12438	4.33432	-0.20994	1982	6.10768	6.19073	-0.08305
1973	4.61031	4.38832	0.22199	1983	6.19970	6.15637	0.04333

Period A (1964-1973)		Period B (1974-1983)	
Root mean square error	= 0.133	Root mean square error	= 0.11036
Mean absolute error	= 0.111	Mean absolute error	= 0.0987
Mean error	= 0.0091	Mean error	= 0.0454
Theil's Inequality Coefficient	= 0.0010	Theil's Inequality Coefficient	= 0.0003
Fraction of error due to bias	= 0.0046	Fraction of error due to bias	= 0.1697
Fraction of error due to covariation	= 0.876	Fraction of error due to covariation	= 0.7065

Government Investment Equation

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	2.92013	3.15041	-0.23028	1974	4.33402	4.31097	0.02305
1965	3.34293	3.0666	0.27633	1975	4.80584	4.75438	0.05146
1966	3.73244	3.43869	0.29375	1976	5.39620	5.11431	0.2817
1967	3.58826	3.78771	-0.19945	1977	5.73581	5.64413	0.09168
1968	3.85828	3.59528	0.263	1978	6.02166	5.84694	0.17472
1969	3.88569	3.79062	0.09507	1979	6.19504	6.03243	0.16261
1970	3.73438	3.85909	-0.12475	1980	6.38785	6.28266	0.10519
1971	3.67896	3.82584	-0.14688	1981	6.44148	6.54382	-0.10234
1972	3.81816	3.95724	-0.13908	1982	6.52993	6.57989	-0.04996
1973	3.98516	4.12229	-0.13713	1983	6.37589	6.38938	-0.01349

Period A (1964-1973)		Period B (1974-1983)	
Root mean square error	= 0.202	Root mean square error	= 0.131
Mean absolute error	= 0.191	Mean absolute error	= 0.105
Mean error	= -0.005	Mean error	= 0.072
Theil's Inequality Coefficient	= 0.003	Theil's Inequality Coefficient	= 0.0005
Fraction of error due to bias	= 0.0006	Fraction of error due to bias	= 0.305
Fraction of error due to variation	= 0.020	Fraction of error due to variation	= 0.05
Fraction of error due to covariation	= 0.978	Fraction of error due to covariation	= 0.0639

Total Investment Identity

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	6.57318	6.89528	-0.3221	1974	9.04580	8.90222	0.14350
1965	7.26	6.89173	0.37261	1975	9.94922	9.98378	-0.03456
1966	7.84861	7.37672	0.47189	1976	10.70637	10.33271	0.37366
1967	7.67052	7.85358	-0.18306	1977	11.33414	11.00669	0.32745
1968	7.83879	7.59585	0.24294	1978	11.61603	11.36015	0.25588
1969	7.79626	7.77785	0.01841	1979	11.81627	11.58198	0.23429
1970	7.59909	7.88708	-0.28799	1980	12.22375	12.04182	0.18193
1971	7.71866	7.90773	-0.18907	1981	12.35651	12.55609	-0.19958
1972	7.94255	8.29156	-0.34903	1982	12.63761	12.77061	-0.133
1973	8.59547	8.51060	0.08487	1983	12.57569	12.54576	0.02993

Period A (1964-1973)		Period B (1974-1983)	
Root mean square error	= 0.284	Root mean square error	= 0.219
Mean absolute error	= 0.252	Mean absolute error	= 0.191
Mean error	= -0.014	Mean error	= 0.1179
Theil's Inequality Coefficient	= 0.001	Theil's Inequality Coefficient	= 0.0003
Fraction of error due to bias	= 0.002	Fraction of error due to bias	= 0.289
Fraction of error due to variation	= 0.003	Fraction of error due to variation	= 0.094
Fraction of error due to covariation	= 0.995	Fraction of error due to covariation	= 0.0615

Import Equation

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	4.33163	4.43720	-0.10557	1974	5.83294	5.76110	0.07184
1965	4.52056	4.52195	-0.00139	1975	6.11373	6.14714	-0.03341
1966	4.63442	4.67322	-0.0388	1976	6.29253	6.36654	-0.07401
1967	5.07122	4.79055	0.28067	1977	6.56536	6.51394	0.05142
1968	5.22206	5.10775	0.11431	1978	6.83714	6.69995	0.13719
1969	5.16551	5.18558	-0.02007	1979	6.97988	6.91991	0.05997
1970	5.14790	5.15925	-0.01135	1980	7.15268	7.08704	0.06564
1971	5.14293	5.22723	-0.0843	1981	7.29784	7.29068	0.00716
1972	5.29246	5.31545	-0.02299	1982	7.46261	7.42031	0.0423
1973	5.41242	5.46078	-0.04836	1983	7.45924	7.54094	-0.0817

Period A (1964-1973)		Period B (1974-1983)	
Root mean square error	= 0.107	Root mean square error	= 0.070
Mean absolute error	= 0.072	Mean absolute error	= 0.062
Mean error	= 0.0062	Mean error	= 0.024
Theil's Inequality Coefficient	= 0.0004	Theil's Inequality Coefficient	= 0.00011
Fraction of error due to bias	= 0.006	Fraction of error due to bias	= 0.122
Fraction of error due to covariation	= 0.99	Fraction of error due to covariation	= 0.87

Export Equation

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	5.5229	5.75271	-0.16042	1974	7.55619	7.52545	0.03074
1965	5.69240	5.71770	-0.0253	1975	7.54866	7.37720	0.17146
1966	5.80447	5.80114	-0.00333	1976	7.32437	7.30906	0.01531
1967	5.84237	5.77016	0.07221	1977	7.37095	7.20875	0.1622
1968	5.89276	5.83597	0.05679	1978	7.26782	7.43166	-0.16384
1969	5.79306	5.85349	-0.06043	1979	7.29462	7.74673	-0.45211
1970	5.87280	6.06611	-0.19331	1980	7.82207	7.55123	0.27084
1971	6.21388	6.15569	0.05819	1981	8.14791	7.22795	0.90996
1972	6.44025	6.46884	-0.02859	1982	8.09937	6.76040	1.33897
1973	6.70114	7.60884	-0.9077	1983	7.62819	6.37314	1.25505

<u>Period A (1964-1973)</u>

Root mean square error = 0.300

Mean absolute error = 0.156

Mean error = -0.118

Theil's Inequality Coefficient = 0.0025

Fraction of error due to bias = 0.155

Fraction of error due to covariation = 0.34

<u>Period B (1974-1983)</u>

Root mean square error = 0.676

Mean absolute error = 0.478

Mean error = 0.354

Theil's Inequality Coefficient = 0.007

Fraction of error due to bias = 0.275

Fraction of error due to covariation = 0.711

Total Domestic Absorptive Identity

YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS	YEAR	ACTUAL VALUES	SIMULATED VALUES	RESIDUALS
1964	16.99849	17.49186	-0.49337	1974	21.55416	21.68611	-0.13195
1965	17.71504	17.42862	0.28642	1975	22.65263	23.18650	-0.53387
1966	18.41817	17.98560	0.43257	1976	23.33758	23.23138	0.1062
1967	18.19650	18.49124	-0.29474	1977	24.23811	23.69344	0.54467
1968	18.52735	17.88334	0.64401	1978	24.47081	24.44249	0.02832
1969	18.38267	18.29139	0.09128	1979	25.08239	24.93263	0.14976
1970	18.40283	18.71680	0.31397	1980	26.40741	25.40352	1.00389
1971	18.96889	18.90539	0.0635	1981	26.83371	26.28474	0.54897
1972	19.38202	20.00395	-0.62193	1982	27.42581	26.17090	1.25491

Period A (1964-1973)

Root mean square error = 0.520

Mean absolute error = 0.433

Mean error = -0.130

Theil's Inequality Coefficient = 0.0007

Fraction of error due to bias = 0.062

Fraction of error due to variation = 0.35

Fraction of error due to covariation = 0.59

Period B (1974-1983)

Root mean square error = 0.765

Mean absolute error = 0.583

Mean error = 0.449

Theil's Inequality Coefficient = 0.0009

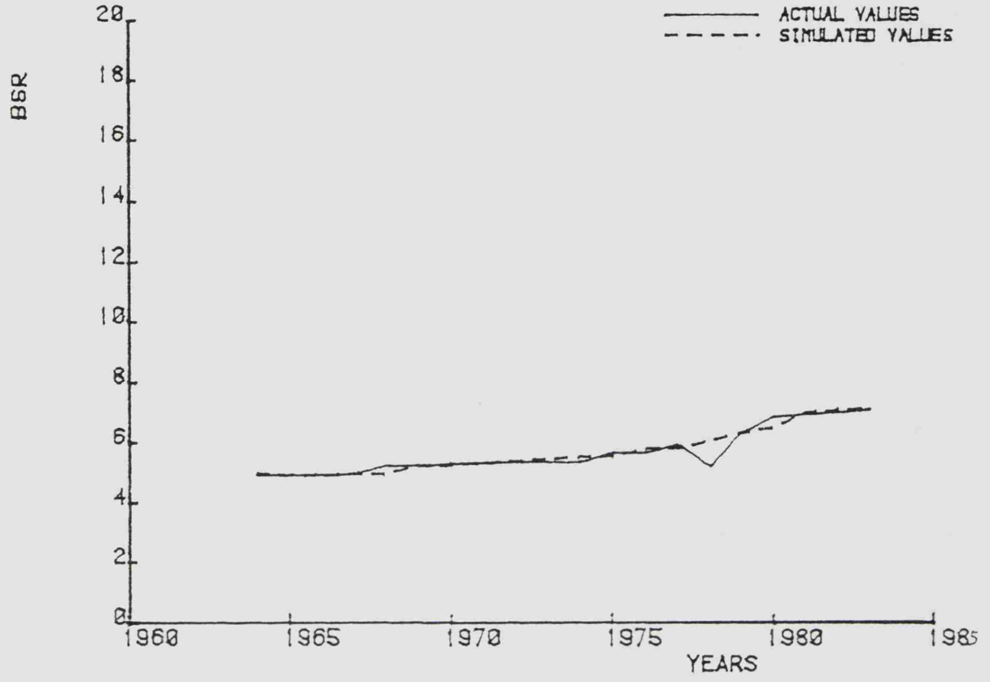
Fraction of error due to bias = 0.345

Fraction of error due to variation = 0.404

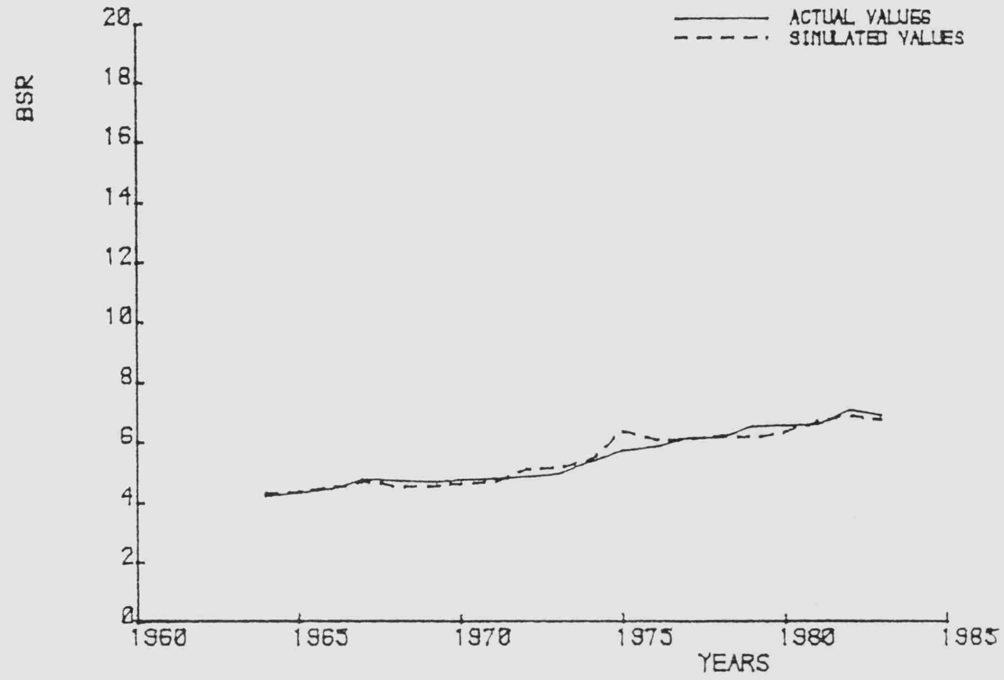
Fraction of error due to covariation = 0.249

APPENDIX III.

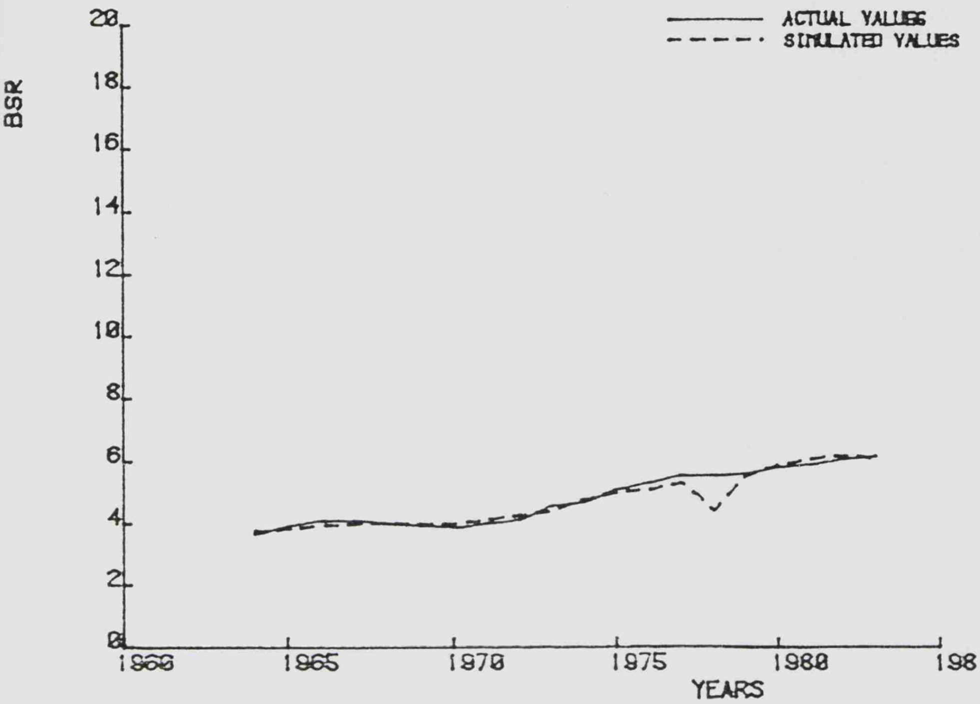
PRIVATE CONSUMPTION



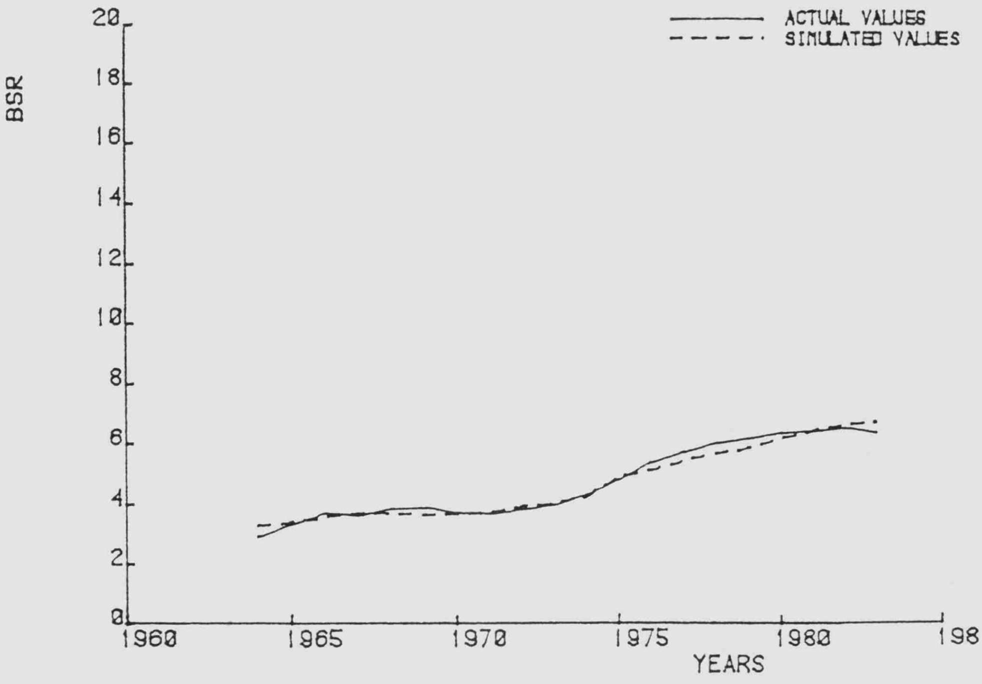
GOVERNMENT CONSUMPTION



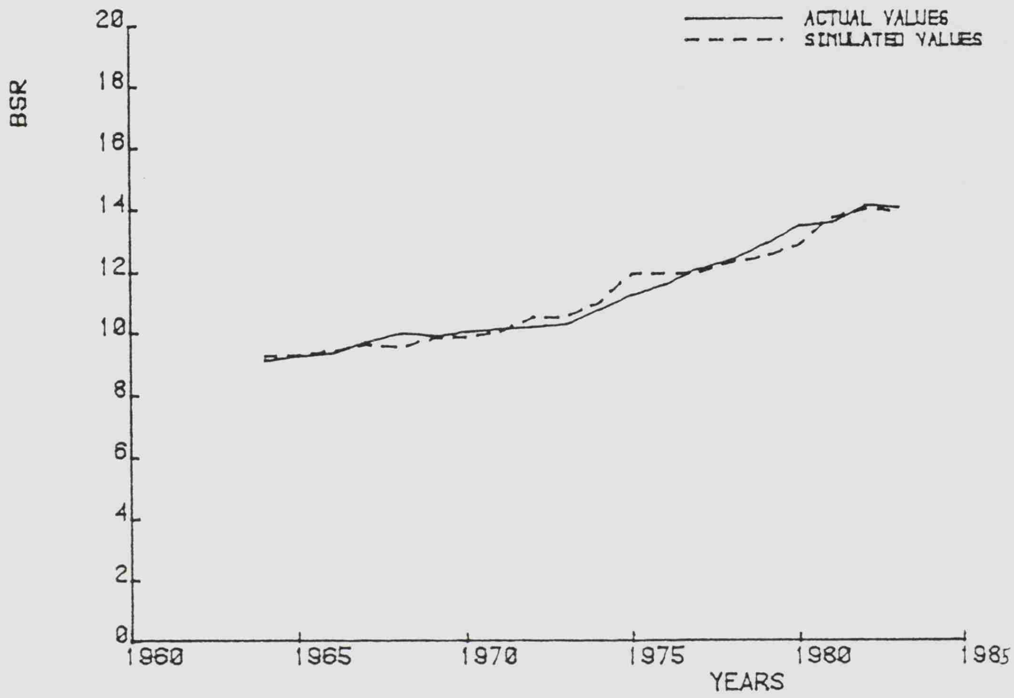
PRIVATE INVESTMENT



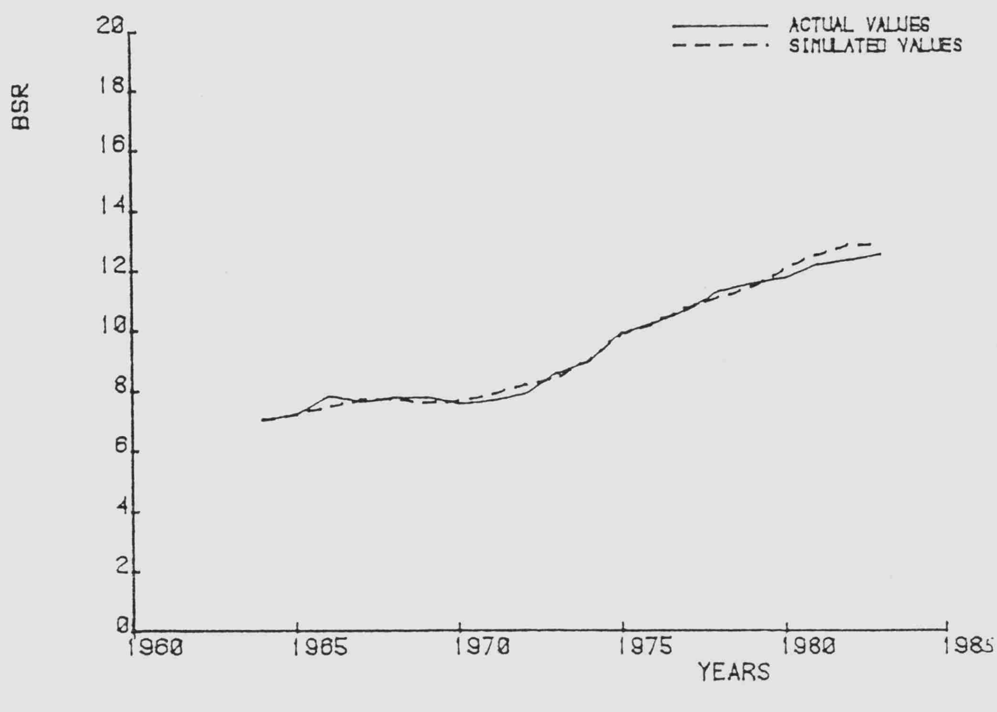
GOVERNMENT INVESTMENT

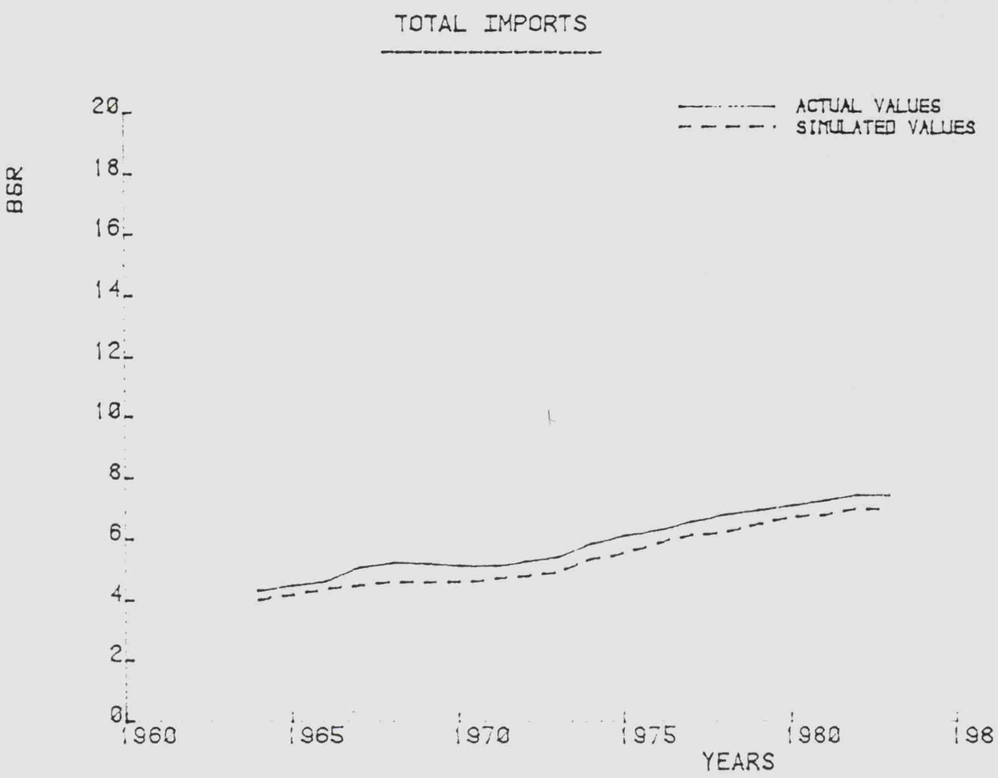


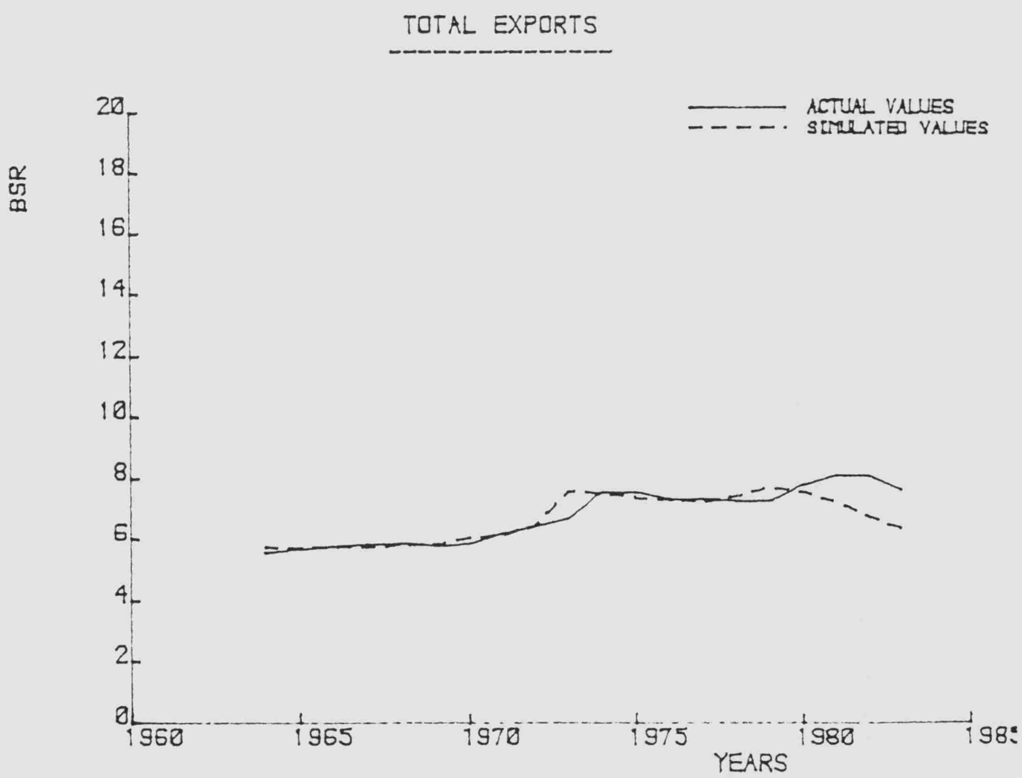
TOTAL CONSUMPTION



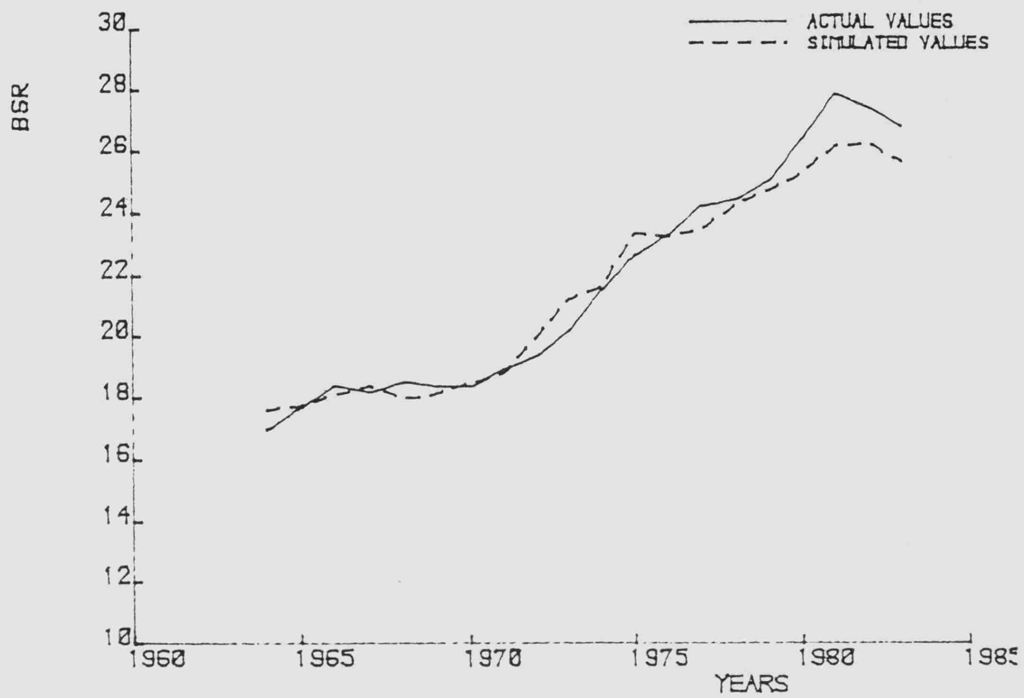
TOTAL INVESTMENT




TOTAL IMPORTS
ACTUAL VALUES
SIMULATED VALUES
BSR
20
18
16
14
12
10
8
6
4
2
0
1960
1965
1970
1975
1980
198
YEARS


TOTAL EXPORTS
ACTUAL VALUES
SIMULATED VALUES
BSR
20
18
16
14
12
10
8
6
4
2
0
1960
1965
1970
1975
1980
198
YEARS

TOTAL DOMASTIC ABSORPTION



CHAPTER EIGHT

FORECASTING THE ABSORPTIVE CAPACITY FOR THE SAUDI ARABIAN ECONOMY (1985 - 2000)

INTRODUCTION

In chapter 7 the validity of the model has been proved and its stability tested.This Chapter determines the nature of the effects produced in the model when policies are changed. This will be done by using dynamic forecasting analysis. As stated earlier different scenarios will be applied. This will allow us to forecast the impact of these changes on the performance of the overall absorptive capacity of the economy during the future period. In section 2 we will analyse the importance of forecasting the absorptive capacity in the short and long-terms. In section 3 the special considerations in forecasting an oil based economy, such as Saudi Arabia, are examined. Section 4 will investigate the projection of the absorptive capacity during the period 1984-1990 and between 1984-2000. The criteria in splitting the sample is to allow us to make a comparative analysis between our projection and what the Saudi planners forecaste for the economy in the fourth plan (1985 - 1990). Different scenarios will be applied under different assumptions. This will allow us to account for the implication of these assumptions on the absorptive capacity of the economy.

In order to help the planners in Saudi Arabia for practical policy formulations, we intend to forecast the absorptive capacity in the light of different assumptions and the implication of any future fluctuations in oil prices in the economic growth of the Kingdom. Given the knowledge of the functional relations which we have already investigated within the framework of a simple macroeconomic model (see Chapter 5, 6 and 7), it is then possible for the Saudi's planners to see clearly, with the help of these projections what policy instruments could be varied to affect the target variables (ie. increasing the overall absorptive capacity). This forecasting approach which will be based on a proper theoretical framework (discussed in chapters 5 , and 6, in spite of the various conceptual limitation, statistical and interpretational problems involved, particularly with regard to oil markets ,seems to us to be more objective compared to the vagueness of most of the current works in this field.
[1]
We must confess that we do not pretend that we have the real solution to this confused field,oil prices, and that we are going to solve the crucial problem which oil countries are facing because of the sharp fluctuations in oil prices, but what we would like to do is to state very honestly the extent of vagueness in this field
[2]

---

[1] For more details see:
Azzam(1976) op.cit, El Mallakh Studies(1976 &1977),op.cit, Gebelein (1974),op.cit,Abolfathi&Others(1977)op.cit, U.S. Department of Commerce (1973),op.cit.

(Footnote continued)

and to draw some guidance based on proper methodology which could provide the planners with some quantitative figures. Any rough orders of magnitude based on proper methodology is ,to our mind, highly useful for the planners because once the planners know these rough order from the econometric works, there is no harm in them giving allowance to the many other qualitative considerations which exist in the complex real world, which would not be allowed for in the econometric works in making final policy judgments. Final decision making will then be much easier than making plans on a guess work.

Before we forecast the Saudi's absorptive capacity and state the importance of absorptive capacity under different scenarios, we will shed some light on the special considerations when forecasting oil-based economies . This is done in section 3. This study attempts to bridge the gap between a fully detailed forecasting structure , capable of distinguishing the effect of narrowly defined changes in initial conditions , and a relatively short period of time available to construct that forecast.The result is a forecast programme that permits the development of alternative forecasts as better and more recent information becomes available. It is possible to amend the information derived from these exercises to generate different projections under different scenarios and to alter the basic assumptions regarding future oil revenues and other

---

[2](continued)

[2]Due to the complexity of this issue ie."projecting oil prices" the Saudi Government has deferred the announcement of the budget for five(till 12,August 1986) months until the oil markets will be predicted.

For more details see: <u>Arab news,</u> 12 March ,1986, p.11.

key variables to generate different projection's and to derive different policy implications.

8.2.0 The IMPORTANCE OF ABSORPTIVE CAPACITY FORECASTING

It could be argued that very little has been said and done either in establishing some basic guidelines or in developing forecasting models capable of projecting accurate figures for the issue in question. This is not surprising since forecasting the future absorptive capacity of an oil-based economy,such as Saudi Arabia,is an extremely complex process, a process which requires the use of highly sophisticated statistical techniques using powerful computer programs. In addition the projections results may be subject to social, political and other considerations which can not be explicitly captured in the model. As most model builders and projectors are aware, these are factors which are difficult to incorporate into an economic model. The importance of forecasting the Saudi absorptive capacity is clear. The issue is sensitive to future oil prices,oil production,Saudi imports,and to the international financial system.

8.3.0 Considerations in forecasting The Saudi's Absorptive Capacity

Before we examine and evaluate the statistical results of our forecast for the short and long run, the following factors need to be considered.

I) Since the oil-boom , which started by 1973, the oil sector has dominated the Gross Domestic Product (GDP) of the Kingdom. Although there has been a large increase in the non oil-sector over recent years, the oil sector still accounted for 43.00 per cent of GDP in 1984.[3]

II) The striking features in the Saudi's public finance is that government expenditure is financed almost entirely by oil revenues. According to the most recent statistics,[4] oil revenues constitute 68.00 per cent of the total income of the country at present. In addition the tax structure in Saudi Arabia is in its rudimentary stage and it could be said that there is very little taxation other than Zakat, (a voluntary tax) and corporation taxes. Given this situation government expenditure is totally financed through oil revenues and net foreign assets from abroad which is not more than oil surpluses invested abroad.[5] By the end of 1981, government expenditure has been a major

---

[3] See, SAMA Annual Report,1984 p.7

[4] King Fahad statement on announcing the deferred budget in Arab News, 12 March 1986. P.(11)

[5] Presley J.: The Monetary Sector in Fanancial Surplus Islamic, Developing Economy - The case of S.Arabia LUBC Research papers Series No. 3, 1985 P.2.

force in the industrial development of the economy with 64.00 per cent of gross capital formation is being undertaken by government.[6]

III) Because of the openess of the economy (high propensity to import {37.00 per cent}) and due to the absence of the domestic production of consumer and capital goods, the country is largely dependent on imports which are financed by oil revenues. If the balance of payments has consistently recorded large surpluses during the last period, there is no guarantee that this situation will persist forever.

IV) The Kingdom is also characterized by a number of distinctive demographic features. The population density in general is low although there is a high density is in the South West where agriculture is the dominant industry. Of more importance, it is estimated that more than 40.00 per cent of the labour force are foreigners.[7]

In the light of the fourth plan's projection, which emphasised the Saudation in the labour force, the planned structural changes in the economy will increase the demand for Saudi's professional and skilled labour. This will require improvements in the government's administrative system. This will, of course, increase government expenditure. Given the declining oil revenues during the last few years and the continuous decrease in oil prices,

---

[6] Domestic revenues had contributed less than 9.00 per cent of the government expenditure see: Fourth Development Plan p.71.

[7] J. Presley , op,cit. p.3

this situation might be aggravated and could have a negative impact on the total absorptive capacity of the economy.[8]

V) Finally, since the economic behaviours of the majority of people are guided by the teaching of Islam, it is unlikely that either foreign assets or oil surpluses which are invested in foreign financial markets can be re_channeled towards financial domestic markets which would diversify public revenues and be used to finance economic development. Given the primitive financial markets in S.Arabia, the religious considerations preclude developing financial activities along the line such as those being established in Bahrain or Kuwait.[9]

Given the above considerations , section 4 will highlight the different scenarios when forecasting the absorptive capacity of Saudi Arabia in the light of its current and potential circumstances.

The general idea of forecasting the absorptive capacity involve two steps. First, the describtion of the assumption that defines the scenarios under which the forecasting is done. This also implies projecting all the

---

[8] In the Fourth Plan, contracts termination and cut in wages are suggested for foreigners.

[9] For more analysis see:

Wilson, R " Islamic Business : <u>Theory And Practice</u>",<u>The Economist Intelligence Unit</u>, October 1984, PP:64-73.

behavioural variables in the model, for the entire forecasting period (1984 - 2000) and making adjustments to the coefficient of the structural equations necessitated by the assumption. The second step involves forecasting the model under alternative scenarios, to asses the impact of change in any of the variables on the other coefficients for the years covered by the forecasting horizon.

ENDIX (1).
LE (8.1)

IMPACT OF CHANGES IN OIL REVENUES ON THE DIFFERENT SECTORS OF THE ECONOMY

(OIL REVENUES 100%)

RS	PC2	GC3	PI2	GI2	MA
84	4.59125	4.08902	3.42764	2.79694	4.66614
85	4.71237	4.23800	3.56647	2.99848	4.86698
86	4.83338	4.38698	3.70530	3.19926	5.06765
87	4.95450	4.53596	3.84413	3.39940	5.26832
88	5.07562	4.68494	3.98296	3.60018	5.46899
89	5.19663	4.83392	4.12178	3.80172	5.66966
90	5.31775	4.98290	4.26061	4.00250	5.87050
91	5.43876	5.13188	4.39944	4.20404	6.07117
92	5.55988	5.28086	4.53827	4.40558	6.27184
93	5.68194	5.42984	4.67710	4.60496	6.47251
94	5.80295	5.57882	4.81593	4.80650	6.67318
95	5.92407	5.72780	4.95476	5.00728	6.87402
96	6.04508	5.87678	5.09359	5.20882	7.07469
97	6.16620	6.02576	5.23241	5.41036	7.27536
98	6.28732	6.17474	5.37124	5.61114	7.47603
99	6.40833	6.32372	5.51007	5.81166	7.67670
00	6.52945	6.47270	5.64890	2.21206	7.87737

INUE FROM TABLE(1)
REVENUES 100%.

RS	X3	TC1	TI1	TDA1
84	5.68172	8.68027	6.22458	15.92043
85	5.82109	8.95037	6.56495	16.46943
86	5.95853	9.22036	6.90456	17.01580
87	6.09597	9.49046	7.24353	17.56164
88	6.23534	9.76056	7.58314	18.11005
89	6.37278	10.03055	7.92350	18.65717
90	6.51022	10.30065	8.26311	19.20348
91	6.64766	10.57064	8.60348	19.75061
92	6.78703	10.84074	8.94385	20.29978
93	6.92447	11.11178	9.28206	20.84580
94	7.06384	11.38177	9.62243	21.39486
95	7.20128	11.65187	9.96204	21.94117
96	7.33872	11.92186	10.30241	22.48830
97	7.47809	12.19196	10.64277	23.03746
98	7.61553	12.46206	10.98238	23.58394
99	7.75297	12.73205	11.32173	24.13005
00	7.89234	13.00215	7.86096	20.87808

8.4.0 Projection of the Saudi's Absorptive Capacity:The different Scenarios.

For the purpose of our projection, two different periods are distinguished:

I) Short Term projections (1985 - 1990)

II) Long Term projections (1984 - 2000)

In order to carry our comparative analysis, a control solution is necessary. Technically speaking, a control solution is a scenario based on different assumptions.

Scenario (1) What are the projection figures for all the variables included in the model for the forecasting period (1984 - 2000).

This scenario is based on the following assumptions:

1) The structure of the model holds true in the future and there are neither future constraints or abnormality which might affect its behaviour .

2) No change will take place either in oil revenues or government expenditure. In other words every thing is unchanged.

Based on the above assumption the future projected absorptive capacity of the Saudi's economy is presented as follows:

TABLE 8.2

EXPENDITURE ON GDP

Expenditure on the GDP as projected by the Government during the Fourth Plan	1985	1990	Expenditure on the GDP as projected by the Auther during the Fourth Plan	1985	1990
Consumption	209.3	220.0	Consumption	225.48	465.74
Gov. consumption	83.6	74.7	Gov. consumption	111.05	257.23
Private consumption	125.7	145.7	Private consumption	114.43	208.51
Gross Fixed Capital Formation	99.5	118.5	Gross Fixed Capital Formation	54.20	126.00
Government-Investment	50.4	44.6	Government-Investment	20.08	57.97
Oil sector	13.9	17.2			
Private non-oil sector	35.2	56.7	Private Investment	34.12	68.03
Exports of Goods & Services	111.4	148.0	Exports of Goods &	395.44	742.48
Imports of Goods & Services	152.6	131.0	Imports of Goods & Services	212.27	706.27
GDP	284.1	345.9	GDP	461.85	627.95
Average Growth of GDP(1985-90)		4%			2.5%

Table 8.1 above presents the forecasting results for the period 1984 - 2000. As the table shows , all economic sectors will be affected by the sharp decline in oil prices which took place in the last few years . According to the projected figures, total government expenditures in 1985 should decline by 43.00 per cent. Compared to total government expenditures in 1983.[10]

In 1990 (the last year of the fourth plan) government expenditures should be reduced by 31.00 per cent of its level in 1983. It could be argued that this result is in line with some recent views[11] which forecasted the future behaviour of the oil market and indicated that oil prices are expected to continue in fluctuations (mostly declining) till the end of this century and boost again by 1990. We also assume that the government will adjust its oil productions (the quantity of oil produced) so that it is in line with the actual projected figures , bearing in mind the possibility for continuous decline. If we compare our projected figures for government expenditures with the projected figures in the fourth plan we will find a difference of about 12.00 - 22.00 per cent since the target for government expenditures was projected at 20.00 - 30.00 per cent reduction in the fourth plan.[12] Since other

---

[10] Taking 1983 year and before as a comparative years since it is the last year where data is available.

[11] For more details see: <u>OPEC</u> <u>Bulletin,</u> VOL.XVI.NO.9,NOV.1985 PP. 5-8.

non-oil revenues are very limited (as stated earlier) it is more likely that the government will rely heavily on net foreign assets to supplement other public revenues (mostly oil revenues). On the other hand, table 8.1 indicates that all other variables in the economy will be negatively affected by the current situation in oil markets. The most important variable to be examined here is the GDP components ie. oil GDP and non-oil GDP (Table 8.2) .

Between 1985 - 1990 oil GDP is expected to increase by an average of 2.50 per cent per annum while non-oil GDP will grow at annual rate of 2.01 per cent. On average the annual rate of growth is projected at 2.5 per cent per annum during the fourth plan period. In the fourth plan, the rate of growth for oil GDP was estimated by the Saudi government at 5.60 per cent and non-oil GDP at 2.40 per cent (4.0 per cent in average)
[13] The government projection for GDP growth is over optimistic if we consider the possibility of further declines in the price of oil. If oil prices continue this actual trend, even 2.50 per cent per annum may be unattainable.

As far as the long term forecasting is concerned, Appendix 1 table 1 shows the projected value for all variables included in the model. It is worth noting that all economic sectors are expected to decline after 1983 except imports and net foreign assets which are projected to grow

---

[12] Fourth Development Plan ,(1985-1990), p.94

[13] For more details see, Fourth Development Plan ,p.115.

at an average rate of 3.50 - 4.0 per cent per annum and about 3.50 per cent per annum respectively. This is not surprising since net foreign assets are mostly Saudi's surpluses invested abroad. Also, any reduction in imports could cause a supply constraint and may impose a negative effect on the absorptive capacity of the economy.[14]

8.4.1. Scenario (1):

Implications of the oil revenue reduction on other variables.

So far the analysis is based on the assumption that no change will take place in any variable of the model. In this scenario we will investigate the impact of an oil-price reduction on the entire economy. Therefore this scenario will be based on three assumptions:

Assumption (1): What is the implication on the economy of a 50.00 per cent reduction in oil revenues. In **assumption** (2) oil revenue will be reduced by 60.00 per cent of its actual level. And finally in **assumption** (3) oil revenue will decline by 70.00 per cent.

---

[14] Also this might cause inflationary pressures which the government is not prepared for.

8.4.1a Assumption (1): Oil revenues are reduced by 50.00 per cent.

There is no doubt that during the first few months of (1986) oil prices declined by more than 50.00 per cent of their previous levels. Accordingly it is expected that total revenue will be reduced proportionaly unless the Kingdom increases its oil productions. As stated earlier Saudi Arabia is playing a stabilizer role in the oil markets, and implementing the OPEC decisions about the quantity of oil production. If we assume that the supply of oil produced will continue on its actual level, then our assumptions that oil revenues will decline by 50.00 will have the following implications on the economy.
As Table (8.3) shows, total investment will increase by 5.00-5.50 per cent per annum during the fourth plan period (1985 - 1990). In absolute values total investments are projected at 141.88 billion BSR in 1985 and 554.9 billions in 1990. The government contribution will be between 46.50 - 50.00 of total investment. The fourth plan projections rely on the role to be played by the private sector. The target for private investments in the fourth plan was projected at 10.00 per cent annual rate of growth (p.95) compared to only 3.50 per cent in our projections.The difference might be attributed to the fact that our forecasting model embodied the recent declining trend in 1981-83 while the Fourth Plan did not take this issue into account.

Another aspect which deserves to be investigated here is the foreign sector. In the course of the fourth plan, changes are expected in both the export /GDP and import/ non-oil GDP ratios. According to the fourth plan projections the export GDP ratio is expected to decline slightly from 42.00 per cent in 1985 to 40.00 per cent in 1990. The plan states that while the general stability of the ratio derived from projecting relatively stable levels of crude oil exports, its small decline is technical and is due to the higher value growth in the GDP component".[15] On the other hand, the estimate for the fourth plan foresees substantial import substitutions as a corollary to the growth targets for agriculture, manufacturing, and the financial/business service sector. According to government projections the import /non oil GDP ratio is estimated to come down from about 90.00 to 67.00 per cent in 1990. As far as our projections are concerned the export/GDP and import/ non oil GDP ratios were projected at 55.33 per cent and 145.00 per cent respectively in 1990. Our projection shows about 15.00 per cent and 55.00 per cent difference in the fourth plan projected figures for X/GDP and M/non-oil GDP. This discrepancy could be related to the basic assumption made by the government in the fourth plan projection that oil prices have been kept unchanged, an assumption which seems to be unrealistic in light of the sharp decline in oil prices in February 1986.. We believe that our estimate is more accurate and realistic and yields more reliable projections for economic sectors.

---

[15] Fourth Plan op.cit p.94.

Finally, to show the impact of the reduction in oil revenues (50.00 per cent) on the total absorptive capacity, Table 8.3 shows that (TDA) is expected to increase at an average rate of 2.50 - 3.00 per cent per annum during the plan period. (Total (TDA) is projected to reach 472.328 billions SR in 1985 and 3586.832 billions SR by 1990.

TABLE(8.3)

IMPACT OF CHANGES IN OIL REVENUES ON THE DIFFERENT SECTORS OF THE ECONOMY

(OIL REVENUES DECLINED BY 50%)

YEARS	PC2	GC3	PI2	GI2	MA
1984	4.59125	2.36951	2.54584	2.13559	4.66614
1985	4.71237	2.44400	2.64647	2.30848	4.86698
1986	4.83338	2.51849	2.74710	2.48061	5.06765
1987	4.95450	2.59298	2.84773	2.65210	5.26832
1988	5.07562	2.66747	2.94836	2.82423	5.46899
1989	5.19663	2.74196	3.04898	2.99712	5.66966
1990	5.31775	2.81645	3.14961	3.16925	5.87050
1991	5.43876	2.89094	3.25024	3.34214	6.07117
1992	5.55988	2.96543	3.35087	3.51503	6.27184
1993	5.68194	3.03992	3.45150	3.68576	6.47251
1994	5.80295	3.11441	3.55213	3.85865	6.67318
1995	5.92407	3.18890	3.65276	4.03078	6.87402
1996	6.04508	3.26339	3.75339	4.20367	7.07469
1997	6.16620	3.33788	3.85401	4.37656	7.27536
1998	6.28732	3.41237	3.95464	4.54869	7.47603
1999	6.40833	3.48686	4.05527	4.72056	7.67670
2000	6.52945	3.56135	4.15590	1.09231	7.87737

YEARS	X3	TC1	TI1	TDA1
1984	5.68172	6.96076	4.68143	12.65777
1985	5.82109	7.15637	4.95495	13.06543
1986	5.95853	7.35187	5.22771	13.47046
1987	6.09597	7.54748	5.49983	13.87496
1988	6.23534	7.74309	5.77259	14.28203
1989	6.37278	7.93859	6.04610	14.68781
1990	6.51022	8.13420	6.31886	15.09278
1991	6.64766	8.32970	6.59238	15.49857
1992	6.78703	8.52531	6.86590	15.90640
1993	6.92447	8.72186	7.13726	16.31108
1994	7.06384	8.91736	7.41078	16.71880
1995	7.20128	9.11297	7.68354	17.12377
1996	7.33872	9.30847	7.95706	17.52956
1997	7.47809	9.50408	8.23057	17.93738
1998	7.61553	9.69969	8.50333	18.34252
1999	7.75297	9.89519	8.77583	18.74729
2000	7.89234	10.09080	5.24821	15.35398

8.4.1b Assumption (2): Oil Revenues Declined by 60.00 per cent :

In this assumption we argue that another 10.00 per cent decline in oil revenues is expected during the coming years (or months), so what will the implication of this decline on the economic sectors ?. Table 8.4 shows the projected figures for different sectors of the economy. To avoid repetition, we will focus on showing the effect of this assumption on the (TDA) during the plan period. It is expected that total domestic absorption capacity will decline to 239.098 billion SR and 1576.377 billion SR in 1985 and 1990 respectively . Accordingly, all other sectors will be affected by this reduction in oil revenues. The projected average rate of growth for TDA will be at 2.70 - 3.00 per cent per annum during the period 1983-1990.

TABLE (8.4)

IMPACT OF CHANGES IN OIL REVENUES ON THE DIFFERENT SECTORS OF THE ECONOMY

(OIL REVENUES DECLINED BY 60%)

YEARS	PC2	GC3	PI2	GI2	MA
1984	4.59125	2.02561	2.36948	2.00332	4.66614
1985	4.71237	2.08520	2.46247	2.17048	4.86698
1986	4.83338	2.14479	2.55546	2.33688	5.06765
1987	4.95450	2.20438	2.64845	2.50264	5.26832
1988	5.07562	2.26398	2.74144	2.66904	5.46899
1989	5.19663	2.32357	2.83442	2.83620	5.66966
1990	5.31775	2.38316	2.92741	3.00260	5.87050
1991	5.43876	2.44275	3.02040	3.16976	6.07117
1992	5.55988	2.50234	3.11339	3.33692	6.27184
1993	5.68194	2.56194	3.20638	3.50192	6.47251
1994	5.80295	2.62153	3.29937	3.66908	6.67318
1995	5.92407	2.68112	3.39236	3.83548	6.87402
1996	6.04508	2.74071	3.48535	4.00264	7.07469
1997	6.16620	2.80030	3.57833	4.16980	7.27536
1998	6.28732	2.85990	3.67132	4.33620	7.47603
1999	6.40833	2.91949	3.76431	4.50234	7.67677
2000	6.52945	2.97908	3.85730	0.86836	7.87737

CONTINUE FROM TABLE(3)
OIL REVENUES DECLINED BY 60%.

Years	X3	TC1	TI1	TDA1
1984	5.68172	6.61686	4.37280	12.00524
1985	5.82109	6.79757	4.63295	12.38463
1986	5.95853	6.97817	4.89234	12.76139
1987	6.09597	7.15888	5.15109	13.13762
1988	6.23534	7.33960	5.41048	13.51642
1989	6.37278	7.52020	5.67062	13.89394
1990	6.51022	7.70091	5.93001	14.27064
1991	6.64766	7.88151	6.19016	14.64816
1992	6.78703	8.06222	6.45031	15.02772
1993	6.92447	8.24388	6.70830	15.40414
1994	7.06384	8.42448	6.96845	15.78359
1995	7.20128	8.60519	7.22784	16.16029
1996	7.33872	8.78579	7.48799	16.53781
1997	7.47809	8.96650	7.74813	16.91737
1998	7.61553	9.14722	8.00752	17.29424
1999	7.75297	9.32782	8.26665	17.67074
2000	7.89234	9.50853	4.72566	14.24916

8.4.1c <u>Assumption (3): Oil Revenues</u> Declined <u>by 70.00 per cent</u> .

It is unlikely that the price of oil will decline by 70.00 per cent of its previous level. However, if we assume that oil revenues do decline by to 70.00 per cent of their previous level this reduction will have the following implications on the economy sectors:

As the Table 8.5 shows the total domestic absorptive capacity is expected to decline to 692.802 billion SR by the end of 1990. By the end of 1985 (the first year of the fourth plan), (TDA) is projected at 121.034 billion SR. The average annual rate of growth is estimated at 2.70 per cent per annum for the period between 1985-1990.

Having examined the impact of any changes in oil revenue on economic sectors, the next scenario will be to build on the assumption that oil prices are unchanged ,ceteris paribus, but that the government decided to decrease its expenditure.

TABLE (8.5)

IMPACT OF CHANGES IN OIL REVENUES ON THE DIFFERENT SECTORS OF THE ECONOMY

OIL REVENUES DECLINED BY 70%

YEARS	PC2	GC3	PI2	GI2	MA
1984	4.59125	1.68171	2.19312	1.87105	4.66614
1985	4.71237	1.72640	2.27847	2.03248	4.86698
1986	4.83338	1.77109	2.36382	2.19315	5.06765
1987	4.95450	1.81579	2.44917	2.35318	5.26832
1988	5.07562	1.86048	2.53452	2.51385	5.46899
1989	5.19663	1.90518	2.61986	2.67528	5.66966
1990	5.31775	1.94987	2.70521	2.83595	5.87050
1991	5.43876	1.99456	2.79056	2.99738	6.07117
1992	5.55988	2.03926	2.87591	3.15881	6.27184
1993	5.68194	2.08395	2.96126	3.31808	6.47251
1994	5.80295	2.12865	3.04661	3.47951	6.67318
1995	5.92407	2.17334	3.13196	3.64018	6.87402
1996	6.04508	2.21803	3.21731	3.80161	7.07469
1997	6.16620	2.26273	3.30265	3.96304	7.27536
1998	6.28732	2.30742	3.38800	4.12371	7.47603
1999	6.40833	2.35212	3.47335	4.28412	7.67670
2000	6.52945	2.39681	3.55870	0.64441	7.87737

YEARS	X3	TC1	TI1	TDA1
1984	5.68172	6.27296	4.06417	11.35271
1985	5.82109	6.43877	4.31095	11.70383
1986	5.95853	6.60447	4.55697	12.05232
1987	6.09597	6.77029	4.80235	12.40029
1988	6.23534	6.93610	5.04837	12.75082
1989	6.37278	7.10181	5.29514	13.10007
1990	6.51022	7.26762	5.54116	13.44850
1991	6.64766	7.43332	5.78794	13.79776
1992	6.78703	7.59914	6.03472	14.14905
1993	6.92447	7.76589	6.27934	14.49719
1994	7.06384	7.93160	6.52612	14.84837
1995	7.20128	8.09741	6.77214	15.19681
1996	7.33872	8.26311	7.01892	15.54606
1997	7.47809	8.42893	7.26569	15.89735
1998	7.61553	8.59474	7.51171	16.24595
1999	7.75297	8.76045	7.75747	16.59419
2000	7.89234	8.92626	4.20311	13.14434

8.4.2. <u>Scenario 2: The Implication of 50.00 per cent reduction of government expenditure on economic sectors</u>.

As stated earlier, because of the importance of the government in nearly all of the key macroeconomic relationships, it is expected that any fluctuations in government expenditures will affect these relationships, but in different ways. The Government projection for its annual revenues during the fourth plan was estimated at 200 billion SR compared to ours of 193.44 billion SR. If we assume that a 50.00 per cent reduction in oil revenue will take place, then the government's annual revenues will reach 116.72 billion RS a shortage of 84.27 billion RS of the government target. As a result of this situation, the government might cut its expenditure by a considerable amount. There is no doubt that the impact of any cut in government spending on consumption will be less harmful to the economy than it will be in the case of government investment. Unfortunately, because of the lack of data for government spending on the disaggregation levels, only total government expenditure can be be examined in our projection.

As Table 8.6 shows, any potential cut in government expenditure will have a great impact on the total domestic absorptive capacity (TDA). If government expenditure is to be reduced by 50.00 per cent (TDA) it is expected to decline to 14209.623 billion RS in 1985. By the end of 1990 (the last years of the plan) this amount is expected to to be at 218758.732 billion RS. The projected TDA under different assumptions are presented in Table 8.6. If government expenditure was to decline by another 10.00 per cent (60.00 per cent of its actual level), TDA will be estimated at 142.286 billion RS and 695.649 billion RS by the end of 1985 and 1990 respectively Table 8.7. The last projection here is based on the assumption that government expenditures will be reduced to only 30.00 per cent of this actual level. Based on this assumption our projections for (TDA) will be at 66.171 billion of RS in 1985 increased to 265.986 billion of RS by the end of 1990.

TABLE (8.6)

IMPACT OF CHANGES IN GOVERNMENT EXPENDITURE ON THE DIFFERENT SECTORS OF THE ECONOMY

GOVERNMENT EXPENDITURE DECLINED BY 50%.

YEARS	PC2	GC4	PI2	GI3	MA
1984	4.59125	4.08902	3.42764	2.79694	4.66614
1985	4.71237	4.23800	3.56647	2.99848	4.86698
1986	4.83338	4.38698	3.70530	3.19926	5.06765
1987	4.95450	4.53596	3.84413	3.39940	5.26832
1988	5.07562	4.68494	3.98296	3.60018	5.46899
1989	5.19663	4.83392	4.12178	3.80172	5.66966
1990	5.31775	4.98290	4.26061	4.00250	5.87050
1991	5.43876	5.13188	4.39944	4.20404	6.07117
1992	5.55988	5.28086	4.53827	4.40558	6.27184
1993	5.68194	5.42984	4.67710	4.60496	6.47251
1994	5.80295	5.57882	4.81593	4.80650	6.67318
1995	5.92407	5.72780	4.95476	5.00728	6.87402
1996	6.04508	5.87678	5.09359	5.20882	7.07469
1997	6.16620	6.02576	5.23241	5.41036	7.27536
1998	6.28732	6.17474	5.37124	5.61114	7.47603
1999	6.40833	6.32372	5.51007	5.81166	7.67670
2000	6.52945	6.47270	5.64890	2.21206	7.87737

YEARS	X3	TC1	TI1	TDA1
1984	5.68172	8.68027	6.22458	15.92043
1985	5.82109	8.95037	6.56495	16.46943
1986	5.95853	9.22036	6.90456	17.01580
1987	6.09597	9.49046	7.24353	17.56164
1988	6.23534	9.76056	7.58314	18.11005
1989	6.37278	10.03055	7.92350	18.65717
1990	6.51022	10.30065	8.26311	19.20348
1991	6.64766	10.57064	8.60348	19.75061
1992	6.78703	10.84074	8.94385	20.29978
1993	6.92447	11.11178	9.28206	20.84580
1994	7.06384	11.38177	9.62243	21.39486
1995	7.20128	11.65187	9.96204	21.94117
1996	7.33872	11.92186	10.30241	22.48830
1997	7.47809	12.19196	10.64277	23.03746
1998	7.61553	12.46206	10.98238	23.58394
1999	7.75297	12.73205	11.32173	24.13005
2000	7.89234	13.00215	7.86096	20.87808

TABLE (8.7)

IMPACT OF CHANGES IN GOVERNMENT EXPENDITURE ON THE DIFFERENT SECTORS OF THE ECONOMY

GOVERNMENT EXPENDITURE DECLINED BY 60%

	PC2	GC4	PI2	GI3	MA
1984	4.62000	1.76360	3.39600	1.14880	5.35600
1985	4.74100	1.83960	3.53300	1.22840	5.55600
1986	4.86000	1.91600	3.67000	1.30760	5.75600
1987	4.98000	1.99200	3.80800	1.38680	5.95700
1988	5.09900	2.06840	3.94500	1.46600	6.15700
1989	5.21900	2.14480	4.08300	1.54520	6.35700
1990	5.33900	2.22080	4.21900	1.62480	6.55800
1991	5.45800	2.29720	4.35700	1.70400	6.75800
1992	5.57800	2.37320	4.49400	1.78320	6.95900
1993	5.69800	2.44960	4.63100	1.86280	7.15900
1994	5.81700	2.52560	4.76900	1.94200	7.35900
1995	5.93700	2.60200	4.90000	2.02120	7.56000
1996	6.05700	2.67800	5.04400	2.10040	7.76000
1997	6.17600	2.75440	5.18100	2.18000	7.96100
1998	6.29600	2.83040	5.13800	2.25920	8.16100
1999	6.41600	2.90680	5.45500	2.33840	8.36100
2000	6.53500	2.98280	5.59300	2.41800	8.56200

YEARS	X3	TC1	TI1	TDA1
1984	5.97600	6.38360	4.54480	11.54840
1985	6.08100	6.58060	4.76140	11.86700
1986	6.18600	6.77600	4.97760	12.18360
1987	6.29200	6.97200	5.19480	12.50180
1988	6.39700	7.16740	5.41100	12.81840
1989	6.50200	7.36380	5.62820	13.13700
1990	6.60700	7.55980	5.84380	13.45260
1991	6.71200	7.75520	6.06100	13.77020
1992	6.81700	7.95120	6.27720	14.08640
1993	6.92300	8.14760	6.49380	14.40540
1994	7.02800	8.34260	6.71100	14.72260
1995	7.13300	8.53900	6.92120	15.03320
1996	7.23800	8.73500	7.14440	15.35740
1997	7.34300	8.93040	7.36100	15.67340
1998	7.44800	9.12640	7.39720	15.81060
1999	7.55300	9.32280	7.79340	16.30820
2000	7.65800	9.51780	8.01100	16.62480

TABLE (8.8)

IMPACT OF CHANGES IN GOVERNMENT EXPENDITURE ON THE DIFFERENT SECTORS OF THE ECONOMY

GOVERNMENT EXPENDITURE DECLINED BY 70%

YEARS	PC2	GC4	PI2	GI3	MA
1984	4.62000	1.32270	3.39600	0.86160	5.35600
1985	4.74100	1.37970	3.53300	0.92130	5.55600
1986	4.86000	1.43700	3.67000	0.98070	5.75600
1987	4.98000	1.49400	3.80800	1.04010	5.95700
1988	5.09900	1.55130	3.94500	1.09950	6.15700
1989	5.21900	1.60860	4.08300	1.15890	6.35700
1990	5.33900	1.66560	4.21900	1.21860	6.55800
1991	5.45800	1.72290	4.35700	1.27800	6.75800
1992	5.57800	1.77990	4.49400	1.33740	6.95900
1993	5.69800	1.83720	4.63100	1.39710	7.15900
1994	5.81700	1.89420	4.76900	1.45650	7.35900
1995	5.93700	1.95150	4.90000	1.51590	7.56000
1996	6.05700	2.00850	5.04400	1.57530	7.76000
1997	6.17600	2.06580	5.18100	1.63500	7.96100
1998	6.29600	2.12280	5.13800	1.69440	8.16100
1999	6.41600	2.18010	5.45500	1.75380	8.36100
2000	6.53500	2.23710	5.59300	1.81350	8.56200

YEARS	X3	TC1	TI1	TDA1
1984	5.97600	5.94270	4.25760	10.82030
1985	6.08100	6.12070	4.45430	11.10000
1986	6.18600	6.29700	4.65070	11.37770
1987	6.29200	6.47400	4.84810	11.65710
1988	6.39700	6.65030	5.04450	11.93480
1989	6.50200	6.82760	5.24190	12.21450
1990	6.60700	7.00460	5.43760	12.49120
1991	6.71200	7.18090	5.63500	12.76990
1992	6.81700	7.35790	5.83140	13.04730
1993	6.92300	7.53520	6.02810	13.32730
1994	7.02800	7.71120	6.22550	13.60570
1995	7.13300	7.88850	6.41590	13.87740
1996	7.23800	8.06550	6.61930	14.16280
1997	7.34300	8.24180	6.81600	14.43980
1998	7.44800	8.41880	6.83240	14.53820
1999	7.55300	8.59610	7.20880	14.99690
2000	7.65800	8.77210	7.40650	15.27460

8.4.3 Scenario 3:

The Implication of 50.00 per cent reduction in NET foreign assets on economic sectors:

The third scenario is based on the assumption that net foreign assets as a substitute for oil-revenue could be reduced. So what implications could this reduction have on the economic variables ?.

Table 8.9 shows that ,ceteris paribus, a 50.00 per cent reduction in net foreign assets will have a major impact on imports and this will affect the (TDA). In our projection, imports are expected to be at 89.12 Millions in 1985 and 225.88 Million RS in 1990. This amount will decline to 82.26 and 206.23 Million in 1985 and 1990 respectively if NFA is at 60.00 actual level. In the third assumption we project NFA at only 30.00 of their actual level. Imports are expected to decline to 75.94 and 186.79 Million RS in 1985, and 1990 respectively table 8.11.

As far as the TDA is concerned, it is expected that the total domestic absorption capacity of the economy will decline proportionally at each level of NET reduction (for more details see Tables 8.9, 8.10, and 8.11.

TABLE (8.9)

IMPACT OF CHANGES IN NET FOREIGN ASSETS ON THE DIFFERENT SECTORS OF THE ECONOMY

NET FOREIGN ASSETS DECLINED BY 50%

YEARS	PC2	GC3	PI2	GI2	MA
1984	4.59125	4.08902	3.42764	2.79694	4.30217
1985	4.71237	4.23800	3.56647	2.99848	4.48839
1986	4.83338	4.38698	3.70530	3.19926	4.67452
1987	4.95450	4.53596	3.84413	3.39940	4.86066
1988	5.07562	4.68494	3.98296	3.60018	5.04679
1989	5.19663	4.83392	4.12178	3.80172	5.23293
1990	5.31775	4.98290	4.26061	4.00250	5.41915
1991	5.43876	5.13188	4.39944	4.20404	5.60528
1992	5.55988	5.28086	4.53827	4.40558	5.79142
1993	5.68194	5.42984	4.67710	4.60496	5.97755
1994	5.80295	5.57882	4.81593	4.80650	6.16369
1995	5.92407	5.72780	4.95476	5.00728	6.34991
1996	6.04508	5.87678	5.09359	5.20882	6.53604
1997	6.16620	6.02576	5.23241	5.41036	6.72218
1998	6.28732	6.17474	5.37124	5.61114	6.90831
1999	6.40833	6.32372	5.51007	5.81166	7.09445
2000	6.52945	6.47270	5.64890	2.21206	7.28058

YEARS	X3	TC1	TI1	TDA1
1984	5.68172	8.68027	6.22458	16.28440
1985	5.82109	8.95037	6.56495	16.84802
1986	5.95853	9.22036	6.90456	17.40892
1987	6.09597	9.49046	7.24353	17.96930
1988	6.23534	9.76056	7.58314	18.53224
1989	6.37278	10.03055	7.92350	19.09390
1990	6.51022	10.30065	8.26311	19.65483
1991	6.64766	10.57064	8.60348	20.21650
1992	6.78703	10.84074	8.94385	20.78020
1993	6.92447	11.11178	9.28206	21.34075
1994	7.06384	11.38177	9.62243	21.90435
1995	7.20128	11.65187	9.96204	22.46528
1996	7.33872	11.92186	10.30241	23.02694
1997	7.47809	12.19196	10.64277	23.59064
1998	7.61553	12.46206	10.98238	24.15166
1999	7.75297	12.73205	11.32173	24.71230
2000	7.89234	13.00215	7.86096	21.47487

TABLE (8.10)

IMPACT OF CHANGES IN FOREIGN ASSETS ON THE DIFFERENT SECTORS OF THE ECONOMY

FOREIGN ASSETS DECLINED BY 60 %

ARS	PC2	GC3	PI2	GI2	MA
984	4.59125	4.08902	3.42764	2.79694	4.22938
985	4.71237	4.23800	3.56647	2.99848	4.41267
986	4.83338	4.38698	3.70530	3.19926	4.59590
987	4.95450	4.53596	3.84413	3.39940	4.77913
988	5.07562	4.68494	3.98296	3.60018	4.96236
989	5.19663	4.83392	4.12178	3.80172	5.14558
990	5.31775	4.98290	4.26061	4.00250	5.32888
991	5.43876	5.13188	4.39944	4.20404	5.51211
992	5.55988	5.28086	4.53827	4.40558	5.69534
993	5.68194	5.42984	4.67710	4.60496	5.87856
994	5.80295	5.57882	4.81593	4.80650	6.06179
995	5.92407	5.72780	4.95476	5.00728	6.24509
996	6.04508	5.87678	5.09359	5.20882	6.42832
997	6.16620	6.02576	5.23241	5.41036	6.61154
998	6.28732	6.17474	5.37124	5.61114	6.79477
999	6.40833	6.32372	5.51007	5.81166	6.97800
000	6.52945	6.47270	5.64890	2.21206	7.16123

ARS	X3	TC1	TI1	TDA1
984	5.68172	8.68027	6.22458	16.35719
985	5.82109	8.95037	6.56495	16.92374
986	5.95853	9.22036	6.90456	17.48755
987	6.09597	9.49046	7.24353	18.05083
988	6.23534	9.76056	7.58314	18.61668
989	6.37278	10.03055	7.92350	19.18125
990	6.51022	10.30065	8.26311	19.74510
991	6.64766	10.57064	8.60348	20.30967
992	6.78703	10.84074	8.94385	20.87628
993	6.92447	11.11178	9.28206	21.43975
994	7.06384	11.38177	9.62243	22.00625
995	7.20128	11.65187	9.96204	22.57010
996	7.33872	11.92186	10.30241	23.13467
997	7.47809	12.19196	10.64277	23.70128
998	7.61553	12.46206	10.98238	24.26520
999	7.75297	12.73205	11.32173	24.82875
000	7.89234	13.00215	7.86096	21.59422

TABLE (8.11)

IMPACT OF CHANGES IN NET FOREIGN ASSETS ON THE DIFFERENT SECTORS OF THE ECONOMY

NET FOREIGN ASSETS DECLINED BY 70%

YEARS	PC2	GC3	PI2	GI2	MA
1984	4.59125	4.08902	3.42764	2.79694	4.15658
1985	4.71237	4.23800	3.56647	2.99848	4.33695
1986	4.83338	4.38698	3.70530	3.19926	4.51727
1987	4.95450	4.53596	3.84413	3.39940	4.69760
1988	5.07562	4.68494	3.98296	3.60018	4.87792
1989	5.19663	4.83392	4.12178	3.80172	5.05824
1990	5.31775	4.98290	4.26061	4.00250	5.23861
1991	5.43876	5.13188	4.39944	4.20404	5.41893
1992	5.55988	5.28086	4.53827	4.40558	5.59925
1993	5.68194	5.42984	4.67710	4.60496	5.77957
1994	5.80295	5.57882	4.81593	4.80650	5.95989
1995	5.92407	5.72780	4.95476	5.00728	6.14027
1996	6.04508	5.87678	5.09359	5.20882	6.32059
1997	6.16620	6.02576	5.23241	5.41036	6.50091
1998	6.28732	6.17474	5.37124	5.61114	6.68123
1999	6.40833	6.32372	5.51007	5.81166	6.86155
2000	6.52945	6.47270	5.64890	2.21206	7.04187

YEARS	X3	TC1	TI1	TDA1
1984	5.68172	8.68027	6.22458	16.42999
1985	5.82109	8.95037	6.56495	16.99946
1986	5.95853	9.22036	6.90456	17.56617
1987	6.09597	9.49046	7.24353	18.13236
1988	6.23534	9.76056	7.58314	18.70112
1989	6.37278	10.03055	7.92350	19.26860
1990	6.51022	10.30065	8.26311	19.83537
1991	6.64766	10.57064	8.60348	20.40285
1992	6.78703	10.84074	8.94385	20.97237
1993	6.92447	11.11178	9.28206	21.53874
1994	7.06384	11.38177	9.62243	22.10814
1995	7.20128	11.65187	9.96204	22.67492
1996	7.33872	11.92186	10.30241	23.24240
1997	7.47809	12.19196	10.64277	23.81192
1998	7.61553	12.46206	10.98238	24.37874
1999	7.75297	12.73205	11.32173	24.94520
2000	7.89234	13.00215	7.86096	21.71358

8.5.0 Conclusions

Having analyzed the statistic results of our forecasts for the Saudi economy, the following conclusions can be derived:

(1) Because oil resources are not infinite, the Kingdom will have to prepare for the day when its oil will be economically depleted. It could be mentioned that Saudi Arabia still has, by far, the largest reserves of crude petroleum in the world. Given the uncertainties about oil-markets, the government will have to adjust to an environment where growth will become even more dependent on other domestic resources. Our projection results indicate that the public sector will have to diversify its revenue sources and the private sector will have to reach a level of sophistication capable of generating a large proportion of its own investment funds.

(2) Given the limited number of linkages in its productive structure, expansion of the GDP requires increased imports to maintain the economy's growth momentum. Given our projection figures for the fourth Plan, and the uncertainties about future oil revenues, the Kingdom will have to develop a number of new and viable export industries capable of earning a foreign exchange adequate to meet import needs. We believe that it is now the time to establish a group of capital industries capable of providing the kingdom with greater domestic self sufficiency.

(3) Based on the projection results of different scenarios, the future economic growth of the country will depend in the long run entirely on the government's expenditure strategy and the response of the private sector. The fourth plan emphasised the new role to be played by both the public and the private sectors. There is also the government's policy of diversification, aimed at reducing the economy's dependence on the oil sector by developing a strong domestic capability in the producing sectors. Also the plan indicates that due to the foreseen tight budget the public sector must maximize the purchasing power of budget appropriations both in the domestic and in the international markets. The following measures are suggested to rational government expenditure. Greater scrutinization of project design and implementation, broadening the base of competition for public tenders and finally the critical examination of cost levels or cost structure in the tenders submitted are needed.

On the private sector side, there is growing competition for the declining volume of government projects, putting pressure on margins and requiring performance of higher quality. This means that the government has been committed to a market economy and to private enterprise system , but one which is tailored to conditions within the Kingdom, to ensure the widespread distribution of the benefits of development among the people as a whole. A notable decline in Saudi Arabia's private enterprise system is due to the provision of incentives to encourage enterprise into specific activities (p.102 fourth plan).

(4) The huge amounts of foreign assets will continue to play their role in financing government expenditures for years to come and if the oil prices continue to decline. This means that without a diversification policy for mobilizing domestic revenues, foreign assets will be affected in the long run. For this reason we think that the tax structure in Saudi Arabia needs to be seriously reconsidered. This suggests that the domestic revenues should play their role in financing economic development.

(5) In our opinion the current situation represent 50.00 pre cent decline in oil revenues. We project that the situation will fluctuate up and down around that level,and improve again in the nineties.

(6) This forecasting should be interpreted with some caution since political and military events could take place in the region and make our projections unreliable.

CHAPTER NINE

CONCLUSION AND RECOMMENDATIONS

9.1.0 CONCLUSION:

1) The concept of absorptive capacity has suffered from much confusion, and controversy. An attempt has been made to derive a clear concept of absorptive capacity which is empirically testable.

2) The following conclusions are drawn after examining the main features of the Saudi economy.

2.1) Analysis of the nation's topography showed a vast, sandy nation (about nine times the area of the U.K.), with erratic rain fall, no permanent water bodies and intense heat. With such a topography, it is easy to understand why the contribution of agriculture in the composition of Saudi GDP lagged behind other sectors. The rate of growth for this sector averaged at 5.25 per cent during the period of study. Such a low absorptive capacity of agriculture has clearly effected the overall absorptive capacity of the economy.

2.2) Similar conclusions about labour constraint can also be drawn from the social structure of the Saudi population. The labour constraint on production has adversely affected the absorptive capacity of the different sectors. Table

2.2) shows that 27.00 per cent of the Saudi population are nomads living in countless number of small communities isolated from urban centers. This also affects the absorptive capacity.

2.3) Despite these constraints, the performance record of the Saudi economy is impressive: the real GDP on average has grown by 13.90 per cent per annum for the period 1963 - 1983,the real per capita GDP recorded an impressive, healthy rate of 9.40 per cent for the same period .

2.4) Another method which could be used to test the Saudi absorptive capacity would be to disaggregate the GDP into two main components: oil and non-oil GDP. The value added by the non-oil GDP averaged to 37.46 per cent for the whole period (1963-1984), (41.00 per cent for the initial period 1963 - 1973 and 34.00 per cent for the second period 1973 -1984. However, there is an interesting phenomenon for the last two years 1983, and 1984, where non-oil GDP reached an impressive ratio of 49.20 per cent and 56.60 per cent respectively. In general , this shows that the economy is passing through a transition period and that the oil surpluses injected into the economy have increased its overall absorptive capacity.

2.5) In answering the question :**WHICH SECTOR TOOK THE LEAD?** , we found that during the period of study, 1963-1983 , that

Table 9.1 Contribution of non oil sector 1963-1983

Sector	Real Growth Rate %
Agriculture	5.23
Manufacturing	13.64
Construction	20.25
Trade	12.05
Transport	11.24
Services	12.26

Calculated by the author using Table 2.9 in Chapter 2.

the construction sector took the lead (table 9.1). Its real growth rate reached 20.25 per cent. In our opinion, this seems natural due to the fact that prior to 1963 the infrastructure of the Kingdom was in its rudimentary stage, and the focus of all development plans was centered on building up the infrastructure base.

The second active sector was manufacturing which recorded an encouraging growth rate of 13.64 per cent .

2.6) Within the international sector , our analysis revealed that producer imports dominate total imports and reached 70.50 per cent of total imports in 1982. In our opinion, this could indicate a shift from importing final goods to importing semi-or non-processed goods. This new trend means that new industrial bases will be evolved and increase the country's absorption .

2.7) The scrutiny of the public finance in Saudi Arabia reveal that the total revenue is attributed from oil and other sources of revenue. The fact that non-oil revenues accounted for more than one quarter of the total revenue in 1984 (33.30 per cent) is encouraging .
Non-oil revenues are resources generated by investment from abroad. (Saudi investment in W. Europe ,Japan,North America and Canada) . These new figures indicated that government policy to diversify its revenues has achieved some success and this will have a positive effect on enlarging the absorptive capacity, due to the fact that government investment is one variable of the total absorptive capacity, of the economy.

2.8) The forecasts for the Saudi absorptive capacity are compared with other methods forecasted the future absorptive capacity. Table 9.3 focuses on the results of selected studies as they show similarities and variations.

Table 9.1 Absorptive capacity of the Saudi economy in billion of 1974 US Dollars (selected studies)

Source	1985
Abolfathi	10.26
Aboulola	47.35
Azzam	15.30
EL Mallakh	7.70
Gebelein	44.87
US Treasury	14.00

Notes:- Our results were originally in Saudi Arabian Riyals and in Log Functions. The exchange rate for 1$ in 1974 = 4.2694.

3)It is important to mention that the approach we used in defining the absorptive capacity (for oil based economies) is comprehensive. Because of the special nature of the Saudi economy, it is necessary that a proper definition of absorptive capacity should include all economic variables that are directly linked to the oil sector. This macro-economic approach avoids the major problem of all previous studies , but includes some major variables, which until now have been missing, in describing the country's absorptive capacity. Our approach contains government expenditure (GC & GI), private expenditure (PC & PI) and movements in the balance of payments (BOB). In this way we included government aid, government expenditure ,defense and private consumption and linked the domestic economy to the international scene through the inclusive import and export relations.

The above Table, 9.3 shows a comparative study of the absorptive capacity in various studies . Despite the fact that these studies used different definitions but we still feel that it could show the importance of using a comprehensive approach in defining absorptive capacity.As no study forecasts the future absorptive capacity (ie. beyond 1985), we were compelled to compare our results with the available studies only up to 1985. It reveals that the most optimistic study of forecasting the Saudi's absorptive capacity was that of Aboulola's . Our results were close to those of Gebelein, but represent a seven fold increase in those of El-Mallakh , and a 3 fold increase in those of Azzam. This, we believe, is due to the comprehensive approach we used in defining and measuring absorptive capacity.

4) The principle purpose of our investigation has been to assess **how successful was the economy in utilizing petro-dollar surpluses to expand the kingdom's absorptive capacity.** Implicitly, this required an examination of the structural changes which the economy has encountered, from 1974 to 1983, in terms of changes in consumption, investment, imports and the total domestic absorption.

Table (9.3) TDA Components (1974-1983) in Million of RS and in Log Function

Year/Sector	TC	TI	M	X	TDA
1974	11.02	8.90	5.76	7.53	21.68
1975	11.97	9.98	6.14	7.38	23.18
1976	11.95	10.33	6.36	7.31	23.23
1977	11.99	11.00	6.51	7.21	23.69
1978	12.35	11.36	6.70	7.43	24.44
1979	12.52	11.58	6.92	7.75	24.93
1980	12.89	12.04	7.09	7.55	25.40
1981	13.79	12.56	7.24	7.23	26.28
1982	14.06	12.77	7.42	6.76	26.17
1983	13.91	12.55	7.54	6.37	25.29

Source:Data combined from appendix 1. Chapter 7, Tables 5-9.

The above Table summarises the effect of injecting petrodollar surpluses into the Kingdom's absorptive capacity. The results confirm the previous findings we summarized in the performance record, ie.that the planners were indeed successful in using oil revenues to expand the Saudi absorptive capacity and ,therefore, improved the standard of living and promoted economic development in the Kingdom.

5) The calculated marginal propensity to consume (MPC) for

private consumption ,in Chapter 5, seems to be quite high (33.00 per cent) compared to the Kuwati MPC (14.00 per cent), but quite similar to Libya (34.00 per cent . About 61.00 per cent of the actual private consumption is adjustable within one year. This reflects perhaps the liberal import policy advocated during the period in question.

6) To analyse the effect of oil wealth on private consumption, GDP was disaggregated to oil and non-oil GDP, this allows us to test the effect of oil wealth on the absorptive capacity of private consumption. The results suggest that both oil and non oil GDP had positive effects in absorptive capacity .

7) Because the Saudi Government is the sole recipient of the oil wealth, it was natural to investigate the effect of government revenues on the absorptive capacity of the government consumption. Oil revenues explains 92.00 per cent of the variation in real government consumption.

8) In our tests for the adjustment mechanism, it was found that 71.00 per cent of actual government consumption is made up within one year.

9) Government consumption has been affected more by oil rather than non-oil revenue. It demonstrates that oil is still the dominant factor in financing the government consumption absorptive capacity.

10) Our analysis of the investment structure in Saudi Arabia shows that the country's special characteristics make the application of traditional economic theory irrelevant. The use of interest rate in a profit maximization model can not be considered as appropriate in explaining investment behavior in Saudi Arabia. It is the huge oil revenue which plays the major role in explaining changes in investment in most oil based economies.

11) The evidence shows that oil revenue, oil GDP, and non-oil GDP are the main determinants of private investment. This confirms the government survey that the majority of private business is a family business, which incorporates religious factors that prohibits use of interest rate. It may also confirm that the banking system in Saudi Arabia is still in its early stages and hence Commercial Bank Claims on the Private Sector (CBCPS) are 8not significant.

12) Saudi Arabia advocates a liberal import policy which is reflected in the high value of its marginal propensity to import (37.00 per cent). The main determinants for imports in Saudi Arabia are TOT (Terms of trade), government expenditure (Government consumption & investment) private expenditure (Private consumption & investment) and Net Foreign assets.Crude and refined oil exports make up most of the Saudi Arabian exports which also generate the bulk of the Saudi revenue.

13) To test for the stability of the model,in Chapter 7

,two methods were used : the Farley & Hinich test and the Chow-test. Again the results were good and showed that the model was stable in different time periods. To investigate the extent of success of the model in duplicating the turning points, the plots (Appendix 3) show a fairly accurate duplication of the turning points which also insured the validity of the specification of the system of equations. In summary, we can say now that the model performance and stability was quite remarkable.

14) Given The current situation in the world oil market, Our ex-ante simulation ,in Chapter 8 ,which is intended to provide the Saudi planner with different future policy choices. Our objective was to forecast the effects of alternative economic scenarios by formulating those possibilities in terms of trajectories for the exogenous policy variables.
Three different scenarios have been used : reduction of oil revenues, government expenditures, and net foreign assets by 50.00 ,60.00 ,and 70.00 per cent respectively. The results obtained shows that the economy is most sensitive to fluctuations in government expenditures and oil revenues. This confirms our previous findings that the economy is highly dependent on government expenditure.

9.2.0 RECOMMENDATIONS

On the basis of Our work , we would like to make the following recommendations to the Saudi policy makers.

1) Our study revealed that the economy is still dependent on oil revenues. This shows that much more must be done to diversify the economic base.The Kingdom has achieved a lot in the last decade,but more efficient efforts are needed to create stronger manufacturing and agricultural bases.

2)We have seen that the tax structure in the economy is in its infancy . We think it is most unfair to wait until oil economic depletion is a reality , to look for an alternative. Perhaps ,a slow , easy introduction to taxation will help finance development expenditures and will avoid unnecessary financial constraints in Saudi Arabia.

3) Another approach which can be used to investigate absorptive capacity is through an input-output table. However, the the Saudi economy does not have an input-output table. Thus no data are available to analyse the inter-relationships between the different sectors. We were therefore, not able to investigate this issue. We hope that more research will be directed to build up such a table in the future.

APPENDIX (5)

TABLE 1 RAW DATA USED IN THE THESIS

YEARS	PC	GC	TC
1963	2742.00	1244.00	3986.00
1964	2835.00	1430.00	4265.00
1965	2910.00	1654.00	4564.00
1966	3026.00	1915.00	4941.00
1967	3177.00	2674.00	6675.00
1968	4585.00	2747.00	7332.00
1969	5360.00	3026.00	8386.00
1970	5859.00	3421.00	9280.00
1971	6412.00	3798.00	10210.00
1972	6915.00	4285.00	11200.00
1973	7895.00	5335.00	13230.00
1974	9827.00	9864.00	19691.00
1975	17897.00	15911.00	33808.00
1976	23738.00	28883.00	52621.00
1977	34148.00	41003.00	75151.00
1978	50995.00	47034.00	98029.00
1979	58608.00	71904.00	130512.00
1980	102385.00	77563.00	179948.00
1981	114905.00	81915.00	196820.00
1982	126514.00	128526.00	255040.00
1983	138776.00	110548.00	249324.00

PC: PRIVATE CONSUMPTION. GC: GOVERNMENT CONSUMPTION.

TC: TOTAL CONSUMPTION.

SOURCE: <u>SAUDI ARABIAN MOENATERY AGENCY (SAMA) REPORTS.</u>

SELECTIVE ISSUES.

TABLE 2

YEARS	PI	GI	TI
1963	713.00	436.00	1149.00
1964	795.00	382.00	1177.00
1965	1070.00	600.00	1670.00
1966	1343.00	915.00	2258.00
1967	1316.00	803.00	2119.00
1968	1269.00	1123.00	2392.00
1969	1383.00	1349.00	2732.00
1970	1383.00	1214.00	2597.00
1971	1727.00	1204.00	2931.00
1972	1960.00	1443.00	3403.00
1973	3709.00	1985.00	5694.00
1974	4984.00	3416.00	8400.00
1975	10329.00	7370.00	17699.00
1976	16049.00	17491.00	33540.00
1977	23839.00	27352.00	51191.00
1978	26407.00	40484.00	66891.00
1979	27623.00	49031.00	76654.00
1980	35470.00	61598.00	97068.00
1981	39502.00	66874.00	106376.00
1982	48434.00	73881.00	122315.00
1983	53546.00	63868.00	117414.00

PI: PRIVATE INVESTMENT. GI: GOVERNMENT INVESTMENT.

TI: TOTAL INVESTMENT.

SOURCE: SAMA REPORTS. SELECTED ISSUES

TABLE 3

YEARS	MCONS	MPROD	IMPORTS
1963	616.53	747.47	1364.00
1964	728.66	838.35	1567.00
1965	864.91	1083.09	1948.00
1966	935.82	1319.17	2255.00
1967	1482.42	2055.58	3538.00
1968	1849.03	2542.97	4392.00
1969	1998.61	2852.39	4851.00
1970	2095.80	2894.20	4990.00
1971	2217.33	2987.67	5205.00
1972	2470.78	3832.22	6303.00
1973	3085.46	5186.54	8272.00
1974	5750.17	9542.83	15293.00
1975	8694.98	18562.02	27257.00
1976	11573.01	31289.99	42863.00
1977	17179.53	45519.48	62699.00
1978	25712.90	65792.10	91505.00
1979	31706.30	75772.70	107479.00
1980	41425.86	90925.14	132351.00
1981	49914.50	107544.50	157459.00
1982	55387.43	132366.58	187754.00
1983	55661.78	133022.23	188684.00

MCONS: CONSUMER IMPORTS. MPROD: PRODUCER IMPORTS

SOURCE: SAMA REPORTS (SELECTED ISSUES)

TABLE 4

YEARS	EXPORTS	XUV	IUV
1963	4975.00	5.50	46.00
1964	5528.00	5.50	47.00
1965	6288.00	5.50	47.00
1966	7266.00	5.50	48.00
1967	7650.00	5.50	49.00
1968	8589.00	5.50	49.00
1969	9086.00	5.50	49.00
1970	10302.00	6.70	50.00
1971	15189.00	7.20	54.00
1972	19862.00	9.80	59.00
1973	30012.00	34.90	73.00
1974	85682.00	37.50	93.00
1975	114461.00	40.20	100.00
1976	120284.00	43.00	100.00
1977	140321.00	44.10	110.00
1978	140762.00	58.80	125.00
1979	147236.00	100.00	145.00
1980	258488.00	113.20	162.00
1981	368425.00	117.30	156.00
1982	354919.00	101.40	158.00
1983	223413.00	99.60	159.00

XUV: EXPORTS UNIT VALUE. IUV: IMPORTS UNIT VALUE.

SOURCES: SAMA REPORTS.SELECTED ISSUES & UNITED NATIONS: INTERNATIONAL FINANCIAL STATISTICS.SELECTED ISSUES.

TABLE 5

YEARS	KDUTY	ODUTY	NOLREV
1963	136.00	279.00	415.00
1964	136.00	266.00	402.00
1965	142.00	364.00	506.00
1966	165.00	617.00	782.00
1967	175.00	863.00	1038.00
1968	192.00	1185.00	1377.00
1969	243.00	1050.00	1293.00
1970	242.00	876.00	1118.00
1971	292.00	552.00	844.00
1972	314.00	513.00	827.00
1973	315.00	682.00	997.00
1974	330.00	1214.00	1544.00
1975	400.00	3415.00	3815.00
1976	375.00	8312.00	8687.00
1977	500.00	10579.00	11079.00
1978	1000.00	14339.00	15339.00
1979	1400.00	12066.00	13466.00
1980	1512.00	2082.00	3594.00
1981	2037.00	2475.00	4512.00
1982	2542.00	3490.00	6032.00
1983	2650.00	40170.00	42820.00

KDUTY: CUSTOM DUTY ODUTY: OTHER DUTY

NOLREV: NON- OIL REVENUE.

SOURCE: SAMA REPORTS. SELECTED ISSUES.

TABLE 6

YEARS	INCTAX	OILRYL	OILREV
1963	1276.00	674.00	1950.00
1964	1563.00	721.00	2284.00
1965	1793.00	813.00	2606.00
1966	2225.00	954.00	3179.00
1967	2826.00	1161.00	3987.00
1968	2433.00	1127.00	3560.00
1969	3056.00	1177.00	4233.00
1970	3522.00	1326.00	4848.00
1971	3963.00	1573.00	5536.00
1972	7728.00	2227.00	9955.00
1973	9647.00	2529.00	12176.00
1974	15930.00	5336.00	21266.00
1975	56871.00	37568.00	94439.00
1976	65702.00	21458.00	87160.00
1977	76854.00	23002.00	99856.00
1978	99337.00	31817.00	131154.00
1979	89492.00	27042.00	116534.00
1980	119003.00	37403.00	156406.00
1981	198706.00	58298.00	257004.00
1982	249116.00	84852.00	333968.00
1983	201145.00	69435.00	270580.00

INCTAX: INCOME TAX. OILRYL: OILROYALTIES

OILREV: OIL REVENUES.

SOURCE: SAMA REPORTS. SELECTED ISSUES.

TABLE 7

YEARS	OILGDP	NOLGDP	GDP
1963	5287.00	3792.00	9079.00
1964	5254.00	4306.00	9560.00
1965	5896.00	4769.00	10665.00
1966	6828.00	5378.00	12206.00
1967	7233.00	5909.00	13142.00
1968	8274.00	6382.00	14656.00
1969	8795.00	7180.00	15975.00
1970	9813.00	7586.00	17399.00
1971	14668.00	8253.00	22921.00
1972	19074.00	9184.00	28258.00
1973	29148.00	11403.00	40551.00
1974	83885.00	15430.00	99315.00
1975	111476.00	28123.00	139599.00
1976	117303.00	47323.00	164626.00
1977	137362.00	67694.00	205056.00
1978	137172.00	88229.00	225401.00
1979	142887.00	106652.00	249539.00
1980	250840.00	134967.00	385807.00
1981	363289.00	157253.00	520542.00
1982	340433.00	184292.00	524725.00
1983	209048.00	205437.00	414485.00

OILGDP:OIL GDP NOLGDP:NON OIL GDP GDP:TOTAL GDP

SOURCE: SAMA REPORTS , SELECTED ISSUES.

TABLE 8

YEARS	WGDP	WCPI	WINDEX
1963	6277.50	44.50	14.00
1964	6605.00	46.50	14.00
1965	7420.50	48.90	14.00
1966	7807.50	51.20	14.00
1967	8604.00	53.40	14.00
1968	9288.00	55.70	14.00
1969	10179.00	58.60	14.00
1970	11195.00	62.10	14.00
1971	12270.00	65.50	15.00
1972	13072.00	69.50	19.00
1973	14210.00	76.10	22.00
1974	15656.00	87.90	30.00
1975	17505.00	100.00	100.00
1976	19185.00	110.90	100.00
1977	21546.00	123.30	106.00
1978	22380.00	133.00	117.00
1979	23185.00	151.00	117.00
1980	23682.00	174.30	170.00
1981	24227.00	197.80	295.00
1982	24227.00	225.90	325.00
1983	24227.00	254.30	325.00

WGDP: WORLD GDP WCPI: WORLD CONSUMER PRICE INDEX

WINDEX: WORLD INDEX.

SOURCE:

TABLE 9

YEARS	INDEX	IPETPR	POP
1963	19.30	5.50	5.14
1964	20.60	5.50	5.27
1965	21.20	5.50	5.41
1966	21.90	5.50	5.55
1967	22.20	5.50	5.70
1968	23.70	5.50	5.86
1969	27.70	5.50	6.03
1970	29.00	5.50	6.20
1971	30.40	6.70	6.38
1972	31.70	7.20	6.57
1973	36.90	9.80	6.76
1974	44.80	34.90	6.97
1975	60.30	37.60	7.25
1976	79.30	40.20	7.58
1977	88.30	43.00	7.92
1978	98.20	44.10	8.26
1979	100.00	58.80	8.61
1980	103.60	100.00	8.96
1981	106.60	113.20	9.32
1982	107.80	117.30	10.00
1983	108.70	101.40	10.42

INDEX: SAUDI PRICE INDEX   IPETPR:INDEX OF PETROLEUM PRICES.

POP: SAUDI POPULATION.

SOURCES:

TABLE 10

YEARS	CBCPS	YD	PS
1963	694.00	5472.00	4408.00
1964	932.00	6118.00	4421.00
1965	1014.00	7023.00	5243.00
1966	1243.00	8208.00	6134.00
1967	1231.00	9386.00	4919.00
1968	1340.00	10252.00	6257.00
1969	1637.00	11555.00	6438.00
1970	1667.00	12221.00	6788.00
1971	1759.00	13255.00	11333.00
1972	1780.00	14912.00	12004.00
1973	2398.00	18723.00	21468.00
1974	4514.00	28710.00	70094.00
1975	6722.00	51404.00	30818.00
1976	9884.00	93697.00	62532.00
1977	10118.00	136049.00	87325.00
1978	14484.00	175747.00	68397.00
1979	25861.00	227587.00	109962.00
1980	34919.00	274128.00	185020.00
1981	43148.00	306042.00	210995.00
1982	50535.00	386699.00	132092.00
1983	56201.00	379853.00	26177.00

CPCPS : COMMERCIAL BANK CLAIMS ON THE PRIVATE SECTOR.

YD :DISPOSABLE INCOME. & PS: PRIVATE SAVINGS.

TABLE 11

YEARS	GDPDF	GNP	NS
1963	50.69	7068.00	5093.00
1964	55.38	7324.00	5295.00
1965	62.22	8730.00	6101.00
1966	69.95	9762.00	7265.00
1967	77.96	10267.00	6467.00
1968	84.91	11435.00	7324.00
1969	91.41	12727.00	7589.00
1970	100.00	13574.00	8119.00
1971	114.41	17241.00	12711.00
1972	131.98	20588.00	17058.00
1973	158.03	30094.00	27321.00
1974	181.86	82551.00	79624.00
1975	182.33	73682.00	105791.00
1976	198.06	16539.00	112005.00
1977	227.99	20772.00	129905.00
1978	241.55	22718.00	127372.00
1979	257.70	25618.00	119027.00
1980	283.75	39055.00	205859.00
1981	306.22	53275.00	323722.00
1982	311.29	52655.00	269685.00
1983	277.71	38194.00	165161.00

GDPDF : GDP DEFLATOR   GNP:GROSS NATIONAL PRODUCT

NS : NATIONAL SAVINGS.

BIBLIOGRAPHY

Abdul Sallam, M.S. & Henadi, H.M. TAXATION ACCOUNTING, Jeddah, Saudi Arabia, Dar AL-biani Publishing, 1982.

Abolfathi, Farid, Keynon, Hazelwood, Crain and Hayes, The OPEC Market to 1985, Lexington, Mass., Lexington Books,1977.

Arabian American Oil Company, Aramco Hand Book, Dhran, Saudi Arabia, Aramco, 1960.

Azzam, H.T., "The Middle East Oil Exporting Countries: Absorptive Capacity, Market Sharing and Investment Strategy", Ph.D. dissertation, University of Southern California, June 1976.

Adler, John H., Absorptive Capacity: The Concept and Its Determinants, Washington, D.C., The Brookings Institute, 1965.

Al-Awadi, Yousef Abdullah, "OPEC Surplus Funds and the Investment Strategy of Kuwait", Ph.D. dissertation, University of Colorado, 1974.

AL-Bashir, F.S., A Structural Econometric Model of the Suadi Arabian Economy: 1960-1970 New York , John Wiley, 1977.

Alchian and Allen, University Economics, Belmont, California: Wadsworth Publishing Company, 1964.

Bridge, John N., "Absorptive Capacity and Investment Policies in the Arab World", in R. EL Mallakh, Energy and Development, Proceedings of the International Conference on the Economics of Energy and Development, Boulder, Colorado, 1974.

Bridge, John,N., "The Absorptive Capacity of the Saudi Arabian Economy, 1976-1980", Department of Economics, University of Durham, 1974.

Brown-Klein, in M.K. Evans, Macro Economic Activity: Theory, Forecasting and Control. New York, Harber & Row, 1969.

Burnell, Peter. "Absorptive Capacity and Development", Working paper No. 14, University of Warwick, Department of Politics, July, 1977.

Chenery, H.B. and A.M. Strout, "Foreign Assistance and Economics Development", Policy Discussion Paper No. 7, Agency for International Development, 1964.

Darrat, Ali:, "The Money Demand Relationship in Saudi Arabia: An Emperical Investigation", Journal of Economics Studies, Vol. 11, No. 3,1984.

El-Jehaim, Taher, "Absorptive Capacity and Alternative

Investment Policies: A Case Study of Libya", Ph.D. Dissertation, University of Colorado, 1975.

El-Mallakh, R. and Kadhim, M. "Absorptive Capacity, Surplus Funds and Regional Capital Mobility in the Middle East", Estratto dalla Rivisita Internationale di Scienz Economiche e Commercial:, Vol. 24, No. 4, (1977).

El-Mallakh, R. and others, Capital Investments in the Middle East: The Use of Sorplus Funds for Regional Development , London,Croom Helm,1976.

El-Mallakh, R. Saudi Arabia: Rush to Development, London, Croom Helm, 1982.

EL-Mallakh, R. and Atta, J. The Absorptive Capacity of Kuwait, Lexington, Massachusetts, Lexington Books, 1981.

EL-Serafy, Salah., "Absorptive Capacity, The Demand for Revenue and the Supply for Petroleum". Journal of Energy and Development, Vol. 7, 1981.

Fiedoreticx, K., "Planning of Economic Infrastructure", Eastern European Economics, Vol. 15, No. 1, Fall 1977.

Field, Michael., Financial Times: Special Survey on the Saudi Economy, March, 1985.

Fowlkes, Frank,. "Petrodollar Surpluses: Boom as Problem For

Monetary System, U.S. Energy Crisis". A report in National Journal Report, August, 18, 1973.

Gebelein, Christopher A., "Forecasting Absorptive Capacity For Oil Revenue: Practical Techniques for Policy Analysis" in El-Mallakh, R and McGuire, C. (eds), U.S. and World Energy Resources, ICEED, Boulder, Colorado, 1977.

Gebelein, Christopher A., "Forecasting Absorptive Capacity For Oil Revenue: Practical Techniques for Policy Analysis". A paper presented to the Annual Meeting of the Western Economic Association, San Diego, California, June 1975.

Gebelein, Christopher A., "Estimation of Saudi Arabian Capacity to Absorb Oil Revenue". Economic and Social Forecasts, Planning and Economics, Shell Oil Company, May 1974.

General Agreement For International Trade and Tariffs (GATT). International Trade, ,selected issues 1981, 82 and 83.

Ghatak, S. and K. Ingersent: "Agriculture and Economic Development", Harvester Press, 1984.

Ghatak, S. "Development Economics", Longman Group Ltd., London, 1978.

Gulhati, R.I., "The Need For Foreign Resources, Absorptive Capacity and Debt Servicing Capacity", in J.H. Adler and P.W. Kuznets (Eds), Capital Movements and Economic Development - Proceedings of a conference held by the International Economic Association, New York: MacMillan, St. Martin's Press, 1967.

Hafiz, Omar. Z., "A Foreign Trade Model For Saudi Arabia: An Econometric Approach" Ph.D. dissertation, University of Indiana, Bloomington, 1981.

Higgins, Benjamin, Economic Development: Problems, Principles, and Policies, New York: W.W. Norton & Co. Inc., 1968.

Hirschman, A.O., The Strategy of Economic Development, New Haven, Yale University Press, 1958.

Hirsch, F. and Oppenheimer, P., "Selling Gold to the Arabs", The Financial Times, January, 1974.

Horvat, Branco, "The Optimum Rate of Investment" The Economic Journal, December, 1958.

International Bank for Reconstruction and Development, Fourth Annual Report: 1948-1949, Washington, D.C., IBRD, 1950.

International Monetary Fund, Burea of Statistic International Financial Statistic, Vol. 32, No. 10 October 1979.

International Munetary Fund, IMF Supplement on prices, 1981.

International Muntary Fund, Year Book, Selected Years, 1979-1983.

Keynes, J.M., "The General Theory of Employment, Inerest and Money" London, Macmillan and Co. Limited, 1948.

Kindleberger, Charles and Brauce Herrick, Economic Development, New York: McGraw, 1977.

Kuburisi, Atif., The Economics of the Arabian Gulf, London, Croom Helm, 1984.

Lewis, Arthur, Development Planning, The Essentials of Economic policy, London, George Allen and Unwin Ltd., 1966.

Little, I.M.D., and Mabro, R.E., "Coping with the Arab billions", The Financial Times, December 27, 1973.

Looney, R.E., "Saudi Arabia's Development Potential", Toronto, Lexington Books, 1982.

Mabro, R. and Monroe, E., "Arab Wealth From Oil: Problems of its Investment". International Affairs, Volume 50, January, 1974.

Mayor, Thomas "Plant and Equipment Lead Times" Journal of Business, April, 1960.

McGilvray, J., "The Stability of Co_efficients in an Irish Inter-Industry Model", Journal of Statistical and Social Inquiry, Society of Ireland, Vol. XXI, Part III, 1964-65.

Mikesell, Raymond F. and H.B. Chenery, Arabian Oil, Chapel Hill, University of North Carolina Press, 1949.

Mikesell, Raymond F. (ed), U.S. Private and Government Investment Abroad. Eugeon, Oregon: University of Oregon Books, 1962.

Millikan, M.F. and W.W. Rostow, A Proposal: Key to an Effective Foreign policy, New York, Harper & Brothers, 1957.

Ministry of Commerce and Industry, Chamber of Commerce, Research Unit: `Mechanization of Agricultural Sector and its Effects on Saudi Agriculture. Riyadh, Embassy publisher offset, Riyadh, Saudi Arabia, 1985 (In Arabic).

Ministry of Finance and National Economy, Zakat and Income Tax Department, Regulations For Income Tax, Road Tax, and Zakat. Riyadh, Safir Bureau Printing Company., 1978.

Ministry of Information, Saudi Arabia and Its Place in the World, Jeddah, Saudi Arabia, Dar Al-Shoroug, 1979.

Ministry of Planning, Achievements of Development Plans 1970-1982, Riyadh, Ministry of Planning, Kingdom of Saudi Arabia, 1984.

Ministry of Planning, First Development Plan, 1970-1975. Riyadh, Ministry of Planning, Saudi Arabia, 1970.

Ministry of Planning, Third Development Plan, 1980-1985. Riyadh, Ministry of Planning, Saudi Arabia, 1980.

Murthy, M.N. The Use of Surveys in National Planning in Developing Countries', in Namboodiri(ed) Survey, Sampling and Measurement. Academic Press, 1978.

Nan, M.S. "Putting The Record Straight", OPEC Bulletin, July, 1983.

Nurkse, Ranger, Problems of Capital Formation in Under-developed Countries , New York, Oxford University Press, 1962.

Nyrop, Richard. Area Handbook For Saudi Arabia. Washington D.C. ,Foreign Area Studies of American University, 1977.

Omair, Saleh Abdulaziz, "A Study of the Association Between Absorptive Capacity and Development Strategies in Saudi Arabia", Ph.D. dissertation, Texas Technology University, 1976.

Peacock, A.T. and D. Dosser, "Input-Output Analysis in An Underdeveloped Country", Review of Economic Studies, Vol. XXV, No.66, July, 1957.

Philby, H.J. The Heart of Arabia, London, Constable, 1972.

Pindyck, R.S. and D.L. Rubinfeld, Econometric Models and Economic Forecasts (New York): McGraw Hill Book Company, 1981.

Pollack, Gerald A. "The Economic Consequences of the Energy crisis", Foreign Affairs, Vol.52, No.3, April, 1972.

Prest, A.R.: "The Role of National Income Estimates in The Statistical Policy of An Underdeveloped Area: A comment". Review of Economic Studies, Vol.XXI, No.61, 1953-54.

Ramsey, F.P. "A Mathematical Theory of Saving". Economic Journal, 1928.

Presely, John.R. A Guide to the Saudi Arabian Economy: The Macmillan Press Limited, 1984.

Rosenstein-Rodan, P.N. `International Aid For Underdeveloped Countries', The Review of Economics and Statistics, Vol.14, No.2, May, 1961.

Salvatore Schiavo-Campo and Hans W. Singer, Perspective of Economic Development. Boston, Houghton Muffline Company, 1970.

Seers, Dudley, "The Use of Modified Input-Output System for an Economic Program in Zambia", in Irma Adelman and Eric Thorbecke (eds.) The Theory and Design of Economic Development. Baltimore, John Hopkins Press, 1966.

Royal Dutch/Shell, "Production at Risk", September 6, 1973.

Saudi Arabia, Kingdom of, Central Bureau of Statistics, Statistical Year Book, Selected Issues, 1975-1983.

Saudi Arabia, Saudi Arabian Monetary Agency, Annual Report, Selected Issues, 1963-1985.

Saudi Arabia, Saudi Arabian Monetary Agency, Research and Statistics Department, Statistical Summary, selected issues, 1963-1985.

Stauffer,Thomas R., Report before the Joint Economic Comittee, U.S. Congress, November 6, 1973.

Steven, Will J., Capital Absorptive Capacity in Developing Countries, Leiden, A.W. Sijthoff, 1971.

Thirlwall, A.P., Growth and Development, The Macmillan Press Ltd., London, 1984.

United Nations, Conference on Trade and Development Statistics, U.N. 1983.

United Nations, Department of Economic and Social Affairs of the Secretariat, Selected World Demographic Indicators by Countries, 1950-2000, New York: United Nations, ESA /P/W, 1970.

United Nations, Year Book of International Trade and Statistics, Vol.1, Trade by Country, 1982.

United Nations, Energy Statistical Year Book, New York, 1984.

United Nations, National Account Statistics, Selected Issues, 1965-1982.

United Nations, Statistical papers, Series j, No. 22 World Energy Supplies, 1973-1978.

Vakil F., Amacro Economic projection For Iran, 1973-1992.

Wancott, and Wancott., Econometrics, John Wiley & Son, New York, 1979.

Wells, Donald A., Saudi Arabian Development Strategy, Washington, D.C., American Enterprise Institute for Public Policy Research, 1976.

Wilson, R "The Economics of the Middle East", The Macmillam Press LTD,London, 1979 p.43.

Wilson, R " Islamic Business : Theory and Practice" , The Economist Intelligence Unit, October, 1984 pp:64-73.

Yousefi, M. and Joy , J ., "Absorptive Capacity Reconsidered". Estratto dall Rivisita Internationale di Scienz Economiche e Commerciali, Vol. 24, No. 5, 1982.

A MACRO ECONOMIC ANALYSIS OF THE SAUDI ABSORPTIVE CAPACITY

I.S. ABOULOLA

ABSTRACT

This thesis intends to evaluate , theoretically and quantitatively , existing studies related to the absorptive capacity of the Saudi Arabian economy .

In our study , we put forward a new approach to understand the concept of absorptive capacity _ one which takes into account the special characteristics of oil-based economies in building a macro-economic model. We define absorptive capacity as " the ability of the economy to absorb, and utilize oil-revenues effectively, within a given period." Such utilization will be for consumption , investment and trade. Our approach is quite comprehensive since it considers all sectors in the economy.

The Saudi economy with its unique feature represents an interesting development pattern, where the problem is not capital scarcity but capital abundance and its effective utilization. We believe that this criterion alone mandates a new development model,a task that we have tried to fulfill in this study.

Our study aims to examine the success of the Saudi economy in utilizing oil revenues to expand its absorptive capacity and in accelerating the process of diversification of the economy.

Accordingly, an econometric model has been formulated and the statistical results have been presented. The simulations exercises are designed to test the validity and stability of the model. The study also provides a forecast for the absorptive capacity of the Saudi economy until 2000. A comparison between our projection and the government's estimation for the Fourth Plan (1985-1990) is also presented. On the basis of the available statistical criteria, the performance of our model could be regarded as very satisfactory.

We hope that the policy implications derived from this empirical investigation will be helpfull as guidelines in formulating future policies for providing sound and stable growth of the economy.