# Determinants of Domestic Investment in the Libyan Manufacturing Sector and its Impact

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# Table of Contents

## List of Tables

## List of Figures

## Abstract

The main objectives of this thesis are to examine and estimate the determinants of domestic investment (public and private) in the Libyan manufacturing sector, and to investigate the impact of domestic investment on the Libyan economy. It adds to the growing literature on the issue of economic growth and econometrics by drawing attention to several issues hitherto little considered in the existing literature. In particular, the thesis blends various aspects of economic growth with models of investment to explain and define the main factors which affect domestic investment, and how domestic investment drives economic growth in the Libyan economy. It is important to recognise that economic growth has become an important aim for all countries in the world; especially less developed countries, which require greater economic efforts to be able to deal with the current international economic climate and the challenges of globalisation: domestic investment is an exemplary element to stimulate economic growth to achieve this target.

The main objective of the Libyan government has been the industrialization of Libya, principally through import substitution. Various import restrictions in the form of licensing, quotas and tariffs have provided several sub-sectors of manufacturing with a high level of protection from foreign competition. The government benefits from high levels of financial return in terms of oil revenues, and the consequent easy availability of imported raw materials and capital goods. Despite government support for investment designed to encourage import substitution and export-oriented production, Libya has continued to experience low levels of investment in the domestic manufacturing sector. The stimulus to undertake this study was a desire to explore the most important determinants of fixed investment in Libya's manufacturing sector.

This study aims to identify determinants of domestic investment in both the public and private manufacturing sectors in the Libyan economy during the period 1962-2008. Furthermore, this study aimed to identify the impact of domestic investment as a determinant of growth in the Libyan economy during the period 1962-2008. Cobb-Douglas Function was used to analyze the relationship between real per-capita GDP and its most important determinants. Properties of time series of the model variables have been analyzed by using several tests for determining the integration level of each time series separately. By using the Johansen-Juselius cointegration method, the results showed that private investment is strongly and adversely affected in the longer term by changes that take place in domestic public investment in the manufacturing sector, which shows the competition factor between the private and public sectors. The results of these tests revealed an equilibrium relationship between domestic investment in the private manufacturing sector and its determinants in the long and short-run. Also, the results showed the significance of the impact of annual appropriations for the manufacturing

sector and imports of machinery & capital goods on domestic investment in the public manufacturing sector, the results of these tests revealed an equilibrium relationship between domestic investment in the public manufacturing sector and its determinants in the long and short-run.

Moreover, the results showed the significance of the impact of investment on per-capita GDP; the results of tests revealed an equilibrium relationship between per-capita GDP and its determinants in the long and short-run. The study concludes that the elasticity of per-capita GDP to changes in domestic investment is greater than the elasticity of the labour force, which appeared inelastic in the short and long-term.

According to the information available, the study and approach adopted have never been undertaken before for Libya, and therefore might contribute toward advancing knowledge and enhancing investment policy, and its implementation by government and private manufacturing enterprises in Libya and other developing countries.

## Declaration

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## GLOSSARY OF TERMS AND ABBREVIATIONS

ADF: Augmented Dickey-Fuller Test.

AIC: Akaike Information Criterion.

APDL: Average Productivity of the Libyan Dinar of Labour Shares per Month.

ARCH: Autoregressive Conditional Heteroskedasticity Test.

AWM: Average of Worker's Share per Month.

CRED: Credits Given to the Domestic Private Manufacturing Sector.

DF: Dickey-Fuller Test.

DGIM: Domestic Investment in the Public Manufacturing Sector.

D.W.: Durbin-Watson Test.

ECM: Error Correction Model.

EXCH: Exchange Rate in the Libyan Economy.

FDI: Foreign Direct Investment.

GAIN: Government's Annual Appropriations Given to the Manufacturing Sector.

GDP: Gross Domestic Product.

GDPM: GDP in the Manufacturing Sector.

I: Domestic Investment in the Libyan Economy.

L: Size of Labour Force in the Libyan Economy.

LPP: Labour Productivity per Month.

MACHIM: Imports of Capital Goods and Machinery.

MANLAB: Size of Labour Force in the Libyan Manufacturing Sector.

OECD: Organisation for Economic Co-operation and Development.

OILR: Oil Revenues.

OLS: The Ordinary Least Squares Method.

OPEN: Economic Openness Level.

PCGDP: Per-Capita GDP in the Libyan Economy.

PEL: Productivity Efficiency of Labour.

PFP: Partial Factor Productivity.

PRIVATE: Domestic investment in the Private Manufacturing Sector.

PP: Phillips-Perron Test.

RESET: Regression Equation Specification Error Test.

SC: Schwarz Information Criterion.

SLP: Percentage of Skilled Labour Production Value.

TFP: Total Factor Productivity.

TSSL: Total Salaries and Share of Labour.

UNCTAD: United Nations Conference on Trade and Development.

VAR: Vector Autoregression.

VECM: Vector Error Correction Model.

VPM: Value-Added in the Manufacturing Sector.

Y: Per Capita GDP in the Libyan Economy.

# Chapter 1

# Introduction

## 1.1. Background and the Research Problem:

Investment has a major impact on the economic and social development process through the establishment of productive projects. It plays a prominent role in countries which intend to expedite the development process by promoting investment in their national economies. This is because investment has a positive impact on the macro economy.

Investment plays an important role in the overall economy. A sharp change in investment can have a significant impact on aggregate demand, and therefore on production. Moreover, it leads to the accumulation of capital. Therefore, investment has a dual role; it affects production in the short term through its impact on aggregate demand, and in the long term through its impact on the growth of output and capital creation (Samuelson & Nordhaus, 1989). The addition of machines and buildings for instance, increases the capacity of production of the country, and promotes economic growth in the long term.

However, an investment decision is an important decision, and must be taken into account, and be well understood. According to Butler, (1993, p.1) "Investment decision-making is the process whereby resources are allocated in organizations in anticipation of future gain. These decisions must, therefore, rank as one of the most critical types of decision made in economies. It is therefore important that we understand the process by which such decisions are made and the means by which this process can be made more effective".

Domestic investment in manufacturing has the potential to be very productive, especially when linked to exports. Most studies emphasize the importance of domestic investment for economic growth, and maintain that developing countries should improve their domestic investments and encourage exports (Ledyaera & Lideny, 2006). At a conference of UNCTAD (Eleventh Session, 2004), economists examined the issue of domestic investment, focusing on the importance of taking measures that promote domestic investment in developing countries. On the problem of foreign direct investment and its crowding out the domestic investment, the results of some research studies indicate the positive impact of FDI on domestic investment and economic growth. Studies emphasize that FDI is a complement to domestic investment, and the importance of domestic investment in developing countries should not be underestimated (Bank of Namibia Report, 2006). Foreign direct investment also plays a particularly vital role in the overall development efforts of developing countries, if these countries are able to guide, and organize the dispersal of these investments successfully. Libya has recently turned towards FDI in many areas and through different countries; this policy may make the domestic industry vulnerable to developed and sophisticated foreign competition. But the fact is that advanced foreign industry helps the progress and development of local industry through friction and competition and providing expertise. Foreign investments can be considered as tool for helping in the development the domestic industries to make them competitive, and exporting industries to act as a source of foreign exchange and an engine of the national economy. Government's interest in FDI should not be at the expense of domestic investment, but must support and provide the domestic industries by skills and modern production methods so as to create successful export industries. It is economically feasible for Libya to use FDI positively, according to the modern theory in the interpretation of these investments which operate to transfer the modern and sophisticated technology, and thus the modernization of production, creating better opportunities for export, and contributing to reducing imports, and thus reducing the deficit in balance of payments of developing countries. Moreover, the more efficient use of material resources and human resources available in developing countries contribute to the training of the local workforce, enabling them to acquire multiple experiences. Foreign direct investment also encourages new areas of production, marketing, and management which contribute to creating networked relationships between sectors in the economy.

Depending heavily on foreign direct investment could undermine the productivity of domestic investment and make it futile if there is no advance planning for compatibility between the two types of investments. This is due to the crowding by foreign investment of domestic investment, which usually acts to decrease or pull out the domestic investment projects of the local market. This also leads to the loss of an important source of development, in addition to the acquisition the foreign investment projects on the sources of production, which could create a kind of economic dependency for foreign companies. Therefore, it is advisable to focus on the impact of settlement of foreign direct investment projects in favour of domestic investment ,there are many studies on determinants and impact of FDI in Libya, (for example Wirfali, 2006; Shebani, 2008; Teeb, 2009; Ben-Taher, 2010), but no adequate studies on domestic investment except two studies conducted by Mohamed, 1997 and Omar, 2002, which will be addressed later. In this regard, the government has to encourage and support domestic investment projects by capital, training, and facilitating the procedures for establishing industrial projects. This study will support foreign direct investment, provided that it does not hamper domestic investment projects, contributes to knowledge and foreign technology transfer, and the training of technical skills that can contribute effectively in the process of growth and development. As is known, Libya for the time being at least is not in need of foreign investment projects in order to seek capital, because the capital is available, especially because Libya is an oil-producing country and has significant revenue from this source, but the target is the settling of sustainable development (Majbri, 2008) through the creation of an industrial society which is capable of keep pace with the development and promotion of economic growth especially in the long run (Ben-Taher, 2010).

Given that Libya is one of the major oil producers, and in spite of the efforts to diversify its economy, it is still dependent on oil revenues as the main source of income, and the hydrocarbons sector still accounts for 95% of total exports (General Authority for Information, 2008). This situation necessitates the exploitation of alternative sources of income in the Libyan economy. Considering that the manufacturing sector has many advantages in playing a prominent role in the economy, investment in this sector will be addressed.

The manufacturing sector is one of the branches of the economy, which produces goods. It is distinct from the other economic sectors. This distinction is due to the transforming process of the physical and natural resources for use in satisfying consumption and production needs. Therefore, manufacturing is able to make contribution in the national economy; by increasing the production, not only in industry, but also in other sectors (Alasadi, 1990).

Investment in this sector does not guarantee a structural shift only, but also creates many job opportunities that absorb surplus labour as a result of a natural increase in the labour force (Alrubaie, 2004). This leads to an expansion in the number of industrial units, and then leads to higher rates of income growth in the manufacturing sector and national income.

Investment in this sector leads to a positive change in the structure of the national economy, especially in most developing countries that rely on a single source of national income. This results in changes to the structure of exports and their diversification.

The promotion of investment in the Libyan manufacturing sector contributes to the diversification of the economy, whereby the ratio of the contribution of this sector (non-oil sector) to GDP will grow. This sector is able to contribute effectively to the development process (Zarmoh, 2002). The manufacturing sector creates forward and backward linkages. For example, the establishment of the iron and steel plant in Libya contributed to the establishment of other production and service units. After the establishment of this industry, many other factories were founded, which depend on the products of the iron and steel plant. Transport companies and other services were also established following the opening of the iron and steel industry in Libya (Tawiri, 2000).

The level of economic development in most of developing countries is relatively low, which may be due to the fact that developing countries have a low tendency to accumulate capital, or because of the low productivity in these countries (Siam, 2004). These factors can be attributed to the lack of domestic investment. (Leiderman & Razin, 1994). Domestic investment refers to both private and public investment which is invested within a country by its government or its citizens. Private investment is very important for development and macroeconomic growth, and is no less important than public investment. According to Everhart and Sumlinski, (2001, p.6) " -There is a growing consensus that private investment is more efficient and productive than public investment, yet the number of studies on the respective roles of private and public investment in developing countries is somewhat limited".

Another problem is the high ratio of investment by the public sector compared to the private sector in Arab countries (El-Naggar, 1999). In Libya, public investment is as high as 90 percent or more of total investment.

The promotion of growth and development in the Libyan economy requires a focus on the determinants of manufacturing investment. As these determinants have a great importance in determining the level of investment in a sector it is considered important to improve the Libyan economy to enable it to reach higher levels of growth. Jorgenson (1996, p.95) said in this regard "The relationship between investment behaviour and its underlying determinants is of critical importance for economic policy".

### 1.2. Aim and Objectives of the Study:

The main aim of this study is to investigate the determinants of investment in the manufacturing sector and their impact upon the Libyan economy by means of economic modelling, to be estimated with a range of econometrics techniques.

The objectives of the study are as follows:

- To examine the investment climate in Libya.
- To estimate and analyse the patterns and determinants of domestic investment in the manufacturing sector.
- To investigate the impact of domestic investment upon the Libyan economy.
- To measure and analyse productivity in the manufacturing sector, and focus on studying the most important industry in the sector.
- To explore the policy implication of the findings.

In relation to the first objective, the aim is to explain and understand the climate of investment in the Libyan economy, especially in the manufacturing sector. To achieve this objective, data analysis and study of development plans in Libya, especially in terms of investment were used to identify the nature and direction of investment.

Furthermore, some policies and strategies implemented by the Libyan government during the period under investigation were addressed in some detail.

With respect to the second objective, regression models were used for two sub-goals, which were: A) to estimate and analyse the determinants of investment in the Libyan public manufacturing sector. The study used OLS method by using time series analysis to achieve this target. B) to estimate and analyse the determinants of investment in the Libyan private sector. A time series method was also used to identify these determinants and analyse them.

With regard to the third objective, the impact of domestic investment on economic growth in Libya was also investigated through the application of OLS method and time series analysis by relying on the Cobb-Douglas function and techniques from some previous studies (Frankel, 1997; Ghani & Din, 2006; Amanja & Morrissey, 2006).

The study empirically attempts to investigate determinants of domestic investment in the Libyan economy, using an econometric approach. Cointegration techniques are used to establish the long-run steady relations between economic variables. Time series data are used in econometric models that capture the dynamic interactions between variables. The econometric analysis pays careful attention to the time series properties of these data. The study also recognises that the ADF and PP tests for a unit root are sensitive to non-linear data transformations and may lead to invalid inferences. The Johansen cointegration methodology is used to estimate and test the long run equilibrium parameters of functions which are used to estimate determinants and impact of domestic investment for Libya. Vector error correction models derived from VAR models are used to test the short run dynamic shocks between dependent and independent variable in models.

Some important criteria employed in measuring productivity were used to achieve the fourth objective; these criteria will be highlighted in chapters seven and eight. Furthermore, emphasis was placed on the iron and steel industry because the results of studying and analysing the manufacturing sector's data showed that the metal industry section is the best performing in this sector, and the iron and steel industry is the most productive and generates the highest income at the level of the metal industry.

### 1.3. Rationale and Scope:

According to Keynesian Theory –The meaning of investment to an economist is a precise term which involves the acquisition of capital goods designed to provide us with consumer goods and services in the future. Investment spending involves a decision to postpone consumption and to seek to accumulate capital which can raise the productive potential of an economy. But investment is similar to consumption as it is an important effect on both the demand-side and the supply-side of the economy (Haavelmo, 1960). The manufacturing sector is important in that it aims to achieve economic growth and the development of an advanced society. Developing countries, which rely on the exportation of basic raw materials, aim for such goals, but those countries will continue to experience more instability in their national income than industrial states. Tybout (1998) states that the manufacturing sector is often the 'darling' of policy makers in less developed countries (LDCs) as it is viewed as the leading edge of modernization and the opportunity to create jobs.

Governments also promote manufacturing. Libya, as a developing country within North Africa, has been seeking to secure a position within the world economy in accordance with its size and abundance of economic resources. In 1998, the share of manufacturing industries in Libyan GDP was 10.7 % but this decreased to 4.8% in 2002 and 4% in 2004 (Central Bank of Libya, 2006, p. 25). Accordingly, Libya is encouraging investment in several areas of the economy particularly in the industrial sector, where quality and efficiency are thought to be achievable. Investment plays an important role in generating rapid economic growth. However, there are certain conditions which control how such investment is made. Several economic theories presuppose different explanatory variables. (see for example Gylfason and Zoega, 2002; Saxena and Wong, 2002; Zipfel, 2004) The Libyan economy recently witnessed a huge expansion in financial investment in the industrial sector through the implementation of an economic plan during the period 1975 to 1985. The development plan called for the allocation of billions of Libyan dinars to heavy industry, - 15 percent of the total development plan allocation (World Bank, 2006, p.3). After this period, however, the plan focused instead on general consumer spending and, consequently, the quantity of imported goods increased to satisfy local market needs (Libyan Ministry of Planning, 1986, p. 69). During this period, spending on investment shifted to other sectors, such as electricity, gas and water supplies as well as the social services sector. According to Otman and Karlberg, (2007, p. 239) "The privatization process in Libya"... seems to fulfil the definition of the "privatization wheel", that is an economy originally having its entire retail and private sector shut down and nationalized in the 1970s, now in the process of being restructured for significantly greater private involvement". Therefore, the ongoing privatisation may have a direct and positive effect on investment.

However, investment in manufacturing does not occur spontaneously, but depends on economic factors and decisions which increase advantages in the economy. (see for example Seruvatu and Jayaraman, 2001; Looney, 1997). Due to the fact that the Libyan economy depends on a single source of income (oil), this research focused on the potential of the manufacturing sector to find and diversify other sources of income, based on increasing the rate of investment in manufacturing, especially that which depends on oil and natural gas for its energy needs, because the abundance of these resources give Libya a clear competitive advantage.

**1.4. The Research Questions:**

The primary purpose of this study is to provide answers to questions regarding the following:

1. What factors drive investment in the Libyan manufacturing sector?
2. What conditions are particularly important for private sector investment?
3. What is the relationship between public and private investment in the sector?
4. What impacts does domestic investment have on the Libyan economy in general?
5. How might more developed knowledge generated in the Libyan context advance:

(a) thinking on the determinants of investment in the literature

(b) domestic economic policy in Libya?

Despite the considerable efforts made to improve the investment climate in Libya, and the development of legislation and the adoption of incentives and inducements to promote investment, both domestic and foreign, domestic investment remains modest and weak. Despite some improvement in the private sector, it remains static and undynamic. Support for domestic investment might be one of economic policies to diversify income, and a successful alternative to reliance on a single source of income (oil revenues). While Libya is not an agricultural country, at the same time it has many valuable natural resources (such as oil, natural gas, iron ore, etc) which may make it more successful in the field of manufacturing than some neighbouring countries such as Tunisia and Egypt, which have a clear advantage with their experience in the field of tourism. Defining and analysing the most important determinants of domestic investment in the manufacturing sector in Libya will contribute in helping government to make good decisions in supporting and guiding of establishing an export-oriented manufacturing industry to be a successful alternative to oil revenues. Furthermore, determining the impact of domestic investment on economic growth in Libya enables the researcher to define the relationship between these two factors, this leads to building economic and social plans based on investment in general, and on domestic investment in particular, to drive growth in the Libyan economy.

Regarding to the most important research questions above, the study expected that there will be different determinants of domestic investment in the public and private manufacturing sector; these determinants depend in one way or another on oil revenues. Moreover, the relationship between domestic private investment and public investment in the manufacturing sector is integrative, in the sense that domestic public investment in the manufacturing sector supports private investment in the same sector in Libya. Furthermore, domestic investment in the Libyan economy is expected to have a positive but low impact on economic growth.

### 1.5. Methodology and Methods:

The perspective adopted in this study is one of scientific realism. The models developed are considered to be related to theory, but also connected to the empirical world. They link between theory and the empirical in the way suggested by Morgan and Morrison (1999). This study therefore follows an established tradition in econometrics, and uses methods familiar in that domain. To explain the conditions for industrial investment within the Libyan economy, it is foreseen that a functional model will be constructed. To identify the relationship between the size of manufacturing investment and the factors affecting it, statistical analyses will be used. For example, a logarithmic functional model is expected to emerge, explaining the relationship between the size of manufacturing investment and its determinants- to provide investors with detailed information on the controlling variables, which can be projected to reflect economic conditions. The most important variables of the model, used for interpreting the changes on manufacturing investment in Libya, are specified on the basis of previously applied studies. Most of the data will be obtained from the General Authority for Investment in Libya, the Ministry of Industry, Ministry of Economy, Central Bank of Libya, the General Authority for Industrial Information and Documentation in Libya, in addition to some other organisations relevant to the topic of study.

This study has also relied on the results of the analysis of some previous studies for selecting the explanatory variables.

First: for the public investment in the manufacturing sector, it depends on several determinants including:

• The value-added growth in the manufacturing sector, (see Bigsten et al, 1997; Looney, 1997; Omar, 2002). The results of these studies indicated that value-added growth is an important factor which has a positive impact on public manufacturing investment.

• The growth of manufacturing sector investment. Looney, 1997 and Devarajan et al, 2002, concluded that the growth of manufacturing investment will contributes to encouraging investment in this sector.

• Real GDP. There is a positive relationship between real GDP and investment in the public manufacturing sector, according to a study of Omar, (2002).

• Oil revenues, (Omar, 2002). This study gave great importance to the availability of finance realized from oil revenues. The increase of oil revenues will encourage investment in the manufacturing sector.

• Economic stability, such as inflation and exchange rate. (Ndikumana, 2005; Omar, 2002).

• The availability of foreign exchange rate, and the cash benefits granted to the manufacturing sector. Manufacturing investment depends on government grants of foreign currency for the import of machines and equipments. This applies to both the public and private sectors. (see Omar, 2002; Nair, 2003).

Second: for private investment in the manufacturing sector, it also depends on several determinants include:

• Real public investment. The following studies: Asante, 2000; Jayraman, 2001; Acosta and Loza, 2003; Moshi and Kilindo, 1991; Ndikumana, 2005; Lesotlho, 2006, found that public investment competes with private investment. But the study by Erden, 2006 showed the importance of public investment to stimulate investment in the private sector.

•Real GDP growth. Some studies such as Jayaraman, (2001); Abduladem, (2004); Moshi and Kilindo, (1991); Lesotlho, (2006), showed that GDP growth leads to an increase in investment, and it is a strong determinant of private investment sector.

•Real private sector credit. Results of studies by Jayraman, (2001); Asante, (2000); Acosta and Loza, (2003); Lesotlho, (2006); Al-Hakami, (2003); and Erden, and Holcomb, (2006) concluded that real private sector credit has a positive and significant effect on private investment, and the availability of credit plays an important role in private sector investment in developing countries.

•Macroeconomic stability, in factors such as inflation rate and exchange rate are essential for private investment, they play an important role in the explication of the pattern of private investment. In addition, economic stability stimulates private investment in developing countries. (see Aysan, 1993, Asante, 2000; Acosta and Loza, 2003; AlHakami, 2003; Valadkhan, 2006; Abduladem, 2004; Erden and Holcomb, 2006).

•Change in profits has a positive relationship with private investment in the manufacturing sector. (Bigsten, 1997; Soderbom and Teal, 2000).

• Openness level. An economy's openness to trade has a positive impact on investment behaviour (see Al-Hakami, 2003; Abduladem, 2004; Acosta and Loza, 2003).

• Structural reforms have a strong effect on private investment (Aysan et al, 2003). And according to Aysan, 1993, the lack of economic reforms remains a problem for most of the MENA countries.

Third: This study will identify the impact of domestic investment as a determinant of growth in the Libyan economy by using Cobb-Douglas Function to analyze the relationship between economic growth and its most important determinants, as described in Cobb-Douglas function. Properties of time series of the model variables will be analyzed by using several tests for determining the integration level of each time series separately.

Econometrics model will be applied to test the basic hypotheses of the study. With respect to the model of study, the economic theory assumes through the investment theories that investment depends on some determinants. To determine the existence of a relationship or non-existence of the relationship between the used variables, and determine the type of this relationship as linear or non-linear, this study will adopt the OLS method. This method is used to estimate economic relations, because it gives the best linear unbiased estimator. Based on the theoretical basis of this method, which will estimate both manufacturing investment equations (public and private) on the independent variables mentioned above. The technique of OLS is used because under certain assumption, the equation to be estimated is linear in parameters, is non-stochastic, and has zero mean value, possess equal variance of distribution, making it a powerful method of regression analysis. The number of observations covers a 46 year period from 1962 to 2008, and the data were collected from many references, books, periodicals, articles and bulletins related to the study. Also, data and statistics were collected from reports and publications for various years on industrial investment issued by the General Authority for Investment and Ministry of General Planning. This is in addition to the Investment Promotion Boards in Libya, the Ministry of Industry, Ministry of Economy, Central Bank of Libya, General Planning Council, General Authority for Information and Documentation in Libya, World Development Database, and UNCTAD, and other sources relevant to this topic of study.

**1.6. Contribution to the Knowledge:**

Manufacturing investment as a domain of study is not new; but what is new is the environment (domestic and international) that gives new dimensions to this subject.

Studying the impact and determinants of manufacturing investment in Libya is new, especially after the reform policies of the 1990s. There is no evidence to show that previous studies have been made specifically on manufacturing investment in this country, (with the exception of a study conducted in 2002, but it touched on only a few determinants and neglected some of the most important of them (See Omar, 2002)). A further novel aspect is that this study will analyse the position of manufacturing investment in Libya in the new economic climate.

The research is new in terms of analysing some new factors and their effect on the determinants in including location of industrial investment for Libya in particular.

This study, in fact, is the first study in Libya which focuses on determinants of domestic investment and their impact. Determinants of domestic investment in the manufacturing sector will be summarised and tabulated based on the experience of many authors and studies applied from the literature review. Defining the determinants of domestic investment allows government and those responsible for the planning process to guide that investment towards ways supporting the national economy and increasing its growth, especially, this study deals with the impact of domestic investment on growth which will be defined through an econometric model as indicated above. This study is also expected to be a useful source in the field of domestic investment and the use of econometric and time series methods in the studying of economy and economic growth.

**1.7. The Plan of the Study:**

This thesis is divided into eleven chapters. Following this introductory Chapter which presents the objectives of the study, its questions and methodology, the thesis consists of the following: Chapters: The theoretical background of investment behaviour is discussed in Chapter two. It reviews the literature of investment strategy, theoretically and empirically. It presents major emphasis on determinants of domestic investment and economic growth. Chapter three gives a brief overview of the Libyan economy before and after the discovery of oil. Particular focus is given to the characteristics of the Libyan economy and its industrialization, with reference to development strategy and its effect on the manufacturing sector and the wider economy in general. Chapter four discusses the policies of the Libyan government regarding the economy and privatization, particularly with regard the private manufacturing sector. Chapter five discusses the evolution and development of Libya's manufacturing sector and its investment. Some measurements of productivity criteria are addressed and applied to the Libyan manufacturing sector in chapter six, while chapter seven deals with the application of measuring productivity criteria to the Libya iron and steel industry. Chapter eight gives an overview of foreign direct investment in Libya, with an emphasis on foreign investment in the manufacturing sector and its relationship to domestic investment. Chapter nine explains the methodology with detailed study of the properties of time series analysis pursued by this dissertation. Chapter ten is divided into three sections, section one discusses the construction of the domestic public investment model in the Libyan manufacturing sector used in the time series data analysis, section two deals with an econometrics analysis of the domestic private investment model in the Libyan manufacturing sector. The time series correlation and regression analysis of the impact of domestic investment on economic growth in the Libyan economy is dealt with in section three. The economic hypotheses and summaries of empirical findings are also presented in this chapter. Chapter eleven summarizes the findings of this study and indicates its recommendations.

# Chapter 2

# Theoretical Framework and Literature Review

## 2.1. Introduction

Many economists are interested in the study of investment and its determinants, largely due to the impact of investment on GDP and the importance of investment in increasing the rate of economic growth. Investment demand is the second part of aggregate demand (after consumption), which includes the demand of projects to purchase new machinery and equipment. Investment impacts on productive capacity, and therefore affects the accumulation of capital, that is, it increases the production capabilities of the economy. Accordingly, investment affects the growth of outputs in both the long and short term; therefore, its impact will be on the total supply as well (Samuelson & Nordhaus, 1989).

According to Keynes, (1936, p.45) "Investment is equal to the value of that part of current output which is not consumed". He means that investment is the purchase of goods that are not consumed today but are used in the future to create wealth; therefore, it represents capital expenditure by countries, companies or individuals in an economy or economic model. Investment is commonly regarded as a function of income and interest rates. Any increase in income encourages further investment, while a rise in interest rates may not encourage investment as it becomes more costly to borrow money. Even if a firm chooses to use its own funds in an investment, the interest rate describes the opportunity cost of investing those assets instead of loaning them out.

On the other hand, the definition of investment in a financial sense may gives us another meaning; in finance, investment is the purchase of securities or other monetary or financial assets in the money markets or capital markets, and other equity investment, and bonds. This type of investment may not result in any addition to the real capital, but it is just a transition ownership of these shares which generate income from the individual viewpoint.

Investment can be classified according to the nature of the investment a gross, replacement and net investment, where:

Replacement Investment is, effectively, the change which occurs when the existing investment is replaced by a new investment. The net investment is that part of the gross investment which is needed to increase the actual capital stock. (Abuhbeel, 1996). According to Shapiro (1966, p.136) "Net investment is an addition to the stock of capital, that means, an increase in the productive capacity of the economy". The above mentioned can be clarified by the following equation:

$$Ig = In + Ir \quad (2-1)$$

where:

$Ig$ = gross investment

$In$ = net investment

$Ir$ = replacement investment

In Solow's model (1956), "today's investment is tomorrow's capital" (see for example, Aniket, 2007; Rosenblat, 2004; Henin, 2003). Solow assumed in his model that investment (additional to capital stock) during the period (t) can be formulated as:

$$It = Kt - (1 - \delta)Kt - 1 \qquad (2-2)$$

where:

$Kt$ = capital stock in the end of period (t), Kt-1 = capital stock in the end of period (t-1) and δ = depreciation rate.

However, Solow's model alludes to the investment rate as a basic determinant of whether a country is rich or poor. Yet, Samuelson and Nordhaus, 1989, p.136, define investment as "the addition to the community's stock of tangible capital goods, capital goods being equipment, structures or inventories".

**Theoretical underpinnings of investment:**

The economic importance of investment as an economic variable appears in its role in the economy. In particular, it is closely related, directly or indirectly, to the following variables: savings, income, consumption, the level of employment, the level of growth and economic development.

Some important aspects of investment can be appreciated through a study of ideas of some important economic schools: classical economic thought for example explains investment through its relationship with savings. In Marxist economic thought, investment is explained according to the theory of value and its relationship to economic surplus. The Keynesian school explained the investment variable by its relationship to consumption, savings and income, in addition to the marginal efficiency of capital and economic growth.

**I) Investment and Classical Economics:**

Although, **Adam Smith,** the classical economist (1723-1790) did not establish an elaborate theory on investment, he dealt with it, especially at the beginning of his criticism of the Physiocrat's[1] ideas. Smith argued that the physiocratic analytical conclusion, "that investment in agriculture is more productive than in other investment", is illogical, and that the pattern of resource investment should be determined by the force of self interest working through the market. Smith defines the former in terms of investment in the investment of agriculture, in livestock, and in the maintenance of the firm's family, and in services (Wood, 1993). He concluded that to obtain maximum return on investment; the investors decide to put their money in a specific industry in order to obtain maximum profitability.

Nevertheless, Smith claimed that investment in agriculture was the type of investment which brought the largest profit to the community, basically, because agriculture enlarged and augmented the productive base of the whole system. Everything else was drawn upon an agricultural base. He also was not against the view that investment in agriculture generally exhibited the greatest returns, (see, Wrigley, 1988) Smith also believed, with regard to investment in agriculture and industry, according to Dobb, (1975, p.55) "... in a century when some of the most notable progress in capitalist investment and new productive methods was made in agriculture rather than in industry. His doctrine can be properly understood only as reflection of period of transition, whose problems essentially consisted in clearing the ground for industrial

[1] - The term Physiocratic economics refers to an economic school of thought that was based on the views and practices of the Physiocrats, a group of influential thinkers who originated in France in the second half of the eighteenth century and who advocated the theory that the prosperity and riches of a nation depended solely on the agricultural sector. It can be argued that Physiocracy was the first economic school of thought to be properly developed.

investment and expansion, which he identified with sweeping away of obstructive and sectional-protective regulation in the interests of quickened competition and widening markets".

In relation to human capital, Smith guessed that the cost of education or training can be regarded as an investment in the future. This investment must be returned during the lifetime of the trainee or student if it is to be economically justified. Therefore, the preferable student and preferable trainee will normally earn more than the people who lack education or training. (See, Blaug, 1997)

**David Ricardo** (1772-1823) encouraged the increase of investment and saving as a useful move in dealing with crises. In this context, he advised that the increase of investment and saving would allay economic problems; in his view, the deed of saving and the deed of investment were considered as two phases of the same accumulation.

Also, Ricardo in his growth model argued that the capital accumulation is in terms of gross investment; that accumulation will be a part of the previous year's production which is available for gross investment. Ricardo divided the total output into three sections: replacement of used capital; rent which will not be added to capital stock, which is received by the renter class or landlords and profit which reverts to be used for net investment. On the relationship between investment and interest rates, Ricardo stated that the interest rate depends on what happens to marginal investment. When competition equals the interest rate on capital in the different types of investment, the rate that is attained in agriculture is an equitable index of the rates attained elsewhere (Wood, 1991, pp.510-561).

In any event, the classic economists focused their attention on the conditions of development and economic growth, considering that the accumulation of capital is a source of economic growth (as indicated by Smith). They identified the phenomenon of economic surplus (saving), and tried to find the relationship between saving and investment. They considered saving as a source of investment (Smith). According to classic economists, capital accumulation happens in the industrial sector not in the agricultural sector. In other words, employers allocate a significant portion of their profits for the purposes of capital accumulation. And thus profit is a key source for saving, and the relationship between them is positive. Therefore, classical analysis focused on saving as a necessary condition to support economic development, and its relationship to investment.

In classical economic thought an increase in savings will lead to an increase in aggregate demand on investment, and a decrease in aggregate demand on consumption with a constant level of total income. Supply also creates demand for what is produced (or so-called Say's Law of Markets, Anderson, 1998). Therefore, the aggregate demand for consumption and investment will be offset by aggregate supply for consumption and investment goods. This means that the aggregate demand for consumption and investment together, will remain equal to the aggregate supply (Omar, 1991).

Despite the fact that classical theory laid the foundation for the concept of investment, and capital, and their role in the development and economic growth, it faced some criticism. One of the criticisms of Smith in his vision of capital accumulation was that it is a narrow concept which ignored increasing employment, whereby the increase in employment requires an increase in capital (Marx, 1867).

**II) Investment and Marx**

**Karl Marx** (1818-1883) examined investment, and was concerned with industry rather than the individual capitalist (whom he criticised). He referred to surplus profit, and said that it should be based on a division of labour, and that special advantages are for all not only for individual capitalists. His primary focus was on the social effects of the generation and use of capital in general. For Marx, in any investment of capital, components of the fixed capital have different ages, and thus have different capital cycles, which depend on usage rate and natural forces, similar to depreciation in modern industry. He pointed out that an increase in diversification of production relying on expansion in investment will create possibilities for capital investment. Marx took up the idea that economic growth in Western Europe's Industrial Revolution was caused by investment in labour and machines, and that industrialization was made by the changes in the organization of economic production. He asserted that investment in labour and machines would cause the economic growth essential for development. He meant additional money for investment in machines, and additional machines will develop labour productivity to the essential expansion of economic growth. (See for example, Hollander, 2008; Richardson & Romilly, 2001; Raymond, 2006)

In his theory of location, Marx stressed that there is an analysis of fixed and capital investment, comprised of the analysis of fixed investment and the availability of lands to facilitate capital accumulation through production, with the assumption that equal capitals are invested in equal areas of land. (Peet, 1977).

Marx argued that investment leads to the creation of productive resources. Therefore, capital accumulation policy requires giving priority to capital goods production. According to Marx, economic surplus means the surplus of economic output of the net social work, i.e., the intellectual and muscular effort which is exerted by humans. (see Hamada, 2004). The investment process is linked to the expanded re-production, and the economic surplus is a source of investment.

Marx also argued that investment is a social relationship and an economic process. This relationship exists between numbers of individuals who make a working investment group in a given economic unit. At the same time, investment is a relationship of technique, because its role is to create the means of production, which enable the productive capacity of the community to be renewed and explained.

On the relationship between investment and capital, Marx sees the investment process as the operation of capital. That is, capital is an investment means. Investment is an independent variable leading to the development of a part of the capital as the dependent variable.

## III) Investment and Keynesian Economics

Keynes observed that saving equals investment, because each of them is equal to the portion of income which is not consumed at the end of a period. Unlike the classic economists, who believed that saving is prior to investment (where investment is a result of the savings and its dependence), Keynes supposed that saving follows investment and is dependent on it. Investment leads the creation of income which creates the saving (Keynes, the General Theory, Chapter III).

The Keynesians considered that government and private investments are a basis of national income growth in the short run, and the main factor in rising growth rates in the long run (Osadchaya, 1979).

Given that income is part of the value of total production, therefore, any intended increase in total income cannot be achieved only by increasing total production. This can only happen through increased investment as a key to achieve a rapid rate of economic growth (Omar, 1991).

In the context of Keynes's system, development and growth models were developed by Harrod (1939) and Domar (1946).

In Keynesian literature, Harrod focused on determining the rate of growth from one period to another, which is enough to maintain full employment. Productivity Energy and employment in the economy will be inoperative without achieving that rate of growth in national income, or it will be used at less than its capacity (Taha, 1990 ).

Harrod-Domar's model reflects the growth rate which is required to maintain full employment as follows (Stern, 2007; Ghatak, 2003; Dixit, 1976):

$$G = \frac{S}{Y} X \frac{1}{K}$$

Where: $G$ = Rate of Growth.

$S$ = saving in a period.

$Y$ = National Income.

$1/K$ = Coefficient of Capital.

According to this model, the saving rate ($S/Y$) and reverse of capital/income ($1/K$) are the factors which determine the rate of growth.

The coefficient of capital / income shows the relationship between what is invested and the resulting income. This means that it is necessary to invest capital to achieve a given increase in income.

Given the above, the importance of the Harrod-Domar's model is highlighted in determining the rate of investment ($S/Y$), which is necessary to achieve a certain rate of economic growth. This model also shows the possibility of increasing the rate of growth, resulting in a reduction of factor (capital/income), or an increase in the rate of investment (saving/income).

**Income and its relationship to investment multiplier in Keynesian thought**

As indicated earlier, there is a relationship between income and investment. Income affects investment and is affected by it. The investment multiplier ($\mu$) represents how investment affects income. It is the change in national income which would result from a unit change in investment (Elalo, 1981; Glahe, 1973; Murad, 1962):

$$Y = C + I \qquad (2-4)$$

where Y= Income, $C$= Consumption, $I$= Investment;

namely:

$$\Delta Y = \Delta C + \Delta I \quad (2-5)$$

That because the excess income is spending in the purchase of consumption goods ($\Delta C$), and investment goods ($\Delta$I).

Of the equation (2-5), we find that:

$$\Delta Y - \Delta C = \Delta I \quad (2-6)$$

and dividing both sides of equation (2-6) on $\Delta Y$; obtained:

$$\frac{(\Delta Y - \Delta C)}{\Delta Y} = \frac{\Delta I}{\Delta Y} \leftrightarrow 1 - \left(\frac{\Delta C}{\Delta Y}\right) = \frac{\Delta I}{\Delta Y} \qquad (2-7)$$

and dividing (2-4) on both sides in the previous equation; obtained equation (2-8):

$$\frac{1}{\left[1 - \left(\frac{\Delta C}{\Delta Y}\right)\right]} = \frac{1}{\frac{\Delta I}{\Delta Y}} \leftrightarrow \frac{1}{\left[1 - \frac{\Delta C}{\Delta Y}\right]} = \frac{\Delta Y}{\Delta I} \qquad (2-8)$$

whereas: $\frac{\Delta Y}{\Delta I}$ = investment multiplier, then:

$$(\mu) = \frac{1}{\frac{1}{1-\frac{\Delta C}{\Delta Y}}} \qquad (2-9)$$

Since the marginal propensity to consume (MPC) = ΔC / ΔY, then:

$$(\mu) = \frac{1}{[1-(MPC)]} \quad (2-10)$$

Of the equation (2-10) we deduce that marginal propensity to consume will rise when the investment multiplier rises, and vice versa.

It should be noted in this regard that marginal propensity to save ***(MPS) = 1 – MPC***, and the investment multiplier in this case is:

$$(\mu) = \frac{1}{MPS} \qquad (2-11)$$

### 2.1.2. Summary

Investment can be an influential factor on other factors such as economic growth as stated by Ricardo, Marx and Keynes, and could be affected by other factors such as profit and labour force as discussed by the classical theory; it will also be highlighted in more detail within the next part. This section reviewed different views of some leading economists, and how these views led to emerge of different theories (as will be shown later) explaining the nature of investment and its impact on other economic factors. Smith argued that people are investing their money in order to obtain profits in the future, he also reviewed those costs of spending on education and training is an investment in the future, and investment is a source of economic growth. Ricardo in his growth model argued that gross investment is a function in total output. Furthermore, Marx pointed to the impact of investment on economic growth, and asserted that investment is one of main causes of growth. Solow defined investment in his growth model as tomorrow's capital, while Keynes disputed that investment is as a function of income and interest rate, and saw investment essentially as a result of savings. These views led to the emergence of many theories on investment; the next section is deals with the most important of these theories.

## 2.2. Survey of Investment Theories

### 2.2.1. Introduction:

This study relies on the economic literature and applied previous studies which have tried to explain investment behavior and determine the economic factors affecting it, in order to build a theoretical model of the relationship between investment and its determinants in the Libyan economy. Many studies on the determinants of investment have been conducted in both developed and developing countries alike. Studies conducted in developed countries have tried to explain the behavior of investment in the light of conventional investment theories such as the simple acceleration principle theory, flexible accelerator model, and the new classical theory of investment.

Reliance on such theories in the interpretation of investment behavior requires a set of conditions which are rarely available in developing countries (the most important of these conditions are full competition, availability of information, efficiency of capital markets), in addition, the interest rate (which is one of the main determinants of investment) does not reflect the real cost of capital in most developing countries, because the financial markets in these countries are either weak or non-existent (Wai & Wong, 1992).

Furthermore, the Libyan economy does not have a real stock market, also, interest rate is fixed and determined administratively by the monetary authorities, and therefore, it has no role in influencing the size and direction of investment spending in the economy.

There is another type of study focused on identifying the factors affecting investment through the influence of different economic variables without being restricted to models based on conventional theories of investment. This type of study is interested in trying to explain the investment behavior in developing countries due to a lack of conditions for building a model to forecast the size and direction of investment (Taher, 2000). Since the goal of this study is to know the determinants of domestic investment (public and private) in the Libyan economy and the importance of each in explaining the behavior and direction of this variable (investment), this study will follow the latter type of study as being the most appropriate in the case of Libya, based on the economic literature and applied studies conducted in developing countries. In preparation for building the theoretical model of the relationship between investment and its determinants, the most important theories that have tried to explain the behavior of investment in economic thought will be addressed in this chapter.

### 2.2.2. THE SIMPLE ACCELERATION PRINCIPLE THEORY

In this section we will review the literature on the theory of the acceleration principle and investment literature. The acceleration principle is formulated by John Maurice Clark (1884-1963). It is a theory of investment in macroeconomics. It asserts that the level of investment is accelerated only through the rate of increase in output, which is the gross domestic product. Since the acceleration principle links investment to output, it also has explanatory value in understanding the development of business cycles. (Shapiro, 1974; Peterson, 1967; Chenery and Clark, 1959).

According to the acceleration principle, each level of output needs a specific amount of capital. Therefore, if output (and the capital required to procure the necessary machinery) is expected to rise, the amount of capital within an economy will also increase. (See, Gupta, 2004; Shapiro, 1966) The accelerator equation is:

$$K = \Delta Y \qquad (2-12)$$

The desired capital stock will change over successive time periods only with changes in output, and then in period t-1, the equation (2-12) will be:

$$\Delta K = A\Delta Y \qquad (2-13)$$

The increase in the desired stock is Kt-Kt-1. To increase the capital stock, investment expenditure is needed. To increase the capital stock during t from Kt-1 to Kt, the net investment expenditure required equals the change in capital stock, or

$$I = Kt - Kt_{-1} \qquad (2-14)$$

In addition, the equation describes net investment expenditure required in period t as

$$I = Kt - Kt_1 = \Delta(Yt - Yt_{-1}) \qquad (2-15)$$

The equation simply says that net investment during t depends on the change in output from t-1 to t multiplied by the capital output ratio.

The desired net investment is governed positively by the change in (expected) output. Since past production was made possible by the past stock of capital, it is only the increment in output that requires the additional capital. When there is acceleration in the business and expected output increases, the net investment is positive. If the expected output stops increasing, the net investment falls to zero. Further, if the expected output declines, the net investment becomes negative. It may be recalled that net investment equals gross investment minus depreciation. Thus, net investment would be negative when gross investment is positive or zero.

Paul Samuelson defines the acceleration principle as "a theory of investment spending which holds that the level of investment will be governed by the rate of increase in GNP. That is, there will be positive (or high) net investment when GNP is just holding steady (even if GNP is already very high)". (Brenner, 2000, p. 209).

According to Brenner and Brenner-Golomb, (2000, p.53) "the acceleration principle does not lead to a cumulative up or down movement but subjects these tendencies to fluctuation. In fact fluctuation will occur because of the inability of income to rise (or fall) beyond a certain limit, or intervention of external factors. Moreover, the amount of capital that may be used to produce a given output is somewhat flexible and firms do not regard their output as remaining constant. Similarly long-term expectation plays a role in decisions so that even if last year's demand was falling, long-term expectation may still induce investment, while increasing demand may not convince entrepreneurs that the trend can continue long into the future".

However, this simple picture of acceleration has faced several criticisms, notably the following: (See, Ibrahim, 1987)

• The theory of acceleration principle explains the investment only. It does not take into account both the gross and replacement investment which defines the changes in total output.

• The assumption of the stability of acceleration to output is not realistic, because the change in acceleration depends on a change in technical level.

• The assumption which says that firms are working at maximum capacity is not realistic. There is no doubt that the existence of idle capacities of these industries weakens the relationship between the change in income and net investment. If income and aggregate demand increase, and can satisfy the increase through the operation of idle capacities of those firms, there will not be any increase in net investment.

These are the most important criticisms of the acceleration principle theory. However, the theory has been modified so that it deals with capital stock, which depends on past production. The new image of this theory is the flexible acceleration principle, which we will turn to in the next section.

## 2.2.3. THE FLEXIBLE ACCELERATION PRINCIPLE THEORY

The literature on the theory of the flexible acceleration principle will be examined in this section. After Clark's introduction of the simple acceleration principle (1917), many improvements emerged, (Chenery, 1959). The flexible acceleration theory is a broader and more comprehensive definition than the simple acceleration principle. Both the flexible acceleration principle and the simple acceleration theory approve a constant capital output ratio to determine the desired stock of capital. The difference, however, is in determining the adjustment from the actual capital to its desired level.

The wording of the flexible acceleration principle removes some of the rigorous assumptions of the simple acceleration theory. One of the assumptions is the acquisition of desired additional capital stock in one period. The improved wording assumes instead that the gap between the actual and desired capital stock is filled over a number of periods. There are achievable reasons for this: a) Production of additional capital equipment takes a longer time than is implied in the simple acceleration principle. b) Acquisition of desired capital stock is usually based on long-term consideration.

The flexible wording of the acceleration principle deals with the time lag in filling the gap between the desired capital stock (k) in period t and the actual capital stock (Kt-1) in period (t-1). In period (t), therefore, only a fraction ($\lambda$) of (Kt) is procured. This relationship is expressed as (See Froyen, 2004):

$$\boldsymbol{Kt - Kt1 = \lambda(Kt - Kt\_1)}\ (0 < \lambda < 1) \qquad (2-16)$$

Where *Kt*= the actual capital stock in period *t; Kt-1*= the actual capital stock in period *t-1; Kt*= the desired capital stock in period *t;* and A= a constant (proportion).

Where *Kt-Kt-1*= net investment (In) and *In= (It - Rt)* - where *Rt* is replacement capital in period t (depreciation), equation (2-15) can be written as

$$\boldsymbol{It - Rt = In = \lambda(Kt - kt\_1)} \qquad (2-17)$$

Equation (2-16) says that net investment in period t equals a fraction of the difference between the desired capital stock in period (t) and actual capital stock in period *t-1*

Since, given the technology, Kt equals capital output ratio (k) times$Y_t$, the output in period t, equation (2-16) can be written as

$$In = \lambda(kYt - Kt\_1) \qquad (2-18)$$

and gross investment (*Ig*) can be expressed as

$$Ig = \lambda(kYt - Kt\_1) + Rt \qquad (2-19)$$

The last equation says that the gross investment is a sum of net investment plus depreciation and represents the widely used flexible accelerator model.

However, the basic principle remains the same between the desired and the actual capital stock, despite the fact that the flexible wording of the acceleration principle confirms a partial adjustment rather than instantaneous adjustment. To sum up, the flexible acceleration principle is a useful theory in discussing the shortcomings of the simple acceleration principle, and many economists have placed great importance on this theory, despite many of them disagreeing with those economists who believe that this theory by itself provides an adequate explanation of investment demand.

### 2.2.4. The Marginal Efficiency of Capital Theory

An investor thinks of the amount of revenues which will be generated by the investment (new investment asset), over the life of this investment. Furthermore, it is possible for instance for the investor to buy interest-bearing bonds, or to deposit his funds in banks which would give a benefit. In this case, the investor compares the returns that can be obtained by investing in new capital assets, and the benefits that can be obtained as a result of depositing money in banks or buying bonds. Consequently, an incentive for investing demands that the return on investment must be higher than interest rates or at least equal to them.

John Maynard Keynes' (1883-1946) theory of marginal efficiency of capital describes the rate of discount which would make the present value of expected income from fixed capital assets equal to the present supply price of the asset. He says in his General Theory, (1936; ch.11), "I define the marginal efficiency of capital as being equal to the rate of discount which would make the present value of the series of annuities given by the returns expected from the capital asset during its life just equal its supply price". John Maynard Keynes suggested that the investment function of the relationship between investment and interest rate was of a rather naive form. Firms were presumed to "rank" various investment projects depending on their "internal rate of return" (or "marginal efficiency of investment") and thereafter, faced with a given rate of interest, chose those projects whose internal rate of return exceeded the rate of interest. With an infinite number of projects available, this amounted to arguing that firms would invest until their marginal efficiency of investment was equal to the rate of interest. Therefore, Keynes imposes the following equation (cited in McDonald, 2008):

$$P = \frac{R1}{(1+r)} + \cdots + \frac{Rn}{(1+r)^n}, \qquad (2-20)$$

Where P is the supply price and the R's are the prospective net incomes from employing the capital asset in each of n years.

For more clarification; assuming that a machine will give future annual returns by using it, the revenue over the life of the project can be presented as follows:

$$R1, R2, R3, \ldots Rn$$

Where: $R$ is the return on using the machine in the first year; $Rn$ is the return on using the machine in the year n.

To calculate the marginal efficiency of capital, it is necessary to calculate the discount rate which makes the total present value of benefits equal to the price of capital (i.e., the price of the machine).

Assumed that ***Pk*** is the price of the capital, and (***r***) is the marginal efficiency of capital, that produces the following equation:

The present value of discounted expected benefits = (***P***). Namely that:

$$\boldsymbol{P} = \frac{\boldsymbol{R1}}{(1+r)} + \cdots + \frac{\boldsymbol{Rn}}{(1+r)^n}, \qquad (2-21)$$

If we know the values of ***P, R1, R2,.. Rn,*** we can know the value of the marginal efficiency of capital (r).

If the marginal efficiency of capital is greater than the rate of interest which is prevailing in the market (***r>i***), in this case, the investor decides to invest.

If the rate of interest is greater than the marginal efficiency of capital (***r<i***), the investor will not invest.

Clearly, Keynes assumes that efficiency of capital decreases with an increase in capital; also, that, as investment rises, it will be less profitable, for two reasons. First, the product you are investing in has a downward sloping demand curve. As more is produced, the price must be lowered in order to sell it, and thus marginal revenue of producing the last units' decreases. Another reason is that the price of capital is bid up when more investment occurs and thus it becomes more expensive to invest. (Harris, 2005; MacLauchlan, 1993).

According to McDonald (2008, p. 15): "Keynes's first summary of the model is that the independent variables are the propensity to consume, the schedule of the marginal efficiency of capital, and the rate of interest. Given a rate of interest, the level of investment demand is determined by the schedule of the marginal efficiency of capital. The level of investment determines the level of income and employment through the propensity to consume by establishing the income level at which investment equals saving". Investment in the Keynesian theory means real investment, (Keynes, 1936) not financial investment; it depends on the marginal efficiency of capital, and the rate of interest. He argues that the marginal efficiency of capital is not less than the rate of interest. According to the theory of marginal efficiency of capital, it has been defined as the highest rate of returns over cost accruing from an additional or marginal unit of a capital asset. The rate of interest has an equally important influence on investment. Comparing the rate of interest with the marginal efficiency of capital, if the rate of interest is greater than the marginal efficiency of capital, there is no event for the investment, because this investment will cause a loss. If the rate of interest is less than the marginal efficiency of capital, this investment will be profitable. In this regard, according to Glahe (1973, p. 90) "the rate of return on real investment by the firm is called the internal rate of return, while that received on the purchase of financial assets is called the external rate of return. The difference between the firm's internal rate of return and external rate of return is called the firm's net internal rate of return. The profit-maximizing firm will therefore attempt to undertake all investment projects whose net internal rate of return is positive".

According to Keynesian analysis, the increase in the use of capital within a certain period, leads to a decrease in the marginal efficiency of this capital. This is due to several reasons, including:

- The expected return of this capital will decrease, when the supply of capital increases.
- The increase in capital assets leads to an increase in production. Therefore, the increase in production and supply leads to a decline in the price of products. Thus, the expected returns for these assets will decrease.
- An increase in capital assets leads to an increase in cost of production, assuming that the production of these assets happens under the law of diminishing returns[1] (the price of these assets or the cost of their replacement tends to rise).

On this basis, if the volume of investment in capital assets increases, this would lead to a reduction in the marginal efficiency of capital. The following figure illustrates this relationship (see Jain & Sandhu, 2006; Lipsey & Harbury, 1992):

[1] Law of Diminishing Returns: when a fixed input is combined in production with a variable input, using a given technology, increases in the quantity of the variable input will eventually depress the productivity of the variable input. (see for example, Sowell, 1974).

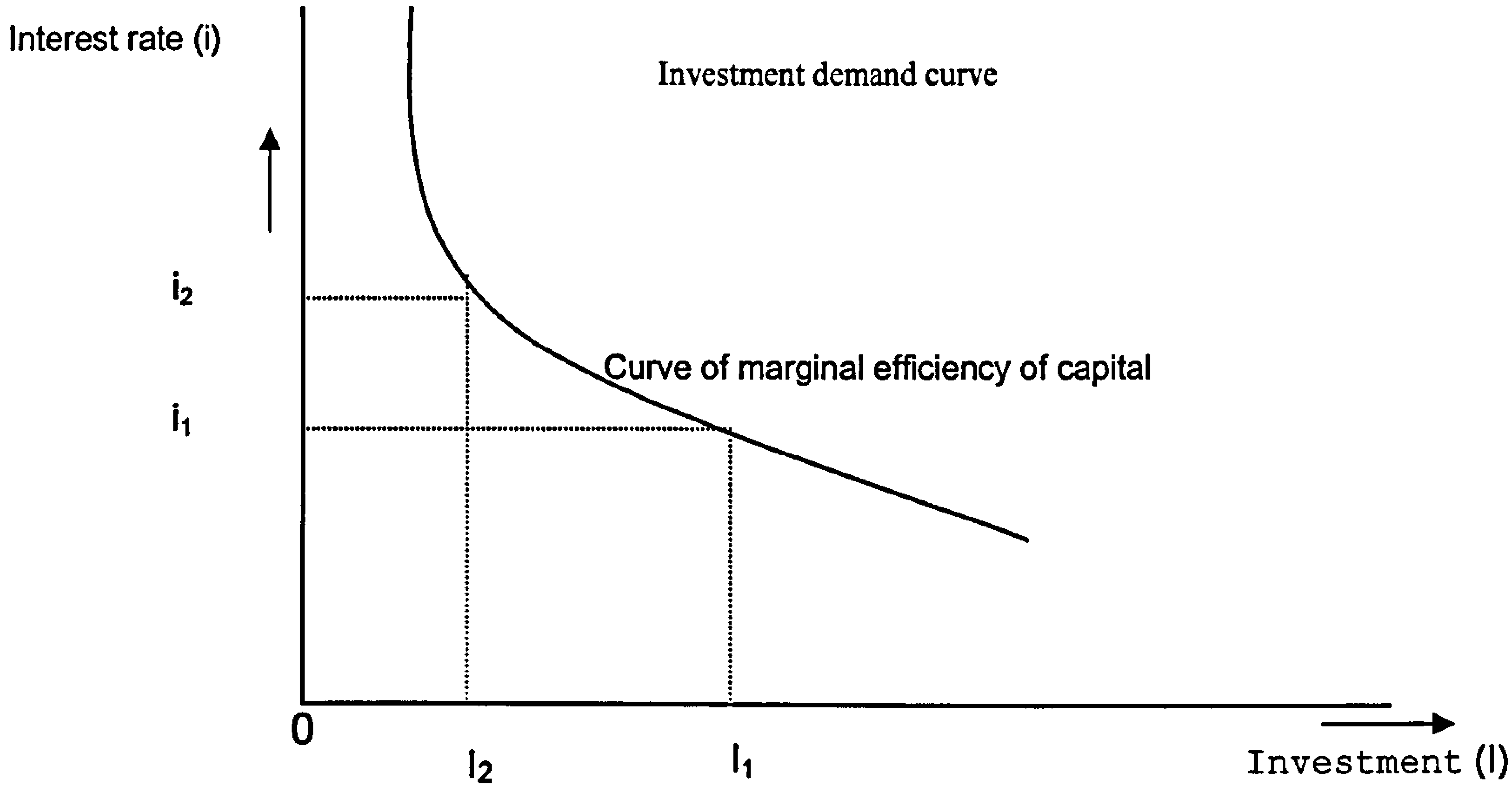


**Figure (2-1): Investment Demand Curve in the Keynesian Theory**

Each point on the curve represents a certain level of discount rates, and investment levels which are consistent with these prices. This figure shows the inverse relationship between the size of investment and the expected discount rate. An increase in the size of the investment leads to a decrease in the expected discount rate, and vice versa.

However, this theory has been criticised by economists. Keynes looked at a single investment option and compared the present value of the income flow with that of cost flow. (Alchian, 1955)

Also, according to Lund, (as cited in Sikwila, 1992, pp. 35-37), there is no stress difference between investment theory and capital theory in the Keynesian analysis of investment. Investment theory deals with closing the gap between actual and desired capital stock, whereas the capital theory deals with desired optimal capital stock, the demand for investment cannot simply be driven by the demand for capital.

Furthermore, Haavelmo questioned the ability of Keynes' demand schedule in the description of investment decisions. He indicated that the demand for investment cannot simply be driven by the demand for capital.

### 2.2.5. The Profits Theory of investment:

This theory states that the amount of capital stock desired, and therefore investment spending depends on the amount of profits made by enterprises in the current and the recent past periods (Khalil, 1994; Wood, 1975).

This means that level of profits actually achieved during the past and present periods of time are a reason to expect the continuation of this level of profits in the future. This theory may be a good way to explain investment spending as long as the profits made by enterprises are an indication of the circumstances that led to profits during the present period or past will continue in the future and determine the amount of profitability. In fact, the current profits of the institution reflect the prevailing circumstances of the demand for its products and supply conditions of the inputs used, but do not accurately reflect changes that may occur in conditions of both demand and supply in the future. The level of profit this year reflects the current demand conditions, but it is difficult to predict that the demand will grow in the future to justify new investments in the current period (Khalil, 1994).

For these reasons, there are other considerations under this theory which give great importance to the current and achieved profits. These institutions prefer to finance their investments internally and make more profits that provide the possibility of a greater volume of investment by self-financing from internal funds provided by the achieved profits. Therefore, this theory also called "The Internal Funds Theory of Investment" (Edgmand, 1983). Thus, the desired capital stock can be measured in accordance with this theory as follows:

$$Kt = \propto Lt \qquad (12-22)$$

Where: $Lt$ = the amount of internal liquidity (or funds) available to the institution.

$\propto$ = ratio of desired capital to the amount of liquidity.

According to this theory, investment is determined by profits, unlike the theory of accelerator, where investment is determined by output. Thus, this theory holds that economic policies aimed to increase the profits of enterprises have more impact on investment, and the most important of these policies is to reduce taxes on investment (Edgman, 1983). While the accelerator theory holds that policies aimed at increasing output by stimulating aggregate demand in the economy is more effective in influencing investment.

In this regard, it should be noted that the originators of this theory did not completely ignore the relationship between investment and output size, especially in the long run, but they stressed that the profits obtained through internal financial assets are a major determinant of investment.

**2.2.6. The Q Theory of Investment:**

The neoclassical economist James Tobin (1969) pointed out that investment depends on the ratio of market value of the capital asset to the replacement cost (*Q* Ratio) (Audretsch, 2006; McDonald, 2004), which is equal to:

$$Q = \frac{Mv}{Rc} \qquad (2-23)$$

Where: ***Mv*** = the market value of the capital asset.

***Rc*** = the replacement cost of the capital asset.

According to this theory, institutions will take an investment decision if the ratio of $Q > 1$, i.e. when the market value of the assets of the enterprise is greater than the cost of replacing these assets.

Due to the ease of this theory and the availability of data on prices of both capital goods and stock prices, it has been very much used in making investment decisions. However, some economists have criticized this theory because the rate of *Q* is an average ratio not marginal, and investment decisions are based on marginal ratio not on average.

### 2.2.7. The Neoclassical Theory of Investment Accumulation and Investment Behaviour

The Neoclassical theory of capital accumulation and investment behaviour was developed firstly by Fisher (1930). In his theory, Fisher supposed that all capital is used up in the production process; therefore a "stock" of capital did not exist. Instead of that, all "capital" is, in effect, investment, and the investment in any direction will depend on a comparison between the rate of return over cost and the rate of interest. To induce new investment, the rate of return over cost must exceed the rate of interest. (Richardson, 2001). Jorgensen (1963) proposed a different investment theory, which was derived, partly, from the Fisher theory. Jorgenson presented the neoclassical theory of optimal capital accumulation. He considered that a representative firm employing only two factors of production, namely labour (L) and capital (K) to maximize the present value of the stream of its net profit over an unlimited term.

Jorgenson defines the present value of the firm as follows (Jorgenson, 1996, pp. 190-196):

$$\boldsymbol{Rt = ptQt - wQt - qtIgt} \qquad (2-24)$$

Where:

$\boldsymbol{Q}$ = represent level of output

$\boldsymbol{R}$ = variable input

$\boldsymbol{Igt}$ = investment in durable goods

$\boldsymbol{p}$ = represent the corresponding prices

$\boldsymbol{w}$ = the flow of net receipts at time t

Present value is defined as the integral of discounted net revenue and given as:

$$\boldsymbol{PV = \int_{\infty}^{0} e(-rt)\, Rt\, dt} \qquad (2-25)$$

Where

***PV*** is the present value

***rt*** is the rate of discounting

e is an exponential indicating continuous discounting

Jorgenson assumed that the present value equation is maximized subject to the firm to two constraints; first, the net investment function, and the second constraint is the standard neoclassical Cobb-Douglas production function which is given as:

$$\boldsymbol{Qt = AKt\,Lt} \qquad (2-26)$$

That is,

$$\boldsymbol{F(Qt, Kt, Lt) = 0} \qquad (2-27)$$

The net investment function is given as

$$\boldsymbol{It = Igt - \delta Kt} \qquad (2-28)$$

Where

***It*** = net investment

***Igt*** = total investment

***Kt*** = replacement investment

**δ** = the rate of depreciation of capital assets

To maximize the present value equation (2-25) subject to equation (2-28) by adding equation (2-27), we get:

$$\boldsymbol{PV = \int_{\infty}^{0} (-rt)\,(ptQt - wtLt - qtIgt) + \lambda 1tF(Qt, kt, Lt)}$$
$$\boldsymbol{+ \lambda 2t\left(\frac{dk}{dt} - Igt + \delta Kt\right) dt} \quad (2-29)$$

where λ is the parameter assumed to lie $(0 < \lambda < 1)$

With combining the necessary condition for labour and output

$$\frac{\partial Qt}{\partial Lt} = \frac{wt}{pt} \qquad (2-30)$$

$$\frac{\partial Qt}{\partial Kt} = \frac{(q(r+\delta) - q)}{p} = \frac{ct}{pt} \qquad (2-31)$$

where *ct* is user cost of capital.

By using equation (2-6), Jorgenson expressed the desired capital stock function as:

$$\frac{\partial Qt}{\partial Kt} = \alpha AKt.Lt = \frac{\alpha AKt.Lt}{Kt} = \frac{\alpha Qt}{Kt} \qquad (2-32)$$

By replacing equation (2-28) into equation (2-29), we will have the desired optimal capital stock

$$K^* = \frac{\alpha pt\, Qt}{ct} \qquad (2-33)$$

where: $pt\ Qt$ = gross revenue

$\alpha$ = a constant in respect to capital

$ct$ = divided by the user cost of capital

Jorgenson assumes this equation

$$Ite = m(K^*t - K^*t\_1) \qquad (2-34)$$

where: ***Ite*** = investment for expansion

***m*** = the weight of the distributed lag.

Adding the replacement investment Irt = ∂Kt; to the right hand side of equation (2-31), gives

$$Igt = m(K^*t - K^*t\_1) + \partial Kt \qquad (2-35)$$

The last equation gives the theory of investment behaviour and states that gross investment equals net investment plus depreciation.

Placing equation (2-33) into (2-35), we will have

$$Igt = m\left[\frac{\alpha ptQt}{ct} - \frac{\alpha pt\_1Qt\_1}{ct\_1}\right] \qquad (2-36)$$

Equation (2-36) gives the econometric definition of Jorgenson's theory of investment behaviour.

Jorgenson's theory consists mainly of the production function and the user cost of capital equation. Despite the fact that many criticisms have been directed at this theory, nevertheless, it contributed significantly to the understanding of the behaviour of investment.

Jorgenson arranged the determined variables for investment used in investment models in three major groups as follows (Jorgenson, 1971):

Group I: Capacity Utilization Variables: these include the ratio of output to capacity, the difference between output and capacity, change in output and the difference between actual sales and previous peak of sales.

Group II: Internal Funds Variables: Include flow of internal funds, the size of liquid assets and their dept capacity, and accrued tax liability.

Group III: External Finance Variables: include interest rates, rates of return, stock prices, and the market value of the firm.

Jorgenson tried to assess the role of each of the previous variables in explaining investment behaviour; he found that using the variables related to capacity utilization is the most influential in determining investment, followed by the variables related to external financing which reflect the cost of capital. Jorgenson also found that the variables of internal financing have a small role in determining the required capital and thus investment.

The neoclassical model possesses as a characteristic that it is built on a clear model of optimum behaviour, which appertains to the relationship between the desired capital stock and interest rates, output, capital prices and tax policies. (Toit & Moolman, 2003).

## 2.3. Summary

In brief, these theories which have been discussed in this section included some determinants of investment, such as change in output, level of output, level of profit, capacity and relative prices. All of these factors can be contained in the neoclassical theory of capital accumulation and investment behaviour. The simple principle acceleration theory assumes that net investment depends on output from one period, and net investment is sufficient to close the gap between actual and desired capital stock, and that occurs in one period. The theory of flexible acceleration is proposed as an adjustment to the simple principle acceleration theory. The improved wording assumes instead that the gap between the actual and desired capital stock is filled over a number periods, because the acquisition of desired capital stock is usually based on long-term considerations.

The marginal efficiency of capital theory suggests the relationship between investment and interest rate, and the rate of interest has an equally important influence on investment. The neoclassical theory of accumulation and investment behaviour consists of the production function and the cost of capital equation; it is built on the relationship between the desired capital stock and interest rates, output, capital prices and tax policies.

Keynes observed that investment depends on what he called "Marginal Efficiency of Capital" which is associated with a certain interest rate reflecting the opportunity cost of funds invested. Accordingly, investment depends on the available interest rate. The simple accelerator theory suggests that investment depends on changes in the level of production. Consequently, an increase in investment is due to a growth of output during one period. Whereas the flexible accelerator theory considers that investment depends on output at multiple levels in more than one period of time. The new classical theory of investment is coincided with the accelerator theory in that output is one of determinants of investment, but also it added that taxes on business sector and cost of capital also have a significant impact on investment. Investment depends on the amount of profits made by business institutions in the current and the recent past period, according to the view of profit theory.

Reviewed above are the most important theories in economic thoughts that have attempted to explain the behaviour of investment. A number of economists have formulated different models for the investment function based on previous theories; these models include a set of explanatory variables such as output, capacity, interest rates, and rates of return. Jorgenson in his study (Jorgenson, 1971) arranged the variables determining investment used in those models into three main groups as follow:

Group I: variables related to the use of capacity utilization, includes ratio of output to capacity, the difference between output and capacity, change in output, and sales minus previous peak of sales.

Group II: variables related to internal fund includes flow of internal founds, the stock of liquid assets, dept capacity, and accrued tax liability.

Group III: variables related to external finance includes interest rate, rate of return, stock prices, and market value of the firm. However, Jorgenson found that capacity utilization variables have the most impact on investment, followed by variables related to external finance which reflect the cost of using capital.

After reviewing the economic theories on investment, it is clear that investment is considered to be one of the most important economic variables. It is an important variable in economic development and has a strong linkage with national income.

Also, by the meaning of investment as a key variable in capital accumulation, it derives its importance from the source of economic surplus. In addition, it takes multiple forms of distribution. This is a problem in economic policy and considered as a fundamental problem in economic development.

It should be noted that the possibility of testing these models based on the previous theories in the economies of developing countries face many difficulties such as lack of data on many of the variables included in these models, including real interest rates, financial flows, rates of return, production capacities and the size of profits, in

addition to the incompetency of the financial markets and the dominance of the public sector on investment activity in these countries.
However, there are some studies on investment which have taken into account the lack of information which is characteristic developing countries; they focus mostly on the macro-variables that affect investment in these countries without full compliance with models based on previous theories, and the following are some of these studies.

## 2.4. Applied Studies on Determinants of Domestic Investment in Developing and Less Developed Countries

As to the previous theories, a brief review can be made of the most important applied studies conducted to utilize them for specifying the variables to be used for the interpretation of industrial investment in developing and less developed countries. Therefore, this section is structured as follows: first, applied studies on determinants of domestic manufacturing investment in the public sector; second, applied studies on determinants of domestic manufacturing investment in the private sector. The most important results reached are:

### 2.4.1. Determinants of Domestic Investment in the Public Manufacturing Sector

The applied study by Mohamed (1997) analysed the factors affecting investment function in the manufacturing sector in Libya. It indicated that investment decision in Libya, especially in the nineties, were a result of social welfare maximisation more than profit maximisation. The author eliminated the factor of interest rate in spite of its importance in economic theory, this is because the interest rate does not exist in the Libyan economy for religious reasons and therefore it does not play an important role in industrial investment. By using time series and OLS method, the author put the real investment in the manufacturing sector as a dependent variable, and the independent variables are: oil revenues; value-added generated in the manufacturing sector; government's annual appropriation given to the manufacturing sector; value-added generated in the manufacturing sector lagged one period; government's annual appropriation for investment in the manufacturing sector lagged one period; investment in manufacturing sector lagged one period.

This study concluded that the government's real annual appropriations given to the manufacturing sector and real investment in manufacturing sector lagged one year are the most significant variables affecting real investment in the manufacturing sector in the Libyan economy.

The Applied study by Bigsten et al. (1997) investigates manufacturing in four African countries in which financial markets have been heavily controlled (Cameroon, Ghana, Kenya and Zimbabwe) during the 1990s, using panel data.

The factors on which this study focuses as determinants of investment are profitability, growth of value added, past firm borrowing and the size and age of the firm. The results indicated that the median rate of investment across the four countries is close to zero. These low investment rates are associated with high profit rates and low rate of growth of value-added.

The study by Looney (1997) examines the causal relationship between the growth in non-manufacturing sector investment and the growth in real manufacturing investment. Also, it studies the relationship between investment in the public manufacturing sector and the private manufacturing sector, and discusses the importance of the transition of investments from the governmental manufacturing foundations to other activities, which stimulate investment in the manufacturing private sector. This study used the OLS method during the period 1988-1992 in Pakistan as a case study. The author used two equations. In the first equation, he puts the growth in non-manufacturing sector investment as a dependent variable, offset by growth in real manufacturing investment as an independent variable. In the second equation, he replaces the two variables: the dependent variable in the first equation became an independent variable, and the independent becomes a dependent variable. This study reached the result that investment in the manufacturing public sector does not encourage investment in the manufacturing private sector. To overcome this problem, the author concluded, the government should continue the process of privatization.

The applied study by Soderbom and Teal (2000) used a panel data to investigate how skills have impacted on manufacturing investment and exports in the 1990s. Comparative data was also used for four African countries - the Cameroon, Ghana, Kenya and Zimbabwe to find out whether there are firms which are sufficiently efficient to be able to export manufactures. In addition, he asked whether there was evidence from Ghana that over the longer term there has been a rise in such exports? Are the exports that have occurred unskilled-labour intensive ones?

This study uses a cross-section to estimate the model, using the proportion of firms' investment to capital as a dependent variable, and the independent variables are the change in real value-added; measure of technical efficiency; change in real profits; percentage of education to employee; percentage of tenure to employee; exports and proportion of real dept to capital. The results found that education and experience gained from work, and the efficiency which the firms were based on, were important factors in investment and export in the manufacturing sector.

The study on determinants of manufacturing investment in the Libyan economy (Omar, 2002) attempted to investigate the determinants of public investment during the period 1980-2000, by using the OLS method and time series analysis. The study shows the impact of some of the factors on public manufacturing investment. These factors are: oil revenue; GDP; imports of capital goods, the value added of the manufacturing sector; the price index (as an inflation rate); the availability of foreign exchange and the cash benefits granted to the manufacturing sector.

This study produced several results, including the fact that most of the investments in the manufacturing sector were imputed to the financial abundance which were attained from the oil revenues; a decline in the rate of the contribution of the manufacturing sector to GDP. This is due to the low rate of investment in this sector; manufacturing investment depends on what the government grants of foreign currency for the import of machinery and equipments; economic instability has a negative effect on manufacturing investment in the Libyan economy. However, the author mentioned the difficulty of obtaining data; in addition, there is a lack of data and information relating to the conduct of the study.

The applied study by Arbelaez and Echavarria (2002) evaluates the degree to which Colombian firms face credit restrictions that alter their investment decisions. It analyzes whether the evolution of the financial sector during the 1990s, characterized by an intense financial liberalization, an increase in size and a deepening of activity, reduced the credit restrictions faced by firms and stimulated investment, using OLS method by putting gross investment to capital stock as a dependent variable, and status capital stock (machinery, plant and equipment), marginal productivity to capital stock, a proxy for liquidity to capital stock as independent variables. The study did not find an important relation between operational profits – cash flow and investment, and it rather found that firms build a stock of liquidity before investment takes place. In addition there was strong evidence that firms belonging to conglomerates and multinational firms are less financially constrained. Multinational firms can use resources of the parent company and should be less constrained when they want to invest in new machinery and equipment.

The applied study by Tabibian (2003) examines the impact of some economic factors on investment in the manufacturing sector in Iran during the period 1978-1995. The author used two models, in the first model, he used the logarithm of the following factors: annual real investment (dependent variable); annual real oil revenue; index of annual inflation tax; ratio of the price index of manufacturing to agriculture; first difference of industry value-added; in addition, the dummy 1 represents the period from the outbreak of the revolution in Iran to the Iraq-Iran war (1978-1988), and dummy 2 represents the period of reforms (1989-1995) (as independent variables). In the second model, the author used the rates of change in the variables rather than the use of the logarithm of the variables in the first model. The variables are as follows: independent variable is the annual growth rate of investment in manufacturing, and the independent variable are: annual growth rate of inflation tax; annual growth rate of real oil revenue; annual growth rate of terms of trade of manufacturing and agriculture; annual growth rate of manufacturing real value-added. The study concluded that oil revenues have a strong impact on manufacturing investment in both models.

### 2.4.2. Determinants of Domestic Investment in the Private Manufacturing Sector:

The PhD dissertation by Baskaya (1986) investigated the determinants of gross fixed capital investment in the private manufacturing sector in Turkey between the 1950s and 1980s, using time series and the OLS method. This econometric study is related to the flexible accelerator model, and the author examined the independent variables (capital stock in the private manufacturing sector, total bank credits for the private manufacturing sector, output in the manufacturing private sector, availability foreign exchange, GNP deflator, price level, public investment in the manufacturing sector, lagged private investment in the manufacturing sector, and net surplus which is equal value added in the manufacturing sector minus both depreciation and wages in the private manufacturing sector) and their relationship with private investment in the manufacturing sector. The mean conclusion for this study showed that output, net surplus, lagged private investment in the manufacturing sector and the availability of foreign exchange have a significant positive effect on private investment in the manufacturing sector.

The study by Sikwila, 1992 used a time series and OLS approach to investigate the determinants of private investment in the manufacturing sector in Zimbabwe from 1965 to 1990. The most important independent variables which are included in this study are: output of the private manufacturing sector; capacity utilization; foreign exchange rate; financial loans for the private manufacturing sector; government investment; inflation; and capital stock. The main results showed that outputs and government investment have a significant and positive impact on gross fixed private manufacturing investment.

The study by Aysan (1993) analyses the determinants of private investment in the Middle East and North Africa countries (MENA) during the period 1980-1990. The author employs private investment to GDP as a dependent variable in this study, offset on the other side as the independent variables were: the accelerator (see the flexible acceleration theory in part 1 of this chapter); the real interest rate; inflation and foreign exchange rate (for macroeconomic stability); dummy indicators of structural reforms; external debt to GDP (for external stability) and the physical infrastructure.

The results indicated that structural reforms have a strong effect on private investment. In addition, the lack of economic reforms remains a problem for most of the MENA countries' economies. Moreover, economic stability stimulates private investment in these countries.

The applied study by Seruvatu and Jayaraman (2001) into private investment in Fiji to identify the determinants of private investment in Fiji by using the OLS Regression method, by putting real private investment as a dependent variable of the model, and using real public investment, real GDP growth, real leading rate, real private sector credit, real effective rate index, terms of trade index and real unit labour cost as variables interpreting the model (independent variable).

The study concluded that the variation in private investment was underpinned by the terms of trade performance of the country, and investment behaviour might have been influenced more by the private sector.

The applied study by Sheriff (2005) purposed to analyze the behaviour of private investment and its determinants in the Libyan economy during the period 1970-2002.

This study used a regression analysis to estimate the relationship between private investment as a dependent variable, and its main variables (per-capita GDP growth, public investment, inflation rate, lagged private investment).

The results of this study showed that the level of private investment in the Libyan economy is positively and significantly related to the changes in lagged per-capita GDP and lagged private investment. In addition, public investment is a very important positive variable in explaining the changes in the level of private investment.

The study by Aysan et al (2006) investigates the problem of low private investment in the Middle East and North Africa countries, with a focus on the role of government in this regard, and the impact of government institutions on private investment. The three stages least square (3SLS) was used in this study to estimate private investment during the 1980s and 1990s in the region mentioned. The analysis used the following independent variables: the quality of administration; public accountability; political stability and a global indicator of governance.

The important findings of the study are: the improvement of government institutions tends to stimulate private investment, and public accountability hampers private investment.

The applied study by Asante (2000) analyses the determinants of private investment in Ghana during the period 1970-1992, using a time series analysis and complementing it with a cross-sectional one. This study seeks to identify the factors that are perceived to influence the investment decisions of private manufacturers by surveying manufacturing firms. The dependent variable in this study is nominal private investment as a percentage of nominal GDP, and dependent variables are: lagged value of nominal private investment; nominal public investment as a percentage of nominal GDP; real exchange rate; growth rate of real credit for the private sector; real interest rate; macroeconomic instability; growth rate of real GDP; investment deflator; dummy for political instability; corporate tax as a percentage of total tax revenue and measure of trade regime. The results of the study showed that the growth of real credit to the private sector has a positive and significant effect on private investment, and that, policies that address only some components of macroeconomic instability may not be enough to improve private investment. For policies to improve private sector response, all four components- the real exchange rate, the debt burden, the black market premium and the inflation rate- must be addressed simultaneously.

In a study on the relationship between private investment and factors affecting it in Egypt by Abdel-Aal & Abdul-Ghani (2002), the authors built a model of four equations. The first equation describes the relationship between the demand for private investment and expected profitability, which depends on the level of economic activity (GDP) on the one hand, and the relationship between demand for investment and income growth, which is represented by the principle of the accelerator on the other. In the second equation, the authors added a partial adjustment process which is based on the investors trying to build a desired balance of capital to produce a certain level of goods and services. Public investment expenditure was added into the third equation to test its impact on private investment behaviour in the Egyptian economy. In the third equation, the real interest rate was added as an independent variable to explain the impact of the financial component on private investment.

The authors estimated the models during two periods: the first period during the period of pre-economic openness (1962 to 1975), a period dominated by the public sector in terms of economic activities, the second period is after the economic openness (1976 to 2000), the period of private investment encouragement in Egypt.

The most important results of this study are that the relationship between economic activity and private investment was negative before economic openness, also, the relationship between public investment and private investment was negative; this means there is a kind of competition. Regarding the results of the estimation during the period of economic openness, they indicated that private investment has a positive effect on the level of economic activity and public investment.

The applied study by Abduladem (2004) aimed to analyse the impact of the determinants of private investment in the Egyptian economy, during the period 1980-2001. This study used time series by applying the OLS method. The important hypothesis which this study aimed at is: Does public investment support private investment, or are both in competition? The dependent variable in this study is the rate of private investment to GDP, and the independent variables are: the value of public investment; the rate of growth in GDP; the rate of total external debt to exports; the real exchange rate; and inflation rate. Other variables indicate the impact of economic instability on private investment.

This study concluded the following: public investment competed with private investment during the study period; the rate of inflation and the real exchange rate play an important role in the explication of the pattern of private investment in the

Egyptian economy; the increase of the ratio of external debt to exports has a negative effect on private investment.

The applied study by Ndikumana (2005) aimed at documenting the role of determinants of private investment that are directly related to macroeconomic policy using both aggregate data at the industry level and disaggregated data at the sub-sector level in the South African manufacturing sector with a special emphasis on the role of factors that are related to macroeconomic policy using data on 27 sub-sectors of the manufacturing sector for the period 1970-2001. This study uses an econometric analysis to attempt to quantify the effects of individual macroeconomic policy indicators on investment to identify channels of transmission of macroeconomic policy by using the OLS method and putting ratio of investment to capital stock as a dependent variable, and the manufacturing sector outputs, cost of capital use, public investment, unit labour costs, indicators of macroeconomic instability (inflation and exchange rate) and profits which is real value added minus real wage bill. The results indicate that macroeconomic stability is essential for private investment. The need to stimulate private investment through a relaxation of the macroeconomic stance ought to be balanced with the need to preserve macroeconomic stability. A demand stimulus will have substantial effects on private investment, which implies that low domestic demand will continue to be a constraint to investment expansion. In addition, the results suggest that relaxing the monetary policy stance will have some positive effects on private investment.

The applied study by Valadkhan (2006) examines the determinants of private investment in Iran. This study uses the annual time series during the period 1960-2000, and uses the multivariate co-integration techniques (a method to test for the existence of long-term relationships between variables). The dependent variable in this study is real private investment, and the independent variables are the real non-oil GDP and the rate of inflation. The author did not use interest rate, because the Islamic banks in Iran do not use it; due to this, he used the inflation rate as a substitute for the interest rate. The most important results of this study are; a) there is a positive relationship between the real non-oil GDP and private investment and a negative one with the rate of inflation, and b) if there is no reduction in inflation, the stimulation of private investment will be difficult.

To determine the relationship between private investment and public investment in the long term and short term, the study prepared by Erden and Holcombe (2006) is helpful. It examines this relationship and the determinants of private investment, and the framework of this study is 50 developing countries during the period 1970-1998, using the OLS method. The ratio of private investment is the dependent variable in this study, and the independent variables are: real public investment; real bank credit to the private sector; the uncertainty measure (linked to inflation rate); real GDP growth rate; real exchange rate; and the interest rate. The results showed that in the long term an increase in public investment by 1% lead to an increase in private investment by about 0.5%. Nevertheless, the study showed the importance of public investment to stimulate investment in the private sector. In addition, the availability of credit plays an important role in private sector investment in developing countries. Inflation rate has a negative impact on private investment in the long term.

The study by Ramirez (1994) investigated the relationship between public and private investment in Mexico depending on a cointegration method as an econometrics approach, and covering the period 1950-1990. The study reached the conclusion that there is a positive relationship between public and private investment. In addition, public investment provides indirect subsidies to the private sector through the establishment of infrastructure projects.

The study by Moshi and Kilindo, (1991) used the OLS method to examine the importance and necessity of economic growth to the private sector, and the role of government policy in the private sector. This study used three equations. In the first equation they used private investment as a dependent variable (as in the three equations), and the independent variables are GDP growth; public sector investment; credit flow to the private sector from investment banks and foreign exchange rate and its availability. In the second equation, public investment is separated into central government investment and semi-public sector investment, leaving the other variables in the first equation as they are. In the third equation, they added government investment into infrastructural and non-infrastructural investment.

This study concluded that the supply of foreign exchange affects private investment. Also, a decrease of public investment in infrastructure may reduce private sector investment. In addition the policy of directing credit to the private sector will promote growth in this sector.

The study by Nair (2003) examines the determinants of private investment (in terms of the impact of liberalisation) in the manufacturing sector in India. The OLS method was used to analyse the determinants during the period 1973-2002. The dependent variable in this study is the fixed investment in the private manufacturing sector, and the dependent variables are: the output of the manufacturing sector; domestic financial liberalisation index; international financial liberalisation index; index of money market liberalisation; index of capital market liberalisation; the capital account liberalisation index; the current account liberalisation index; profit and real bank credit to the private manufacturing sector. The study concluded that investment responds to profit and output more than to financial liberalisation factors. This means liquidity constraints may limit investment in the manufacturing sector. Nevertheless, the index of money market liberalisation has a strong and positive relationship with investment.

The applied study by Patnaik & Joshi (1997) investigated the relationship between inflation rate and economic growth in the long-term, supposing that investment represents economic growth in long-term. The study used an econometric model to analyze the determinants of private investment in the manufacturing sector in India during the period 1980-1996, by using private investment in manufacturing as a dependent variable, and the independent variables are: output in the manufacturing sector; the rate of inflation; public investment in manufacturing; ratio of resource gap to GDP. The most important findings are: the rate of investment decreases when there is an increase in the inflation rate; inflation adversely affects investment and, therefore, it affects long-term economic growth; also, public investment in the manufacturing sector crowds out private investment.

The study by Acosta and Loza (2003) provides an empirical analysis of the macroeconomic factors that can affect investment decisions in Argentina in the short, medium and long run. The main goal of this work is to elucidate the main determinants of private investment decisions in Argentina. This study used the OLS method to find the relationship between private investment as a dependent variable and: GDP; public investment, openness level ((exports + imports)/GDP); real exchange rate; external dept (as a percentage of GDP); credit to the private sector; inflation rate; relative price investment/consumption as independent variables. The results suggest a structural change in the investment trend during 1976-1983. Moreover, an exploration of the determinants of private investment for the last three decades of the 20$^{th}$ century reflects that the regularity of capital accumulation from the private sector seems to have been determined by both transitory factors and by yield (exchange rate, inflation, trade liberalization); the study shows evidence of a displacement effect coming from government investment decisions, by competing for resources that could have been utilized by the private sector. Also, the poor operation of the financial credit system seems to have been an important obstacle to economic growth

The applied study by Lesotlho (2006) examines the determinants of macroeconomic private investment in Botswana, and which of these determinants support the growth of private investment in the economy. In addition, this study investigates policies that encourage private investment. The OLS method was used to estimate the investment function, during the period 1976-2003. This function contains real private investment as the dependent variable, and the independent variables are: GDP growth; inflation rate; public investment; credit to the private sector; real interest rate; and trade liberalisation index. The results indicated that macroeconomic factors affect private investment in the short-run and in the long-run. Also, GDP leads to the increase in investment and it is a strong determinant of private investment. Furthermore, this study suggested that public investment competes in the private investment sector.

Furthermore, regarding the relationship between public and private investment, a study by Al-Hakami (2003) aimed to analyse the impact of the most important factors which determine the investment behaviour in the Saudi Arabian economy, during the period 1969-2000. In addition, it examines the relationship between private investment and public investment. The co-integration and error-correction models were used in this study. The size of private investment is the dependent variable, and the independent variables are: the rate of GDP growth; lagged GDP; public investment; openness level ((imports + exports)/ GDP); government credit to the private sector and the domestic inflation rate.

The results showed that public investment competes with private investment, but there is a positive role for government credits that are granted to the private sector. Concerning openness level, it has a positive impact on investment behaviour in the Saudi economy.

## 2.5. The Impact of Domestic Investment on Economic Growth in Developing Countries:

### 2.5.1. Introduction:

Economists have been interested in economic growth for several decades. This subject has assumed an important place in economic theory. Economic growth has become particularly relevant to researchers since the 1990s with the emergence of modern growth theory. Growth theory analyses the disparity in the rates of economic growth between countries, in order to identify the factors that affect the growth of output. These factors differ in terms of their impact on growth depending on economic circumstances. Determinants of growth are not identical in all countries, differing from one country to another, and from one time period to another. The type of economic system also affects the ratio of the impact of these determinants.

Economic growth in the MENA countries was weak during the 1980s and 1990s compared with the rate of growth in other regions. During the period 1980-2005, economic growth in the MENA region was 0.5%, while it was 4% and 0.6%, respectively in East Asia and the rest of the developing countries (Albrikan et al, 2006). However, the growth rate in Libya was approximately 0.76% during the same period[1]. The absence of growth was a source of concern to policy makers in MENA, as it is exacerbating the problems caused by the generally high unemployment rates and relatively fast growth in the size of the labour force in the region.

One of the focuses of this study is to determine the impact of domestic investment on growth in Libya, we start this section by reviewing the literature on these issues in an attempt to find a literature consensus regarding the relation between domestic investment and growth, as well as to identify which theories serve best in analysing domestic investment and growth in Libya. This section is also focused on some applied studies carried out in developing countries regarding the impact of domestic investment on economic growth in those countries in an attempt to explain the trend of economic growth as a result of the impact of domestic investment in both the private and public sectors.

### 2.5.2. Literature Review on Economic Growth

**First: Classical Economics**

Adam Smith focused on increasing productivity through the division of labour and specialization, which resulted in greater productive efficiency. He considered that the profits gained from agriculture and industry contribute to the increase in savings, which leads to increased investment, and thereby increases growth. Also, the division

[1] Growth rate was calculated through the rates of growth in real per-capita GDP at constant prices 1997.

of labour, increasing productivity, applies to industry more than agriculture (Thirlwall, 1999).

This optimistic outlook for growth by Smith was offset by the pessimistic outlook at most other classic economists, such as Malthus through his theory of population. He considered that if rate of population growth is accelerating more than the rate of growth of production, the solution would be to decrease the population through war and famine (Reekie, 1998; Hardin, 1993).

According to Marx, growth would go down due to a decline in the return on capital, and increasing the share of capital for production which would lead to a profit rate of zero. In addition, the crisis of surplus production, would negatively affect economic growth (Salvadori, 2006).

At a time in which Marshall referred to the organization as a factor of production (Buckley and Michie, 1996), and pointed to the relationship between education and growth, Shumpeter and Keynes focused on the importance of technology in economic growth (Gylafson, 1999).

**Second: The Neo-Classical Growth Theory (Exogenous Growth):**

**I) Traditional neo-classical theory:**

Robert Solow is considered the founder of this theory, which assumes that the growth rate is determined by the rate of population growth and technical progress. Both are external factors for growth, which is determined by the equation of production of the first degree.

Depending on the equation of production of the first degree as follows (Clarck, 2007):

$$Y = F(K, L)$$
$$Y = AK\,L \qquad (2-37)$$

where:
$Y$ = GDP, $K$ = Capital Stock, $L$ = Employment

Augmenting the previous equation by accommodating time in the equation, we get the following equation:

$$gy = agk + cgl + ga \qquad (2-38)$$

where: gy = the growth rate of output per worker, gk = capital per worker, gl = land per worker, ga = efficiency, and it is as total factor productivity and reflects the major determinant of long-term growth (technological progress).

Based on this, Solow found that most economic growth in the United States in the first half of the twentieth century was due to technological progress (Delong et al, 2002).

The justification of this approach is that the return on capital is decreased due to an increase in the proportion of the capital stock to output. This occurs even up to this equilibrium level which cannot increase the proportion of capital to beyond production. Also, it is not possible to invest in productivity in the long-term, but it will increase and then return temporarily to stability. Therefore, investment and employment are not affecting factors in long-term growth. The pioneers of this theory believe that economic policy and the institutional system are neutral for long-term economic growth (Delong, 1996).

The theory also assumes that the relationship between per capita income and the rate of economic growth is negative (Crafts and Toniolo, 1996), i.e., the possibility of achieving high growth rates will be low when increasing the average per capita income. The justification for this theory is that countries with low per capita income have a weak capital accumulation, and therefore, investment will achieve growing returns contrary to the countries with high per capita incomes. This leads to the conclusion that developing countries are able to converge in income with developed countries if they succeed in increasing their domestic and foreign investment. This hypothesis has been successful in practice in developed countries, but has not achieved the same result in developing countries (see Obstfeld, 2008).

**II) Modern neo-classical theory:**

The failure of the convergence factor in traditional classical theory led to the emergence of a modern theory which relies on the hypothesis of conditional convergence. Through this theory, neo-classical economists tried to isolate some variables that affect growth rate and per capita income, which led to the proof of the inverse relationship between growth and per capita income. They added variables: population growth; the ratio of investment to GDP; education; research and development; trade; and political stability. Some applied studies have proved the conditional convergence (Barro and Martin, 2003).

The most important weaknesses in the neo-classical theory is that they do not to take internal factors into the long-term economic growth, focusing on the external factor of technology, in addition to the neglect of the effects of policies and institutions on economic growth (Cihan, 2006).

**Third: Modern growth theory (endogenous growth):**

This theory was established by Paul Romer, (1986), as an important component of the theory of development of developing countries. This theory assumes that continued growth is determined by the production process, not by outside factors (Grandy, 1999). One of the most important drivers of this theory is the lack of response by neo-classical theory to the reason for the different rates of economic growth among countries that have the same technological level.

Modern theory also assumes increasing marginal returns on the size of production factors through the role of external effects of returns on human capital investment, which will generate improvements in productivity.

Growth depends on savings and investment in human capital on the one hand (Lucas, 1988), and investment in research and development on the other (see Mattana, 2004). In addition, it is argued that the free market leads to a less than optimal level of capital accumulation in human capital and research and development. Therefore, the government may improve the efficiency of resource allocation through investment in human capital, and encourage private investment in high-tech industries.

Therefore, economic policy is not neutral for growth, but (Romer) considered that good governance is the basis for long-term growth (Ito, 1997).

Neo-classical theory failed to address the issue of the convergence between rich and poor countries that have the same savings rate and population (Williamson, 2004).

### 2.5.3. Applied Studies on the Impact of Investment on Economic Growth in Developing Countries

The applied study by Ghani and Din, (2006) investigates the impact of public investment on economic growth (GDP) in Pakistan. Time series from 1973 to 2004 are applied in this study, using the vector autoregressive approach (VAR). The model contains private investment, public consumption and public investment as independent variables. Conclusions showed that economic growth is strongly driven by private investment and there is no strong deduction which can be abstracted from the effects of public investment and public consumption on economic growth.

A study by Alabdeli (2005) analysed the impact of exports and investment on economic growth in 21 developing countries. This study used time-series during the period 1960-2001, and concluded that domestic investment has a positive significant relationship with economic growth.

The applied study by Al-Ghannam (2004) examines the causal relationship between economic growth rate (the author used non-oil GDP) and employment in the private sector in Saudi Arabia during the period 1973-2002. This study used a cointegration model and annual time series data. The study concluded that there is a positive causal relationship between the rate of economic growth and increased employment in the private sector in the short as well as the long run.

According to some studies that have addressed the impact of investment in both public and private sectors in economic growth, most of these studies emphasize the importance of investing on the impact on economic growth. A study of Frankel (1997) examined the impact of investment in the public and private sectors on economic growth in East Asian economies. This study found that investment is one of the most powerful determinants of economic growth in the long term.

A study by Mallick (2002) examined the effects of long-term growth in India during the period 1950-1995; the author relied on the use of the neo-classical model with the endogenous growth. Economic growth was measured in terms of real GDP. The findings of this study indicated that real public investment expenditure affects growth positively in a direct manner, and private investment has an indirect positive effect.

The study by Amin, (2002) studied the sources of growth in the Cameroonian economy. The author divided the economy into three sectors: agriculture, industry, and services, each sector being examined separately. The results were as follows:

Physical capital contributes significantly to the composition of agricultural sector output, while labour has a negative effect. The study described the industrial sector as a secondary sector, although capital is the most significant factor affecting its growth. Also, the contribution of labour is low in this sector.

Capital has a positive impact in the composition of the service sector output, while the impact of labour is low. In addition, the study attempted to compare the impact of various factors on the composition of output between Cameroon and Nigeria. It concluded that the impact of labour is more important than the impact of capital in

Nigeria. On the other hand, the impact of capital is more important than the impact of work in Cameroon.

The applied study by Amanja & Morrissey (2006) examined the determinants of growth in Kenya during the period 1964-2002. Growth in this study was reflected by per capita GDP as a dependent variable, and independent variables were: investment; foreign aid; and economic openness level. The study found that investment has a strong impact on economic growth in Kenya, in addition to the impact of openness level.

Table (2-1) shows a summary of the main previous empirical studies examined in this chapter.

**Table (2-1)**
**Summary of the Main Empirical Studies**

| Study | Time and Countries | Variables | | The main results |
|---|---|---|---|---|
| | | **Dependent** | **Independent** | |
| Bigsten, et al (1997) | The study used data from four African countries (Ghana, Cameroon, Zimbabwe, and Kenya) over the period 1990s. | Gross investment in manufacturing sector | Profitability, growth of value added, past firms borrowing, size and age of firm. | Profit, age and size of firm are highly significant determinants of investment decision. |
| Mohamed (1997) | Libya 1962-1991 | The public manufacturing investment | Oil revenues, value added in the manufacturing sector, government's annual appropriations. | Appropriations given to the manufacturing sector have a positive strong effect on investment in manufacturing sector |
| Soderbom and Teal (2000) | Ghana, Cameroon, Kenya and Zimbabwe. 1990s | Proportion of investment to capital in manufacturing sector. | Δ value added, measure for technical efficiency, Δ profits, percentage of education to employee, percentage of tenure to employee, export and proportion of debt to capital. | Education, experience gained from work and efficiency are important factors determining positively investment in the manufacturing sector. |
| Omar (2002) | Libya 1980-2000 | Investment in the public manufacturing sector | Oil revenues, GDP, imports of capital goods, value added, inflation rate, availability of foreign exchange and cash benefits granted manufacturing sector. | Oil revenues and cash benefits have positive strong effect on investment in manufacturing sector |

**Table (2-1) Continued**

| Study | Time and Countries | Variables | | The main results |
|---|---|---|---|---|
| | | Dependent | Independent | |
| Arbelaez and Echavarria (2002) | Colombia 1990s | Gross investment to capital stock in manufacturing sector | Capital stock, marginal productivity to capital stock and liquidity to capital stock | Liquidity is an important factor affecting investment in a positive relation. |
| Tabibian (2003) | Iran 1973-1995 | Gross investment in manufacturing sector | Oil revenues, inflation, tax, ratio of manufacturing to agriculture sector and value added | Oil revenues have a strong impact on manufacturing investment |
| Baskaya (1986) | Turkey 1950s-1980s | Investment in the private manufacturing sector | Capital stock in the private manufacturing sector, bank credit for the private manufacturing sector, output in the private manufacturing sector, investment in the public manufacturing sector, net surplus and availability of foreign exchange. | Output, surplus and availability of foreign exchange have a positive significant effect on private investment in the manufacturing sector. |
| Sikwila (1992) | Zimbabwe 1965-1990 | Private investment in manufacturing sector | Output in the private manufacturing sector, capacity utilization, foreign exchange rate, loans for the private manufacturing sector, public investment, inflation rate and capital stock in the private manufacturing sector. | Output and public investment have positive and significant impact on investment in the private manufacturing sector. |

**Table (2-1) Continued**

| Study | Time and Countries | Variables | | The main results |
|---|---|---|---|---|
| | | Dependent | Independent | |
| Sheriff (2005) | Libya 1970-2002 | Private investment | Per capita GDP growth, public investment, credit and inflation rate | Private investment is positively and significantly related to per capita GDP growth. |
| Asante (2000) | Ghana 1970-1992 | Investment in the private manufacturing sector | Lagged private investment in manufacturing sector, public investment in private manufacturing sector, exchange rate, growth rate of credit for private sector, interest rate and GDP growth. | Growth rate of credit for private sector has a significant and positive effect on investment in the private manufacturing sector. |
| Ndikumana (2005) | South Africa 1970-2001 | Investment in the private manufacturing sector (ration of investment to capital stock) | Output in manufacturing sector, cost of capital use, public investment in manufacturing sector, cost of labour, inflation rate, profit and exchange rate. | Inflation and exchange rate are essential factors for private investment in manufacturing sector. |
| Nair (2003) | India 1973-2002 | Investment in the private manufacturing sector | Output in manufacturing sector, bank credit for manufacturing sector, indexes for domestic and international financial liberalisation and index for capital market liberalisation | Output, profit and money market liberalisation have a strong and positive relationship with investment in the private manufacturing sector. |

**Table (2-1) Continued**

| Study | Time and Countries | Variables | | The main results |
|---|---|---|---|---|
| | | Dependent | Independent | |
| Ghani and Din (2006) | Pakistan 1973-2004 | Economic growth reflected by real GDP | Private investment, public consumption and public investment. | Economic growth is strongly driven positively by private investment |
| Alabdeli (2005) | 21 developing countries 1960-2001 | GDP | Gross investment and export | Investment has a positive and significant relationship with economic growth. |
| Mallick (2002) | India 1950-1995 | GDP | Private investment and public investment | Private and public investment has a positive and significant impact on economic growth. |
| Amanja and Morrissey (2006) | Kenya 1964-2002 | Per capita GDP | Investment, foreign aid and economic openness level | Investment has a strong impact on economic growth. |

## 2.6. Summary and Conclusion

The previous applied studies have given information on investment behaviour, in developing and less developed countries, and each study has opened a various extent to focus on the important propositions concerning investment behaviour. These studies showed that developing countries suffer from a lack of adequate data collection, and there is difficulty in obtaining data; this is due to the institutions and government policies in those countries as noted in the studies of Omar, (2002) and Mohamed, (1997), which examined the determinants of manufacturing investment in Libya.

This chapter reviewed the basic theories of investment, and the investment theories in developing and less developed countries. This opens various fields of interest on important issues which concern investment behaviour. For instance, the acceleration principle theory assumes that investment depends on the rate of increase in output, which is the change in output (GDP), whereas, the flexible acceleration theory improves this theory on the basis that the gap between the actual and desired capital stock is filled over a number of periods. In respect of the marginal efficiency of capital theory, it is assumed that investment depends on the rate of discount which would make the present value of expected income from capital assets equal to the present supply price of the assets. In other words, investment depends on the interest rate, and firms will invest until their marginal efficiency of investment is equal to the rate of interest. The neoclassical theory of capital accumulation and investment behaviour depends on the relationship between the desired capital stock and the interest rates, output, prices and tax policies.

Most of the applied studies that have been addressed in this chapter were based on the study of the determinants of manufacturing investment, both public and private in the developing and less developed countries. Those studies showed that domestic public manufacturing investment depends on several determinants (such as whether the country is rich or poor, or relies on one source of income, such as oil, for example). The most important of these determinants are: the growth of value added; the growth of manufacturing sector investment; GDP; oil revenue; inflation rate; labour force; imports of capital goods; Government's annual appropriation for investment in manufacturing sector; value-added generated in the manufacturing sector; economic stability, and foreign exchange rate. To study the determinants of investment in the public manufacturing sector, in the case of Libya, it should be borne in mind that Libya is an oil producing country, where the public sector controls most economic activities, in addition to which there is a lack of financial markets in the Libyan economy (financial market has been established recently but is still new and has a weak contribution to the economy), and interest rates are not employed in Libya due to religious considerations. However, through viewing the previous applied studies concerned to study the determinants of investment in the manufacturing sector in developing countries, and taking into account the case of Libya, consequently, it has been decided that the most important determinants of investment that will be addressed in this study are as follows: value added in the Libyan manufacturing sector (Bigsten et al., 997; Mohamed, 1997; Omar, 2002; Devarajan et al., 2002), oil revenues (Mohamed, 1997; Omar, 2002; Tabibian, 2003), Government's annual appropriations given to the public manufacturing sector (Mohamed, 1997), real GDP in the manufacturing sector (neo-classical investment theory; Omar, 2002), imports of capital goods and machinery (Omar, 2002; Mileva, 2008), labour force in the manufacturing sector (Soderbom and Teal, 2006). In addition, according to the previous studies which have been dealt with in this chapter, private investment in the manufacturing sector depends on the following: real public investment; real GDP growth, real private sector credit; exchange rate; interest rate; macroeconomic stability; political stability; profitability; manufacturing sector output; domestic inflation rate; real value added to manufacturing sector; real non-oil GDP; total external debt rate; employment; infrastructure investment, and openness level. Furthermore, by taking the same considerations in addition to that related to the private sector into account, determinants of private investment in the Libyan manufacturing sector that will be included within this study are as follows: public investment in the manufacturing sector (Asante, 2000; Ndikumana, 2005; Lesotlho, 2006; Erden, 2006), real exchange rate (Asante, 2000; Nair, 2003; Ndikumana, 2005), economic openness level (Al-Hakami, 2003; Abduladem, 2004; Acosta and Loza, 2003; Amanja and Morrissey, 2006), Labour force in the private manufacturing sector (Al-Gannam, 2004; Seruvatu and Jayraman, 2001; Ndikumana, 2005), (because there is no data available about the size of employment in the private manufacturing sector, the total number for labour in the manufacturing sector will be used in this study), per-capita GDP (Abdladem, 2004; Sheriff, 2005), and credit for the private manufacturing sector (Baskaia, 1986; Sikwila, 1992; Asante, 2000; Nair, 2003).

After reviewed some of theories of economic growth from around the world, including what is classified within the scientific legacy of economic theories of the classic, including what is modern, especially after the Second World War until recent years, this study found that every theory has manifestations of strength and weakness, and that all theories were developed to address the disadvantages of a former theory, and that therefore it is not possible that there will be consensus on a universal theory for all the countries of the world away from the infrastructure and institutional capacity of each state. Differences in theories of growth make this subject of particular importance and a cause of increased research. Moreover, through the study of the most important theories and some applied studies of economic growth, we found that the determinants of economic growth differ from one country to another and from one time period to another. Those showed that the most important determining factor affecting economic growth is investment which has a positive effect on economic growth in all countries. A number of theories such as Harrod-Domar and Neoclassical theory, referred to investment rate as a determinant for economic growth. This study adopted the classical theory model of growth represented in the Cobb-Douglas model (Nerlove, 1965) by introducing the domestic investment factor into the equation instead of capital stock to investigate the effect of domestic investment on economic growth in Libya and compare it with the impact of another important factor which is the labour force. Classical theory recognized that the sources of growth include capital, labour and technology, and the proportion of each variable can be identified through the production function (Cobb-Douglas) as described in chapter ten. This study will focus on investigating the impact of domestic investment on economic growth in Libya depending on the Cobb-Douglas function and previous studies such as Mallick, 2002; Alabdidli, 2005 and Ghani and Din, 2006.

# Chapter 3

# General Background: Economic, Socio-Political Environment and Policies of Industrialization

## 3.1. *Introduction*

Most of studies both theoretical and applied interest are into clarification the economic system. There are several subsidiary aspects in order to clarify the effect of some sides on the main themes of those studies. This study sheds light on aspects of the influences on investment behaviour in particular, and on economic activity in general in the Libyan economy. The most important points addressed in this section are the economic environment, geography and climate and socio-political environment.

## 3.2. The Economic and Business Environment:

Before the discovery of oil in Libya (in the mid-twentieth century), there was no indication of economic development. Libya's economy suffered from all the obstacles to economic development which can be found in any developing country; these constraints were geographical, economic, political, social and technological (Alhaseya, 1979). Prior to this, agriculture was most important sector of economic activity in Libya; the majority of the population was engaged in this economic activity, directly or indirectly. Statistics indicate that 70% of Libyans were engaged in agriculture and animal husbandry (Alhaseya, 1979). However, the participation of this sector did not reach 26% of GDP. This obviously indicates a low level of labour productivity. In addition, the sector was characterized by primitive production methods in that period. There was also a scarcity of capital and water resources.

The industry sector was limited to some traditional industries, mainly family businesses, such as carpet manufacturing, and other simple industries which relied on agricultural production and animals, such as wool spinning and canning tomatoes. Furthermore, the contribution of this sector to GDP was very modest.

The service sector was also modest in size and mainly depended on domestic trade. Barter played a key role, and the role of money was limited to the large cities (Tripoli and Benghazi) and the services of foreign banks in the country.

Basic public utilities, such as education, health and transportation, were at very poor levels due to lack of revenues.

From 1962, oil started to take a leading role in Libyan exports. Despite the fact that the discovery and export of oil was an important source of income and economic development, a set of negative features emerged which still characterize the Libyan economy. These features are as follows (Alhaseya, 1979):

-The dependence on oil production and export as the main source of income.

-Given the steady growth in the external trade sector, many domestic products vanished due to their inability to compete with imported foreign goods.

-Due to the fact that oil is owned by the state, which has access to the entire state revenue (the state receives the full revenues), the state began taking the lead in economic activity, and this led to a decrease in the role of the private sector. Libya witnessed a growing government intervention in the economy after it became a socialist State in the early 1970s (The World Bank Report, 2006).

Oil has always had a direct and indirect effect on the factors that lead to the development of the Libyan economy. The development process has two phases:

The first phase, 1973-1985:

In this period there were three government plans for economic development, with a total expenditure 21 billion Libyan Dinars (LD). The result of this period was to increase the contribution of non-oil sectors to GDP. During this period, a more than 9% increase was achieved in non-oil GDP. (Abuhbeel, 2004)

The second phase, 1986-2000:

In this period, the preparation of plans was stopped, and the government focused only on the development of annual budgets. The total state expenditure was about LD10.8 billion. This period was characterized by a lack of clarity in terms of developmental perspective, and non-application of coordinated development plans; this led to an economic and social crisis.

Development plans during the third period, 2002-2006 were characterized by limited allocations being adopted, and the inadequacy of the implementation of the proposed programs and projects (Ministry of Economy Report, 2008).

Libya faced economic decline in the 1990s, as a result of political and economic isolation. This was due to sanctions and an economic embargo on Libya due to the Lockerbie case. This led to a rise in import costs and inflation rates, which impacted negatively on the standard of living for the majority of citizens (Library of Congress, 2005).[1]

Due to positive developments in the oil market, and also because of some changes at the level of structural reform (including the expansion of the program of privatization and foreign investment), Libya witnessed some remarkable growth in this period (International Monetary Fund, 2006).

During the period 2001-2007, the oil sector contributed about 56% of total GDP (in real terms), 97% of merchandise exports and 80% of government revenues. Growth in the macro economy was achieved through growth in the oil sector (4.5%), and non-oil economic sectors (6.6%). This improvement was due to the growth of non-oil sectors brought about by changes in the Libyan economy including increasing the role of the private sector in economic activity (This issue will be studied in more detail later) (Central Bank of Libya, 2007, annual report No.51).

### 3.2.1. Characteristics of the Libyan Economy

Libya is the fourth-largest country in Africa with a total area of 1,759,540 sq km. It has a strategic location linking North Africa and Europe. Libya's population is estimated at 5,673,031 people, according to preliminary results of the General Population Census 2006 (General Authority for Information, statistics book 2007, p. 45).

The Libyan economy shares the characteristics of most developing countries: the economy is relatively small in size and open to the outside, it depends mainly on oil income. Despite the relative success in the formation of infrastructure and the relative improvement in some indicators of human development, there is a set of less favourable characteristics which mark the Libyan economy. According to Shameya (2007), the characteristics of the Libyan economy can be summarized as follows:

• Dependence on oil as a source of national income and foreign exchange, whereby oil exports constitute more than 96%of total Libyan exports. Thus, the oil sector is the

[1] United Nations sanctions and U.S. sanctions on trade with Libya were lifted in September 2003 and September 2004 respectively.

main source of foreign currency. In addition to the high proportion of economic openness[1] (Table 1-3), the proportion of imports to GDP range between (25-30)%, and the ratio of trade to gross domestic product amounted to 67% in 2006 (Central Bank of Libya, Annual Report 2007). Table (3-1) shows a steady increase in output due to the adoption of the Libyan export on oil commodity, which led to a surplus in trade balance. In the beginning of the 2000s, the Libyan government decided to reserve a proportion of oil revenues, to be tapped in the future. However, this surplus could be utilized in the present time for supporting economic projects by providing an appropriate investment climate and investment opportunities for the private sector. Before thinking about the policy of surplus oil revenues, it is advised to find alternatives to the proportion of oil in the composition of GDP.

**Table (3-1)**
**Economic Openness Level in the Libyan Economy (2000-2008)**

Millions L.Ds

| Year | GDP | Total Trade | Oil Export % | Openness % |
|---|---|---|---|---|
| 2000 | 17620.2 | 7132.9 | 73.6 | 38.6 |
| 2001 | 20609.3 | 8054.4 | 95.3 | 44.6 |
| 2002 | 27843.9 | 15762.7 | 96.5 | 60.8 |
| 2003 | 33921.6 | 20404.5 | 94.9 | 64.3 |
| 2004 | 43445.9 | 29103.5 | 96.3 | 70.0 |
| 2005 | 59157.4 | 40985.0 | 92.6 | 74.0 |
| 2006 | 72031.9 | 44271.0 | 97.5 | 67.0 |
| 2007 | 81363.7 | 49473.5 | 97.4 | 61.0 |
| 2008 | 92724.8 | 54653.9 | 98.0 | 59.0 |

Source: Central Bank of Libya. The Annual Report 2009.

• A high rate of population growth and a limited skilled national labour force; the population reached 5.6 million at an annual rate of close to 4% (General Authority for Information, 2006), while the increase rate of the economically active population was 45%. A vast geographical area and the rate of increase in population density on the coast (which represents about 20% of the total area and 79% of the population) led to additional burdens on the development efforts and difficulties in the use of available resources. The scarcity of skilled labour resources has resulted from the lack of

[1] For more information on these indicators can be found on Preeg, 1998; Bredenkamp & Schadler, 1999; Alaisawi, 1989.

strategic utilization of oil revenues in the human investment field. Some data has indicated that only 12% of the total Libyan workforce is skilled (Beltamer, 2003), due to the absence of manpower planning and to the absence of identifying clear goals for labour market outputs, whereby some studies suggest the existence of unemployment among workers with qualifications, and among trained workers in some instances (Beltamer, 2003). The utilization of oil revenues in the training of workers through the provision of market needs of skilled labour and employment in local projects helps to reduce the level of unemployment and achieves high rates of labour productivity.

• An increase in the contribution of the services sector to GDP: Table 3-2 shows that the Libyan economy is dominated by the service sector which contributed more than 45% on average to real GDP in the period (2000-2006). The industry and agriculture sectors contributed 15.3% and 8.6% respectively to GDP during the same period. This sector covers the activities of trade, restaurants, hotels, transport, communications, storage, finance, insurance, banking, social services, government services and other services. The high proportion of the contribution of government services is significant, which indicates higher customs duties and taxes, and means the rising cost of access to government services.

• Oil revenues of the country are a main driver of many economic activities, which makes the size of the state budget and public expenditure an indicator of the strength of the government sector, the reason is because the government is dominant in overall economic activities. The most important problems facing some developing countries in the process of development is their lack of capital, it is different in the case of Libya, where there is no such problem. The problem is how to take advantage of the funds available in terms of development and how to access good growth rates. For example, investments can be spent to increase GDP by increasing the value added of manufacturing industries, and having an industrial base that can be developed to cover some of the needs of the local market for industrial products and consumer goods.

### 3.3. Geography and Climate

Libya is located in Northern Africa between the latitudes of 22° N and 32° N of the Equator, and longitudes of 10° E and 25° E of Greenwich. It is bordered by (Egypt in the East; Tunisia and Algeria in the West; Sudan, Chad and Niger in the South). Libya has an area of about 1775500 $Km^2$ (about seven times the size of the UK), and this make it the fourth largest country in Africa after Sudan, Algeria and Congo. (Otman & Karlberg, 2007) The country has one of the longest Mediterranean coastlines (1770 Km in length). (Ham, 2002)

There are no rivers in Libya, only the valleys (dry or seasonal), and riverbeds can flood after heavy downpours of rains (Jones, 2008, p.12). These are particularly on the east coast (Jebel Akhdar or Green Mountain) and on the West coast (Jebel Gharbi or Western Mountain). There are other mountains in the south of Libya (Sahara desert) such as Jebel Acacus in the South West, and Tibesti along the border with Chad.

About 93% of Libya is covered by desert which consists of sand dunes and a very small number of scattered oases (Al-Idrissi et al., 1996). The presence of a large part of the Sahara desert, and the Mediterranean Sea affect the climate in Libya, the summer is hot generally, the temperature on the coast about 30° C and often accompanied by high humidity. The temperatures in the South can reach up to 50° C.

In winter, the weather can be cold and rainy on the coast (particularly between October and March), temperatures can decrease to freezing point at night, and sometimes snow falls in Jebel Akhdar and Jebel Gharbi, both have the highest rainfall rates (250-600 mm) (Al-Idrissi et al., 1996)

In the spring, northern Libya may encounter the Ghibli wind, it is hot, dry wind and laden with sand, and it can raise the temperature to above 40° C.

### 3.4. Socio-Political Environments

On 24th December 1951, Libya became an independent state by a UN resolution, governed as a kingdom. On 1st September, 1969 Libya became a republican regime. Many political changes occurred after that date, followed by economic and social changes. The most important of these changes was the declaration of the Libyan Jamahiriya on 2nd March 1977. Jamahiriya, according to the Green Book by Gaddafi

(1981), means a self-governing people taking decisions through the people's congresses.

Political parties are banned in Libya according to the ideology of Muammar al-Gaddafi, and according to his third universal theory. Accordingly, the system of government is public and based on the concept of Shura[1] in Islam. This system calls for the exercise of power through the people's congresses which include all Libyans over 18 years old. People's Congresses elect members who represent the local government. These members represent the General People's Congress, which is the highest legislative body in the country. The General People's Congress has the formal power to declare war, ratify treaties with other countries, and consider general policy plans and their implementation. However, it is subject to the advice of the General People's Committee and the supervision of the general secretary and General Secretariat, which make the final decisions. Moreover, Libya announced its neutrality with respect to all superpowers in the world, and has supported Arab Unity Since the revolution in 1969. The political side in Libya is very important and has an influential role in economic relations, it seems clear from the control of public sector on economic activities and suspension of the private sector role, this result is as stated in the Green Book. However, during the mid-nineties, the government was going to adopt policies that supported the private sector, which will be addressed in detail later.

In relation to the social environment and population, the annual population growth rate declined from 4.21% in 1984 to 2.86% in 1995. It also dropped to 1.83% in 2006 (General Authority for Information, 2007). The reason for this is due to the following factors (See, Otman & Karlberg, 2007):

- Increase in the average age of marriage.
- Decrease of fertility level for Libyan women to one child on average.
- Progress in the field of education for the population and increase of the proportion of females who wish to continue their education.
- Increase of the participation rate of women in economic and social activities, the increasing role of women in the workplace means accepting the formation of smaller families. In this regard, data indicate that family size was highest in 1995, where it

[1] Shura is essentially parallel to the democratic principle in Western political thought, being analogous and about the same tendency or direction. It is predicated on a basic precept which is that all persons in any given society are equal in human and civil rights.

was on average 6.95 people, but it registered a decline in 2006, when it reached about 5.9 (Abuaisha, 2007).

• The use and proliferation of factors of birth control, especially in the last decade of the twentieth century.

Due to this decrease in the population growth rate, the age structure of the Libyan population changed, resulting in an increase in the age group 15 years and over. The number of people under the age of 15 of the total population was 39% in 1995, and then declined until it reached 32% in 2006 (Abuaisha).

Most people in Libya live on the coast, which is about 1990 km in length. They are concentrated especially in the north-west, where the capital city (Tripoli), as well as in the north-east, in Benghazi. Around 90% of the population live on less than 10% of the land, and the native Libyan are Arabs, Berbers, Tuaregs, and Tebou. The area is also inhabited by foreign residents who are mostly from other African countries, especially Egyptians, Tunisians, and Sub-Sahara Africans.

The general features of Libyan society (Abuzakuk, 2007):

• Conservative tribal structure and the attendant convergence of interests.

• Bedouin and the attendant isolationism and difficulty of compliance.

• Oil wealth resulting in sudden acquisition of capital and tendencies toward extravagance and waste, and the transition to a consumer society.

• Arab and Islamic identity, language, religion, customs and traditions. The era of foreign colonization (Italian occupation, 1911-1950) established the identity of an Arab and Islamic society, and linked the historical and cultural roots of Libyans.

### 3.5. Policies of Industrialization and Economic Development

#### 3.5.1. Import substitution policy

The import substitution policy is one of the industrial policies used in developing countries, especially in the early stages of the manufacturing process. The aim of this policy is the establishment of local industrial products to replace imports of similar foreign goods (for more information about this policy, see Krueger, 1992; Sloan, 1984). Most economists agree on the definition of import substitution as the local production of goods rather than importing them. It can be defined also as a series of acts which attempt to establish the local production of certain goods to replace imports of those goods (Saman, 1992).

The policy of import substitution may occur automatically as a result of the appropriate conditions, or deliberately in order to stimulate economic growth by directing the country's productive resources towards this type of industrialization. Most developing countries tend to produce goods which are relatively labour-intensive and significantly rely on local raw materials. This industrial process usually begins in the production of consumer goods, and then continues with the production of capital goods.

The policy of import substitution is usually applied through three stages:

Stage I: To produce non-durable consumer goods, to replace similar imported goods, in addition to industries that produce inputs required for those goods such as raw materials required for the manufacture of textiles, leather products, and timber based goods.

Stage II: To expand the production of intermediate industries such as iron & steel and petrochemicals as well as durable goods, in order to reduce the burden of imports on the balance of payments. This stage is marked by the intensive use of capital and skilled labour.

Stage III: To produce the capital goods and machinery needed for production. This stage requires advanced technical as well as high-efficiency administrative cadres, in addition to a large amount of capital. At this stage, countries usually resort to foreign loans and encourage foreign investment, as happened in Latin America countries (Sloan, 1984).

**I) Import substitution policy objectives:**

• Improving the balance of payments by reducing imports; most poor countries cannot provide the foreign exchange required to cover all imports.

• Expansion in industrial production and increase its relative importance in the composition of GDP, therefore, to increase economic growth in general.

• Reduce the dependence of the local economy on foreign trade to avoid the impact of economic fluctuations that may occur in global markets.

• Creation of new jobs in the industrial sector, which usually absorbs a great deal of employment.

**II) Problems limiting the application of the policy of import substitution:**

The continuation of the manufacturing process and the development of higher stages in the type and level of production may make the policy of import substitution face a number of problems and obstacles including:

• The small size of the domestic market is an obstacle, because it does not help industries to achieve economies of scale (Taylor, 2006).

• Increase in economic problems like unemployment due to renouncing the use of part of the labour force because of the use of sophisticated equipment in factories that does not require much labour.

• Increase in the need for developing countries to import capital and intermediate goods leading to an increase in economic dependence.

• Import substitution policy depends on protecting domestic goods from foreign competition, which has adverse effects on the national economy because leads to the domestic industry producing poor quality goods.

In short, the policy of import substitution has many problems and difficulties. Studies have shown that, to overcome these challenges, alternative policies should be adopted, such as promoting exports.

### 3.5.2. Export promotion policy

Exports of developing countries are characterized by the lack of diversification in the production of commodities, focusing on the export of primary products, which means a decrease in the value-added. This leads to a decline in the rate of trade in favour of industrialized countries, which leads to developing countries following different policies, such as export promotion (Buffie, 2001).

This policy is based on the expansion of national exports, whether labour or capital-intensive, depending on promoting the production of goods that have a competitive advantage in foreign markets, which can be produced at low cost compared to competing manufacturers (Shameya; Garyo). This policy takes into account the risk of entering foreign markets, thus it requires the production of high-quality goods at competitive prices. The success of this policy can create an industrial export base to contribute to the growth of the economy and diversify its sources of income.

For the development of exports, the training of workers and managers must be encouraged to ensure the reduction of costs, through an increase in capital and labour productivity, and continuous improvement in production. An increase of exports requires that there be incentives for workers, in addition to a reduction in sales and income taxes on industrial exports.

**Obstacles facing the export of goods:**

There are many obstacles facing the export of goods which are imposed by governments, including:

Customs obstacles: Countries typically do not impose customs tariffs on raw materials (or they are low if imposed), but tariffs tend to be high on finished goods.

Non customs obstacles: The difficulty in finding overseas markets for manufactured goods in developing countries is generally due to the lack of global quality. The policy of import substitution means the abandonment of import of some goods by producing them locally; it requires a policy of encouraging domestic investment through the establishment of industrial projects that provide those goods for the domestic market. Thereafter, a policy of export promotion, which is a later stage of the policy of import substitution, after the establishment of industrial projects that meet local market needs of local goods and products required, the role of increasing production begins to produce a surplus. This surplus is directed to export. These policies may encounter difficulties such as those mentioned above. However, the optimal planning to adopt an appropriate policy based on the experiences of other countries might be an appropriate solution to help to overcome such obstacles, and connect the domestic economy to acceptable levels of development and economic growth.

### 3.5.3. Industrial Development Policy in Libya and Development Plans:

**First: Introduction:**

The industrial development strategy applied in Libya since the beginning of the seventies has proceeded on two tracks: a) the first track adopted the policy of the development of small and medium-sized industries to meet the consumer need for food and intermediate goods, and to reduce dependence on foreign trade. b) The second track adopted a policy of the development of heavy industries, particularly export-oriented, giving priority to the petrochemical and mineral industries.

Through the tracks outlined above, the Libyan industry in its early stages (1970s) adopted a strategy of import substitution, followed by a strategy designed to promote the establishment of export industries, in addition to the pursuit of the export of industrial surplus production which was established with the objective of import substitution. From this principle, we note that the industrial policy in Libya brings together import substitution and export promotion policies. This is shown clearly through the objectives of the economic and social transformation plans which will be dealt with in the following section. Although the policy of import substitution that had been applied previously in Libya, it has not succeeded very well, but it has had to be successful if the goods that have a comparative advantage were to be manufactured locally, at the same time maintaining the importation of goods that are difficult to be manufactured locally, which would require greater costs for their production. The policy of export promotion requires a large market depending on trained employment and an advanced manufacturing base. This is because goods destined for export are required to have an advantage in terms of quality and level of proficiency, which requires large numbers of trained and qualified workers who are missing in the Libyan economy. Therefore, before thinking of the application of such policies, it is necessary to create the appropriate environment for setting up a manufacturing base which depends on a high level of investment directed to the manufacturing sector, and to prepare employees to be able to reach higher levels of productivity. Such a policy may be successful if coupled with the necessary political will in Libya which suggests that it has a key role in the economic decision-making of the country.

For some of the experiences of other developing countries, there are two states, for example, one of them is oil (UAE), and other non-oil (Egypt), that have successful policies in terms of export promotion. Egypt is interested in internal economic reform, and has directed domestic investment for the establishment of small industrial projects, helped by the large size of the Egyptian local market backed by the availability of skilled labour in the Egyptian labour market. As a result of the UAE's exports diversification policy, less than half of its export value directly comes from oil and gas products. A crucial factor that has contributed to such diversification is the UAE's so called Free Trade Zones. The zones are designated areas within the UAE where traditional laws and regulations governing licensing and private sector requirements are suspended (Ministry of Foreign Trade, UAE, 2010).

**Second: Key economic variables during the period 1962-2008:**

After the transition to a socialist system (end of 1970s, and early 1980s), the prevailing idea of the Libyan government was the inability of the private sector to carry out the development process given the small size of this sector, and the small size of the domestic market. Therefore, the public sector took a greater role in economic activity and economic and social development. This is reflected in the distribution of planned fixed capital formation between the public and private sectors (Al-Farsi, 2003). Table 3-2 shows the declining proportion of private sector investment of total investment from an average of 12.7% during the period 1976-1980, to 8.3% during 1981-1985. In the early of 1980s, an economic blockade was imposed on Libya[1] ; this resulted in a high cost of imports of various goods, and coincided with a reduction in the price of oil on global markets. As a result, the State's revenue declined by a large margin. To address the problem, the government adopted a method of deficit financing and internal public debt stood at around L.D 5045 million in 1989 (Central Bank of Libya, 1989. p. 40), this in turn led to a rise in the rate of inflation to unprecedented levels. To deal with inflation and other economic negatives in the economy, the Government adopted a set of economic policies to correct the economic situation. Most important of these policies was providing an greater opportunity to the private sector in economic activity. Given the instability of these economic policies, that led to a high degree of uncertainty, which made the contribution of the private sector low. With regard to fiscal policy, emphasis was placed on public spending to achieve some of the goals of economic policy. Due to the magnitude of the size of the administrative body, the bulk of the reduction in public expenditure was concentrated on investment spending, which resulted in a low impact on the rate of growth.

Also, the low foreign exchange revenue in the second half of the 1980s led to a series of shortcomings in trade policy. For instance, to prevent the importation of certain goods, tariffs were increased resulting in the emergence of a black market of smuggled imports, which are not subject to taxes, in addition to a relatively lower standard of living for most individuals as a result of the high prices.

As for the exchange rate, a fixed exchange rate regime[2] was the case until 1994. This resulted in negative effects on the system, including the emergence of a black market in foreign exchange and commodities. Thereafter, the government adopted a multiple exchange rate system, resulting in advantages such as increasing the value of exports

[1] The economic blockade in this period was represented in the specification of the quantity of exported oil, which determines the State's capacity to meet the requirements of the domestic market for various goods, including spare parts for production factories.

[2] The Libyan Central Bank defined the fixed exchange rate as official price of the national currency linked to gold price in Libyan case (Central Bank of Libya, 1994).

in local currency, and achieving a surplus in the trade balance and balance of payments after a deficit in 1993 (Central Bank of Libya, 1994, Table 36). To avoid the negative aspects of the multiplicity of exchange rates and to reduce the rate of inflation, the Government enacted a number of policies. Most important of these policies was the creation of successive reductions in the value of the Libyan Dinar against foreign currencies in the years 2000, 2001 and 2002, where the total reduction was to 50% of its prior value before 2001. Thus, the difference between the official and real exchange rate reduced to the lowest level. The economic policies applied were fairly successful in reducing the rate of inflation and the elimination of the black market for foreign exchange. It was supported by the improvement in the prices and quantity of oil exports in the same period.

**Table (3-2)**
**Percentage Distribution of Investment between Public and Private Sectors (1976-2007)**

| Period & Year | Public Sector % | Private Sector % |
|---|---|---|
| 1962-1965 | 25.8 | 74.2 |
| 1966-1970 | 42.7 | 57.3 |
| 1971-1975 | 78.4 | 21.6 |
| 1976-1980 | 87.3 | 12.7 |
| 1981-1985 | 91.7 | 8.3 |
| 1986-1990 | 91.1 | 8.9 |
| 1993 | 87.6 | 12.4 |
| 1994 | 87.4 | 12.6 |
| 1995 | 82.3 | 17.7 |
| 1996 | 84.8 | 14.2 |
| 1997 | 85.7 | 14.3 |
| 1998 | 81.5 | 18.5 |
| 1999 | 81.7 | 18.3 |
| 2000 | 86.4 | 13.6 |
| 2001 | 82.7 | 17.3 |
| 2002 | 82.1 | 17.9 |
| 2003 | 78.0 | 22.0 |
| 2004 | 78.0 | 22.0 |
| 2005 | 77.0 | 23.0 |
| 2006 | 80.8 | 19.2 |
| 2007 | 82.0 | 18.0 |
| 2008 | 81.5 | 18.5 |

Source: the period (1976-1990) from - The Revolution in Libya 30 years. Political, Economic and Social transformations(1969-1990). Public house publications. Second edition. 1990 P.255. Rest of the years: the Central Bank of Libya, Department of Research and Statistics. Economic Bulletin, various issues

**I) The first five-year development plan (1963–1968)**

Concentration was focused on developing the industrial sector from 1964 according to the first five-year development plan (1963-1968), and the government allocated about 7 million pounds for industrial credits, industrial research centres, industrial estate bank and for training in industry. In addition some protective measures were introduced such as restricting imports and tax exemptions in order to encourage local industry to compete with imported commodities.

Before 1969, it was very clear that one of the government's policies was to encourage the private sector to develop the industrial sector by providing loans and technical information for private investors; in 1964 there were 7954 manufacturing establishments, employing 23800 workers in both large and small establishments. 56% of the large establishments were located in Tripoli and Benghazi which are the two regions that have a significant number of large manufacturing establishments in Libya (Hudana, 1975).

This plan was designed to increase industrial production and to expand and improve the quality of agriculture. About 70% of total oil revenues were earmarked for this plan; 23% of the total was for public works, 17% for agriculture, 16% for communications, 13% for education, 7% for public health, and 4% for industry. Another year (1968-1969) was added to this plan, and its allocations amounted to 603 million pounds (Council of Arab Economic Unity, 1984).

The first plan before the revolution included the following objectives for the industry sector:

1 - To raise the level of production and its quality.

2 - To encourage consumption of locally produced industrial goods.

3 - To improve working conditions and raise the level of adequacy of workers.

4 - To take advantage of local raw materials and improve the conditions of marketing.

5 - To promote exports and reduce dependence on industrial imports.

6 - To diversify production in order to avoid dependence on a single product.

7- To obtain the maximum contribution of the income of the industrial sector to achieve economic development.

Amounts allocated by the plan to the industrial sector were not responsive to these goals, where the proportion of the total allocation to industry was only 4%. Through the above, industrial development was the first fundamental premises of the strategy of economic transition. However, the improvement of manufacturing was very limited due to the lack of trained manpower, the small domestic market, and the inability of the national economy to provide the necessary investment.

**II) The Three-Year Plan for economic and social development (1973-1975):**

The strategy and objectives of this plan aimed to achieve a high rate of growth of the national economy, in addition to the diversification of the economic structure. It targeted a growth of 11% annually in GDP. Investment was allocated as follows: industry and mineral resources, 15%; agriculture, 14%; communications, 14%; housing, 11%; petrochemicals, 11%; and education, 9%. This plan amounted to LD 2203 million, and the most important objective adopted by the plan was an increase in the rates of growth in productive economic activities such as industry and agriculture, in order to build a diversified productive economy.

The data on the evaluation of the performance of this plan indicated that:

- This plan created about 25% of jobs for Libyans, and 75% for non-Libyans; this indicates that the plan relied heavily on non-Libyan employment in the implementation of its projects.
- It achieved a growth rate of 9.2% in real GDP, representing 88% of the planned growth rate.
- The private sector contributed to the implementation of a number of projects in the plan, for instance, 44.4% of targeted housing units.
- The contribution of the oil sector to GDP remained high, falling slightly from 77.4% in 1973 to 72% in 1975.
- The average of non-oil per capita GDP increased from LD 608.5 in 1973 to LD 838.5 in 1975.
- There was no significant improvement in the diversification of export structure, where oil exports amounted to 96.7% of total exports in 1975.

Given the short time period of the Three-Year Plan (1973-1975), it could be argued that it made great strides in achieving its objectives.

**II) The Five-Years Plan for economic and social development (1976-1980):**

This plan coincided with a significant rise in oil revenues; and it contributed towards the creation of a commodity production base. The government adopted a policy of expanding the role of the public sector, and reducing the private sector role, which lead to a deterioration in some activities such as agriculture. The strategy of industrial development in this plan gave priority to the manufacture of goods that could replace imports, especially finished consumer goods, and started to plan the establishment of the and chemical industries. The strategy of this plan was based on the following points:

•To rid the national economy of the domination of the oil sector.

•To diversify production, exports, and import substitution.

•To pay more attention to agricultural development.

•To pay more attention to the efficiency of the labour force.

The general objectives of this plan were as follows:

•To reach a growth rate of 10.7% in GDP, 14.1% in non-oil GDP, and 7.8% in oil GDP.

•To reach a growth rate of 5.6% in per-capita GDP.

•To focus on manufacturing and agriculture, and to achieve appropriate levels of self-sufficiency.

•To reduce the rate of final consumption in relation to GDP from 57% in 1975 to 54% in 1980.

•To emphasize the achievement of social objectives that was adopted in the Three-Year Plan (19973-1975).

The data on the evaluation of the performance of this plan indicated:

•Expenses of the plan amounted to L.D 8259 million representing an implementation rate of 94% of its allocations. Most of these expenditures were funded from oil revenues.

•The plan achieved a growth rate of 4.6% in GDP, representing by 60% of the target rate. The growth rate of the non-oil GDP was 11.8%, representing 84% of the planned rate.

•The rate of growth in per-capita GDP reached 6.3%, representing 112.5% of the planned rate.

•This plan created 58.1% of jobs for Libyans and 41.9% for non-Libyans.

• The agriculture sector accounted for 21% of the expenses of the plan, while its contribution to GDP was low (2% on average). The manufacturing sector accounted for 15.5%, and its contribution to GDP was also low (2.2% on average).

• Although the proportion of the contribution of the oil sector to GDP declined from 71.9% in 1975 to 64.1% in 1980, this percentage was still significant.

• The plan did not achieve a significant improvement in the diversification of exports, but the contribution of oil exports increased from 96.7% in 1975 to 99.8% in 1980.

It is clear from the above that this plan achieved low ratios of its goals, and it relied largely on oil revenues to finance its expenditures. Moreover, no improvement in the diversification of non-oil exports was achieved. In addition, the plan witnessed the beginning of the demise of the private sector role in economic activity and its contribution to development, with the exception of housing construction.

**III) The Plan for economic and social development (1981-1985):**

This plan was prepared in conditions characterized by high oil prices and oil revenues, reflected in the large size of its allocations which amounted to LD 18.5 billion, distributed to a range of sectors with a focus on heavy industries.

The plan addressed the key features of its strategy, which is summarized in the following points:

• Focusing on the transformation of the Libyan society to a socialist productive society according to the Third World Theory[1], as stated in the Green Book.

• Increase the efficiency of productivity of the various factors of production.

• Giving a great importance to education and technical training.

• Focusing on supporting the agriculture sector in order to reach advanced stages of self-sufficiency of crops and agricultural commodities.

• Entry in the field of strategic and heavy industries to ensure a formation of an economic base.

• Focusing on scientific research and pursuing advanced scientific methods in the implementation of transformation projects.

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[1] Political, economic and social ideas authored by Colonel Muammar Qaddafi, printed in three chapters in a book called the Green Book.

The overall goals of this plan are summarized as follows:

• To grow non-oil GDP by an annual real growth rate of 10.3%.

• To grow GDP in the agriculture and manufacturing sectors by annual real growth rates of 7.4% and 22.4% respectively.

• To reduce crude oil production to an adequate level.

• To intensify the development of human resources and increase the contribution of Libyans to the economic transformation.

• To achieve further improvement in the standard of living, and to achieve justice in the distribution of income, in addition to spatial development at the district level.

• To protect and improve the environment.

The data on the evaluation of the performance of this plan indicated:

• The performance of this plan was modest, with a growth rate of the non-oil GDP of 2.7%, representing 26% of the planned growth rate, while the total GDP growth rate was negative.

• Real growth rate in agriculture was 5.9%, or 79.7% of its planned growth rate, while the manufacturing industry achieved a real growth rate of 14.2% or 63.4% of the planned growth rate.

• Relative improvement was achieved in reducing the oil sector contribution to GDP from 69% in 1980 to 49.4% in 1985 (however, this percentage was still high).

Libyan employment rose to 176.2 thousand, compared to a decline of non-Libyans employment to 85.8 thousand.

• The contribution of the manufacturing and agricultural sectors remained low, 4.0% and 3.7% respectively on average during the plan period.

• This plan did not comply with the decided ratio for development (70% of oil income). Data indicated the low proportion of the actual allocation of oil revenues for development from 51% in 1981 to 26% in 1985.

• Oil exports accounted for 99.4% of total exports in 1981, and then decreased slightly to 97.1% in 1985.

• In spite of the rise of industrial capacity during the period, its operating rates were low, with a rise in the volume of inoperative capability.

Based on the foregoing, it should be noted as follows:

• The primary objective of generating foreign exchange through the creation of alternative sources of revenue was not achieved.

• The goal of diversification of exports was not achieved, and oil exports continued to be a large percentage of the total exports.

• The private sector was marginalized and deprived of its contribution to development, which led to the development of a burden on the government.

**IV) The period of work without plans 1986-2002:**

The continuous decline in crude oil prices in international markets, and then the collapse in the price of oil in 1986 led to a situation of uncertainty concerning the expected oil revenues; thus, the beginning of the disruption of development efforts in Libya.

During the period mentioned (1986-2002), a number of draft plans and investment programs were developed, and could be reviewed as follows:

**V) Draft plan of economic and social transformation 1986-1990:**

Allocations of this plan were estimated at LD 10.9 billion, and a set of goals was identified. However, this draft was not adopted, and was not implemented for several reasons, including the sharp decline in oil prices, and the lack of clarity and stability of many of the policies.

This plan was replaced by the preparation and implementation of annual budgets for development during the period. The allocations amounted to LD 7,055 billion, while expenditures amounted to LD 4.153 billion, with an implementation rate of 58.9%. However, available data on this period indicated an annual GDP growth rate of 3%, and non-oil GDP growth rate of minus 1.7%.

**VI) Draft plan of economic transformation 1991-1995:**

The general framework of this plan was prepared, but was abandoned due to the aggravation of the difficulties mentioned above. The plan was replaced by the preparation and implementation of annual budgets for development during the period. The allocations amounted to LD 5.15 billion, while the expenditures amounted to LD 2.35 billion, with a low implementation rate of 58.9%. The national economy during this period achieved a real GDP growth rate of 1.4%, and 2.6% for non-oil GDP at 1980 prices.

**VII) The Three-Year programme 1994-1996:**

This programme is not a development plan in itself. Its aim was to prepare a plan for new development, and the liquidation of accrued liabilities on projects of transformation. However, the latter goal was not achieved, and it was reduced by 10.5% only.

**VIII) The Period 1997-2001:**

During this period, annual budgets of transformation were prepared, with allocations amounting to LD 6.592 billion, while expenditures amounted to LD 5.196 billion, ie, the implementation rate was 78.8%. However, the national economy during this period experienced many developments which can be summarized in the following points:

- A continued reliance on oil to finance government expenditures.
- A decline in productive capacity.
- Oil exports still accounted for the majority of exports (91.4% of total exports).
- The goal of diversifying the structure of the national economy was not achieved, and the contribution of the production sectors (such as agriculture and manufacturing) to GDP remained low; the contribution of agriculture and manufacturing were 8.9% and 8% on average respectively.
- The absence of a clear perception of developmental parameters and dimensions, and the absence of support policy at the macroeconomic level led to stalled development efforts.
- The austerity policy that was pursued by the government during this period did not succeed in reducing expenditure in accordance with the available resources, which led to the growth of black markets in currencies and commodities, and an inflationary depression.
- The suspension of the importation budget led to a suspension of production in the majority of institutions, production and service companies, and infrastructural projects.

These developments mentioned above led to a review of the method of planning, and to preparing plans in line with evolving economic conditions both domestically and internationally.

**IX) Draft plan of economic transformation 2002-2008:**

The volume of investment for this plan was LD 35.8 billion. Oil revenues contributed 43.8% to the plan's financing, and the private sector and self-financing contributed 56.7%. This plan identified a set of objectives at both the macroeconomic levels; the most important aim was to achieve a growth rate of real non-oil GDP of 6.3%. In addition, the plan included a set of policies; the most important being to give a greater role to the domestic and foreign private sector, to contribute to the financing and implementation of the plan.

The government considered plans to diversify the economy, reducing its total dependence on oil, which accounted for 95% of Libya's foreign currency. Tourism was one sector of the economy targeted for development, and those working in the industry encouraged the formation of commercial banks to finance tourism projects.

The government urged Libyans to undertake investment projects such as road and port projects, and communication and industrial production projects. The oil sector was not to be privatized, but rather open to investment, while the public sector would not be entirely dismantled, but would work with the private sector. Moreover, companies would not be owned by the government, but by the people who run them, assisted by foreign investors if need be.

Macroeconomic performance during this period was relatively satisfactory with economic growth of about 4.5%. This was supported by the relatively high oil prices in global markets and some improvement on structural reforms, particularly the expansion of the program of privatization and foreign investment. However, reform implementation continued to suffer from the lack of coordination between government institutions (International Monetary Fund, 2006). This growth was concentrated in the construction sector, due to recent construction development in the country and housing loans granted by the Bank of Savings and Real Estate Investment. The growth was also concentrated in the transport and communication and service sectors (Central Bank of Libya Report, 2007).

However, this plan was delayed for several reasons including:

- The magnitude of the planned investment program, and the lack of financial and executive capacity for this program.
- Multiple exchange rates and the growth of the black market.

• Difficulties and bottlenecks that affected production and service companies.
• Economic, political and social development at the domestic and international level, which occurred in 2001.

In brief, the new international economic and political developments require that planning should rely on building a diversified economy dependent on strong growth potential. The government's role was to provide the appropriate economic climate, including the development of policies and actions that would serve to sustain economic growth.

**Third: Local and global changes affecting the manufacturing sector and changes in development plans**

Development plans during the period 2002-2006 were characterized by limited allocations adopted, and the inadequacy of the implementation of the proposed programmes and projects (Ministry of Economy Report, 2008). The most important characteristics of this period are the following:
•Reduce the role of the public sector in economic activity, and promote the role of the private sector to engage in all economic activities.
•Transfer of ownership of several companies and production units and public service, in the context of broadening the base of collective ownership. However, difficulties were encountered with this trend. In this context, the ministry of Economy established an institution called the General Authority for owners of companies and economic units, which is presently studying and evaluating 74 public companies and economic unit with the purpose of transferring ownership to the private sector (Ministry of Economy Report).
•Elimination of some of quantitative and administrative restrictions which were imposed on imports and exports, which contributed partially to the promotion and development of economic activity.
On the other hand, problems and difficulties faced these plans, including the following:
•The absence of the structures needed to ensure the implementation of policies and objectives, as a result of the lack of the elements required for success (administrative, human, financial, and organizational).

•Instability of the legislation which regulates investment activity within the country led to the reluctance of some investors to establish new projects with added value.

•Also, as mentioned above, there are difficulties which faced broadening the collective ownership base, including:

•Low demand of citizens to buy into the companies and units which were put up for sale.

•Obsolescence of assets and techniques, due to lapse of a period of time without any replacement or development, which led to low level of quality and competitiveness.

•The companies which were put up for sale generally did not have comparative advantages.

The most significant global changes affecting the manufacturing sector are (according to a report issued by the Ministry of Industry, 2008): the Convention on international trade, the development of communications and information technology, changes in the pattern of recruitment of personnel. The most important local changes are: the end of the economic embargo on Libya, more foreign companies investing in industry, encouragement of domestic investment and more opportunity given to the private sector, and the need to provide jobs for the younger generations.

In this regard, the Ministry of Industry has set targets for the manufacturing sector, including:

•Production of manufactured goods which have competitiveness at home and abroad, through the restructuring of manufacturing enterprises, by focusing on manufactures that rely on local resources.

•Seeking to make the activity of manufacturing a key component of the national economy, and working to increase the proportion of its contribution to GDP.

•The contribution of manufacturing to accommodate a significant proportion of employment which engages in the labour market annually.

•Find real markets for national products by focusing on the transfer of technology, in order to gain competitive strengths in the global production system.

•Intensification of training and the development of teaching methods in the field of manufacturing, and improving the performance of specialized institutes which aim to form the national capacities in the areas of management, research and development, and assimilation of technology.

•Focus on work completed to comprehensive quality standards in the manufacturing sector.

•The focus on mining and quarrying activity by completing studies on this aspect, and making a statement the raw materials which are available locally, that helps to attract foreign and domestic investment to establish mining projects.

•The focus on manufacturing strategy that relies on manufactures which have an economic feasibility. Besides, replacement of the strategy of import replacement with an export strategy and access to world markets (as well as local markets).

•Promote the role of private sector investment in the manufacturing sector, and attract foreign investment to contribute and participate in the activities of this sector.

•The preservation of health, safety and environmental protection from pollution is an important part of the activities of manufacturing sector.

•Use of natural gas in power stations because it is less costly and less damaging to the environment, with a focus on infrastructure projects.

**Fourth: Foreign Exchange Policy in Libya**

Foreign exchange policy in Libya managed by the Central Bank, Libya has used an installed system of exchange rate, related with special drawing rights (SDR). Linkage of the Libyan dinar with the SDR underpins the cash base in the economy as discussed by some specialists from the Central Bank of Libya. Also, it allows some flexibility in the exchange rate of the dinar against other major currencies. Some data indicate the actual value of the real transformation of the dinar against other major currencies as acceptable, especially in 2008 and 2009 (see, IMF, 2009).

Since the beginning of the seventies, most of institutions and companies in Libya are controlled by the government, which did not have profit as its sole aim, rather providing a wide range of goods and services for Libyan people. However, in the current situation, especially after adopting the economic reform policy, and attracting foreign direct investment, the exchange rate has become an important factor in the economy, especially as it is considered as the decisive factor for investment decisions. Law No. (21) of 1994 in relation to engagement in economic activities was amended by law No. (1) of 2004 which decreed the principle of fixed exchange rates. This aims to encourage investment and savings, so that individuals can contribute to the establishment of special economic projects, as well as attract foreign investments

(Abdussalam, 2006). This policy was part of the requirements of the program of economic reform and privatization policy.

The Central Bank of Libya argued that exaggeration in the value of the Libyan dinar would have a negative impact on FDI. It therefore, reduced the value of the national currency by 51% in 2002, this led to a dual exchange rate policy which is still followed to date (Otman and Karlberg, 2007). The exchange rate policy coupled with an encouraging private sector established since 2000s resulted in stimulating private investment in the manufacturing sector, Central Bank of Libya dealt with private industrial companies by selling foreign currencies at prices lower than the actual price in order to import raw materials and industrial machinery. This shows the importance of exchange rate policy being compatible with the objectives of the planning process adopted by the government in order to encourage the private sector and diversify sources of income (Abulsayen, 2005).

**3.6. Summary:**

This section gives an idea of some features of economic, social and political environment pertaining in Libya, which have identified that Libya is a country with important economic resources; the most significant being oil and natural gas which constitute a key element of the country's economy.

The Libyan economy depends heavily on oil revenues, which are the main influence on most economic activities including investment activity, which took a clear tendency towards the services sector, especially in 1990s and 2000s, in addition to some legislations enacted by the government which led to restricting private sector activities, and also the adoption of economic strategies were not clearly successful (as we will discuss it in the next section), all of which contributed to the faltering path of investment in the productive sectors in the country.

In the context of the economic transformations which were taking place in the Libyan economy, the government began to think about the restructuring of the economy since the early nineties of the twentieth century. The Government decided to move towards a position of greater economic freedom, and some of the economic units under Government control have already been transferred to the private sector. This took place through the issuance of Law No. 9 for the year 1992, which encourages individual ownership and the formation of private companies (Shameya, 2006). Despite this government legislation, the private sector has not been seriously involved in investment and production. After that, a series of laws have been designed to correct some of the gaps in the legal environment to encourage private sector investment. The most important of these laws is Law No. 8 for 2001, which was aimed to amend some articles of Law No. 9 for the year 1992.

As a result, the government issued Law No. 3 for the year 2004, which was about the amendment of some of the ownership provisions, and law No. 6 for the year 2004 on organizing commercial agencies. Decision No. 7 issued by the Central Bank of Libya for the year 2002, aimed to adjust the exchange rate of the Libyan Dinar and enable easier trade with foreign currencies.

However, many difficulties are facing the policies intended to ensure the transfer of the manufacturing sector institutions from public ownership to the private sector, and to stimulate the private sector to invest manufacturing: at the same time the government has sought to revitalize the manufacturing sector and make it a key element in the national economy and increase the proportion its contribution in output, each these economic objectives is associated with the period of restructuring that has been faced by difficulties, the most important is the failings in the implementation of these policies by the government. The next chapter deals with the transition to privatization and the legislation adopted by the Libyan government in this regard.

# Chapter 4

# Private Sector and Foreign Direct Investment in the Libyan Economy

## 4.1. Introduction

In order to identify the most important changes that have taken place in economic policy which have resulted in economic reform, transition to privatization and a openness to Western economies, this chapter provides an explanation of the objectives of private sector involvement in the process of development in Libya. This section lists the most important changes and developments that occurred in the private sector between 1962 and 2008, accompanied by the development plans and the most important laws associated. Given the importance of investment to the national economy, this section also deals with data and important developments in private sector investments in this period.

Yarrow (1996, p.5) defines privatization as "the transfer from the public to the private sector of entitlements to residual profits from operating an enterprise, coupled with any accompanying changes in regulatory policy". In light of this, privatization means the ownership transfer of institutions or their departments from the public sector to the private sector. This can be through: the total or partial sale, lease, operation or management contracts, direct sales or auction (El-Naggar, 1998). In theory, since the privatization of British Telecom in 1984, many developed and developing countries have embarked on the implementation of privatization programs on a large scale, and countries have continued to adopt privatization strategies. The International Finance Corporation (IFC) still encourages the growth of production of private projects in developing countries through the promotion of privatization (Donaldson & Wagle, 1995). Since that time, the majority of governments around the world have taken decisions to divest state-owned enterprises (SOEs), either by selling them to the private sector, liquidating them or going into joint venture with the public sector (Dinavo, 1995).

Privatization in practice has, indeed, attracted much attention in western industrialized economies as well as in developing countries. It aims to reduce the role that governments play in their national economies and to encourage the private sector to take over this role for many reasons (Dinavo, 1995).

Due to the sensitivity of the economic, financial, political and social concept of privatization, the political factor plays an important role in the decision to privatize. Governments also should through the political factor convince their people that privatization leads to the public interest and to an improvement in economic conditions. Governments in many developing countries have adopted programmes of privatization as a means of strengthening their economies (Dinavo, 1995).

### 4.2. Economic Reform

Many actions have been taken by the General People's Congress (Libyan government) regarding the reform of the Libyan economy. Instability in the price of oil, as well as the misuse of economic resources by the public sector, made the government consider economic reform (Fakher, 2005). According to some authors (see for example Sahn, 1996; Hughes & Lovei, 1999), economic reform leads to improved performance, and eliminates the perverse incentives that underlay many of the environmental problems of centrally planned economies.

In confirmation of this approach, the Libyan government has worked to establish a council of economic reform called the National Council for Economic Development (United Nation Development Programme. 2007).

The objectives of this Council are as follow: (General People's Committee. Resolution Nó 3, 2007):

• To encourage the private sector and improve the working environment and investment, in order to obtain the optimal number of economic projects.

• To provide a link between the public and private sectors in order to improve communication and cooperation between them, also to assist in the establishment of partnership between both sectors.

• To develop local human resources in order to enhance the efficiency of their performance, through the establishment of institutes for administrative and economic training.

• To design plans and programmes to take advantage of technical expertise and capital at the international level. FDI is a case in point, which helps to stimulate competition in the Libyan economy.

This vision promoted by the Council exists in the context of supporting private free enterprise, reducing reliance on energy controlled by the government, attracting foreign investment and increasing the level of wages. It is working to reduce bureaucratic constraints and accelerate decision-making, in addition to facilitating the establishment of private companies in the country (United Nation Development Programme, 2007).

Alhuni (2007), says that economic reform will have a positive impact on other aspects (social, political, cultural), but there are negative implications, including administrative corruption[1] and tribalism. He argues that the reform process requires as increase in the standard of living for labourers which in turn requires a more equitable income distribution.

Essentially, the reform process should focus on raising the contribution of non-oil production sectors, such as manufacturing, agriculture and tourism.

Libya, like some other countries which have recently introduced economic reforms, suffers from administrative corruption. Many studies have attributed this corruption to the misconduct of government officials, which may be due to individuals not to institutions (Park, 2003, p.31). Concerning the relationship between corruption and the economy, much of what has been written on this subject deals with the economic impact. GDP per capita is one of the most important economic determinants of corruption (Paldam, 2002, p.283). This means that corruption will be reduced if the economy grows, i.e., when GDP per capita rises. It concludes that corruption is usually seen as one of the fundamental problems in developing economies (Montinola & Jackman, 2002, p.169). Economic liberalization and the rate of inflation also affect levels of administrative corruption (Paldam, 2002, p.238). Changes such as liberalization inflation rates led to other changes included the reduction of some ministries and development of others, and other changes in economic policy purpose to prepare a good base for direction towards policies encouraging the private sector and attracting foreign direct investment. Because the results of these changes are not yet clear due to the short duration of this policy, the lack of coordination between the government and the private sector appears clear from the modest effect on private sector output, as will be noted in overview of the manufacturing sector given later. Moreover, the levels of productivity in the Libyan economy have not improved. These

[1] The public sector is the biggest field of administrative corruption under any totalitarian regime. Besides, the declining efficiency of economic and financial institutions leads to more financial and administrative corruption (Libyan Human and Political Development Forum, 2006).

changes are supposed to have positive effects on productivity levels, and on increased proportion of investment, especially in the private manufacturing sector.

### 4.3. Privatization in Libya

The public sector in Libya has dominated the management and conduct of economic activity since the beginning of the revolution until 1977. It was natural that the public sector played a key role in economic activity due to the government ownership of oil resources. In 1977, with the emergence of the Third World Theory advocated by Gaddafi (Green Book), slogans such as "partners not wage-workers" became institutionalized. The maxim was starting point to a socialist system calling for the partnership of all members of the community. In March 1981 all private retail licenses were officially suspended, although this was never fully implemented. However, at the end of the same decade Gaddafi was publicly proclaiming the benefits of a rapid expansion in private enterprise (Ham, 2002). On this basis, small firms were established, which are named "Tasharukeyat[1]" (this can be translated as a formula or a way to distribute the community's wealth equally among its members).

The trend towards privatization started through the issuance of a number of laws that opened the way to private sector for the exercise a range of economic activities. Law No. 9 concerning the conduct of economic activities was issued in 1992, it impacted on more than 2500 companies, and the "Tasharukeya" exercise established various economic activities (Shameya, 2007). The privatization process in Libya is named "expanding the base of ownership". Libya is starting to make up for the years of state control by freeing up its highly centralised economy. The government has been officially declared the process of reducing the role of the public sector and developing the private sector is under way.

The government is keen to develop and diversify the economy in order to reduce its dependence on non-renewable oil resources, and to export a wider range of products. The government aims to promote businesses such as food processing, textiles, handicrafts and cement, and to encourage the development of the private sector (World Report, Libya: Back on the world stage, 2006).

[1] It is a term meaning a participatory system based on the principle of participation in production, sale or ownership advocated by Colonel Gaddafi.

### I) Justifications of the privatization programme in Libya:

The basic question here is why privatization is suitable in Libya? This raises several points as justifications for the privatization programme in Libya, including:

• Privatization often falls within the program of structural adjustment or correction proposed by most international bodies, particularly the International Monetary Fund (Goldsbrough et al., 1996), in order to qualify for assistance and loans, due to the failure of public-sector economic control in developing countries.

• Government institutions are often weak; therefore, privatization will help the government to reduce its wage burden, and to ensure stable resources through taxes. The increasing deficit of public institutions can becomes a significant burden on the state budget.

• The public sector in Libya is suffering from many problems which reduce its efficiency and hinder development.

• Failure to achieve planned objectives. Some studies by the Ministry of Industry on 20 firms showed that the proportion of actual production reached a very low percentage, amounting to 4% of planned production. Another study by the National Authority for Scientific Research on 30 factories also indicated that the rate of productivity did not exceed 29%. (Al-Bahi, 2004).

• Using the majority of the labour force in the public sector which reached a peak rate in 1995 when public sector employment represented 77% of the total workforce. This high percentage suggests inefficiency in the Libyan labour force.

These points above necessitated opening the way for privatization and the private sector to play its real role in economic activity.

### II) The goals of privatization in the Libyan economy:

• To promote and encourage the private sector through the transfer of ownership from the public to private sector, and to clarify the rules for both sectors, without preference of one over the other.

• Optimum utilization of available resources through competition in both sectors.

• To improve the financial situation of the public sector through the closure of some of its institutions, and transferring others to the private sector, development of financial institutions that are the essential foundation of the privatization program. i.e., reduce the financial burden of public institutions that adversely affect the State budget (see for example, Shehadi, 2002).

• To raise the productive efficiency of economic institutions through the promotion of employment in the contribution of good governance, development of competitive markets through the elimination of monopoly, and development of the capital market.

However, the success of the privatization process in Libya must achieve a number of conditions, including:

• The elimination of bureaucracy, because the private sector cannot succeed under current management conditions.

• Giving priority to productive investments, which is the basis of growth.

• The encouragement of competition and the elimination of monopoly, not allowing the transfer of monopoly from the public sector to the private sector.

The method of privatization used in Libya is characterized by the transfer of ownership of some public enterprises to their employees without a change in the pattern of management. This has resulted in the continuing decline in the performance of these institutions, despite privatization. In addition, the process of supporting the private sector focused on entering the sectors that were previously monopolized by the public sector. Moreover, some tax exemptions were granted to the private sector to encourage domestic and foreign investment. The Libyan government (Resolution No. 31 of 2003) aimed to transfer ownership of 360 economic enterprises from the public sector to the private sector. These businesses would be entirely privatized or operated in partnership between the private and public sectors (Otman & Karlberg, 2007). Some of these firms have been privatized, and others are yet to be privatized.
However, these attempts have not been followed up by procedures for establishing the appropriate legislative and regulatory environment, and sophisticated banking institutions commensurate with the ongoing reforms towards a market system (National Planning Council Report, 2008).
The following Table (4-1) shows the total number of licenses issued for the conduct of private economic activities amounted to 108532, most of them concentrated in commercial activity (50.16%), and manufacturing (21.97%). Where the licenses are distributed is shown below:

**Table (4-1)**
**Number and type of licenses in Libyan private activity**

| License Type | No. Of Licenses | Percentage % |
|---|---|---|
| Individual License | 88013 | 81.1 |
| Tasharukeyat | 14759 | 13.6 |
| Joint-Stock Company | 1562 | 1.4 |
| Family Company | 4198 | 3.9 |
| Total | 108532 | 100 |

Source: Statistical inventory permits private economic activities. (2003). General Authority for Information and Documentation. p.5.

Licenses mean the eligibility of their holder to engage in a particular economic activity within the private sector, such as establishing a factory, or a particular business activity, within the species shown in Table 4-1. The able shows that most of the licenses granted by the government are individual, and most of them come within the service projects, such as business shops and private transport. Most of Tashatukeyat licences are issued in respect of small industrial projects, such as some metal industries. Most family companies are small industries which do not need significant capital investment, such as certain textile and detergent industries.

## 4.4. Developments of the Private Sector and its Investment in Libya:

### I) The Period 1962-1970:

The rapid developments in the Libyan economy which occurred after the discovery of oil led to a high level of investment activity in the services sector, oil and petrochemical and related sectors, as well as the construction sector, it also attracted large numbers of people who were seeking work.

The most important results of the above situations were the high price of consumer goods, high cost of living, and the emergence of differences in income among the population. This led to the emergence of the first plan for economic and social development (Ministry of Planning, the five-year plan (1963-1968)).

This plan adopted a set of goals in the economic and social fields to raise the standard of living and economic stability. These goals showed the respective roles of the public and private sectors in the development process, it focused on the role of the public sector in public services such as education, health, transport, housing, leaving the private sector to undertake investment in agriculture and manufacturing, and the government to provide all facilities to investors (Ministry of Planning, the five-year plan 1963-1968).

In addition to encouragement for investment through tax policies, import control and providing the necessary infrastructure, the government allocated money from its budget of the plan submitted in the form of medium and long term interest-free loans, in addition to the expansion of training and the extension of agriculture and industrialization, to ensure low-price products.

However, despite the encouragement given to the private sector to invest in these sectors, the implementation was hampered during the first three years due to the lack of skills and government red tape (Atega, 1972). However, the increase of government facilities helped to bring modern methods, equipment, fertilizers and other modern means of production enabled farmers to increase the total cultivated area and increase production.

The manufacturing sector did not benefit greatly from the fiscal expansion caused by oil due to the underdevelopment of the means of production and strong competition from imported goods. In 1963, the Government had established "the Industrial Development Corporation" for the purpose of promoting industry through research studies and providing loans to the private sector (this corporation was replaced by the Industrial Bank in 1965). This corporation awarded more than a third of its granted loans to food industry activities as these represented most of the factories in number and production. The building materials industry ranked second, and then the textile industry.

In addition, commercial banks provided loans for investment in industrial activities which have the highest rate of increase between the loans granted to all sectors although they were not exempt from interest reverse loans granted by the Industrial Bank. Moreover, the size of private investment in construction and trade sectors rose due to the increased demand for housing and administrative buildings with the increase of companies operating in the oil sector increasing the numbers of foreign workers employed there (Atega, 1979).

From Table 4-2, we can conclude that private sector investments of the first Five-Year Plan (1963-1968) amounted to LD 416.6 million, i.e., 61.8% of total investments of the plan which amounted to LD 673.8 million. Private sector investment was dominated mostly by the oil companies' activities, which contributed 80% at least of the total investment in the private sector in this period (Ministry of Planning, 1971, pp. 26-27). This figure shows the domination of the oil sector over economic activity in the country.

As for the public sector, more than three-quarters of investment spending went on the building and construction sector, due to the focus on infrastructure and fundamentals of the economy such as roads, ports, schools, hospitals, housing, etc..

Table 4-2 shows the rates of the evolution of growth of both private and public investment during the period 1962-1970, showing the rapid growth rate during the plan period which exceeded 30% annually until the share of public investment reached 50.5% of total investment in 1970, having been only 24 .7% in 1962. The table shows a gradual decline in the proportion of private investment since 1964, which was 75.3%, to reach 64.7% in 1969. This is due to the discovery of oil in Libya, and access to income from its export led to the revitalization of public sector investments, which was spent on infrastructure projects, and the establishment of public enterprises which had to be included for the provision of goods and services to the population.

**Table (4-2)**
**Investment Spending Indicators in the Libyan Economy (1962-1970)**

In current prices and millions LD

| Year | Total Investment | Public Investment | Public % Investment | Private Investment | Private % Investment | Growth (total) |
|---|---|---|---|---|---|---|
| 1962 | 64.4 | 15.9 | 24.7 | 48.5 | 75.3 | - |
| 1963 | 74.3 | 16.7 | 22.5 | 57.6 | 77.5 | 15.37 |
| 1964 | 109.0 | 24.5 | 22.4 | 84.5 | 77.6 | 46.70 |
| 1965 | 146.7 | 44.5 | 30.3 | 102.2 | 69.7 | 34.58 |
| 1966 | 191.2 | 69.3 | 36.3 | 121.9 | 63.7 | 30.33 |
| 1967 | 210.4 | 107.4 | 51.1 | 103.0 | 48.9 | 10.04 |
| 1978 | 289.7 | 122.5 | 42.3 | 167.2 | 57.7 | 37.69 |
| 1969 | 315.2 | 111.4 | 35.3 | 203.8 | 64.6 | 8.80 |
| 1970 | 242.7 | 122.6 | 50.5 | 120.1 | 49.5 | -23.00 |

Source: Ministry of Planning, National Accounts 1962-1971.

**II) The Period 1971-1980:**

This period was marked by high oil prices and significant growth in the state's ability to spend. The government tried to use this financial surplus in the implementation of social and economic programs aimed at diversifying national income sources and reducing dependence on oil.

This period also marked by trend towards liberalization of the national economy from the dominance of foreign companies and the assertion of control of domestic capital to run the economy. Therefore, a package of legislation emerged such as the Act No. 65 of 1970 which required that the ratio of what was owned by Libyans in the capital of joint stock companies should be at least 51%, and the Act No. 80 in 1970, which provides the nationalization of insurance companies, in addition to the Act No. 153 in 1970 concerning the nationalization of foreign stakes in banks operating in Libya (Kanus et al., 1999).

With the beginning of the implementation of the three-year development plan (1973-1975), domestic investment witnessed a clear rise in the various economic sectors, the ratio of investment to GDP reached 26% during this plan, and ratio of public investment to total investment reached 79%.

The private sector played a prominent role in the development process, and the development plan clarified the respective roles of the public and the private sector. In the industrial sector, the government specialized in establishing strategic industries, and encouraging the private sector to establish small and consumer goods industries.

In the agriculture sector, the private sector managed agricultural land, and the government provided them with the required loans, and the machines needed. In this context, the government established "the Council of Agricultural Development", which took over supervision of agricultural projects in Libya (Ministry of Planning, Three-year plan for economic and social development 1973-1975, p.201).

In the area of trade, the government monopolized the import and export of essential goods such as finished goods and petroleum products, and allowed the private sector to import and export other commodities. The public sector also absorbed all investment in the finance sector, banks and insurance, and absorbed all investments spent on infrastructure projects.

The Five Year Development Plan (1976-1980) came to consecrate the dominance of the public sector in aspects of economic activity, although the private sector continued in engaging the economic activities in the areas of trade, services, agriculture and construction, but its role was reduced due to some legislation which identified its activity (National Authority for Scientific Research, 1992). This legislation represented the forefront of legislation that was subsequently issued, which increased government domination over all economic activities and abolished the role of the private sector in economic life in the 1980s: the public sector absorbed 87.8% of the total investment in the Development Plan 1976-1980.

Table 4-3 shows the total investment and the share of both the public and the private sector during the period 1971-1980 in the Libyan economy.

**Table (4-3)**
**Investment Spending Indicators in the Libyan Economy, 1971-1980**

In current prices and millions LD

| Year | Total Investment | Public Investment | Public % Investment | Private Investment | Private % Investment | Growth (total) |
|---|---|---|---|---|---|---|
| 1971 | 287.9 | 208.5 | 72.4 | 79.4 | 27.6 | - |
| 1972 | 436.5 | 337.9 | 77.4 | 98.6 | 22.6 | 51.61 |
| 1973 | 636.2 | 499.8 | 78.6 | 136.4 | 21.4 | 45.75 |
| 1974 | 979.4 | 780.5 | 79.7 | 198.9 | 20.3 | 53.94 |
| 1975 | 1054.7 | 834.2 | 79.1 | 220.5 | 20.9 | 7.68 |
| 1976 | 1225.9 | 1029.6 | 84.0 | 196.3 | 16.0 | 16.23 |
| 1977 | 1368.3 | 1171.5 | 86.0 | 196.8 | 14.0 | 11.61 |
| 1978 | 1532.0 | 1284.4 | 83.8 | 247.6 | 16.2 | 11.96 |
| 1979 | 1955.3 | 1772.6 | 91.0 | 182.7 | 09.0 | 27.63 |
| 1980 | 2756.8 | 2556.3 | 92.7 | 200.5 | 07.3 | 40.99 |

Source: Ministry of Planning (1984), National Accounts 1971-1980.

The table shows that most investments in economic sectors were implemented through the public sector, and its share amounted to about 85% on average of the total investments during the period 1971-1980, while the share of private sector was 15% on average. This ratio continued to decline gradually until the private sector almost disappeared with the beginning of the adoption of policy of socialism by the Libyan government at the beginning of the 1980s. The percentage of private investment continued in decline gradually between 1971 and 1980 to reach only 7.3%, in contrast, the percentage of public investment continued increasing during the same period to reach its peak of 92.7% in 1980. This is due, as noted earlier, to decisions of the government to give the public sector a greater role and reducing the role of the private sector. This policy was undertaken on the grounds that the Libyan economy needs first to establish the infrastructure and the requirements of major development, and then gradually allow the private sector to engage in economic activities. However, this did not happen before 1995, but beyond that economic activities became almost completely monopolized by the public sector: this was reflected in the proportion of public investment, which was in excess of 90% of total investment in most years.

**III) The Period 1980-1989:**

This period witnessed a dramatic economic transformation in terms of the transfer the private sector activities (industry, trade, hotel services, real estate investment, etc.) to public sector domination.

A number of measures were taken in this period which emphasized the domination of government over economic institution, such as workers taking control of companies and factories and forming popular committees to manage them, instead of the former owners. The nationalization of trade, real estate ownership and the abolition of land ownership occurred in the same period. The most important laws that supported these actions were Act No. 4 of 1978 on real estate ownership, Law No. 8 of 1984 on trading that prevented persons from doing business brokerage, and Act No. 7 in 1986 on the abolition of land ownership (National Authority for Scientific Research, 1992).

Due to these procedures and legislation, the national economy became fully managed by the public sector; the role of the private sector almost vanished and was limited to agriculture and pastoral and some small craft activities.

Government became responsible for the provision of all goods and services to citizens, as it absorbed the employment in the economy, thereby, public sector institutions dominated the internal and external economic activity in the country.

Despite the vast amount of investment that was intended to create an alternative source of revenue to oil, public projects continued to drain the public budget of the State (Al-Tabuli, 2004), due to the low rates of productivity in these projects, in addition to decisions to ease the burden unemployment over the economic needs of these projects.

However, this approach led to negative impacts on the national economy which can be summarized as follows:

• Private sector participation in total investment spending fell from 35% at the beginning of the 1970s to less than 9% in the mid-1980s, which led to a deficit in the public budget for meeting the needs of consumer and investment spending. This deficit amounted to 21% of GDP in 1986 and continued throughout the period 1980s and 1990s (Tulba and Efhema, 2004).

• The low level of returns on public sector projects, and the decrease in their contribution to financing the state's budget led to an increase in the public budget deficit, whereby the budget remained heavily dependent on future oil revenues, and the relative contribution of the production sector in the state's operating budget was only 2.5% in 2004. (Dagger, 2004).

• The significant decline in oil prices in the mid-1980s, coupled with the consequent rapid collapse in the ability of the government to spend, led to the cancellation or suspension of a lot of investment projects, resulting in an implementation rate of investment plans of 57.4% during the period 1986-1997 (Tulba & Efhema, 2004).

• The decrease in the transformation budget and the absence of new investments had a negative impact on the creation of additional jobs in the economy despite a steady increase in population. In addition there was a lack of investment from the private sector which could make up for shortfalls in public investment resulting in an increase in unemployment in the economy, which reached 10% at the beginning of 2001 (Al-Faituri, et al., 2002).

Government tried to intervene in the economy and took over tasks beyond its capacity, resulting in a dispersion of its efforts which caused it to ignore a lot of its basic functions, at the same time depriving all other economic forces of the opportunity to participate in the development process. Government relied initially on its spending ability to cover all the negatives and shortcomings that emerged as a result of adopting that approach.

However, with the decline in oil prices in the mid-1980s, the beginning of a deficit and the deterioration in institutions appeared, which prompted the government to take extraordinary measures such as restrictions on the sale and trading of foreign exchange, quantitative restrictions on imports, a quota system in the distribution of goods, and the freezing of wages and salaries. These measures resulted exacerbating the problem rather than treating it, which led to the emergence of black market goods, a devaluation of national currency, higher prices, and an increase the suffering of citizens.

The great changes witnessed by the world at the end of 1980s, such as the collapse of central planning systems and socialist economies, coincided with the pressure of business and financial institutions (such as IMF and WTO) on developing economies, through the terms of belonging to these institutions to carry out reform and restructuring, all of these factors resulted in the importance of the role that could be played by the private sector in economic activity.

Thus, the national economy entered a new phase in the period of the 1990s which marked a trend towards reducing the role of the government in economic activity and allowing the private sector to perform its economic role and participate in rebuilding the economy.

**IV) The period 1990s and beyond:**

This period witnessed a new economic orientation assimilated in reducing the role of government in economic life and giving an opportunity for the private sector to participate in various economic activities. A number of measures were taken to regulate and stimulate the private sector to invest in different economic sectors to overcome manifestations of weak economic performance and low growth rates.

These trends took two forms as follow:

**1)** The first trend succeeded in opening the door to the private sector to engage in economic activities individually or collectively (Tasharukeya), or by establishing joint-stock companies.

Under Act No. 8 of 1988, some small economic activities in the area of trade and distribution of goods and some craft activities resurfaced. But the continuation of government control over the core activities and foreign imports and exchange controls did not encourage the private sector to enter into the more important areas in the economy, which led to the enactment of Act No. 9 in 1992 to regulate economic activities. This Act opened the way for the private sector to engage in economic activity and set the bases and foundations for the establishment of public and joint-stock companies. In the same period, the General People's Committee issued Decision No. 43 of 1993 on the activities of wholesale trade, and No. 1 in 1993 concerning the banks, money and credit, which allowed individuals to establish banks and to open bank accounts in foreign currency (Kanus, et al, 1999).

However, the private sector remained cautious of the investment climate because of the uncertainty that surrounded the former laws and also because the government continued to adopt monetary, financial and trade policies which did not encourage investment. This made the contribution of the private sector in economic activity lower than the required level: the contribution of the private sector in total investment was less than 13% in 1999 (General Planning Council, National Accounts, 1986-2000).

This situation made the government enact more legislation in the second half of the 1990s aimed at improving the investment climate. The most important of these pieces of legislation were the amendments that occurred in the law of economic activities No. 9 in 1992, which was amended by the Act No. 21 of 2001, and further amended by Act No. 1 in 2004. The intent behind these improvements and amendments was to encourage private sector investment.

In order to achieve monetary stability in the economy, the Central Bank of Libya issued resolution No. 49 in 2001 to identify and unify the exchange rate of the Libyan Dinar, this resolution also allowed the sale of foreign currency through banks, which led to the elimination of the black market in foreign currency and to relative price stability in the economy.

Moreover, Government issued resolution No. 815 in 1994 encouraged workers in the administrative system of public institutions to shift towards production and to establish private economic activities.

2) The second trend was the privatization of public economic units, which either transferred control to their workers or put them to public subscription by citizens, through the issuance of Resolution No. 300 for 1993.

Despite this decision issued in 1993, there many difficulties were encountered in this policy, especially problems of debts and surplus employment in the units targeted for privatization.

Government also tried to apply the process of privatization by issuing a new regulation to transfer the ownership of companies and economic units to the private sector, under the resolution of the General People's Committee No. 31 of 2003. This regulation gave extensive powers to the board of transference public companies' ownership, including the evaluation of companies and identifying transfer methods and then overseeing the sale process with priority given to workers in such companies (Dagger, 2004). A set of operational procedures are attached in the regulation, including exemptions from customs duties and tax cuts (Al-Faituri, et al., 2002).

Requirements of success of the privatization program exist in providing the appropriate economic and legal environment , in addition to political volition and the desire to support this trend (Mgerbi, 2004), as it also requires knowledge of the economic variables affecting the decisions of investors, which can motivate them to participate in investment.

Due to the absence of these requirements, the attempts of reformation and restructuring did not show positive results and have not yet succeeded, and as a result there has been little change in the ratio of private investment to GDP, indeed this ratio did not exceed 2% in 2008, in addition, investment expenditure focused on home ownership, and the Investment production sectors (industry, agriculture) did not exceed 10% of total private investment.

### 4.5. Foreign Direct Investment in the Libyan Manufacturing Sector

#### 4.5.1. Introduction:

Foreign Direct Investment (FDI) has played an important role in supporting the growth of the economies of developing countries, especially during the 1980s and 1990s, which witnessed a significant increase in the volume of investment flows around the world, and gave an important impetus to global economic integration by contributing to linking capital markets and labour markets, and increasing wages and capital productivity in countries which received FDI.

Foreign direct investment is defined internationally, according to the Manual Preparation of Balance of Payments Statistics issued by the International Monetary Fund in 1993, "as an investment involving management control of a resident entity in one economy by an enterprise resident in another economy. FDI involves a long-term relationship reflecting an investor's lasting interest in a foreign entity".

Therefore, foreign investment can be defined as all the opportunities available to investors outside their national borders, which are considered as foreign investments by the host country. Regardless of whether made by a person or legal entity, or whether these investments are made either directly or indirectly, foreign direct investment denotes that the investor manages a foreign investment project in a place outside the geographical boundaries of his, her or its country, whether it is a productive or a service project. This kind of investment involves a long-term relationship, and partial or full ownership by the foreign investor of the project. As for indirect foreign investment, this occurs when an investor buys a stake in the portfolio of a local investment firm, without using the cash to purchase productive operation or production means.

The Libyan government recognizes the importance and necessity of foreign direct investment in achieving sustainable economic growth; it seeks to attract this type of investment, as it is committed in making improvements in the economic system. The government began to encourage foreign direct investment by providing tax incentives and other investment incentives; it also sought to integrate Libya into the global and regional economies through its accession to the WTO. There have been vigorous and continuous efforts by the government to encourage foreign investment in order to comply with the strategy of a broader and more comprehensive economy, which have focused on the development and improvement of the non-oil sector. Furthermore, many efforts have been made to carry out reforms to the trade environment to encourage and develop the domestic private sector, and attract foreign investors as well. Moreover, the Government aims to promote and strengthen the financial sector and increase the number of banks and create a financial market. This requires a national strategy for investment promotion which has a role in defining clear objectives for foreign direct investment which can be measurable. It is also necessary to identify a clear relationship between the objectives of foreign direct investment and the general objectives of the national development plan. Obstacles to investment must be removed, and local factors improved, because this remains important and essential to the success of Libya in attracting foreign direct investment. FDI should preferably be limited to the quality of investment that can be useful to the homeland and its citizens, and should ideally focus on technical and technological industries that benefit the country, such as large companies with high capital, which have experience in technology, energy, oil and gas, petrochemicals, electricity, water desalination and other advanced technology industries. It would also be desirable to support domestic investors and stand beside them, to facilitate their works with foreign investors by accessing solutions to satisfy all parties. Domestic investment must be shared with foreign investment; this will reflect positively on the national economy and citizens in terms of finding jobs and establishing industrial techniques.

The issue of foreign direct investment in Libya will be addressed in this chapter, in order to differentiate between foreign and domestic investments, as well as to give an idea of the status of foreign investment in Libya in terms of being a competitor or a support to domestic investment. Both types of investment are important for economic growth, therefore, it is economically desirable to encourage them, and not to neglect either of them, but through coordination between each one to act for the benefit of the national economy.

### 4.5.2. General Approach

#### 4.5.2.1. The purpose of foreign direct investment

Foreign direct investment takes many forms which vary according to the purpose for which this investment aims, and these purposes are summarized below (UNCTAD, 1999):

• Investment seeking for natural resources:

Many foreign companies seek to benefit from natural resources (raw materials) that are available in other countries, especially oil, natural gas and many other extractive industries. This type of investment encourages increased exports of raw materials, and increased imports of capital and consumer goods.

• Investment seeking for markets:

This type of investment dominated the manufacturing sector in developing countries in the 1960s and 1970s, during the application of the policy of import substitution; the reason for this presence of FDI in the host country was to overcome the restrictions imposed on imports. This type of investment can contribute to high growth rates in the host country by increasing capital stock, in addition to having expansible implications for trade in production and consumption by increasing the host country's exports, and increasing imports of production inputs and goods received.

• Investment seeking for manpower:

This type of investment occurs when foreign companies focus part of their activities in host countries in order to increase profitability; the higher levels of wages in industrial countries encourage some companies to invest in developing countries, to take advantage of low labour costs.

### 4.5.2.2. Forms of FDI

**I) Joint Venture investment** (Babaker, 2004):

A Joint Venture is a project owned or shared by two or more parties of different countries on a permanent basis; participation may include management, expertise, patents and trademarks. This type of investment involves the following aspects:

- Long-term spending between two or more investors, one is national and the at least one other is foreign for the exercise of productive activity within the host country (national).
- The national side may be a legal entity of the public sector or private sector.
- Purchase of a stake in a national company by a foreign investor can transform this company to a Joint Venture company.
- Participation in the investment project may be through the provision of expertise, knowledge, work and technology, and not necessarily through capital.
- Each of the investors has the right to participate in the management of the project.

However, although Joint Venture Investment is the most widely accepted form of FDI in developing countries, that is usually due to political and social reasons, for instance to reduce the degree of control of foreign companies on the national economy, and also to assist in the development of national ownership and creating new layers of national entrepreneurship.

**II) Wholly Owned FDI:**

This is an investment that is wholly owned by foreign investors, foreign companies generally favour this method. Some countries often hesitate to agree to this kind of investment for fear of economic dependency and the monopoly of foreign investors over local markets. However, this type of investment attracts more foreign investment, which can have a positive effect on the host country.

**III) Assembly Operations:**

This type of investment takes the form of an agreement between the foreign and the national sides, whereby the first side provides components for the second to assemble, to become a finished product, in addition, the foreign investor provides expertise or knowledge required for the manufacturing processes.

**IV) Investment in Free Zones:**

The establishment of free zones is designed to encourage the establishment of export industries, and countries endeavour to make their free zones attractive to investment through granting to investment projects many incentives, benefits and exemptions.

### 4.5.2.3. Advantages of foreign direct investment

Foreign direct investment plays a particularly vital role in the overall development efforts of developing countries, if these countries are able to guide and organize the layout of these investments successfully. It is possible, for example, to state the following (Wei & Balasubramanyam, 2004; Moran, 2006):

•FDI is a good source of currency and foreign capital, which represents a central part of most development programs in developing countries. Developing countries can use a portion of these funds to finance economic development and social projects.

•FDI can play an effective role in developing national ownership and creating new entrepreneurs in the future by contributing the project investment, construction of new projects or providing help to services, or supply of raw materials, or the distribution of the products of foreign investment projects.

•FDI is a good source and efficient method to transfer modern technology and techniques to the host countries; they represent a more effective way to attract technology, particularly for some types of industry such as quarrying, as well as at the level of a particular economic progress. The host countries can maintain their competitive position in foreign markets (exports) only if they produce new products at a relatively high level of technical sophistication, which should not be less than what is available in foreign markets.

•FDI helps in creating good and new opportunities for work, and also in the development and training of human resources in developing countries, although this depends on what the host country's regulations and procedures are to assist them in achieving these benefits.

•FDI helps in opening new markets for export, especially when foreign companies dominate the markets for some goods.

•Foreign companies are generally more skilled in the exploitation and organization of natural and human resources, with their administrative and technical capabilities which are not available to national companies in developing countries.

#### 4.5.2.4. Disadvantages of FDI in the view of some economists

According to some authors, the primary and direct effect of foreign investment on the balance of payment of the host country may be positive, due to the increase of the country's foreign exchange. In addition, foreign companies with their experience in international markets, and also thanks to the reputation of these companies in such markets, those companies allow the host countries more possibilities for penetration of export markets and increased export earnings. However, the effects on the balance of payments in the medium term often are negative, due to the following (Prasad and et al, 2003; Sakr, M, 1998):

•The positive effects on the balance of payments accompanying to flow of foreign direct investment will turn to negative effects when the activities of foreign companies lead to an increase in the host country's imports of intermediate goods and services; in this case, companies will transfer their profits and part of the salaries of foreign workers abroad.

•As a result of the pricing policy for exports and imports which is followed by foreign companies, especially in the case of vertical integration with a number of its subsidiaries, this may increase pressure on the payment balance of the host country, and the parent company may raise the price of goods and services provided by some of its branches, and may resort the pricing of exports of goods and services from some its branches to less than real value. This may be an attempt to shift the burden of taxes from a country with high rates of taxes to another with lower.

•Foreign companies usually have a monopoly or near monopoly situation in the markets of the host country, either as a result of producing unique items or if distinct alternatives are not available in those markets, or these companies absorb a large segment of the market demand for goods in the host country, which ensure the price leadership of the foreign companies.

### 4.5.3. FDI in the Libyan Economy

#### 4.5.3.1. Introduction

During the 1980s and 1990s, the government did not allow FDI in the economy, or allowed it only through limited ways, especially in the sectors of oil and strategic industries. The reasons behind this policy were the political vision of private economy, in addition to the adoption of the principles of the Third Universal Theory, which calls for public ownership. In 2002, Libya announced that it would allow foreigners to invest directly in the country as part of an effort to reduce the government's dominant role in production and services.

International economic changes and rises public costs made the Libyan government adopt a policy of so-called 'popular capitalism' (Hawat, 2004), this policy was also intended to achieve the goal of diversifying sources of income, and ending reliance on oil as a sole source. To achieve this, the Government reached the conclusion that it could rely on foreign direct investment and the private sector for investment in non-oil sectors. This led to the development of a legal framework for the private sector economy and foreign investment in Libya, and a series of economic and legal measures to regulate the work of these institutions. These measures are mainly based on the search for a variety of sources of national income and improving the productive capacity in industry, agriculture and services. This could be achieved (according to the Government; see Hawat, 2004) through the adoption of several strategies including foreign direct investment, partnership between foreign investors and Libyans, as well as encouraging Libyan investors to invest in other countries.

**4.5.3.2. The legal framework for foreign direct investment in Libya.**

Law No. 5 for the year 1997 concerning encouragement of FDI was a gesture toward opening the way for foreign investment in Libya (For more information about this law, see Law No. 5 for the Year 1997; Ben-Gebleya, 2006; Otman & Karlberge, 2007). This law aimed to encourage the investment of foreign capital for establishing projects within the framework of State policy, and the objectives of economic and social development, especially regarding the transfer of modern technology and diversification of income sources.

Also, the law determined forms of foreign investment; which had to be in one of the following forms: convertible foreign currency or its equivalent, received through formal banking methods; machinery, equipment, appliances and spare parts and raw materials needed for the investment project.

Following this law the Government established the Privatization and Investment Board (PIB), which enjoys independent legal authority, and the Ministry of Economy, Trade and Investment. The most important conditions covered by the law and which must be complied with by investment projects are: the production of goods for export or contributing to increased exports; in addition, providing job opportunities for Libyan labour and equipping them with technical skills and expertise.

The law also addressed the areas that foreign entities are permitted to invest in, such as industry, health, tourism, services, and agriculture, and contains advantages granted to the investment projects including:

•Exemption of machinery, equipment and devices necessary to implement the project from all customs duties and taxes imposed on imports.

•Exemption of equipment, spare parts and raw materials necessary for the operation from all customs duties and taxes.

•Exemption of the project from income tax on its activities for a period of five years from the date of production commencement, which may be extended by a period of additional years by a decision of the General People's Committee.

•It also prevents the disposal of machinery and equipment, machinery and spare parts and resources imported for the project by selling or abandonment without the consent of the PIB.

Moreover, the law established a set of rights for the investor, including:

•The investor has the right to re-export capital invested in the following cases: the end of the project period, the liquidation of the project, the sale of the project in whole or in part, after a period of time not less than five years from the project starting date.

•The investor has the right to retransfer foreign capital outside Libya in the same manner which it was imported, that after the expiry of six months if difficulties or circumstances beyond the control of the investor prevent the project's completion.

• The project is allowed to transfer net profits and earned interest abroad.

•The investor has the right to use foreign workers when there is no alternative available from the national labour force.

•Investor has the right to transfer ownership of the project in whole or in part to another investor following the PIB's approval.

However, the law set the minimum requirements for foreign investment to be $US 50 million or its equivalent in a convertible currency, with the exception of national capital and Libyan companies owned by foreigners.

The Central Bank of Libya issued resolution No. 28 of 2004, which provides for allowing the commercial banks in Libya to grant credit facilities to foreign companies and foreign investors, as well as to establishing a stock market; moreover, the General People's Committee issued Decision No. 4 of 2004 establishing chambers of commerce and industry.

However, the decision of the General People's Committee No. 13 for the Year 2005 specified a list of activities permitted for foreign companies in Libya, these are as follow: contracting and civil works, electricity sector, oil field sector, communication sector, industry sector, surveying and planning sector, environmental protection sector, computer and IT sector, consultancy and technical studies field, and health sector (see Appendix (A) for more details).

### 4.5.3.3. FDI Inflows to the Libyan Economy

Arab countries which are still exporting oil come on top of the list of countries most attractive to foreign direct investment, among Middle East countries. This is due to the actions taken by these countries in the past few years, which have come to fruition. Libya came in fifth place between Arab countries in 2007 and 2008 with a volume FDI flow of 2.54, 4.11 billion dollars respectively. This is due to Government efforts to improve the investment environment, particularly with regard to facilitating the procedures for establishing companies and reducing the size of bureaucracy and a significant reduction in the rate of tax.

The figures in Table 4-4 show that the proportion of FDI inflows in Libya as a proportion of all Arab countries rose from 3.5% to 9.7%, while there was a decrease in the proportion of investments in Arab States as proportion of the whole world from 3.9% to 2.5%, while at the same time, the world witnessed a drop in value of investments from 1.8 to 1.6 trillion dollars.

**Table (4-4)**
**FDI Inflows in Selected Arab Countries**

Millions of dollars

| Country | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| Jordan | 621 | 1532 | 3121 | 1835 | 1954 |
| UAE | 10004 | 10900 | 8386 | 13253 | 13700 |
| Kuwait | 24 | 250 | 110 | 123 | 56 |
| Egypt | 2157 | 5376 | 10043 | 11578 | 9495 |
| Tunisia | 639 | 762 | 3312 | 1618 | 2761 |
| Libya | 357 | 1038 | 2013 | 2541 | 4111 |
| Morocco | 1070 | 2446 | 2898 | 2577 | 2388 |
| Total Arab State | 23219 | 44103 | 61878 | 72368 | 42319 |
| World | 742143 | 958697 | 1411018 | 1833324 | 1697353 |
| Arab States/ World % | 3.1 | 4.6 | 4.4 | 3.9 | 2.5 |
| Libya/ Arab States % | 1.5 | 2.3 | 3.2 | 3.5 | 9.7 |

Source: UNCTAD, World Investment Report 2008, 2009. Annex Tables B.1 FDI flows by region and economy.

The ratio of FDI to GDP reflects the importance of this investment flow to economic growth and consequently the extent of its impact on the host country's economy. Despite the low proportion of foreign investment in Libya (Table 4-5), it increased from 0.82% in 2004 to 4.4%, and this indicates that the government started paying more attention to foreign direct investment and its importance in economic growth and development in Libya.

**Table (4-5)**
**The importance of FDI as a percentage of GDP in the Libyan Economy**

| Year | FDI | GDP | FDI/GDP % |
|---|---|---|---|
| **2004** | 357 | 43445.9 | 0.82 |
| **2005** | 1038 | 59157.4 | 1.75 |
| **2006** | 2017 | 72031.9 | 0.30 |
| **2007** | 2541 | 81363.7 | 3.12 |
| **2008** | 4111 | 92724.8 | 4.4 |

Source: FDI data from UNCTAD, World Investment Report 2008, 2009. Annex Tables B.1 FDI flows by region and economy., GDP data from General Authority for information, Statistics Book.

### 4.5.3.4. The Operational Position of FDI's Projects in Libya

Foreign projects in Libya are distributed throughout a set of economic activities concentrated mostly in the industrial sector, which includes 74 projects, 37 of them have entered the operational phase, and 37 more are under implementation. This is followed by tourism activities, which included 56 projects, 36 of them have entered the operational phase. As shown in Table 4-6, the lowest number of these projects is in agricultural activity, which includes only 2 projects in the operational phase. These projects altogether provide 17941 jobs, including 12251 for nationals (68% of total employment in FDI's projects), in addition to 4788 jobs for foreign workers.

**Table (4-6)**
**The Position of FDI's Projects and Labour force in Libya**

| Activity | Companies in the operational phase | Companies under implementation | Total |
|---|---|---|---|
| Industry | 37 | 37 | 74 |
| Health | 8 | 6 | 14 |
| Tourism | 36 | 20 | 56 |
| Agriculture | 2 | - | 2 |
| Services | 13 | 10 | 23 |
| Real estate Investment | - | 4 | 4 |
| Total | 96 | 77 | 173 |
| National Employment | 5690 | 12251 | 17941 |
| Foreign Employment | 1242 | 3546 | 4788 |
| Total | 6962 | 15823 | 22785 |

Source: Investment Promotion Board, Section of Follow-up Projects Report, 2007.

### 4.5.3.5. The size of investments

Table 4-7 shows the size of investments distributed to projects according to economic activity, including projects that have started operation, under corporation and under construction. It is clear from the table that industrial activity accounted for the majority of foreign investments, which represented 32% of total investment, at the same time; investments did not exceed 0.15% of agricultural activities. The number of FDI's projects and their investment size according to year are shown in Table 4-8.

**Table (4-7)**
**Size of Investment in accordance with the Operational Status**

| Position of Projects | Number | Percentage | Investment (million L.D) |
|---|---|---|---|
| started operation | 96 | 36.75 | 610.762 |
| under corporation | 77 | 29.48 | 8843.145 |
| under construction, | 92 | 33.76 | 26398.008 |
| Total | 265 | 100.00 | 35851.916 |

Source: Investment Promotion Board, Section of Follow-up Projects Report, 2007.

**Table (4-8)**
**Number of FDI's Projects and its Investment**

| Year | Number of projects | Percentage | Investment | | | |
|---|---|---|---|---|---|---|
| | | | US$ | its equivalent in L.D | Libyan Dinar | Total (L.D) |
| 2000 | 1 | 0.38 | 95,500,000 | 124,150,000 | 0 | 124,150,000 |
| 2002 | 18 | 6.89 | 88,097.373 | 114,526,586 | 31,485,124 | 146,011,710 |
| 2003 | 10 | 3.85 | 77,810,922 | 101,154,199 | 29,283,349 | 130,437,548 |
| 2004 | 32 | 12.24 | 810,002,857 | 1,053,003,717 | 191,752,292 | 1,244,756,009 |
| 2005 | 56 | 21.42 | 2,468,167,166 | 3,208,617,319 | 1,214,113,678 | 4,422,730,997 |
| 2006 | 70 | 26.78 | 1,881,942,710 | 2,446,525,521 | 1,005,132,212 | 3,451,657,733 |
| 2007 | 78 | 28.43 | 15,323,626,095 | 19,920,713,923 | 6,411,458,320 | 26,332,172,243 |
| Total | 265 | 100.00 | 20,745,147,123 | 26,968,691,265 | 8,883,224,975 | 35,851,916,240 |

Source: Investment Promotion Board, Section of Follow-up Projects Report, 2007.

### 4.5.3.6. Foreign investments in Libya at the national level

As shown in Table 4-9, the Island of Anguilla accounted for the largest proportion of investments in Libya ($US1625.00 million), equivalent to (LD2112.50 million); these investments were in the refining of oil through a company named Zwara for Crude Oil Refining. UAE came in second place, investing ($US 813.97 million) through 11 projects, mostly in the area of real estate investment, building and construction, foodstuff, building materials industry, and engineering industries. The UK is ranked third in terms of value of investments which amounted to $US 549.289 million, mostly in the metallurgical industry through the Delta Co. aluminium industry, and tourism services through the Tourist Green City project. Table 4-9 shows the size of foreign direct investment in Libya at the national level.

**Table (4-9)**
**Size of foreign investments for projects entered operation, and under implementation distributed according to countries (2007)**

| S.N | Country | Projects Number | US$ | Libyan Dinar |
|---|---|---|---|---|
| 1 | Algeria | 1 | 328170 | 426621 |
| 2 | Austria | 1 | 1717392 | 2232610 |
| 3 | Bahrain | 1 | 3338461 | 4339999 |
| 4 | Belarus | 1 | 7940307 | 10322399 |
| 5 | Belgium | 2 | 3555538 | 4622200 |
| 6 | Bosnia | 1 | 2972384 | 3864099 |
| 7 | Canada | 2 | 3896185 | 5065041 |
| 8 | China | 3 | 44794954 | 58233440 |
| 9 | Cyprus | 5 | 36677483 | 47680728 |
| 10 | Egypt | 6 | 17391967 | 22609558 |
| 11 | France | 3 | 11504155 | 14955402 |
| 12 | Germany | 4 | 14739873 | 19161835 |
| 13 | Gibraltar | 1 | 110769231 | 144000000 |
| 14 | Greece | 2 | 5933462 | 7583501 |
| 15 | India | 1 | 3832950 | 4982836 |
| 16 | Iraq | 1 | 4500000 | 58500000 |
| 17 | Island of Anguilla | 1 | 1625000000 | 2112500000 |
| 18 | Italy | 11 | 59276687 | 77059696 |
| 19 | Jordan | 3 | 7362941 | 971824 |
| 20 | Kuwait | 1 | 2287175 | 2973328 |
| 21 | Libya | 11 | 44433514 | 57763570 |
| 22 | Malta | 7 | 232968062 | 302858481 |
| 23 | Mauritius | 1 | 158856154 | 206500000 |
| 24 | Morocco | 2 | 5063077 | 6582000 |
| 25 | Netherland | 2 | 11222709 | 14589522 |
| 26 | Panama | 2 | 258923076 | 336599998 |
| 27 | Qatar | 2 | 12383076 | 16097999 |
| 28 | Saudi Arabia | 2 | 379231 | 4900000 |
| 29 | Slovakia | 1 | 484000 | 629200 |
| 30 | South Africa | 1 | 29428462 | 38257001 |
| 31 | South Korea | 1 | 15000000 | 19500000 |
| 32 | Spain | 2 | 1699753 | 1209679 |
| 33 | State of Bahamas | 1 | 2733077 | 3553000 |
| 34 | Switzerland | 7 | 201416214 | 261841079 |
| 35 | Syria | 1 | 1000000 | 1300000 |
| 36 | Tunisia | 21 | 139346236 | 181150108 |
| 37 | UAE | 11 | 813970359 | 1058161468 |
| 38 | UK | 17 | 549289069 | 714075789 |
| 39 | USA | 3 | 26328606 | 34227188 |
| | Total | 146 | 4476023990 | 5818831199 |

Source: Investment Promotion Board, Section of Follow-up Projects Report. 2007.

#### 4.5.3.7. FDI projects in the manufacturing sector

There are 38 foreign investment project within the manufacturing sector which have entered the operational phase, including 12 projects in the field of food industries, 12 in the field of engineering industries, 7 in the chemical industry, 4 in the field of building materials, 1 in textile industries, 1 in the furniture industry, and 1 in paper-making, these figures being for the end of 2007.

Table 4-10 shows that total foreign investments in the manufacturing sector were LD 331,110 millions until 2007, mostly in engineering and food industries, which accounted for 86% of the total investment in this sector.

**Table (4-10)**
**Investment Projects within the Manufacturing Activity**

Million L.D

| Activity | Number of projects | Investment | Percentage |
|---|---|---|---|
| Food Industry | 12 | 119.171 | 34 |
| Chemical Industries | 7 | 19.069 | 5.7 |
| Textile industries | 1 | 1.474 | 0.4 |
| Engineering Industries | 12 | 186.528 | 54.0 |
| furniture industry | 1 | 1.775 | 0.5 |
| Paper-making | 1 | 1.300 | 0.4 |
| Building Materials | 4 | 19.791 | 5.0 |
| Total | 38 | 331.110 | 100.00 |

Source: Investment Promotion Board, Section of Follow-up Projects Report, 2007.

Most investments in the manufacturing sector concentrated in the manufacture of soft drinks, which accounted for 74% of the total investment in this activity. Regarding the activity of engineering projects, car assembly and the formation of minerals accounted for nearly 68% of the total investment in this activity.

In addition, there were eight other projects within manufacturing activity under incorporation, their investment value reached LD 107.07 million, one of them in the field of furniture industry, and seven in the building materials industry.

### 4.5.3.8. Foreign investment projects in the manufacturing sector according to the source of capital invested

**I) Projects with 100% foreign capital:**

There are 13 projects in operation in manufacturing with capital equivalent to LD 147,142,360, mostly concentrated in the manufacture of soft drinks (32% of total investments), and in assembling cars (44%) through the Factory of Tajoura for car assembly (IVECO), and the Africa Company for the manufacture of soft drinks.There are also 7 projects under implementation; the most important is Jiangyin San Yuan Iron and Steel Co., Ltd. with a capital equivalent to 74% of the total investment under implementation with 100% foreign capital.

**II) Projects with joint capital (national and foreign):**

There are 26 projects in the area of manufacturing in operation with a joint capital of L.D 195,356,695, 31% of these investments are in the manufacture of food commodities, 25% in the manufacture of metal forming, and the rest in the chemical industry and other.

There are 30 projects under implementation with a joint capital LD 3,738,589,964, 65% of foreign investment, mostly concentrated in the petrochemical industry through the company of Zwara for Crude Oil Refining, which accounted for 87% of the total joint investments under implementation. A joint report by the European Commission and the U.S. Office (Schlumberger) for the year 2008 refers to the fact that there is significantly increased activity in the Libya Geo-Market, including a strong demand for artificial lift products and for drilling & measurements (Schlumberger, 2008).

**III) FDI in the Libyan manufacturing sector by nationality and activities:**

Table 4-11 shows foreign direct investment in the manufacturing sector by nationality and activities: as can be seen in the table, the UK is in first place with a value of LD 2378.94 million, 99% of these investments in the mineral industry, specifically the aluminium industry.

United Arab Emirates came in second place, with investment of LD 2070.10 million in several industrial activities, the most important of which is the iron and steel industry, which accounted for 60% of these investments.

Italy came third in terms of investment with LD 617.63 million in various industrial activities; the most important of these industries is building materials, which accounted for more than 89% of total Italian investments in the Libyan manufacturing sector.

Egyptian investment in the Libyan manufacturing sector amounted to LD493.45, mostly (97%) in the building materials industry.

It is noted that most foreign investments were concentrated in the areas of metal and building materials industries, this may be due to the Libyan market need for such products for the purpose of bridging a gap in supply.

## Table (4-11)
## FDI in the Libyan Manufacturing Sector at the State Level and Activities

Millions Libyan Dinars

| Country | Building Materials | Chemical Industries | Food Industry | Textile industries | furniture industry | Paper-making | Engineering & Metals | Glass Industries |
|---|---|---|---|---|---|---|---|---|
| Spain | 55.51 | 0.77 | | | | | | |
| Jordan | 10.40 | 12.06 | | | | 1.54 | 0.21 | |
| Bahrain | 4.34 | | | | | | | |
| Bosnia | | | 3.86 | | | | | |
| Algeria | | 0.43 | | | | | | |
| Saudi | | | | | | | 3.90 | |
| China | | | 3.10 | | | | 55.16 | |
| Germany | 14.66 | | | | | | 5.43 | |
| Morocco | | 4.81 | 1.77 | | | | | |
| Austria | | | | | | 1.37 | 2.23 | |
| Greece | | 1.42 | | | | | 6.20 | |
| USA | | 0.35 | | | | | 30.00 | |
| Italy | 530.00 | 1.30 | 42.65 | 2.77 | | | 40.91 | |
| UK | 1.62 | | 27.55 | | | | 2377.30 | |
| Belgium | | | | | | | 0.60 | |
| Turkey | 3.00 | | 10.00 | | | | 19.56 | |
| Tunisia | 28.55 | 5.18 | 21.96 | 5.74 | | 2.65 | 18.83 | |
| Belarus | | | | | | | 10.32 | |
| Slovakia | | | | | | | 2.87 | |
| Switzerland | | | | 0.85 | | | 19.50 | |
| Cyprus | 3.10 | | 48.07 | | | | 2.60 | |
| Canada | | | 2.60 | | | | | |
| Malta | 7.57 | | 25.10 | | | | 2.55 | |
| Egypt | 482.12 | 3.30 | | | 2.53 | 3.65 | 0.80 | 1.05 |
| Netherlands | | | 8.16 | | | | | |
| S. Korea | | | | | | | 19.50 | |
| UAE | 413.70 | 352.56 | 49.77 | 8.66 | | | 1245.40 | |
| Kuwait | | 2.98 | | | | | | |
| Portugal | | | 39.10 | | | | | |
| India | 129.84 | | | | | | | |
| Ukraine | | | 3.50 | | | | | |
| Syria | | | 1.30 | | | | | |
| Iraq | 5.85 | | | | | | | |
| Panama | | | | | | | 26.76 | |
| Gibraltar | | | | | | | | 144.00 |
| Croatia | | | | | | | 3.50 | |
| Lebanon | 40.63 | | | | | | | |

Source: Investment Promotion Board, Section of Follow-up Projects Report, 2007.

#### 4.5.3.9. Proposed Policies to Attract FDI to the Libyan Economy

Before exploring the policies proposed to attract investment, it is necessary to display the most important obstacles facing foreign investors when they desire to invest in Libya, these constraints are:

- Lack of industrial zones equipped with basic facilities and infrastructure to facilitate the resettlement of industrial ventures in most areas.
- Lack of an investment map on the locations of available raw materials which could be used to develop projects.
- The need to sign several agreements to ensure the protection of investment.
- The reluctance of some international financial institutions to finance foreign investments in Libya .
- Lack of data and statistics required by foreign investors to evaluate investment opportunities.
- Difficulty in obtaining visas for foreign investors.
- Weak financial and technical capability of the local investor compared to participating foreign investor.
- Lack of media propaganda to show Libya as an attractive area for foreign investment.

Given to studies on experiences of developing countries in attracting foreign direct investment, some appropriate policies could be formulated to attract foreign direct investment to Libya. These policies are divided into two parts, general and specific attraction policies, as follow:

**I) The most important general economic policies which help to create the climate for foreign investment:**

- Create policies based on the free market with a minimum of government intervention, with prices to be determined by market forces, and the institutions having their own freedom to work without prejudice to the public sector.
- Provision of foreign exchange in quantities that ensure the implementation of foreign investment projects.
- Provision of a package of positive incentives that will attract foreign investment such as: tax incentives, ease and speed of the completion of procedures, development of skills of workers, improvement in the level of infrastructure.
- Intensify efforts to cooperate with international organizations that have a role in the promotion of investment projects (such as International Agency for Investment

Guarantee under World Bank, Arab Institution for Investment Guarantee, and Authority of Consulting Services for Foreign Investment under the World Bank).

- Create a database on the distribution of foreign investment among economic sectors.

**II) The most important specific economic policies which help to create the climate for foreign investment:**

a) In the financial field:

- The need for a securities market.
- Development of the banking system so that contributes to development projects.
- Consolidation of the relationship and re-instilling confidence in foreign funding institutions as a guarantor for foreign investment.

b) In the economic field:

- Encourage the private sector.
- Encourage competitiveness.
- Improve and increase savings rates.
- The need of establishment of free zones in Libya linked to foreign investment.
- Liberalization of foreign trade.
- Separation between policy of encouraging foreign investment and policies of the government.
- The need to find specific projects, studied economically to promote them for attracting foreign investment.

c) In the administrative field:

- The necessity of stable administrative structure in Libyan institutions.
- Interest in training, particularly training and rehabilitation of administrative bodies in Libya to reduce the level of bureaucracy.
- Consistency of laws and their clarity, with clarity and stability of policies and procedures.

## 4.6. Summary and Conclusions

Although public investment has been the key engine driving economic activity in Libya, the Government has paid attention to the importance of the role that can be played by private investment in many economic areas which were previously monopolized by government institutions, thereby easing the burden on the public budget and overcoming many problems faced by public sector institutions.

Therefore, the government moved to take action to transfer the ownership of some public enterprises to the private sector through the privatization policy, through the issuance of a series of laws and regulations.

International economic changes, rises in public costs and also the aim of achieving the goal of diversifying sources of income made the Libyan government develop a legal framework for the private economy and foreign direct investment in Libya, searching for a variety of sources of national income and improving the productive capacity of economic activities.

Libya recently turned towards FDI in many areas and through different countries; this procedure may make the domestic industry vulnerable to developed and sophisticated foreign competition. But the fact is that advanced foreign industry may help the progress and development of local industry through friction and competition and providing expertise

Although most foreign investment in manufacturing has been in the soft drinks industry and metal & building materials industries, there are many investment projects in other industrial areas of importance to the national economy such as the Italian and Egyptian investments in building materials, UAE in iron and steel and the UK investment in aluminium. For instance, investment by the United Kingdom by establishing an aluminium plant helps in the spread of this industry and its development in the country, through the use of these products which gains experience and skills formation.

Foreign investment is considered a tool for helping in development of domestic industries to make them competitive, and enable them to become exporting industries that are a source of foreign exchange and an engine of the national economy. Government's interest in FDI should not be at the expense of domestic investment, but must support and provide the domestic industries with skills and modern production methods so as to create successful export industries. It is economically feasible for Libya the use FDI in favour of the modern theory in the interpretation of these investments which operate as a transfer of modern, sophisticated technology, and thus the modernization of production, creating better opportunities for export, while also contributing to reducing imports, and thus reducing the deficit in balance of payments in developing countries. Furthermore, through the more efficient use of material resources, and human resources available in developing countries, this also works to contribute to the training of the local workforce, and helps them acquire multiple experiences. Foreign direct investment also has an effect on the use of new areas of production, marketing, and management which contributes to creating networked relationships between sectors in the economy.

There are many factors that limit the usefulness of foreign investment in Libya, for example we find the absence of experts and professionals in the field of development of investment, and the reason for this is the absence of de facto independence in the recruitment of qualified users and specialists.

Foreign direct investment in Libya has not yet reached the desired level both in terms of size and in terms of providing jobs despite new legislation and incentives for the development and promotion of FDI. In the light of this situation, the Libyan government is claiming to speed up its economic reforms, initiating, and putting into practice a real policy of development of investment, especially foreign, based on identifying and clarifying the various advantages conferred on those investments, and especially the size of the domestic market, and the level of industrial performance, and the advantages that result from its privatization program.

# Chapter 5

# Development of the Manufacturing Sector in Libya

## 5.1. Introduction

Because one of this study's objectives is to study the determinants of investment in the Libyan manufacturing sector, it is necessary to illustrate the nature of this sector in terms of the objectives assigned, as well as some economic characteristics important for this sector such as its contribution to GDP, per capita GDP, employment, production and sales.

As well as illuminating the evolution of investment in the manufacturing sector from 1962 to 2008, there are two reasons to start from the year 1962: the lack of sufficient data before this date, as well as the Libyan government's policy toward a strategy of increased industrialization after 1970. This chapter gives a general overview of investment in Libya, and aims to introduce the investment climate in various forms: private; public; domestic. Considering that the main objective of the study is to analyze the determinants of domestic investment, this chapter focuses on a study of domestic investment in the Libyan economy and manufacturing sector, and on the development of the manufacturing sector in Libya.

## 5.2. The Structure of Libyan Manufacturing:

The most important characteristic of the period 1962-1969 is government's interest in developing infrastructure in Libya, with emphasis on providing basic commodities such as food, housing and various services, This period witnessed the first five-year plan which focused on raising the standard of living and economic stability.

As stated previously, the role of industrial activity until 1970 was marginal in the Libyan economy; it depended on individual initiatives that gave priority to activities which generated fast profit. This impacted on the structure of industrial activity, which was reflected in the preponderance of small industrial units with limited capacity in that period. The economic and social development plans in Libya during the period 1970-2007 focused on the transformation of the national economy to a productive economy. To achieve this, the government focused on the implementation of large-scale manufacturing projects by the public sector (the private sector does not usually invest in such projects as these due to the magnitude of investments required or to a monopoly by the government).

In this regard, the manufacturing sector adopted a set of goals that can be summarised as follow:

1- The increase of the contribution of the manufacturing sector to diversifying the sources of national income.
2- The increase of the sector's contribution to GDP.
3- The satisfaction of consumption needs by substituting locally-made products for imported goods.
4- Export orientation.
5- Exploitation of the resources which are available locally.
6- Adoption of heavy industries.
7- Creation of new jobs in manufacturing.
8- Creation of spatial and human development which aims to populate all regions of the country.

In accordance with the International Standard Classification of all economic activities, this sector consists of all the production units operating in the area of the transform of materials or components into new products, either by machine or hand, and whether in a factory or as a cottage industry. In Libya, the General Planning Council and the General Authority for Information class the enterprises operating in this sector depending on their size, small or large. A large enterprise is defined as employing ten workers or more, while small enterprises are defined as employing fewer than ten workers. In 2007, there were 16,750 enterprises classified as small, and 864 as large factories (General Authority for Information, 2007, p. 191).

### 5.3. Contribution to GDP

This indicator is useful to assess the extent of development reached by the manufacturing sector in the productive structure of the Libyan economy. The contribution of the manufacturing sector to GDP increased from less than 1.8% in 1970 to 9.1 % in 1990, then decreased to about 5.3% in 2008 (Table 5-1 ). As can be seen from the same table, it is clear that the percentage of contribution remained relatively modest despite its high value if we compare the percentage of the contribution of the manufacturing sector to GDP with other sectors such as services and agriculture.

The contribution of manufacturing fluctuated and witnessed a decline in some years, and did not exceed 10.5% during the period 1978-2006. However, this pattern is mainly due to the great importance given to the oil sector and the increase of its share in GDP.

**Table (5-1)**
**The Structure of Non-Oil GDP 1978-2008 (Percentages)**

| Year | Agriculture | Manufacturing | Total Commodity Sectors except Oil | Construction | Services | Non-oil Sector | Total Sectors except Oil | Oil Sector |
|---|---|---|---|---|---|---|---|---|
| 1978 | 4.5 | 5.5 | 11.3 | 35.9 | 19.2 | 33.6 | 48.9 | 51.1 |
| 1979 | 4.6 | 6.1 | 12.0 | 34.6 | 18.9 | 34.5 | 40.2 | 59.8 |
| 1980 | 5.9 | 5.2 | 12.3 | 39.0 | 18.9 | 29.7 | 38.2 | 61.8 |
| 1981 | 6.2 | 5.7 | 13.1 | 35.1 | 21.7 | 30.1 | 50.0 | 50.0 |
| 1982 | 6.1 | 5.7 | 13.0 | 36.4 | 18.2 | 32.4 | 52.6 | 47.4 |
| 1983 | 6.5 | 7.0 | 14.8 | 33.3 | 17.1 | 34.7 | 55.1 | 44.9 |
| 1984 | 7.0 | 7.9 | 16.1 | 30.9 | 15.3 | 37.8 | 58.9 | 41.4 |
| 1985 | 7.9 | 9.7 | 18.7 | 29.0 | 19.0 | 33.4 | 55.4 | 44.6 |
| 1986 | 8.8 | 8.2 | 18.4 | 25.1 | 24.0 | 32.5 | 62.7 | 37.3 |
| 1987 | 9.9 | 8.1 | 19.7 | 26.2 | 23.8 | 30.3 | 70.7 | 29.3 |
| 1988 | 9.2 | 8.6 | 19.6 | 23.7 | 21.5 | 35.1 | 74.6 | 25.4 |
| 1989 | 8.6 | 8.0 | 18.6 | 23.8 | 21.2 | 36.5 | 71.4 | 28.6 |
| 1990 | 9.7 | 9.1 | 20.9 | 25.1 | 21.5 | 32.5 | 60.7 | 39.3 |
| 1991 | 9.6 | 8.4 | 20.0 | 21.7 | 20.0 | 38.4 | 64.6 | 35.4 |
| 1992 | 10.0 | 8.8 | 20.8 | 21.8 | 18.5 | 38.9 | 68.3 | 31.7 |
| 1993 | 10.6 | 10.5 | 23.2 | 22.4 | 20.7 | 33.8 | 73.1 | 26.9 |
| 1994 | 12.2 | 8.9 | 23.2 | 22.1 | 20.2 | 34.5 | 70.1 | 29.9 |
| 1995 | 12.8 | 10.2 | 24.8 | 21.9 | 20.6 | 32.7 | 68.3 | 31.7 |
| 1996 | 12.8 | 8.4 | 23.5 | 22.6 | 21.2 | 32.7 | 67.9 | 32.1 |
| 1997 | 13.6 | 8.8 | 24.6 | 22.3 | 20.2 | 32.9 | 67.4 | 32.6 |
| 1998 | 14.2 | 7.9 | 24.1 | 21.8 | 20.3 | 33.8 | 77.9 | 22.1 |
| 1999 | 14.4 | 8.6 | 25.2 | 22.7 | 20.0 | 32.2 | 71.9 | 28.4 |
| 2000 | 13.4 | 8.3 | 24.5 | 23.3 | 19.1 | 33.1 | 58.0 | 42.0 |
| 2001 | 12.3 | 7.8 | 22.8 | 23.4 | 20.0 | 33.7 | 62.5 | 37.5 |
| 2002 | 11.0 | 6.6 | 20.8 | 25.0 | 20.4 | 33.9 | 47.4 | 52.6 |
| 2003 | 10.8 | 6.0 | 19.6 | 24.0 | 20.6 | 35.9 | 40.3 | 59.7 |
| 2004 | 10.0 | 5.3 | 18.3 | 24.3 | 20.0 | 37.3 | 34.5 | 65.5 |
| 2005 | 9.5 | 4.9 | 17.5 | 25.6 | 21.2 | 35.7 | 30.0 | 70.0 |
| 2006 | 7.4 | 4.5 | 18.0 | 26.0 | 21.6 | 35.0 | 27.7 | 72.3 |
| 2007 | 6.7 | 4.9 | 17.0 | 27.0 | 22.0 | 35.1 | 33.0 | 67.0 |
| 2008 | 6.4 | 5.3 | 18.3 | 27.8 | 22.3 | 35.6 | 30.5 | 69.5 |

Source: General Planning Council. Economic and Social Indicators. (1962-2000). 2001; (2001-2006). 2007.
2007, 2008 data from Central Bank of Libya, annual report and economic bulletin 2009.

### 5.4. Per Capita GDP in the Manufacturing Sector:

Per capita output of manufacturing is an indicator used to study the development of the manufacturing sector generally; and it is complementary to the share of manufacturing in GDP at any given period. As shown in Table 5-2, the per capita GDP of manufacturing increased from LD90.7 in 1970 to LD234.1 in 1990. It decreased to L.D177.4 in 1994 due to a decrease in GDP, as well as an increase in the rate of the population which negatively affected per capita GDP growth as it recorded a negative rate. The relatively larger increase in population size led to the reduction in the per capita GDP of manufacturing to LD155.6 in 1997. Continuous increases in GDP which were greater than the increases in the rates of population led to a rise in per capita GDP until it reached L.D456.8 in 2004. There was a steady increase in per capita GDP over subsequent years to reach L.D656.9 in 2008, the highest value during the years of the study. Manufacturing output per capita in 2008 was 2.8 times higher than in 1990.

**Table (5-2)**
**Per Capita GDP of the Manufacturing Sector 1970-2008**

At a constant prices of 1997

| Year | Manufacturing GDP Million LD | Population Thousand | Per capita GDP | |
|---|---|---|---|---|
| | | | LD | Growth% |
| 1970 | 178.2 | 1963.0 | 90.7 | - |
| 1980 | 1105.6 | 3245.8 | 340.6 | - |
| 1990 | 1021.8 | 4363.7 | 234.1 | - |
| 1991 | 950.3 | 4394.7 | 216.2 | -7.6 |
| 1992 | 1012.9 | 4404.9 | 229.9 | 6.3 |
| 1993 | 1149.5 | 4799.0 | 239.5 | 4.1 |
| 1994 | 864.9 | 4873.5 | 177.4 | -25.9 |
| 1995 | 958.9 | 4949.0 | 193.7 | 9.1 |
| 1996 | 801.4 | 5019.5 | 159.6 | -17.6 |
| 1997 | 818.6 | 5147.5 | 155.6 | -2.5 |
| 1998 | 696.5 | 5174.2 | 134.6 | -13.5 |
| 1999 | 678.8 | 5200.5 | 130.5 | -.3.0 |
| 2000 | 788.0 | 5306.8 | 148.4 | 13.7 |
| 2001 | 1003.9 | 5308.7 | 189.1 | 27.4 |
| 2002 | 1458.1 | 5337.2 | 273.1 | 44.0 |
| 2003 | 2005.8 | 5427.4 | 369.5 | 35.2 |
| 2004 | 2521.7 | 5519.4 | 456.8 | 23.6 |
| 2005 | 3161.0 | 5612.9 | 563.1 | 23.4 |
| 2006 | 3643.3 | 5673.0 | 642.2 | 14.0 |
| 2007 | 3709.6 | 5743.9 | 645.8 | 2.0 |
| 2008 | 3820.8 | 5816.0 | 656.9 | 1.72 |

Source: General Planning Council. Economic and Social Indicators, different years.

### 5.5. Employment in the Manufacturing Sector and Labour Productivity

The number of employees in the manufacturing sector rose from 20,400 in 1970, (4.7% of the total number of employees in the economy) to 169,600 in 2000 (11.7% of the total number of employees in the economy). Then, it witnessed a remarkable decline to reach 115,800 in 2001, then increased again to 136,300 thousand employees in 2006. The decline of employment in the manufacturing sector after the year 2000 was partly due to the policies of restructuring and economic openness adopted by the Government in that period. This made many of the workers in this sector go to work in other activities, mostly to the service sector, which witnessed a rise in the number of workers Table 5-3.

However, the reduction in the number of workers in the manufacturing sector did not reflect negatively on the productivity of labour, which increased during the 2000s to LD26730 in 2006 from 4199.1 in 1999. However, the subject of productivity in the manufacturing sector will be discussed in greater detail in chapter 7.

**Table (5-3)**
**Employment in the Manufacturing Sector**

| Year | Number of Employees in Manufacturing (thousands) | Total Employment in the Libyan Economy | Employee in the Manufacturing sector to total employment % |
|---|---|---|---|
| 1970 | 20.4 | 433.5 | 4.7 |
| 1980 | 58.0 | 812.8 | 7.1 |
| 1990 | 99.4 | 1018.6 | 9.7 |
| 1991 | 101.1 | 1012.5 | 9.9 |
| 1992 | 105.4 | 1044.0 | 10.0 |
| 1993 | 112.6 | 1113.6 | 10.1 |
| 1994 | 120.5 | 1149.0 | 10.4 |
| 1995 | 124.5 | 1186.2 | 10.5 |
| 1996 | 128.5 | 1224.0 | 10.5 |
| 1997 | 147.8 | 1255.1 | 11.7 |
| 1998 | 156.8 | 1323.7 | 11.8 |
| 1999 | 163.6 | 1383.8 | 11.8 |
| 2000 | 169.6 | 1445.0 | 11.7 |
| 2001 | 115.8 | 1448.7 | 8.0 |
| 2002 | 118.7 | 1492.6 | 8.0 |
| 2003 | 121.6 | 1535.0 | 8.8 |
| 2004 | 126.2 | 1588.8 | 8.0 |
| 2005 | 131.1 | 1665.2 | 7.8 |
| 2006 | 136.3 | 1727.2 | 7.8 |
| 2007 | 140.2 | 1789.2 | 7.8 |
| 2008 | 144.7 | 1851.2 | 7.8 |

Source: General Planning Council. Economic and Social Indicators, various years.

### 5.6. Production Evolution in the Manufacturing Sector:

Table 5-4 shows the structure of production at the level of sections of the manufacturing sector in the Libyan economy. The table shows a constant rise in the value of production during the period. It rose from LD 749.055 million in 2000 to LD1893.154 million in 2007, i.e. a rise of 60.4% over seven years. As for the industries which constituted the manufacturing sector, food manufacturing represented the largest value of production during the 1990s and early 2000s. However, increased production in the metal industries (mainly in the iron and steel industry in the complex in Misurata city) in order to provide domestic market demand and export surplus led to a change in the structure of manufacturing. This led to a rise in the percentage of metal industries proportion value from 19.27% on average during the 1990s to 36.28% in 2005, before it dropped to 35.60 % in 2007. This rise was due primarily to the increased production of the Iron and Steel Complex, which is still at the forefront of this industry in the Libyan economy.

**Table (5-4)**
**The Structure of Manufacturing in the Libyan Economy**

| Section | Percentage of Production % | | | Production Value 2004 | | Production Value 2005 | | Production Value 2006 | | Production Value 2007 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1991-1994 | 1995-1999 | 2000-2003 | Million L.D | % | Million L.D | % | Million L.D | % | Million L.D | % |
| Food Manufacture | 26.55 | 27.2 | 28.90 | 297.65 | 30.70 | 322.02 | 28.02 | 360.41 | 27.92 | 549.63 | 28.50 |
| Textile & Furniture Manufacture | 11.45 | 10.60 | 9.90 | 8.75 | 0.90 | 7.14 | 0.63 | 9.05 | 0.70 | 8.02 | 0.40 |
| Chemical Manufacture | 12.71 | 11.30 | 8.50 | 59.20 | 6.11 | 61.82 | 5.46 | 69.22 | 5.40 | 75.35 | 4.00 |
| Cement & Building Materials | 12.35 | 12.20 | 14.20 | 196.01 | 20.22 | 225.20 | 19.70 | 193.72 | 15.01 | 385.36 | 20.00 |
| Metal Industries | 19.27 | 19.80 | 25.70 | 335.40 | 34.61 | 413.23 | 36.28 | 510.64 | 39.55 | 686.69 | 35.60 |
| Energy & Electrical Industries | 17.67 | 18.90 | 12.8 | 72.35 | 7.46 | 112.87 | 9.90 | 147.33 | 11.42 | 222.10 | 11.50 |
| Total | 100 | 100 | 100 | 969.36 | 100 | 1142.28 | 100 | 1290.36 | 100 | 1927.15 | 100 |

Source: General Authority of Information. Statistics Book. Various Years.

The value of production achieved at the level of sections of the manufacturing sector amounted to L.D1893.154 million in 2007. Metal Industries achieved 90% of the value of target production, and 71% of design capacity. Also, the rate of growth in this section was 35% in 2007, which is high if compared to other sections in the same sector (Centre of Industrial Documents and Information Report, 2008). Thus, metal industries performed the best in terms of achieving the success of its goals; this is due to the productivity of the Iron and Steel Complex and its policy in achieving goals. On the other hand, we find that Spinning Fabric & Furniture Manufacture achieved only 12% of its target production and 6% of design capacity; the rate of growth in this section was 1% negative. However, this section was facing several problems which limited the rate of achieving its desired goals, including the decline in labour productivity and capital productivity. Generally, the operating level in the manufacturing sector was only 37% in 2007, which is low when compared to the size of employment and investment in this sector. The total rate of production achieved to target at the sector level was 66%; most of this percentage was due to metal industries and cement and building materials, then food manufacture.

The increase in the production capacity in the manufacturing sector led to an increase in industrial production in the various branches of this sector. Table 5-5 shows the achieved quantities of production for certain manufactured products during the period 1970-2001, which shows the expansion in production of some manufactures. The period of the 1980s witnessed the development of new types of manufactured products in the Libyan economy, such as refrigerators, ovens, washing machines, liquid batteries, iron & steel, and iron pipes. Some industries experienced a decline in their production volumes, especially in the period of economic embargo on Libya, which was due to the dependence of these industries on imports of capital goods.

**Table (5-5)**
**Quantities of Production for Manufactured Products 1970-2001**

| Industry | unit of measure | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|
| **Grain Milling** | Thousand tons | 32.0 | 186.6 | 146.4 | 366.5 | 393.0 | 458.0 | 159.8 | 191.55 |
| **Cement** | Thousand tons | 195.0 | 622.0 | 1900.0 | 2800.0 | 4000.0 | 3200.0 | 1000.0 | 5979.0 |
| **Refrigerators** | Unit | - | - | - | 7610.0 | 6900.0 | 11900.0 | 22309.0 | 9583.0 |
| **Iron Bars** | Thousand tons | - | - | 16.8 | 41.2 | 368.6 | 400.0 | 465.0 | 422.0 |
| **Iron Pipes** | Thousand tons | - | - | 11.1 | 19.0 | 28.6 | 16.0 | 12.9 | 20.75 |
| **Bicycles** | Thousand | - | - | - | 47.1 | 52.0 | 68.6 | 14.1 | 47.40 |
| **Glass** | Ton | - | - | 600 | 2400 | 11500 | 3000 | 2400 | unavailable |
| **Washing Machine** | Unit | - | - | 6251 | 4690 | 10140 | 58000 | 9188 | unavailable |
| **Ovens** | Unit | - | - | - | 9370 | 38116 | 34800 | 41678 | 6742.0 |
| **Shoes** | A pair | - | 380.0 | 4100.0 | 6600.0 | 83400.0 | 5600.0 | 3500.0 | 3500.0 |
| **Copper Wires and Cables** | Thousand tons | - | 1.9 | 3.7 | 3.2 | 3.8 | 3.3 | 4.3 | 1.58 |
| **Liquid Batteries** | Thousand | - | - | 53.1 | 73.1 | 60.2 | 180.0 | 87.3 | 51.44 |
| **Tobacco** | Thousand tons | - | 2.8 | 2.4 | 2.8 | 3.6 | 4.4 | 10.3 | 10.3 |
| **Canned Fish** | Ton | 186.0 | 800.0 | 1334.0 | 580.0 | 1215.0 | 1861.0 | 2000.0 | 694.0 |

Source: 1- General Planning Council. Economic and Social Indicators, various years.
2- Information and Documentation Centre Industrial, Manufacturing Sector Reports, various years.

### 5.7. Sales of the Manufacturing Sector:

Total sales of the manufacturing sector amounted to L.D2132.345 million in 2007, the share of exports was only 25%, the share of Metal Industries section's exports was 56% of the total exports of this sector, and 12% of the chemical manufacture's output were exports. Regarding the rest of the sections, there are no exports except 0.14% of the cement manufacture. The low value of exports of this sector was mainly due to lack of productivity, which were barely enough for the local market on the one hand, and the lack of locally produced goods to compete with foreign goods, especially in the global market.

To sum up, the proportion of exports of the manufacturing sector to total exports was 1.5% in 2007, due to the dominance of crude oil exports, which represented in excess of 90% of total exports in most years, and the weak and undiversified export base due to the low level of industrial productivity and the inability to meet local needs (see for example, Statistical Book, 2007; Ministry of Industry Report 2007).

### 5.8. Evolution of Manufacturing Investment in the Period 1970-2008

#### 5.8.1. The Period 1970-1985

Development allocations to the manufacturing sector during the period 1970-1985 amounted to L.D 24148 million. Table (5-6) shows total investment in the manufacturing sector and other sectors. The size of investment in the manufacturing sector reached high levels in the years 1980 and 1981 compared to other years, they amounted respectively to LD 429.1 and LD498.8 million. That was due to a number of reasons including:

•Rising oil revenues in the late 1970s led the government to allocate large sums to finance development plans.

•Focusing on some industrial activities whose purpose was to export and to reduce dependence on oil.

•The years 1980 and 1981 saw the start of heavy industry production in Libya (Iron and Steel industry, for example).

The development plans mentioned earlier in this chapter refer to the following: The manufacturing sector during the first plan (1973-1975) took up 12.1% of the total allocation, which is low when compared to allocations directed to other sectors. For instance, the agriculture sector received 14.4% of allocations. The same was repeated during the second plan (1976-1980) when the manufacturing sector received 13.6%, which is a low percentage when compared to the strategic importance of this sector in the development process on one hand, and the allocations obtained by other sectors on the other hand. The third plan (1981-1985) saw a marked increase in the proportion of investment allocations directed to the manufacturing sector, which came in the second rank at 16.1% after the transport and communication sector which come first with 18.7% of allocations.

### 5.8.2. The Period 1986-1999

This period witnessed a decline in oil revenues due to the drop in oil demand and the deterioration of its price in international markets. Another reason was to the desire of governments in the developed world to adopt rational use of oil in the circumstances which emerged in that period. Decline in oil revenues was reflected in the emergence of a deficit in the state budget in terms of investment expenditure, in particular directed to commodity sectors (manufacturing and agriculture). The most important observations of this period include:

-There were marked declines in the proportion of allocations directed towards the manufacturing and agriculture sectors. This decline is explained by the Government's desire not to expand by adding new production capacities, and being satisfied with only the lifting of the utilization degree of existing capacity. This led to the suspension or postponement of many industrial and agricultural projects.

-Compared with the decline of investments in the group of commodity activities, activities of non-commodity witnessed a remarkable increase from 8% during the period 1981-1985 to 15.8% during 1990-1996. This was explained by the focus of government spending during that period being to meet public services, and reduce the volume of investment expenditure made for purposes of economic development (due to the drop in oil revenues and the rise in the deficit in the state budget).

In light of the above, it can be said that the period 1986-1999 witnessed a marked decline in the productive trends of the investment policy compared to the emergence of consumption trends. This approach formed the basis for generating the inflationary waves in the Libyan economy during this period. In addition, trends of the investment policy were a dependent variable to the size of the contribution of oil revenues to the state budget. The relative importance of development expenditure increased compared with current expenditure (this stage is characterized by the development plans during the period 1973-1985). However, after a decline in oil revenues during the period 1986-1996, a deflationary investment policy was adopted. Policies aimed at the rationalisation of government expenditure were also adopted, and focused on the financing of current spending requirements (mainly operating expenses, particularly the wages of public sector employees). Therefore, the policy of long-term development plans was abandoned, and annual investment programmes were adopted. Table (5-6) reviews the trends of the investment policy during the period 1973-2006 for selected economic sectors in the Libyan economy.

**Table (5-6)**
**The Relative Distribution of Investments between Sectors 1973-2006**

Percentages

| Economic Sector | 1973-1975 | 1976-1980 | 1981-1985 | 1986-1992 | 1993-1996 | 1997-2000 | 2001-2006 |
|---|---|---|---|---|---|---|---|
| Agriculture | 14.4 | 13.0 | 9.5 | 8.1 | 8.4 | 25.5 | 10.9 |
| Manufacturing | 12.1 | 13.6 | 16.1 | 9.4 | 6.7 | 5.5 | 3.9 |
| Transportation | 14.6 | 16.6 | 18.7 | 12.7 | 10.9 | 9.9 | 9.4 |
| Oil & Gas | 16.6 | 16.9 | 19.0 | 19.0 | 17.5 | 13.15 | 11.3 |

Source: From the data available from the reports of the General Planning Council, various years.

### 5.8.3. The Period 2000-2008

Table 5-7 shows the values of investments in major sectors in the Libyan economy during the period 1970-2006. Through the table, it is noted that investments of the manufacturing sector were relatively high, especially in the period 1980-1984 which witnessed the beginning of the policy of introducing heavy industries to Libya (as previously noted). However, those investments were also low, especially in the early 1990s, while some other sectors (such as agriculture) witnessed a rise in investments. Increased investments in the agricultural sector during this period were due to the trend towards investment in "the Man-Made River[1]" project.

[1] The Man-Made River Project is a major water transfer and supply scheme begun in the 1980s.

Total investments increased generally during this period. However, the ratio of investment in the manufacturing sector to the total investment declined from the previous period. Table 5-7 shows also a significant drop in the proportion of investments in the agriculture sector from 26.5% to 9.1%. The increase of total investments due to adopting an investment policy aimed at the expansion of service activities and the rehabilitation of infrastructure, in addition to the focus on investment in the oil sector which saw a slight rise in the percentage of its investment. In addition, the policy of restructuring the economy, which the government started to be a sign of economic change in the country, had an impact on investment behaviour, in accordance with the new international economic and political developments.

We can deduce from the above that the rates of investment at the macroeconomic level were relatively weak, where these ratios were weaker than the rates which had to be achieved to drive and activate the economic sectors. In addition, the ratio of investment in the manufacturing sector was relatively high, reaching 16.3% in the early 1980s, and then falling sharply to 4.2% during the 2000s. Overall, it can be concluded that there was a lack of a real important change in the structure of production in the manufacturing sector in the form which confirms the existence of an advanced industrial sector.

## Table (5-7)
## Investment in the Major Sectors of the Libyan Economy 1970-2008

| Sector / Year | Manufacturing value | % | Agriculture value | % | Constructions value | % | Services value | % | Oil value | % | Total* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 9.4 | | 11.6 | | 2.2 | | 26.3 | | 93.0 | | 242.7 |
| 1971 | 3o.5 | | 33.6 | | 11.5 | | 52.6 | | 28.5 | | 287.9 |
| 1972 | 54.9 | 11.5 | 37.9 | 12.5 | 14.5 | 3.1 | 79.2 | 15.8 | 29.5 | 7.9 | 436.5 |
| 1973 | 75.2 | | 79.4 | | 22.4 | | 106.4 | | 32.3 | | 636.2 |
| 1974 | 127.3 | | 154.1 | | 31.1 | | 144.6 | | 22.1 | | 979.4 |
| 1975 | 121.5 | | 149.9 | | 28.4 | | 192.1 | | 26.1 | | 1054.7 |
| 1976 | 171.2 | | 170.9 | | 26.3 | | 212.9 | | 24.2 | | 1225.9 |
| 1977 | 164.6 | 12.4 | 188.4 | 13.5 | 31.2 | 1.8 | 251.5 | 18.7 | 45.4 | 3.9 | 1368.3 |
| 1978 | 162.2 | | 217.5 | | 16.3 | | 278.6 | | 99.1 | | 1432.0 |
| 1979 | 269.8 | | 234.2 | | 20.0 | | 400.9 | | 87.4 | | 1955.3 |
| 1980 | 429.1 | | 336.4 | | 43.7 | | 352.9 | | 171.7 | | 2756.8 |
| 1981 | 498.8 | | 350.3 | | 45.9 | | 455.2 | | 156.2 | | 2660.3 |
| 1982 | 348.1 | 16.3 | 237.5 | 10.3 | 56.4 | 2.1 | 614.5 | 17.4 | 147.7 | 7.6 | 2771.5 |
| 1983 | 398.8 | | 208.3 | | 57.4 | | 451.3 | | 327.9 | | 2524.3 |
| 1984 | 418.1 | | 190.4 | | 74.1 | | 363.7 | | 171.7 | | 2127.7 |
| 1985 | 215.1 | | 120.5 | | 91.6 | | 331.3 | | 145.8 | | 1558.1 |
| 1986 | 178.4 | | 82.3 | | 91.0 | | 255.5 | | 143.2 | | 1375.9 |
| 1987 | 135.0 | 12.6 | 71.6 | 7.7 | 87.1 | 7.5 | 207.2 | 20.2 | 146.2 | 12.5 | 949.9 |
| 1988 | 158.8 | | 71.8 | | 93.8 | | 207.6 | | 146.6 | | 1049.8 |
| 1989 | 82.3 | | 112.8 | | 98.6 | | 727.6 | | 185.5 | | 1156.8 |
| 1990 | 43.9 | | 174.1 | | 102.0 | | 184.3 | | 240.7 | | 1135.3 |
| 1991 | 37.6 | | 30.1 | | 102.3 | | 187.5 | | 198.7 | | 1034.3 |
| 1992 | 67.6 | 7.2 | 85.0 | 9.6 | 112.8 | 2.7 | 176.7 | 15.1 | 244.5 | 11.5 | 1007.8 |
| 1993 | 122.5 | | 521.4 | | 14.4 | | 174.2 | | 405.9 | | 1503.7 |
| 1994 | 171.7 | | 410.0 | | 11.6 | | 227.1 | | 365.1 | | 1622.4 |
| 1995 | 162.4 | | 401.9 | | 12.6 | | 235.2 | | 154.1 | | 1244.6 |
| 1996 | 301.9 | | 436.4 | | 16.1 | | 373.2 | | 109.1 | | 1639.7 |
| 1997 | 82.8 | | 649.1 | | 11.1 | | 372.2 | | 127.3 | | 1684.5 |
| 1998 | 131.0 | 8.3 | 345.5 | 26.5 | 14.1 | 0.8 | 270.8 | 26.3 | 234.0 | 11.4 | 1396.6 |
| 1999 | 93.5 | | 257.5 | | 9.5 | | 434.2 | | 297.7 | | 1536.0 |
| 2000 | 40.3 | | 508.7 | | 9.0 | | 884.3 | | 200.0 | | 2281.2 |
| 2001 | 80.4 | | 369.9 | | 11.0 | | 737.7 | | 200.0 | | 6688.5 |
| 2002 | 478.0 | | 1351.0 | | 25.0 | | 3194.0 | | 949.0 | | 9707.6 |
| 2003 | 441.0 | | 906.0 | | 28.0 | | 2515.0 | | 1153 | | 9974.0 |
| 2004 | 471.0 | | 676.0 | | 29.0 | | 2352.0 | | 1238 | | 10682.7 |
| 2005 | 480.3 | 4.2 | 1227.1 | 9.1 | 34.0 | 31.8 | 2340.0 | 22.8 | 1664 | 11.6 | 13331.3 |
| 2006 | 581.2 | | 1127.0 | | 38.0 | | 2872.0 | | 1747 | | 14515.6 |
| 2007 | 620.7 | | 1461.0 | | 42.7 | | 2784.5 | | 2002.5 | | 16676.1 |
| 2008 | 675.7 | | 1686.5 | | 47.2 | | 2890.4 | | 2223.3 | | 18592.6 |

Source: General Planning Council. Economic and Social Indicators. (1962-2000). 2001; (2001-2008). 2009.
*The total for all the economy's sectors.

### 5.9. The Libyan private manufacturing sector

### 5.9.1. Introduction:

The newness of the private sector in general, and the private manufacturing sector in particular in Libya, as well as lack of information and data on this sector does not provide comprehensive and clear information on the development of this sector and its failure or success. However, we can form an impressionistic profile of its simple processes, and the most important points that could be affecting it.

The private manufacturing sector in Libya is a nascent sector which has produced weak returns since 1990, following Act No. 9 for economic activities. This sector works in conditions of mistrust of government economic policies.

After Act No. 9 for economic activities, most enterprises in the manufacturing sector were operating in the production of plastics and food, but they encountered difficulties, mainly in complex administrative procedures, and delays in the opening of credits to import raw materials and spare parts.

The sites of small manufacturing enterprises of the private sector usually are in city centres, in order to benefit from economies, markets and other facilities. This situation made these industries separated from large enterprises in the public sector and not able to operate as their branches; as a result, integration is weak between them. The private manufacturing sector in Libya includes the establishment of individual and collective ownership by the private sector, operating within the manufacturing sector, usually producing simple manufactures and not using sophisticated techniques, as they employ a small number of workers. The following Table 5-8 shows the relative importance of the private sector within the manufacturing sector in Libya.

Small enterprises dominate the manufacturing structure in terms of number, as they represent 94% of the total manufacturing units in Libya. However, the relative importance of investment is very low; it is only 6% of the total investment in the manufacturing sector. This is partly due to the nature of the production process, which employs modest techniques and a low percentage of capital; this is also reflected in the contribution of small enterprises to total manufacturing output which was 8.3% in 2004 (Shameya, 2005).

There are about 16,750 enterprises operating within the private manufacturing sector, the total value of its industrial production reached LD749.358 million in 2006, and the total number of employees in these enterprises is 42,017. Gross value added in the manufacturing sector amounted to LD406.75 million, which is equal to 14.8% of the total value added in the manufacturing sector, 18.2% of the share of foreign companies, and 67% of the share of public companies.

Table 5-8 shows the contribution of manufacturing private sector concentrated in certain branches which distinguish fast capital turnover, and which are based near markets and communities in cities. These branches include the food industries with the highest percentage in the private value added amounting to 25.27%, and the highest percentage in employment, amounted to 34.81%, this is due to the number of enterprises operating in the field of food industries which reached 3921 in 2006. As for the other branches, especially the metal and engineering industries, these witnessed a contraction as a result of the expansion of the public sector in such industries. The private manufacturing sector specialized in some industrial activities which often aim to satisfy consumer demand and often used a certain type of skill or simple technique.

As a result, the industrial expansion and development that occurred after the mid-1970s did not occur within a complementary pattern, and did not take into account industrial integration between branches of the manufacturing sector; where private enterprises remained operating as divisions separate from public enterprises. Also, the strategic objective which aims to maintain the quality of the industrial structure was neglected, and did not make private enterprises as secondary suppliers or partners to the public manufacturing sector.

**Table (5-8)**
**Contribution of Private Sector enterprises at the Level of Manufacturing Branches (2006)**

Thousands of Libyan Dinars

| Branch | No. of enterprises | No. of workers | Production value | Intermediate consumption | Value added |
|---|---|---|---|---|---|
| Dairy Manufactures | 25 | 77 | 2278 | 217 | 818 |
| Grain milling & animal food | 1112 | 2620 | 27439 | 11263 | 16175 |
| Food manufactures | 3921 | 14626 | 181605 | 78821 | 102783 |
| Beverages | 67 | 108 | 1963 | 780 | 1182 |
| Textiles | 19 | 47 | 1911 | 1245 | 666 |
| Garment industry | 1797 | 2685 | 10371 | 15759 | 34709 |
| Leather products | 69 | 108 | 1061 | 394 | 667 |
| Chemicals | 187 | 428 | 10740 | 3842 | 6898 |
| Iron & steel | 7 | 21 | 419 | 132 | 287 |

Source: General Authority for Information, The results of the Annual Examination of the Private Manufacturing Sector Enterprises 2007.

The number of enterprises in the iron and steel industry is the least, because the public sector through a complex group of iron and steel manufacturers is a successful competitor to the private sector. That resulting in the establishment a small number of projects that produce some kinds of spare parts, metal furniture and other simple metal industries, depending on the output of the iron and steel complex. Also, it should be noted that most of the licenses granted to the private sector related to small factories for fruits and vegetables canning, and the manufacture of some other food commodities. The number of factories reflects the number of workers employed by these factories. Regarding the textile industry, it did not succeed at the level of the public sector, as we will see later in chapter 7; this industry within the private sector included a small number of family factories that use a small amount of unskilled labour. This led to very low levels of productivity. Investment in these projects is generally small and thus produced few successes, plus they are mainly based on demand of a small domestic market, monopolized by some imported foreign goods which are generally cheaper and of higher quality.

### 5.9.2. The most important difficulties facing the private manufacturing sector

After adopting resolution No. (9) for the year 1992 for privatization, followed by resolution No. (31) for the year 2003, which provides for ownership of some public companies by the private sector, that led to the existence of a class of businesspeople (most of whom belonged to the public sector), mostly with little experience in project management and dealing with productive projects. They did not succeed in enabling the projects to develop better, for the following reasons (Abdussalam, 2006):

• The low level of education and experience of the new owners, as most were performing the role of owners and managers at the same time.

• The inability of the new owners to handle a volatile economic environment that characterized the Libyan economy, especially with regard to fluctuations to the value of the Libyan Dinar.

• Reduction of customs restrictions imposed on imported goods, which led to competition with foreign goods which are characterized by higher quality and are sometimes more inexpensive.

• Burden of financial commitments, and economic problems which were inherited from the public sector, which were been settled, but transferred to the private sector. In addition to that the number of workers was much higher than the number required to operate the projects, which led unemployment.

This made productive enterprises in the private manufacturing sector inefficient, and made them a burden on the national economy rather than a support to it. As a result, the private sector is still unable to meet the needs of the domestic market for produced goods.

The condition of economic reform in Libya is somewhat similar to those experienced by Egypt in the mid seventies following the announcement of the policy of economic openness and privatization. This situation may lead to negative consequences if action is not taken in the form of clear problem-solving, both with respect to the debt of the public sector, or unemployment, as well as policies for domestic private investment.

### 5.9.3. The Development Bank's contribution to supporting the activities of the private manufacturing sector:

The Development Bank is an institution supporting the activities of the private manufacturing sector, and its most important objective is ensuring the diversity of income sources through the granting of loans to the private sector, in order to establish and support private sector projects in the field of manufacturing. The most important condition for the granting of industrial loans is the availability of a successful feasibility study for the projects involved.

The Development Bank is working towards a set of goals, notably the following:

• To contribute in activating the production process and increasing production rates through the provision of funding for industrial and agricultural projects, whether new projects or for the expansion of existing projects.

• To search for investment opportunities available in economic and social return which contribute to the diversification of income sources.

• To ensure the success of projects which are funded through the provision of technical assistance and advice (directly or indirectly) to the owners of these projects.

Table 5-9 can give a snapshot of the private manufacturing sector activities through loans granted to the various branches of the sector.

**Table (5-9)**
**Loans Granted By the Development Bank to the Private Manufacturing Sector (2004-2007)**

Millions of Libyan Dinars

| Years / Industry | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|
| Food | 11.2 | 10.8 | 25.7 | 29.1 |
| Building Materials | 6.5 | 18.6 | 59.5 | 129.9 |
| Plastic | 4.1 | 8.6 | 14.8 | 7.8 |
| Metal & engineering | 2.2 | 3.2 | 6.8 | 5.9 |
| Leather & textile | 0.2 | 0.2 | 2.5 | 0.5 |
| Wood & paper | 0.3 | 8.4 | 2.5 | 0.2 |
| Industrial services | 7.1 | 196.7 | 13.0 | 6.9 |
| Other | 4.4 | 8.0 | 52.6 | 41.8 |
| Total | 36.0 | 254.4 | 177.4 | 221.9 |

Source: Development Bank, annual financial report, various issues.

The previous table shows that most of the loans granted in 2007 were for building materials industry activity (LD129.9 million or 58.5% of the total), most of this value was to establish and support projects of the tile and brick industry. The food industry accounted for 13.1% of the total loans granted in 2007. Most of these loans were distributed between projects concerned with millings cereals, dairy products, and tomato paste industries.

Loans for plastics and chemical were LD7.8 million in 2007; it saw decrease in this value given the reluctance of the Bank to find the expansion of credit for this activity for reasons of protection of the environment. Metal and engineering industries, which include melting and formation of minerals industries and metal and engineering works industries accounted for 2.6% of total loans in 2007. The requirements of this type of industry depend on skilled labour with qualifications, specialization, and expertise, and due to that the public sector absorbs most of this type of employment: we found that loans granted to this activity are relatively low.

The leather and textile industry, notably including garment industry, cotton industry, blankets and leather, formed 0.22% of total loans in 2007, and 1.41% in 2006 (Central Bank of Libya Report, 2008).

### 5.10. Summary and Conclusions

The Libyan government has worked to increase the contribution of the manufacturing sector to GDP, with an attempt to create an export base dependent on the products of this sector, in an attempt to diversify income sources and reduce dependence on the oil sector revenue as the main source of funding for development processes in Libya.

The contribution of the manufacturing sector to GDP is still limited although it has witnessed increases in some years. Also, despite per capita GDP in the sector experiencing a rise during the period studied, that has not been reflected in any improvement in the contribution of this sector to the national economy compared to some other sectors such as oil and services, and also the rate exports did not exceed 1.5% in 2007.

Given the data of production values in branches of the manufacturing sector, we found that the metal industry section achieved the highest percentage, reaching 35% of the total production of the sector in 2007. The policy of restructuring and encouraging the private sector adopted recently by the Libyan government has led to a transfer of the ownership of a number of manufacturing facilities from public to private sector, but the Government stipulated that the new owners could not lay off excess labour, which led to a form of disguised unemployment in organizations of the manufacturing sector.

The percentage of investment in the manufacturing sector decreased from 16.3% during the 1980s to 4.2% during the 2000s. This low investment percentage was due to the Government's focus on investment in building and infrastructure, this is what we see in the significant rise in the proportion of investments directed to the construction sector which increased from 2.1% in 1980s to 31.8% in the 2000s.

Through studying the three previous chapters, we note the following: First and second plans extended during the period from 1963 to 1969 generally focused on supporting the agricultural sector, the provision of infrastructure and consumer goods, as well as the training of personnel. While the third plan allocated 15% of total investments to the industrial sector, the most important result of this plan was an increase in per capita GDP from LD608.5 in 1973 to LD838.5 in 1975. Despite high oil revenues, the plan 1976-1980 witnessed the adoption of a policy of expanding the role of the public sector and reducing the role of the private sector by Government, where domestic investment was directed at the establishment of factories to manufacture goods to replace imports, in addition to planning for the establishment of mineral and chemical industries. This was in order to reach the goal of diversifying sources of income, but this goal was not achieved, and the contribution of oil revenues to total exports increased from 96.7% in 1975 to 99.8% in 1980. Plan 1981-1985 witnessed the control by the public sector of economic activity in Libya, in addition to the establishment of some heavy industries (such as the Iron & Steel Complex), depending on oil revenue resulting from high oil prices in that period. However, the establishment of heavy industry did not lead to increases in the contribution of the manufacturing sector to GDP, and this contribution did not exceed 4% during that period. Despite the high contribution of the manufacturing sector to GDP during the period 1986-2002, it is still low due to blocks on the import of some industrial goods, which caused the suspension of production in many industrial enterprises. The government earmarked LD35.8 billion for domestic investments in the period 2002-2008 which witnessed a greater role for the private sector in contributing to economic activities. However, this plan has been postponed due to several causes have been mentioned in chapter four. During this period, the Government took a series of measures on the reform of the Libyan economy and the trend towards privatization, in the belief that this would help the government to get rid of the burden of state ownership of economic activity, especially since relying solely on the public sector has failed in achieving the desired objectives. This led to allow the establishment of many small factories following the manufacturing sector operating within the private sector. However, these still have a modest contribution to output, and mainly use simple techniques and employ a low percentage of capital. Although there is a bank support for the private manufacturing sector, this has not resulted in a notable increase in the contribution of this sector, and their contribution has not yet exceeded 8.3% of the total of the manufacturing sector.

However, the development of private sector contribution does not occur by issuing a set of laws, but the matter needs an appropriate and stable investment environment to give confidence to investors. The policy of manufacturing loans pursued by the Development Bank in Libya did not have positive targets as evidenced by lack of positive impact of private manufacturing sector on the national economy. For instance, loans granted to the private manufacturing sector in 2007 totalled LD 221.9 million, while the value added in the same year did not exceed LD 170.0 million.

Appendix C contains 66 companies from the manufacturing sector which have been transferred from public to private sector, we note that there are 16 companies which have suspended production, and 20 are operating at less than their productive capacities. This means there is still a waste of economic resources even after transition to the private sector. The most important problems faced by these companies are as follow: lack of liquidity, scarcity of trained technical personnel, worn out machinery and equipment, competition of imported goods, poor management, lack of diversification of products, low level of production, conflict over ownerships, especially lands ownerships, where the original owners of lands on which factories are located are claiming their lands seized by the Government previously. In addition to the modest loans granted to the private manufacturing sector, it also did not reflect well in its contribution to gross domestic product. This is due to the fact that there are percentages of granted loans which are not used in producing goods, or may not reach the factories concerned, and this makes us go back to recall the subject of administrative corruption touched by some authors in this regard (Alhuni, 2006).

# Chapter 6

# Research Methodology and Methods

## 6.1. Introduction

This chapter describes the steps used to achieve the objectives of this study, as it explains the methodology used to estimate the function of domestic investment in the manufacturing sector. The perspective adopted in this study is one of scientific realism. The models developed are related to theory, but also connected to the empirical world. They mediate between theory and the empirical in the way suggested by Morgan and Morrison (1999). This study therefore follows an established tradition in econometrics, and uses methods familiar to that domain. To explain the conditions for manufacturing investment within the Libyan economy, a functional model is constructed, based on various independent variables. To identify the relationship between the size of domestic public manufacturing investment and the factors affecting it, statistical analyses are used. For example, a logarithmic functional model is expected to emerge, explaining the relationship, which is intended- to provide investors with detailed information on the controlling variables, which can be projected to reflect economic conditions. This study adopted the econometric quantitative methods to test the direction of economic relations between variables, and tests have been conducted concerning the stationarity of time series, cointegration, and error correction model and causality test. This study used the Johansen test for cointegration in the context of the error correction model to detect the extent of integration, stability and the existence of a long-term relationship between variables.

This model tried to consider some of the improvements made on previous studies, furthermore, it will relate to recent years, in addition to the inclusion of other important factors which have important effects on investment in the manufacturing sector in Libya. The models of this study consists of three equations; the first equation investigates the determinants of public investment in the manufacturing sector; the second equation focuses on an analysis of the determinants of private investment in the same sector, while the third equation measures the impact of investment on GDP growth in the Libyan economy. Section 9.2 describes the methods of time series used in this research.

### 6.2. Statistical Properties of the stationary Time-Series

Applied studies that use a time series usually assume that this series is stationary; this stationarity is determined by some statistical properties that will be displayed in this section. In the case of a lack of stationarity, the regression obtained between the variables of time series is often spurious. Preliminary indicators which show the estimated regression of time-series data as spurious are a large coefficient of determination ($R^2$), statistical parameters estimated significantly, and autocorrelation which appears in the value of Durbin-Watson coefficient (DW). This is because the time-series data often includes the trend factor, which reflects certain circumstances affecting all the variables, making them change in the same direction although there is no real relationship between them.

#### 6.2.1. Normality Test

The parameters that describe normal distributions and allow us to differentiate between various normal distributions are the *mean* ($\mu$, the measure of central tendency), and the *variance* ($\sigma^2$, the measure of dispersion). Variable will be a normal distribution if *mean* 0 and *variance* one (N (0, 1) (Studenmund, 2001).

To know whether the variables of the model are distributed as a normal distribution or not, it is advisable to use the normality distribution test. A normality test is used to determine whether a data set is well-modelled by a normal distribution or not. To test for normality used is the Anderson-Darling test. The way this test works is by generating a normal probability plot based on what a normally distributed data set of a given sample size should look like. This tests the correlation between the predicted normal data and the actual data. This correlation coefficient has some critical value based on the degrees of freedom of the data set that we can compare coefficient to the critical value (Hamilton, 2004).

#### 6.2.2. Multicollinearity Test

Perfect multicollinearity is a violation of the presumption that there is no independent variable is a perfect linear relationship with one or more other independent variables (Studenmund, 2001). One of the important hypotheses for using O.L.S method is the lack of relationship between independent variables in the regression model, if a fully or not fully linear relationship between all or some of the explanatory variables is found, then the regression model used in the estimate is suffering from a multicollinearity problem. If the relationship between two variables is fully liner, in this case we cannot separate the effect of any of them on the dependent variable.

In this study, Multicollinearity Test is used to discover the degree of correlation between the independent variables: it is clear that there is a correlation between the independent variables, but not with much effect. To make sure, we calculated multicollinearity by using the VIF test (Variable Inflation Factor). VIF is a measure that can guide a researcher in identifying multicollinearity.

### 6.2.3. Stationarity in Regression

According to Granger and Newbold (1974), some time-series regressions, which produce impressive empirical fits, but have no statistical meaning are 'spurious regressions' produced by non-stationary data. Ensuring stationarity of time-series data used for any kind of empirical analysis has since been recognised as an important first step in this study.

A time series is considered stationary if it meets the following characteristics (Greene, 2003; Enders, 2004):

1- $E(Y_t) = u$. Average value is constant over time t.

2- $Var(Y_t) = E(Y_t - u)^2 = \delta^2$, variation of $Y_t$ is constant over time t.

3- $(Cov\, Y_t, Y_{t-1}) = E[(Y_t - u)(Y_{t+k} - u)]$. Covariance between any two values of the same variable is constant and depends on the time gap between the two values t but not on t or k, t not equal to k.

Many economic time series are non-stationary processes, rather they are trending and thus may not fulfil any of the above three conditions. There are a number of tests that are used for stationarity testing in the time series, the most important is the unit root test of stationarity. It should be noted that the ADF Unit Root Test, Engle-Granger Cointegratioin Test and Error Correction Model (ECM) are used in this study.

## The Unit Root Test of Stationarity

Random component or permanent change in a variable can be measured statistically by using Autoregressive Regression Models. The form of these models depends on an estimate of the relation between the dependent variable and the independent variable which represents the dependent variable, but for a lagged time period. Assuming that the series Yt is generated from the auto-regression process of first order AR (1), it will be as follows:

$$Y_t = pY_{t-1} + error \qquad (6-1)$$

The previous relation can be used to test the parameter of lagged variable equal to the unit, or $p = 1$. In the case of acceptance of the null hypothesis, the time series will include unit root and include a lasting random component affecting the standard deviation of the estimate and thus the rest of the significant tests of statistical calculation based on the standard deviation (Asteriou and Hall, 2007). In detail:

1- If p = 1, the time series will be a random walk series and include drift, the variance increasing stable over time for this series and becoming a variation of the series is unlimited.

2- If p > 1, the time series becomes an explosive series.

3 - If p = 0, the series is white noise.

All of these previous series are non-stationary.

4 - If the parameter ρ is equal to zero, this means the absence of permanent changes in the series and the series will be stationary and could be used for estimation.

Thus, stationarity or non-stationarity of time series should be tested before making regression through testing a unit root (Asteriou and Hall, 2007).

The problem that appears when testing a unit root in the original time series for a variable is that standard tests or estimates of regression using the previous version does not detect correctly the presence or absence of a unit root in the series, because the previous estimate does not include many of the explanatory variables that must be included in the equation. Therefore, the estimated unit root parameter ρ will not be characterized as one of the properties of the capabilities of competence OLS method. This is accepted to increase the likelihood of appearance autocorrelation or serial correlation with limited error series of this equation. To remove the autocorrelation, other methods are used to detect the unit root, and most famous of these formulas are the Dickey-Fuller (1979-1981) (DF) and the Augmented Dickey-Fuller (ADF) Tests.

**First: Dickey-Fuller Test (DF)**

This test relies on three elements: a formula of the form, the sample size, the level of significance. This test uses three formulas, which are:

- Simple Random Walk: Such a formula there is no intercepted or time trend variable as follows (for more details see for example Cromwell, Labys and Terraza, 1994):

$$Y_t = pY_{t-1} + u_t \quad \text{or} \quad \Delta Y_t = \lambda Y_{t-1} + E_t \qquad (6\text{-}2)$$

- Random Walk with Intercept:

$$Y_t = \alpha + \rho Y_{t-1} + U_t \quad \text{or} \quad \Delta Y_t = \alpha + \lambda Y_{t-1} + E_t \qquad (6\text{-}3)$$

- Random Walk with Intercept and Trend:

$$Y_t = \alpha + \alpha_1 T + \rho Y_{t-1} + E_t \quad \text{or} \quad \Delta Y_t = \alpha + \alpha_1 T + \lambda Y_t + E_t \qquad (6\text{-}4)$$

To test DF, using the first formula we follow the following steps:

-We calculate ($\tau^*$) using the following equation:

$$\tau^* = \frac{\hat{\rho}-1}{S_{\hat{\rho}}} \text{ or } = \frac{\hat{\lambda}-0}{S_{\hat{\lambda}}} \qquad (6\text{-}5)$$

where: $S_{\hat{\rho}}, S_{\hat{\lambda}}$ are standard errors for the estimated parameters.

-We search for critical value for ($\tau$) in Dickey-Fuller where there are critical values at a certain sample size (n), and the level of significance (1%, 5%, 10%).

-If ($\tau^*$) statistics > ($\tau$) critical, we reject the null hypothesis: p=1 or λ=0 and accept the alternative hypothesis p<1 or λ < 1, and thus the series is stationary.

--If ($\tau^*$) statistics < ($\tau$) critical, we accept the null hypothesis, and thus the series is stationary, it must be considered comparable between absolute values for critical statistics p regardless of the signal.

However, (DF) will not be appropriate if there is a serial correlation problem despite the fact that data variables in the estimated relationship may be stationary, thereupon, we use another test which is Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979).

**Second: Augmented Dickey-Fuller (ADF)**

ADF relies on the same three elements indicated in the case of DF test, and it should be noted in this regard that there are three formulas of the model which can be used in the case of ADF:

Formula (I):

$$\Delta Y_t = Y_{t-1} + \sum_{1}^{k} \rho_j \Delta Y_{t-1} + \varepsilon_t \qquad (6-6)$$

It is noted that this formula does not contain a drift or time trend, and the hypotheses in this case are:

$H_0$: p=1

$H_1$: p<1

A number of differences with the time lag (k) included in the previous formula eliminate the serial correlation problem, if this problem, for example, disappears after three limits of difference, then these differences are:

$\Delta Y_{t-1} = Y_{t-1} - Y_{t-2}$

$\Delta Y_{t-2} = Y_{t-2} - Y_{t-3}$

$\Delta Y_{t-3} = Y_{t-3} - Y_{t-4}$

After estimating the previous formula, ($\tau^*$) ADF could be calculated by using the following formula:

$$\tau^* = \frac{\hat{\lambda}}{S_{\hat{\lambda}}} \qquad (6-7)$$

And then get the critical value $\left(ADF_{\lambda(I,n,e)}\right)$ of the tables allocated to that, for the model *I*, the sample size *n*, and the level of moral *e*.

Thereafter, $\tau^*$ statistics is compared with the critical value according to a method that will be addressed later.

Formula (II):

This formula differs from the previous by containing a drift.

$$\Delta Y_t = \alpha + \lambda Y_{t-1} + \sum_{1}^{k} \rho \Delta Y_{t-1} + \varepsilon \qquad (6-8)$$

In this case, the hypotheses to be tested are as follows:

$H_0$: $\lambda$=0 or p=1

α =0

$H_1$: $\lambda$<0 or p<1

α ≠0

In order to complete the test, $(\hat{\tau}^*_{\lambda})$ must be calculated by using the previous formula, and $(\hat{\tau}^*_{\alpha})$, for the vector parameter using the following formula:

$$\hat{\tau}^*_{\alpha} = \frac{\hat{\alpha}}{S_{\hat{\alpha}}} \qquad (6-9)$$

And then get the critical value $\left(ADF_{\lambda(II,n,e)}\right), \left(ADF_{\alpha(II,n,e)}\right)$ of the tables is allocated to that, for the model *II*, the sample size *n*, and the level of moral *e*.

Thereafter, $\hat{\tau}^*_{\alpha}$ statistics is compared with the critical values according to a method that will be addressed later.

Formula (III):

This includes a drift and time trend:

$$\Delta Y_t = \alpha + \beta_t + \lambda Y_{t-1} + \sum_{1}^{k} \rho \Delta Y_{t-j} + \varepsilon_t \qquad (6-10)$$

And the hypotheses to be tested as follow:

$H_0$: $\lambda$=0 or p=1

α=0

β=0

$H_1$: $\lambda$<0 or p<1

α≠0

β≠0

Then calculate the statistics values for $\tau^*$ for the various parameters which they are:

$$\tau^*{}_\lambda = \frac{\hat{\lambda}}{s_{\hat{\lambda}}}$$

$$\hat{t}^*{}_\alpha = \frac{\hat{\alpha}}{s_{\hat{\alpha}}}$$

$$\hat{t}^*{}_\beta = \frac{\hat{\beta}}{s_{\hat{\beta}}}$$

Then get the critical value $\left(ADF_{\lambda(III,n,e)}\right)$, $\left(ADF_{\propto(III,n,e)}\right)$, $\left(ADF_{\beta(III,n,e)}\right)$ of the tables allocated to that, for the model *II*, the sample size *n*, and the level of moral *e*.

**Steps of Testing the ADF**

Following the steps in ADF methodology:

Step (1):

I) Estimate the third formula (III), and the test the hypothesis $\lambda$=0 or p=1.

II) If $\tau^*{}_\lambda > ADF_{\lambda(III,n,e)}$, we reject the null hypothesis which states that there is a unit root and accept the alternative which states the data series for the variable $Y_t$ is stationary, then stop doing any other tests.

III) If $\tau^*{}_\lambda < ADF_{\lambda(III,n,e)}$, we accept the null hypothesis which states that there is a unit root then continue to the next point.

IV) We test the hypothesis β=0 (it is time trend's parameter).

V) If $\tau^*{}_\beta < ADF_{\beta(III,n,e)}$ we accept the null hypothesis and this confirms that there is a unit root, then continue in the second step in testing and exclude the remaining points from the first step.

VI) If $\tau^*_\beta > ADF_{\beta(III,n,e)}$, we reject the null hypothesis for time trend and accept the alternative hypothesis, then we test the hypothesis $\lambda$=0 using T-test under normal and moderate distribution.

- If $\tau^*_\lambda > \tau_{\lambda,n,e}$, we reject the null hypothesis λ=0, and accept the alternative hypothesis λ < 1, this means that the time series is stationary and we stop at this step.
- If $\tau^*_\lambda < \tau_{\lambda,n,e}$, we accept the null hypothesis which confirms that there is a unit root in the series, then continue to the next step.

Step (2):

I) Estimate the second formula (II), and test the hypothesis $\lambda$=0 or p=1.

II) If $\tau^*_\lambda > ADF_{\lambda(II,n,e)}$, we reject the null hypothesis which states that there is a unit root and accept the alternative which states the data series for the variable $Y_t$ is stationary, then stop doing any other tests.

III) If $\tau^*_\lambda < ADF_{\lambda(II,n,e)}$, we accept the null hypothesis which states that there is a unit root then continue to the next point.

IV) We test the hypothesis $\lambda$=0 (it is time trend's parameter in the model II).

V) If $\tau^*_\beta < ADF_{\alpha(II,n,e)}$ we accept the null hypothesis and this confirms that there is a unit root, then continue in the second step in testing and exclude the remaining points from the first step.

VI) If $\tau^*_\alpha > ADF_{\alpha(II,n,e)}$, we reject the null hypothesis for time trend and accept the alternative hypothesis, then we test the hypothesis $\lambda$=0 using T-test under normal and moderate distribution.

- If $\tau^*_\lambda > \tau_{\lambda,n,e}$, we reject the null hypothesis λ=1, and accept the alternative hypothesis λ < 1, this means that the time series is stationary and we stop at this step.
- If $\tau^*_\lambda < \tau_{\lambda,n,e}$, we accept the null hypothesis which confirms that there is a unit root in the series, then continue to the next step.

Step (3):

I) Estimate the second formula (II), and the test the hypothesis $\lambda$=0 or p=1.

II) If $\tau^*_\lambda > ADF_{\lambda(I,n,e)}$, we reject the null hypothesis which states that there is a unit root and accept the alternative which states the data series for the variable $Y_t$ is stationary, then stop doing any other tests.

III) If $\tau^*_\lambda < ADF_{\lambda(I,n,e)}$, we accept the null hypothesis which states that there is a unit root. Then, we correct the series by taking the first difference for the series to make it stationary, and re-test to make sure that the time series is stationary. This occurs when we make sure that the time series does not have the co-integration feature, as will be dealt in this study.

### 6.2.4. Cointegration Test of Variables

**First: Introduction**

If there are two nonstationary series $(Y_t, X_t)$ which feature cointegration, it is not necessary to use them in estimating a relationship to obtain a spurious regression.

If there is a stationary variable $Y_t$ in its original form, before making any amendments to it, we say it is integrated of zero level or at the level, i.e., $Y_t \sim I(0)$. If this variable is nonstationary in its original form, and became stationary after obtaining a first difference, we say it is integrated at the first level: $\Delta Y_t = Y_t - Y_{t-1}$.
In general, if a time series of variable $Y_t$ became stationary after obtaining a number of differences = d, this series is said to be integrated of the level d, that is: $Y_t \sim I(d)$.

Cointegration is a required method for any econometric model using non-stationary time series data. If the variables are not stationary, then there are problems of spurious regression and econometric work becomes nearly meaningless (Asteriou & Hall, 2007).
Cointegration in the case of the stationarity the two series $(Y_t, X_t)$ of order 1 each separately requires that the residuals which resulted from the estimation of the relationship between them $(Y_t, X_t)$ be integrated of order zero. In other words, cointegration between two variables $Y_t, X_t$ will exist if the following conditions are achieved (Brooks, 2008):

$Y_t \sim I(1)$

$X_t \sim I(1)$

$Y_t = a + bX_t + u_t$

$u_t \sim I(0)$

In this case, the residuals ($u_t$) measure the deviation of the estimated relationship in the short term from its equilibrium direction in the long term (Phillips and Magdalinos, 2008).

However, we find that cointegration is the statistical expression of long-run equilibrium relationship, if there are two variables which have a cointegration feature, the relationship between them will tend to equilibrium in the long term although there are deviations from this trend in the short term. These deviations are reflected in the residuals:

$u_t = Y_t - a - bX_t$ (6-11)

According to that, the system will be stationary if $u_t = 0$, and nonstationary if $u_t \neq 0$.

**Second: Engle-Granger Test for Cointegration**

This test is used in this study and done by following these steps:

1 - We estimate one of the following formulas of cointegration:

$Y_t = a + bX_t + u_t$ *II*

$Y_t = a + b_1T + b_2X_t + u_t$ *III*

Note that the model (II) has a drift without time trend, and model (III) has a drift time trend.

2 - We get the residuals ($u_t$) according to the formula used:

$u_t = Y_t - a - bX_t$

$u_t - a - b_1T - b_2X_t$

3 - We test the stationarity of series by estimating one of the following formulas:

$\Delta u_t = \lambda u_{t-1} + \varepsilon_t$

$\Delta u_t = \lambda u_{t-1} + (6 - 12)$

Then, define ($\tau^*$) statistics to compare it to the critical value, if ($\tau^*$) statistics> the critical value we reject the null hypothesis, therefore the series ($u_t$) of is stationary, and data $(Y_t, X_t)$ will be characterized by the cointegration feature. Accordingly, the estimated regression will not be spurious. But if the opposite happens, the variables will not be characterized by cointegration feature, and the estimated regression will be spurious.

There are other tests for cointegration such as Cointegration Regression Durbin-Watson Test (CRDW) and Johansen Approach.

**Third: Johansen Test for Cointegration**

Using Likelihood and ratio Maximum Eigenvalue proposed by Johansen (1991) and Johansen and Juselius (1990) is advisable when the variables in a model are more than two for the possibility that there is more than a vector for cointegration. This method's feature is not confined to the case of multiple variables, but it is recommended even in the case of the simple model (consisting of two variables, one dependent and the other independent) (Gonzalo, 1990).

To determine the number of cointegration vectors, Johansen (1988, 1991) and Johansen & Juselius (1990) proposed two tests to test the hypothesis that there are at most r of the cointegration vectors against the alternative hypothesis, which states the existence of r + 1 of the cointegration vectors.

To determine the number of cointegration vectors the following tests could be used:

1 - Trace test is calculated as follows:

$$\lambda_{trace} = -T \sum_{i=r+1}^{p} p ln(1 - \lambda_i) \qquad (6-13)$$

2 - Great Maximum Eigenvalues Test and is calculated as follows:

$$\lambda_{max} = -T ln(1 - \lambda_{r+1}) \qquad (6-14)$$

By comparing the rates of potential with critical values at the potential level of 1%, 5% we can determine the number of cointegration vectors; therefore, it is preferred to use the ECM.

### 6.2.5. Error Correction Model (ECM)

If the variables which form a relationship are characterized by cointegration feature, then the model most appropriate to assess the relationship between them is the error correction model. This model is usually used to reconcile the behaviour of economic variables in both the short and long term. Economic variables are supposed to be tending towards a situation of stationarity called equilibrium, these variables may deviate from the stationarity direction for temporary reasons, but they will be not be stationary unless proven to be tending for a long-term equilibrium.

Error correction model formula takes into consideration both the long-term and short-term, it contains lagged variables, and time series differences.

If we start with two variables $(Y_t, X_t)$, and estimate the relationship between them using the following simple formula (Enders, 2004):

$$Y_t = \hat{\alpha}_0 + \hat{\alpha}_1 X_t + \varepsilon_t \qquad (6-15)$$

Where:

$Y_t$= value of the dependent variable or its natural logarithm.

$X_t$= value of the independent variable or its natural logarithm.

Thereupon, we can get a new variable called an error correction variable, which is the residuals $(\varepsilon_t)$, where:

$$\varepsilon_t = Y_t - \hat{\alpha}_0 - \hat{\alpha}_1 X_t \qquad (6-16)$$

By using that new variable the error correction model could be formulated as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{k} \beta_j \Delta X_{t-j} + \theta (Y_t - \hat{\alpha}_0 - \hat{\alpha}_1 X_t)_{t-j} + Z_t \qquad (6-17)$$

Where:

$\Delta Y_t = Y_t - Y_{t-1}$

$j = 1, 2, \dots k.$ = number of lagged differences for independent variable ($X_t$).

$k$ = number of lags in the model.

$\Delta X_{t-j}$ = difference for the explanatory variable.

$\theta$ = speed of adjustment coefficient; it indicates to the value of change in dependent value as a result of deviation of the value of an independent variable by one unit in the short term from its equilibrium value in the long term. This coefficient is expected to be negative because it refers to the rate taken by the short term relationship in trending towards the long term relationship.

### 6.3. Summary

The Methodology of the study is addressed in this chapter, it examines time series properties of the variables by discussing various tests such as stationarity and cointegration tests to determine whether the variables selected for this analysis satisfy these properties. This chapter introduced an idea of how to use the econometric methodology using time series analysis upon which this study examines the determinants of domestic investment in the Libyan public and private manufacturing sector, and identifies the impact of domestic investment on economic growth. These analyses will be discussed in chapter nine, therefore, some important criteria employed in measuring productivity were used to achieve the fourth objective; these criteria will be highlighted in chapters seven and eight to find out the circumstance and the nature of the manufacturing sector and the extent to which this industry achieved its goals in terms of productivity.

# Chapter 7

# Productivity Measurements in the Libyan Manufacturing Sector

## 7.1. Introduction:

Investment has a close relationship with productivity, this relationship should be positive so that there is an incentive to invest money in different sectors and projects. High levels of productivity in the economic units of a sector show that money invested is increasing in value, and is having beneficial and satisfactory economic outcomes.

It has become firmly established that productivity is the real source of economic growth of any country; it has an essential role in the economies of developed and developing countries alike. It allows a nation to raise its standard of living, to support such social goals as education and health care, and to contribute to other aspects of general welfare; it is an essential underpinning of a nation's security (Stupak and Leitner, 2001). Increased productivity is the key to economic progress, and the standard of living of communities and their income levels depend on the progress of the level of productivity; higher levels of productivity in economies lead to increased rates of growth and prosperity (Shebeb, 2006).

Industrialized countries have been interested in productivity since the beginning of the nineteenth century. An increased real source of growth focused on increasing rates of growth through continuous improvement in productivity which led to the achievement of high growth rates. Some developing countries were able to benefit from the experience of developed countries, through the strategies designed to improve and increase productivity, and thus were able to compete with industrialized countries. Some other developing countries realized the importance of productivity and moved towards the establishment of industrial projects, but they did not achieve high rates of productivity, as this move was to set up factories and increase production without attention to the concepts of real productivity.

There is a multiplicity of concepts of productivity. Consequently, a series of definitional complexities and competing philosophies have emerged, and these confuse the development of productivity and its related measurement. However, the general concept of productivity is the amount of output per unit of input (labour, equipment and capital). It is a measure relating a quantity of output to the inputs required to produce it (Stupak and Leitner, 2001). Productivity also demands the optimum use of available resources, such as raw materials, labour, energy and equipment, to produce the quantity of goods required in the specified time period.

The public sector in Libya (Government) is an important player in economic activity, as the flow of oil revenues have led to the creation of the economic well-being of communities. Revenue is generally recognized as income from oil, used for intervention in the budgets of Libya and then in turn spent every year to create demand for goods and services, which in turn leads to the stimulus of the private sector. In this sense, the government follows a strategy of moral obligation towards the people in that every individual has the right to have a job in order to live, because oil revenue is a national treasure which belongs to all. Since the public sector does not aim to profit, so it does not care much for the concept of economic productivity. This is why there are large numbers of employed in the government sectors. The Government had focused since the beginning of the post-revolution era and even today on the creation of vacancies and employment opportunities in the public sector, without giving great importance to the issue of productivity. While measuring the output of the productivity process is of great importance, in Libya it is overlaid in turn with the importance of developing criteria and indicators to assess renewed economic activity to assess their ability to achieve goals, including social goals.

Because economic resources are limited (material, human and finance resources), there should be an optimal exploitation of these resources, which leads to the selection of the theme of productivity. Because productivity means the criterion by which we can measure the proper utilization of productive resources, therefore, it can identify and assess the degree of utilization of planning resources and access to targeted results. Efficiency means optimal use of inputs used to accomplish goals; it represents the optimum use of factors of production in order to obtain maximum benefit from those elements involved in production processes.

For the reason that the industrial sector plays an important and essential role in the process of growth and development (industrial countries are the best witness of this), this part of the study will investigate, analyze and examine productivity in the manufacturing sector in the Libyan economy, in order to identify the key aspects of production and productivity in this sector, and to reach conclusions about productivity that help to understand trends in manufacturing sector operations in order to allow decision-makers to make informed decisions.

## 7.2. General Approaches:

**First: The importance and goals of productivity measurement:**

I) - at the internal level of the facility:

• Productivity is an important element for the success of the business and its continuity

• It is an important element in achieving profits.

• It plays a major role in expanding the market to provide more goods and services to meet the needs of the community.

• It is also an important element in the efficient use of production capacities and in creating opportunities for employment.

• It helps the development of the domestic economy of the facility by using the elements of production without an increase in costs.

• Productivity measurement can be used for technical, economic and managerial aspects in different places or over different periods, or both. It may also be appropriate and necessary to use these results in productivity bargaining and incentives (Jassbi, 1979).

• It enables comparison between different firms, and the results of productivity measurement and analysis can be used for forecasting requirements of labour, materials and other resources for each product.

II) -at the external level (Silimi, 2000): productivity is an important indicator of the degree of development and progress, and gives a high value to the national economy of any given country. Thus, productivity has an impact on the economic development of a country, and it is a goal sought by all countries at different economic levels, developed and developing, socialist or capitalist alike.

Productivity is an important strategy for underdeveloped countries. Its importance increases in developing economies that have scarce productive elements, whether material or human, which forces those economies to improve the utilization of their resources to realize an acceptable return on investment.

Improved productivity leads to increased national income and profit of projects, and therefore improves average per-capita income, which leads to developing investment and creating capital accumulation and reinvestment in productive projects. High per capita incomes contribute seriously to increasing savings, which represent a source of investment in new or expansionist production processes.

At the state level, increases in productivity lead to:

- Providing foreign exchange through the optimal use of raw materials, which cost the state huge sums of money, especially if they are imported.
- Increasing national income, which leads to higher living standards and increasing welfare productivity (Dolan1984).

Productivity and development will bring increased sales resulting from increased demand, which in turn improves the purchasing power of citizens and reduce costs. Productivity measurement is used for comparison and forecasting with respect to changes in income and output, occupational shifts, labour requirements, population, aggregate prices, foreign trade and markets.

The above points illustrate the importance of productivity to the individual and society, regardless of the nature of the economic system prevailing in various economic and social systems. The state and owners of projects urgently seek to improve and develop productivity because of its high value to society in different fields, aimed at improving the standard of living of society as a whole (Turner et al., 2008).

**Second: Factors affecting productivity:**

There are many factors affecting productivity, including economic, social, and technical factors. Some directly affect productivity and others indirectly. Some have a positive impact, others have a negative impact. In addition to the multiplicity and differences of these factors, they usually have a nature of correlation and interaction between each other, where the impact of one factor may depend on the influence of other factors that accompany it. For example, technical factors play a key role in influencing productivity. Quantity and type of equipment used (defined as fixed capital), as well as quality of raw materials, production methods, techniques used and different specifications of products have a strong impact on level of productivity. Factors that affect the performance of the human element are characterized by plurality and overlap. Therefore, researchers and specialists in productivity have dealt with the classification of these factors from different perspectives. Some of these factors will be used to analyze the reality of productivity and the changes that have occurred in the Libyan manufacturing sector.

Figures 7-1 and 7-2 show how Kukoleca and Judson identified factors affecting productivity (Judson, 1984 & Kukoleca, 1962; Tawiri, 2000). By understanding and assimilation of these factors, it is possible to work to improve and raise productivity rates through supporting the positive factors and avoiding negative ones.

**Third: Units of productivity measure:**

**Quantity:** according to this measure the number of units produced (outputs) is divided by the number of units used in production (human working hours, working hours of the mechanism, units of raw materials, and energy units).

This measure is characterized by simplicity and ease, and also by the possibility of making comparisons to the performance of workers doing the same work, or machines performing the same operations. However, the problem of this type of measurement is that it is cannot be used in the case of multiple products, and additionally when there are parts of non-finished goods. Also, the calculation of quantity does not show improvements that may occur in the product quality.

**Value:** This method uses multiplication of quantity × price, and the value of output divided by the value of inputs. This measure differs from the previous one in its ability to measure the relative productivity of multiple products and parts not finished, as well as comparing products that have different prices.

However, there are problems of price fluctuations, the differences between the cost and market prices, domestic and international prices, and the difference in prices from one year to another when comparisons of productivity between a number of years are made. Therefore, specific year prices are used as a basis for comparison to remedy this problem. Even in this case, there remains a further difficulty which is the presence of various factors which impact on productivity not shown by this measure, such as varying degrees of the quality of raw materials, and varying degrees of experience and skill among workers.

**Value Added:** This method is used to express the full cost of the efforts made in production, and all revenue from these efforts; therefore, it represents the difference between gross sales and the cost of raw materials and services. Therefore, the value added is the actual contribution in the production of the commodity, or what is added to the production requirements and parts and depreciation (Strassmann, 1985).

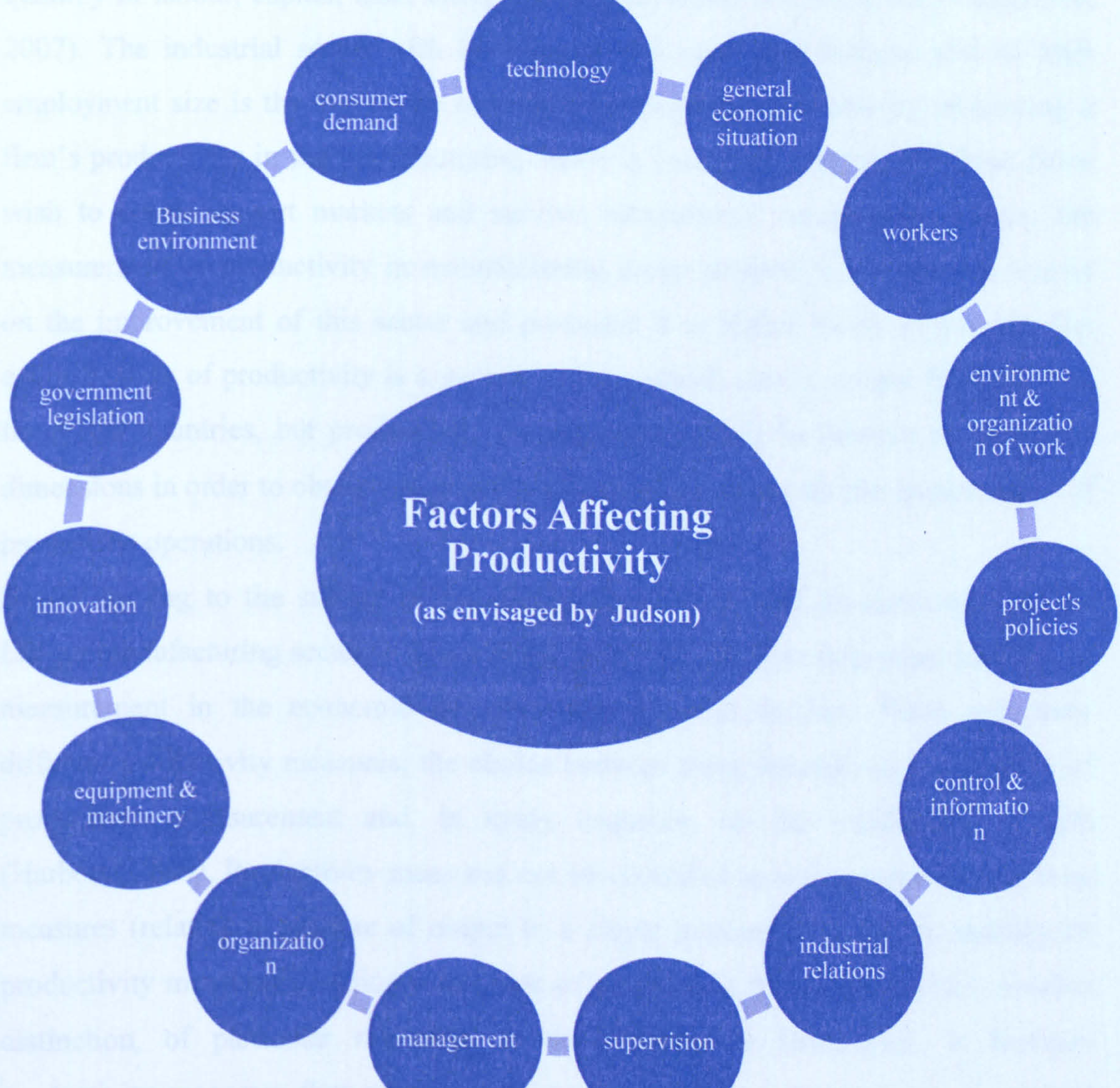
This measure has some advantages, including accuracy, objectivity, and enabling management to use analysis tools such as mathematical operations research in order to reach the best alternatives that achieve the optimal use of raw materials, machinery and services, as well as to obtain the maximum output at minimum cost and efforts, and thus achieve an increase in profits.

On the other hand, using value-added measurement requires accurate accounting data, which can demonstrate the real costs that have reliable economic significance. Another problem in measuring the value added is it does not show the impact of quantitative factors, such as the nature of the organizational structure and management practices that are of great importance in productivity.

Figure (7-1): Factors Affecting Productivity as Kukoleca's Envisaged


Source: Tawiri. (2000)

**Figure (7-2): Factors Affecting Productivity as Judson's Envisaged**




Source: Tawiri. (2000).

## 7.3. Methods of Measuring Productivity:

Productivity is defined as the ability of an organization to produce effectively and efficiently the required amount of finished goods at the lowest quantity of inputs and resources. Basically, it expresses the optimum production of organizations based on the relationship between the quantity of goods and services produced over a given quantity of labour, capital, land, energy, intangible assets and resources (Valenzuela, 2007). The industrial sector with its forward and backward linkages and its high employment size is the key to the economic development of a country; enhancing a firm's productivity in the manufacturing sector is extremely important if these firms wish to access export markets and survive international competition. Hence, the measurement of productivity in manufacturing sector projects has a positive impact on the improvement of this sector and promotes it to higher levels of growth. The quantification of productivity is a generic activity which covers several fields in both firms and countries, but productivity measurement should be focused on particular dimensions in order to obtain quantifiable and effective results for the improvement of production operations.

Before turning to the subject of measuring productivity and its application to the Libyan manufacturing sector, it is advisable to review the most important methods of measurement in the economic literature and previous studies. There are many different productivity measures; the choice between them depends on the purpose of productivity measurement and, in many instances, on the availability of data (Harbour, 2009). Productivity measures can be classified as single factor productivity measures (relating a measure of output to a single measure of input) or multifactor productivity measures (relating a measure of output to a bundle of inputs). Another distinction, of particular relevance at the industry or firm level, is between productivity measures that relate some measure of gross output to one or several inputs and those which use a value-added concept to determine movements of output (OECD, 2001).

Organizations and companies have used several types of productivity measurement for monitoring and developing operations and strategic considerations. Several definitions have been proposed in the literature to classify productivity measures, but the most common classification of productivity measures is:

- Total Factor Productivity.

- Partial Factor Productivity (Valenzuela, 2007).

Total Factor Productivity (TFP): This is the ratio of output to the aggregate measure of the inputs of all the factors of production. Theoretically, this is the true measure of productivity as it incorporates the contribution of all the factor inputs.

$$TFP = \left(\frac{output}{input}\right) X\,100 \qquad (7-1)$$

where ***input*** = materials, labour, capital, which may be measured in terms of size or financial value. Thus, input and output should be expressed in similar units.

Partial Factor Productivity (PFP): There are many problems that are associated with measuring total factor productivity. For example, it is difficult to construct an index number that will serve as the input. It means adding hours done by labour to units of investments, the contributions of land, technology, etc. to get a single index. To quantify them all in monetary terms is very cumbersome. The construction of a total factor productivity index is, therefore, not appealing. In its place, therefore, partial productivity is used. This estimates the ratio of total output to a single input, usually labour. In most discussions, especially in economics, productivity is taken to be synonymous with labour productivity. This is because it is a simpler concept to estimate and it is a rough measure of effectiveness. However, it is noteworthy that productivity is not determined by the efforts of labour alone, but in combination with land, capital, technology, management and even the environment. Partial Factor Productivity is calculated by dividing the output by one of the factors of production, as shown:

$$PFP = \left(\frac{output}{one\ of\ production\ elements}\right) X\,100 \qquad (7-2)$$

The list of measurements are incomplete insofar as single productivity measures can also be defined over intermediate inputs, and labour-capital multifactor productivity can be evaluated on the basis of gross output. However, these measures of labour and capital productivity, and multifactor productivity measures (MFP), either in the form of capital-labour MFP, based on a value-added concept of output, or in the form of capital-labour-energy-materials MFP, based on a concept of gross output.

Appendix (C) contains guides to some productivity measures, including the five most widely used productivity concepts. They point out major advantages and drawbacks and briefly interpret each measure.

Productivity enhancement remains crucial to the drive for rapid industrialization and economic growth in developing countries. The literature on growth is definitive on the centrality of productivity improvement to the fostering of growth. Several policy articulations in Libya have placed productivity concerns at their centre. The measurement of productivity in the manufacturing sector will induce overall industrial efficiency in the economy by exposing local firms to competition and thereby improving the allocation of factors across sectors and increasing the value of domestic production.

For the purposes of this study, a number of criteria were selected to measure productivity, using data from the period 1997-2008. It is worth mentioning the difficulty of obtaining real data from the bodies concerned, especially with regard to real profits and costs. The following section details these criteria. (For more information on productivity measurement criteria used in this study (see for example appendix C, Jackson, 1999, and Anderson and et al, 2005).

### 7.4. Measuring Productivity in the Libyan Public Manufacturing Sector

#### 7.4.1. Performance Measurement of Plan

According to the performance measurement of plan (Table 7-1; Figure 7-3), the highest proportion of plan index was in the metal industry, which was an average of 82.99% across the years mentioned in the study, and 81.86% in 2008. The proportion of actual production to design capacity in the metal industry was 68% in the same year.

On the other hand, data found that the standard of measuring the performance of the plan in the textile & furniture industry was the lowest among all industries, with up to 25.65% on average, this indicates the low performance of the plan in the manufacture of textile & furniture industry, especially if we compare the figures in 2008, where the proportion of actual production to target production was 11.98%. To make matters worse is the ratio of actual production to low energy design, which was only 0.47% in 2008.

Where:

$$performance\ measurement\ of\ plan = \left(\frac{actual\ production\ value}{target\ production\ value}\right) X\,100 \qquad (7-3)$$

Regarding the rest of the industries, the cement & building materials industry ranked second with 78.7% on average, and it achieved 69% in relation to the proportion of actual production to design capacity. This was followed by the chemical industry, which was 51.92% on average.

The high proportions mentioned above do not necessarily relate to improvement in overall productivity in enterprises. In order to assess this, the study will look to measure productivity at the level of industries of the manufacturing sector, as described in the next section.

## Table (7-1)
## Performance Measurement of Plan Index in the Manufacturing Branches

Thousands L.D

| Branch | Metal | | | Cement & building Materials | | | Chemical | | | textile & furniture industry | | | Food | | | Electrical & Engineering | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | target | actual | % | target | actual | % | target | actual | % | target | actual | % | target | actual | % | target | actual | % |
| 1997 | 291254.0 | 237821.0 | 81.65 | 195656.0 | 169876.5 | 86.82 | 370816.0 | 198370.0 | 53.49 | 337143.5 | 155756.0 | 46.20 | 188269.0 | 93212.0 | 49.51 | 287327.0 | 154605.0 | 53.80 |
| 1998 | 363168.0 | 248352.0 | 68.38 | 198787.0 | 157654.9 | 79.30 | 289742.0 | 197964.0 | 68.32 | 233145.0 | 171739.0 | 73.66 | 184342.0 | 104052.0 | 56.44 | 263295.0 | 173691.0 | 65.96 |
| 1999 | 363618.0 | 258883.0 | 71.20 | 200768.0 | 171137.0 | 85.24 | 298754.0 | 112183.0 | 37.55 | 150716.0 | 41577.0 | 27.59 | 378756.0 | 199580.0 | 52.69 | 303434.0 | 182179.0 | 60.03 |
| 2000 | 365010.0 | 269414.0 | 73.81 | 210987.0 | 169876.0 | 80.51 | 312349.0 | 100965.3 | 32.32 | 139604.5 | 38562.8 | 27.62 | 416237.0 | 192340.0 | 46.20 | 335506.0 | 197732.3 | 58.93 |
| 2001 | 365010.0 | 279945.0 | 76.70 | 216954.0 | 176954.0 | 81.56 | 306780.0 | 84062.0 | 27.40 | 88493.0 | 25522.0 | 28.84 | 480225.0 | 174516.0 | 36.34 | 305755.0 | 59086.0 | 19.32 |
| 2002 | 394418.2 | 290476.0 | 73.65 | 227539.7 | 166543.0 | 73.19 | 198876.0 | 68875.8 | 34.63 | 97381.5 | 38655.8 | 39.70 | 587765.0 | 228008.8 | 38.79 | 331783.0 | 103359.7 | 31.15 |
| 2003 | 339201.0 | 280312.0 | 82.64 | 280083.0 | 129686.0 | 46.30 | 59970.0 | 51344.0 | 85.61 | 96270.0 | 9248.2 | 9.61 | 652460.0 | 253098.4 | 38.79 | 356315.0 | 109773.0 | 30.80 |
| 2004 | 329236.0 | 335398.0 | 101.87 | 281183.0 | 196006.2 | 69.70 | 68934.0 | 59180.0 | 85.85 | 95158.5 | 8751.5 | 9.20 | 652460.0 | 297657.5 | 45.62 | 222549.0 | 72354.0 | 32.51 |
| 2005 | 398463.0 | 413234.0 | 103.71 | 254254.0 | 225185.0 | 88.56 | 79693.0 | 61815.2 | 77.56 | 84047.0 | 7144.0 | 8.50 | 784746.0 | 322015.0 | 41.03 | 15810.9 | 11287.6 | 71.39 |
| 2006 | 562284.0 | 510644.0 | 90.82 | 118825.0 | 93718.0 | 78.87 | 191062.0 | 69219.0 | 36.22 | 70905.0 | 9046.0 | 12.76 | 784746.0 | 360408.0 | 45.92 | 476949.0 | 147327.0 | 30.88 |
| 2007 | 766028.0 | 686692.0 | 89.64 | 449766.0 | 385360.0 | 85.68 | 182068.0 | 75348.0 | 41.38 | 65885.0 | 8018.0 | 12.17 | 863856.0 | 549626.0 | 63.62 | 538369.0 | 188109.0 | 34.94 |
| 2008 | 1037999.0 | 849656.0 | 81.86 | 483465.0 | 433772.0 | 89.72 | 203580.0 | 86985.0 | 42.72 | 48682.0 | 5831.0 | 11.98 | 1049318.0 | 718673.0 | 68.48 | 530714.0 | 222071.0 | 41.84 |

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.

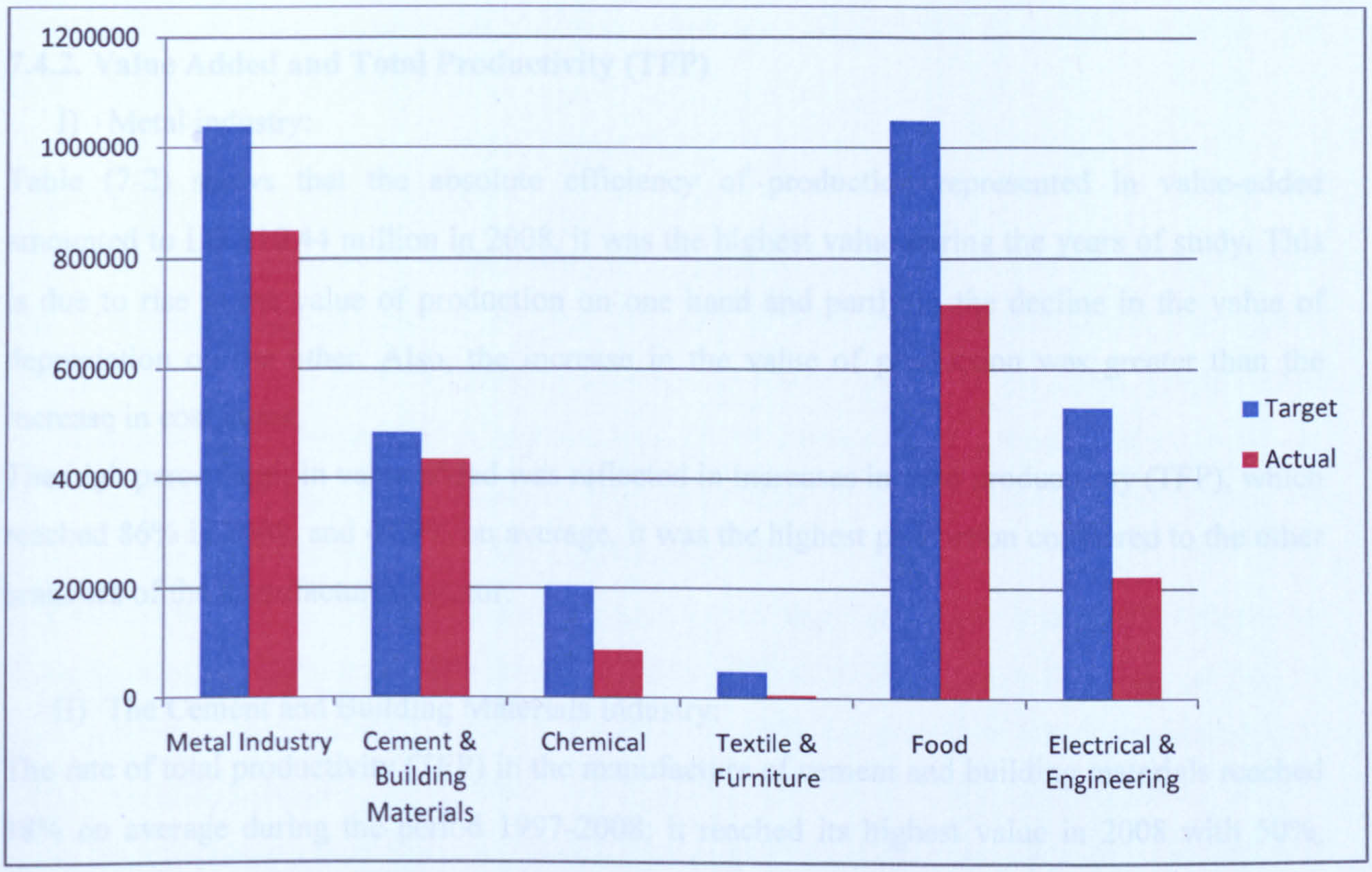



Figure (7-3) Performance Measurement of Plan Index for the Manufacturing Branches in 2008

### 7.4.2. Value Added and Total Productivity (TFP)

I) Metal industry:

Table (7-2) shows that the absolute efficiency of production represented in value-added amounted to LD 810.44 million in 2008, it was the highest value during the years of study. This is due to rise in the value of production on one hand and partly to the decline in the value of depreciation on the other. Also, the increase in the value of production was greater than the increase in cost items.

The high percentages in value added was reflected in increases in total productivity (TFP), which reached 86% in 2008, and 49.9% on average, it was the highest proportion compared to the other branches of the manufacturing sector.

II) The Cement and Building Materials Industry:

The rate of total productivity (TFP) in the manufacture of cement and building materials reached 38% on average during the period 1997-2008; it reached its highest value in 2008 with 50%, after having been about 27% in 2006. The policy of increasing production and reducing costs used recently in the factories of Libyan Cement Company for Cement and the Arabian Company led to a slight improvements in total productivity of factories in this branch. However, the increase in the quantity of production in this branch came as a result of increasing the designed capacity of LD205.487 million in 2006 to LD623,606 in 2008 (Industrial Documentation and Information Centre). This reflects the attempts of local cement companies to meet the demand in the Libyan market, which has led in some cases, to importing large quantities of cement from neighbouring countries to cover the deficit in the domestic market.

III) Chemical Industry:

Productivity of the chemical industry branch rose from 21% in 2001 to 60% in 2008 due to increases in value added by 3.2% and a decline in costs by 63%. However, this increase was not reflected in a real increase in the value of production which rose by a modest value of 3%. The real reason for increasing value and the total productivity in this branch is due to the decline in all of the following: decrease in the cost of requirements by 67%, decrease in the cost of spare parts by 79%, and also decrease the administrative costs by 29.2% (for more clarification on this data, see Table 6-2 & Appendix B).

IV) Textile and Furniture Industry

TFP in textile and furniture industry was 25% during the period 1997-2008 on average. There was a decline in design capacity of manufacturers of textiles and furniture and therefore a decrease the quantity of production, in addition to lower prices for produced goods which suffered from the competition of imported goods of higher quality, which led to a fall in production value, impacting negatively on the value added, which declined from LD 127 million in 1997 to only LD 4.1 million in 2008, a decrease of 90%.

Despite the decline in production and employment in this branch, some cost items rose, for instance, administrative costs rose from LD2.6 in 1997 to LD3.3 million in 2008; the cost of spare parts increased from LD0.7 to LD1.6 million in 2008, in addition to other costs item which rose from LD0.05 to LD0.24 million in same period. The nature of the textile industry did not allow the Government to increase its productivity growth; this decreased the value of production from L.D 155.756 in 1997 to L5831.0 in 2008, a decrease of 96%. Government could not achieve any success with regard to increasing labour productivity and the reason is partly due to the operations of this industry, which depend on the use of manual labour to a large extent. Despite the reduction of employment, the situation has not improved, but turned to the worse, this calls for developing appropriate policies regarding this unsuccessful industry either by disbanding it or by supporting the necessary methods to make it a successful industry and not a burden on the government.

V) Food Industry:

Productivity of the food industries ranged between 15% and 30% in the period 1997-2008, and 20% in average. Despite the low productivity in this sector, it increased from 15% in 1997 to 30% in 2008, relying on increasing value-added worth LD375.2 million resulting from the high production value of 67%.

VI) Electrical and Engineering Industry:

This branch of the manufacturing sector witnessed fluctuations in its productivity percentages which fell from 40.5% in 1997 to 19.4% in 2001, then rose to 69.9% in 2004. Nevertheless, it declined again to reach 18.7% in 2005 which is the lowest level in the years covered by this study.

However, the average productivity during the study period was 32.5%, which is good if compared with counterparts in some other branches such as food manufacture and textile & furniture.

It remains to point out here that this period witnessed radical and structural changes in the Libyan economy, especially with regard to privatization and the transfer of ownership of some institutions to the private sector. The failure to adopt the right and successful method in privatization process had a negative impact on productivity levels, as well as the inability of the private sector to meet the ownership conditions imposed by the government, which should be acceptable to new owners, since institutions are sold with all their shortcomings and surplus employment.

## Table (7-2)
## Total Productivity in the Branches of the Manufacturing Sector

Thousand L.D

| | Metal Industry | | | Cement & Building Materials | | | Chemical Industry | | | Textile & Furniture Industry | | | Food Industry | | | Electrical & Engineering Industry | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Input* | *Output* | *TFP %* | *Input* | *Output* | *TFP* | *Input* | *Output* | *TFP* | *Input* | *Output* | *TFP* | *Input* | *Output* | *TFP* | *Input* | *Output* | *TFP* |
| 1997 | 384022.00 | 190602.40 | 50 | 345395.3 | 131650.2 | 38 | 390475.5 | 162215.7 | 41 | 357421.1 | 127138.7 | 46 | 356228.1 | 54799.3 | 15.0 | 228598.0 | 92633.0 | 40.5 |
| 1998 | 429852.20 | 189565.90 | 44 | 326931.3 | 122188.4 | 37 | 314171.5 | 161902.7 | 51 | 361353.4 | 140137.7 | 74 | 396824.7 | 61290.0 | 15.0 | 245463.9 | 104074.6 | 42.4 |
| 1990 | 461669.70 | 198889.50 | 43 | 351120.2 | 132562.9 | 37 | 301202.9 | 91671.1 | 30 | 178547.9 | 33519.5 | 28 | 551296.5 | 118593.5 | 21.5 | 259509.5 | 109112.7 | 42.0 |
| 2000 | 505505.80 | 210992.90 | 42 | 349862.5 | 131658.0 | 37 | 308520.8 | 82395.2 | 26 | 158363.0 | 31095.4 | 28 | 574585.3 | 114236.2 | 19.8 | 268827.3 | 118489.4 | 44.0 |
| 2001 | 533191.80 | 218472.40 | 41 | 348681.2 | 137085.1 | 39 | 316705.8 | 68650.0 | 21 | 111537.4 | 20639.5 | 29 | 573929.2 | 103528.5 | 18.0 | 182417.0 | 35301.5 | 19.4 |
| 2002 | 535192.40 | 235563.40 | 44 | 393063.9 | 128656.6 | 32 | 223962.2 | 56232.9 | 25 | 124799.6 | 31330.8 | 40 | 641913.2 | 135610.8 | 21.0 | 264695.9 | 61826.0 | 23.4 |
| 2003 | 558312.15 | 240446.90 | 43 | 300522.2 | 99801.6 | 33 | 93072.9 | 41465.7 | 44 | 114525.2 | 7116.7 | 10 | 699973.4 | 150651.3 | 21.5 | 274300.9 | 65610.1 | 23.9 |
| 2004 | 602723.10 | 296713.40 | 49 | 439419.9 | 151156.0 | 34 | 127768.7 | 40725.6 | 31 | 124006.9 | 6851.3 | 09 | 1021659.6 | 177394.5 | 17.4 | 61720.3 | 43121.1 | 69.9 |
| 2005 | 783106.25 | 372372.30 | 48 | 405828.0 | 174267.1 | 42 | 84880.7 | 45697.0 | 53 | 113708.7 | 5439.1 | 09 | 877206.6 | 192001.2 | 21.8 | 34993.4 | 6551.6 | 18.7 |
| 2006 | 792330.60 | 474678.00 | 60 | 262064.9 | 72459.3 | 27 | 93796.1 | 55757.7 | 59 | 86909.7 | 6901.3 | 13 | 954781.8 | 214944.8 | 22.5 | 434074.8 | 88215.5 | 20.3 |
| 2007 | 963038.85 | 645840.70 | 67 | 610583.6 | 299189.6 | 49 | 104284.7 | 60993.6 | 58 | 86538.0 | 5902.9 | 12 | 1229036.5 | 328455.6 | 26.7 | 519934.3 | 112665.4 | 21.7 |
| 2008 | 1193007.19 | 810440.07 | 68 | 664107.3 | 336944.3 | 50 | 116543.2 | 70907.9 | 60 | 79614.4 | 4166.4 | 12 | 1412358.7 | 429993.4 | 30.4 | 556495.9 | 133112.6 | 23.9 |

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre which set out in Annexes of this study.

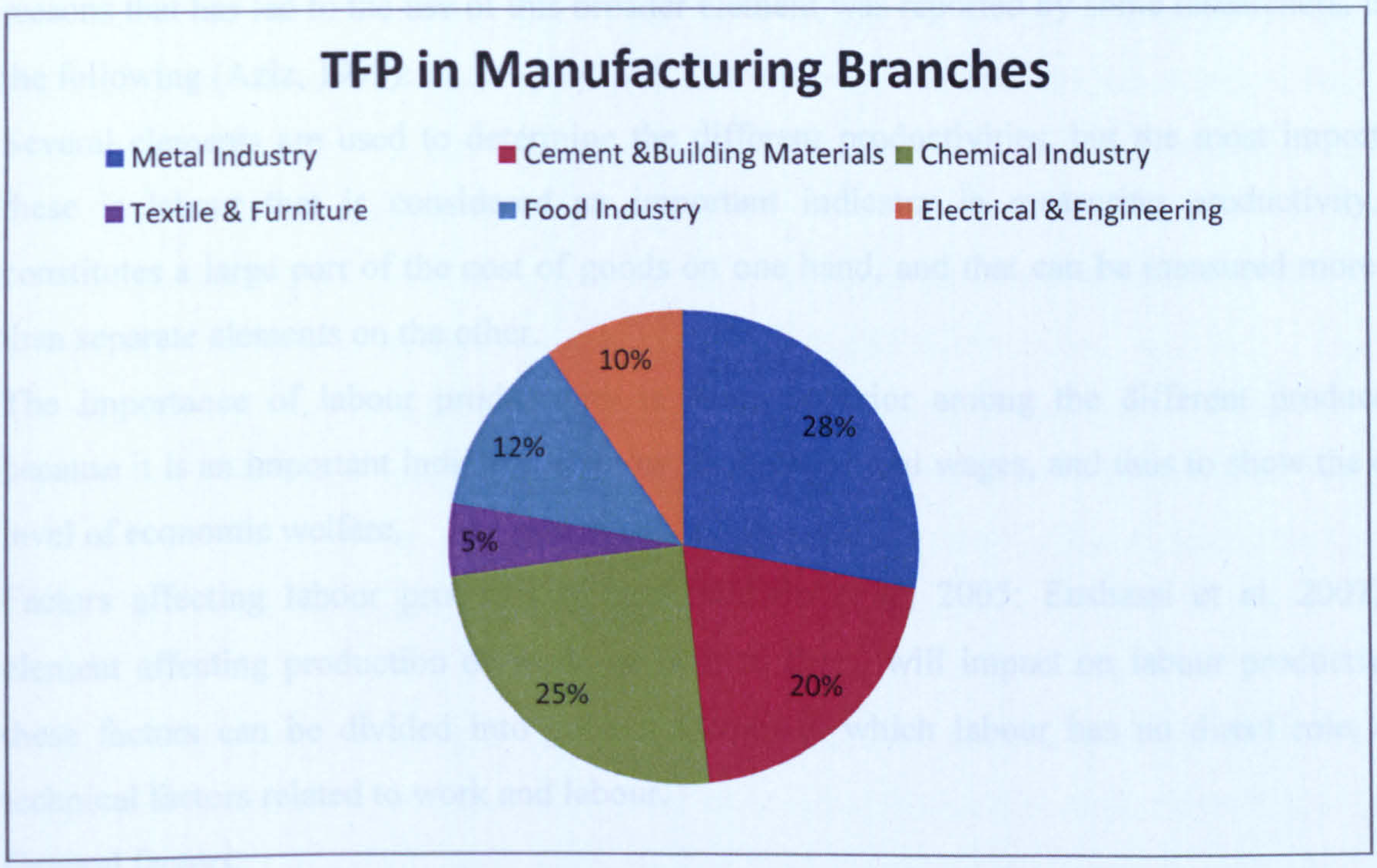



**Figure (7-4) TFP Index in the Manufacturing Branches in 2008**

### 7.4.3. Partial Factor Productivity (*PFP*)

**First: Labour Productivity**

Labour is a broader element used in measuring productivity in Libya, and the most important reasons that has led to the use of this broader element was reported by some researchers, include the following (Aziz, 1999):

Several elements are used to determine the different productivities, but the most important of these is labour that is considered an important indicator in measuring productivity, as it constitutes a large part of the cost of goods on one hand, and that can be measured more easily than separate elements on the other.

The importance of labour productivity is being superior among the different productivities because it is an important indicator to know the level of real wages, and thus to show the overall level of economic welfare.

Factors affecting labour productivity (see Baldwin et al, 2005; Enshassi et al, 2007): Any element affecting production or work, or both of them, will impact on labour productivity, as these factors can be divided into general factors in which labour has no direct role, and to technical factors related to work and labour.

General factors:

Factors related to the availability of raw materials and their quality, the extent of the feasibility of economic policy, seeking to provide terms of productivity growth, degree of interdependence among diverse economic sectors and industries, and availability of food, transport and services for workers. There are other factors related to the age composition of population which increase or decrease the size of the labour force and its type and influence on the evolution of productivity.

There is also the rate of employment change (labour rotation rate), where productivity is high if this rate is low, and vice versa. In addition to other factors related to climatic conditions within the workplace, affecting the physical capacity of workers such as temperature, sound, ventilation, and other, which have a direct impact on productivity.

High wage levels increase the purchasing capability of workers, and therefore increase their demand for goods and products which will have an impact in increasing production. On the contrary, low wages lead to lower purchasing capability of workers and have an opposite effect.

In addition to all these, there are other minor factors that could lead to greater willingness of workers to develop production and increase yields.

Technical factors:

These are factors that have usually a long-term impact on output and influence on how to upgrade input and its organization. Therefore, it is worth knowing all the technical factors that affect the improvement of the quality of work, or improve the quality of inputs related to the labour element which include the following:

A - Specialization and division of labour: it is either a professional specialization between different professions, or specialization within the same profession.

Specialization within the same profession (technical division of work) is one division working to a number of work parts. Professional specialization and specialization within the same profession both lead to increases the skill of workers and offer the possibility of transmission of the profession to another, or from one part of a profession to another.

B - Orientation education and setting: The professional qualification of workers and the preparation of scientific personnel in general are the most important factors that help to increase labour productivity. Individuals could receive their orientation, education and setting in the education sector, either through schools, universities and institutes of vocational orientation and various technical institutes, or directly in factories which provide the necessary information to workers in the form of training courses and specialized programs, in order to understand the fundamentals of work and the acquisition of new skills commensurate with development.

C - Organization and rationalization of work: labour productivity can be increased by organizing the effort of workers and regulating the relationship between the worker and the machine through organization of scientific work. The Taylor method is considered to be a way of organizing work and rationalization (Haggemann, 1997), this method is purposed to increase the output of work compared with inputs through organization of working methods, as well as through arrangement of machinery, equipment and raw materials in the workplace to allow them to be exploited efficient, and also through determining the time required to complete each part of work, and finally through the adoption of a specific wage system based on incentives for workers which linking wages paid and the size of output produced. Wage should be commensurate with the amount of outputs.

D - Using machinery: labour productivity increases as a result of reducing the working time necessary to obtain a certain amount of output by using machinery, which previously required time and strenuous effort by workers. Machinery also helps to increase the effectiveness of the division of labour, organization and rationalization.

Increasing the use of machines has a negative impact, as it leads to increased unemployment in the short term. However, these negative effects vanish in the long run because the increase in labour productivity and reduced costs lead to an increase in output and a new increase in the demand for workers, especially in the services sector which become more in demand with increasing incomes and rising living levels.

Measurement of Labour Productivity in the Libyan Manufacturing Sector:

As already point out that the productivity of labour reflects the relationship between the value of output and labour element, the measures used are as follows (see Smith, 1995; Tawiri, 2000):

• labour productivity per month (in dinars) ***(LPP)***

$$labour\ productivity\ per\ month = \left(\frac{value\ of\ real\ production}{average\ total\ labour}\right)/12$$

where

average total labour in a given year =

$$average\ total\ labour\ in\ given\ year = \left(\frac{labour\ in\ the\ beginning\ of\ the\ year}{labour\ at\ the\ end\ of\ the\ year}\right)/2$$

• productivity efficiency of labour ***(PEL)***

$$productivity\ efficiency\ of\ labour = \frac{real\ value\ added}{average\ total\ labour}$$

• percentage of skilled labour to production value *(SLP)*

$$\text{percentage of skilled labour to production value} = \left(\frac{\text{average total skilled worker}}{\text{actual production value}}\right) X\ 100$$

• average productivity of the dinar of labour shares per month *(APDL)*

$$\text{average productivity of the Dinar of labour shares per month} = \frac{\text{labour productivity per month (in dinar)}}{\text{average of worker's share per month}}$$

where:

average of worker's share per month *(AWM)*

$$\text{average of worker's share per month} = \left(\frac{\text{total salaries and share of labour}}{\text{average total labour}}\right) /12$$

❖ **Labour productivity per month (in dinars) (*LPP*):**

This criterion measures the contribution of a worker to the value of production per month. As can be seen in the Table 7-3, labour productivity in the metal industry branch increased by 174.7% during the period between 1997 and 2008, unlike other branches which witnessed different fluctuations in their labour productivity. This means that the productivity per worker in the metal industry (in 2008, for example) was LD 8912.9 per month; this number is relatively large if compared with the productivity of labour in other sections.

The largest number of this measure was for the branch of food industry; its labour productivity reached LD10,581.17 in 2008, compared to this, the worst figure was for textile and furniture industry, which saw a large decline in labour productivity, and recorded only LD 255.34 in 2008, by a decline of 82.89% from 1997.

❖ **Productivity efficiency of labour (*PEL*):**

This criterion measures worker contribution to the achievement of value added, and Table 7-3 shows that the productivity efficiency of the metal industry recorded the lowest value in 1999 of LD 29248.46, then continued increasing until it reached LD102019.1 in 2008, where the worker contribution was LD 102019.1.

In the same year, worker in the branch of the cement and building materials industry achieved an added value of LD 60699.8, the third largest number after the food industry, in which the average worker contributed LD 75970.87 of value added in 2008.

The worst contribution in 2008 was the contribution of labour in the textile and furniture industry, which recorded only LD2189.4, having been L.D 23723.6 in 2001.

❖ **Proportion of skilled labour to production value (*SLP*):**

This measure equals to invert labour productivity, whenever ***SLP*** is small amount, that is a positive indicator. This proportion measures what one unit of production requires in terms of the labour factor. ***SLP*** continued to decline gradually from 0.0023 in 1999 to reach its lowest level 0.0008 in 2008. Each one unit of output value in 1999 demanded 0.0023 work unit, and as a result of improved labour productivity in the metal industry led to the per unit of production requiring only 0.0008 of work unit. The same case involving the rest of other branches to a lesser extent, except the textile and furniture industry which saw a rise in value of ***SLP*** from 0.0056 in 1997 to 0.0326 in 2008. This is a reflection of the lower labour productivity in this branch.

The following tables demonstrate the most important measurements of labour productivity and their analysis in the branches of the Libya manufacturing sector.

Table (7-3)

Measurement of Labour Productivity in the Manufacturing Sector Branches (1997-2008)

| Year | Metal Industry | | | Cement & Building Materials | | | Chemical Industry | | | Textile & Furniture Industry | | | Food Industry | | | Electrical & Engineering Industry | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *LPP* | *PEL* | *SLP* | *LPP* | *PEL* | *SLP* | *LPP* | *PEL* | *SLP* | *LPP* | *PEL* | *SLP* | *LPP* | *PEL* | *SLP* | *LPP* | *PEL* | *SLP* |
| 1997 | 3244.67 | 31205.37 | 0.0022 | 3242.97 | 30158.7 | 0.0025 | 1218.01 | 11952.23 | 0.0068 | 1484.23 | 14538.45 | 0.0056 | 1553.84 | 10962.04 | 0.0053 | 1252.07 | 9002.24 | 0.0066 |
| 1998 | 3332.69 | 30525.91 | 0.0021 | 3009.0833 | 27985.8 | 0.0027 | 1334.493 | 13096.81 | 0.0062 | 1646.71 | 16124.47 | 0.0050 | 1624.09 | 11479.67 | 0.0051 | 1374.70 | 9884.57 | 0.0060 |
| 1999 | 3172.59 | 29248.46 | 0.0023 | 3265.7863 | 30356.2 | 0.0025 | 838.2876 | 8220.148 | 0.0099 | 606.78 | 5870.323 | 0.0137 | 2750.40 | 19611.95 | 0.0030 | 1520.44 | 10927.66 | 0.0054 |
| 2000 | 3167.04 | 29763.42 | 0.0023 | 3241.1043 | 30143.2 | 0.0025 | 846.286 | 8287.585 | 0.0098 | 848.57 | 8211.086 | 0.0098 | 2357.11 | 16799.44 | 0.0035 | 2059.71 | 14811.18 | 0.0040 |
| 2001 | 3266.42 | 30589.81 | 0.0022 | 2810.9353 | 26131.4 | 0.0029 | 802.2408 | 7861.887 | 0.0103 | 2444.6 | 23723.61 | 0.0034 | 1923.17 | 13690.62 | 0.0043 | 692.04 | 4961.56 | 0.0120 |
| 2002 | 3489.45 | 33957.53 | 0.0020 | 2899.2236 | 26876.3 | 0.0028 | 763.0484 | 7475.795 | 0.0109 | 2062.30 | 20058.12 | 0.0040 | 2631.68 | 18782.66 | 0.0031 | 1560.38 | 11200.36 | 0.0053 |
| 2003 | 3383.94 | 34832.23 | 0.0021 | 2497.0348 | 23059.5 | 0.0033 | 677.8623 | 6569.348 | 0.0122 | 421.83 | 3895.298 | 0.0197 | 3011.36 | 21509.32 | 0.0027 | 1707.94 | 12249.83 | 0.0048 |
| 2004 | 3898.71 | 41388.39 | 0.0018 | 4221.724 | 39068.5 | 0.0019 | 966.6144 | 7982.281 | 0.0086 | 364.46 | 3423.947 | 0.0228 | 3647.76 | 26087.43 | 0.0022 | 1161.53 | 8306.90 | 0.0071 |
| 2005 | 4141.45 | 44783.2 | 0.0016 | 6398.0282 | 59416.0 | 0.0013 | 1097.181 | 9733.115 | 0.0075 | 270.85 | 2474.564 | 0.0307 | 3950.91 | 28268.73 | 0.0021 | 189.57 | 1320.36 | 0.0439 |
| 2006 | 5105.42 | 56949.97 | 0.0013 | 2839.9394 | 26348.8 | 0.0029 | 1295.945 | 12527.01 | 0.0064 | 342.96 | 3139.797 | 0.0242 | 4508.26 | 32264.31 | 0.0018 | 2474.25 | 17778.21 | 0.0033 |
| 2007 | 6849.11 | 77299.9 | 0.0010 | 5830.3074 | 54319.1 | 0.0014 | 1649.764 | 16025.63 | 0.0050 | 325.30 | 2873.847 | 0.0256 | 7776.26 | 55764.96 | 0.0010 | 3342.38 | 24022.47 | 0.0024 |
| 2008 | 8912.97 | 102019.1 | 0.0008 | 6511.9198 | 60699.8 | 0.0012 | 1609.76 | 15746.82 | 0.0051 | 255.34 | 2189.395 | 0.0326 | 10581.17 | 75970.57 | 0.0007 | 4109.69 | 29560.87 | 0.0020 |

Source: Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre which set out in Annexes of this study.

❖ **Average Productivity of the Dinar of the Shares of Labour per Month *(APDL)***

Due to lack of access to data available on some indicators that are used to calculate this measure, focusing on 2008 will be base of this analysis (Table 7-4).

**Table (7-4)**
**Measurement of Labour Productivity in the Manufacturing Sector Branches (2008)**

L.D

| Branch | *LPP (1)* | *Total Labour (2)* | *TSSL (3)* | *AWM (4) = (3÷2)/12* | *APPL = (1) ÷ (4)* |
|---|---|---|---|---|---|
| **Metal Industry** | 8912.97 | 7944.00 | 83954.1 | 0.88 | 10.13 |
| **Cement & Building Materials** | 6511.9198 | 5551.0 | 14216.2 | 0.21 | 29.8 |
| **Chemical** | 1609.76 | 4503.0 | 18538.8 | 0.34 | 4.73 |
| **Textile & Furniture** | 255.34 | 1903.0 | 4408.6 | 0.19 | 1.34 |
| **Food Industry** | 10581.17 | 5660.0 | 40040.9 | 0.59 | 17.9 |
| **Electrical & Engineering** | 4109.69 | 4503.0 | 23491.0 | 0.44 | 9.34 |

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre which set out in Annexes of this study.

Note: *TSSL* = Total Salaries and Shares of Labour.

**Second: Degree of Contribution to Exports:**

This criterion measures the extent of contribution of the industrial establishment's exports to the total exports; the importance of this criterion lies in the fact that it helps to show the branch's contributions to export in subsiding the sector and access to foreign exchange, as well as in comparing and evaluating industrial projects according to their importance in the export promotion policy. The most commonly used criteria are as follows (Musa, 1996; Smack, 1997):

❖ $\textit{proportion ot industrial project's to the total sector'sexports} = \frac{\textit{net branch's export}}{\textit{total sector's export}}$

❖ $degree\ of\ contribtion\ to\ export = \frac{the\ value\ of\ total\ export}{the\ value\ of\ total\ sales}$

As shown in Table 7-5 the metal industry branch represented the largest contributor to exports of the manufacturing sector, its contribution was about 85% of total exports of the sector during the years covered by this study, while the percentage of exports of this section was 35% of its total sales during the same period.

The contribution of the rest of the branches were relatively very low, except the chemical industry which contributed about 26% of the sector's total exports, while the rest of the branches were non-existent in this area; the cement industry, textile, and food had no exports.

**Table (7-5)**

**Contribution of Export in the Manufacturing Sector Branches (1997, 2008)**

Thousands L.D

| Industry | Total sales | | Exports | | Contribution degree in Exports % | | % of total sector | |
|---|---|---|---|---|---|---|---|---|
| | 1997 | 2008 | 1997 | 2008 | 1997 | 2008 | 1997 | 2008 |
| **Metal industry** | 203030.0 | 1246565.0 | 61541.0 | 554058.0 | 30.30 | 44.40 | 80.00 | 96.20 |
| **Cement & building materials** | 1009876.6 | 444707.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Chemical** | 198732.3 | 88393.0 | 15177.0 | 21627.0 | 7.60 | 24.50 | 18.50 | 3.75 |
| **Textile & Furniture** | 143763.6 | 5906.0 | 104.6 | 0.0 | 0.730 | 0.00 | 1.40 | 0.00 |
| **Food** | 98413.3 | 728054.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Electrical & Engineering** | 169058.5 | 284437.0 | 110.0 | 263.0 | 0.06 | 0.10 | 0.10 | 0.05 |

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre which set out in Annexes of this study.

### 7.5. Summary

The previous section showed a decrease in total productivity in most branches of the manufacturing sector and a failure to achieve annual plan targets. Important reasons that led to this failure include: -Lack of indicators of productivity standards in most of the factories of the manufacturing sector, which led to the failure to take appropriate decisions on plan future productivity. Lack of full awareness of the concept of productivity by the decision makers in factories led to negative results on the policy of making production plans. Absence of routine and preventive maintenance of production lines resulted in a lack of available production capacity utilization.

The indicators of partial productivity show that there are fluctuations in productivity in the Libyan manufacturing sector during the period 1997 to 2008. For example, we found that labour productivity in the metal industry and food sectors increased, whereas it decreased in the textile and furniture industry. The total productivity indexes show that there are fluctuations in the Libyan manufacturing sector in general, and it was found that total productivity increased in the metal industry, cement and building materials, food industry and engineering industry, while it decreased in the chemical industry and textile and furniture industry. Investment makes it possible to increase productivity i.e. the outputs produced from given quantities of inputs. Capital investment should yield greater returns at lower unit costs - enabling what is referred to as economies of scale. Productivity is measured in units of output produced from given units of input, or in terms of revenue per unit of input employed. Therefore, there is a positive relationship between investment and productivity efficiency. However, increased investment only leads to increased levels of productivity if it well and properly invested.

The metal industry scored the best rates of productivity compared with other branches; this section depends on the Iron and Steel Complex, which constitutes about 90% of its production. This leads us in the next chapter to focus on productivity in the Iron and Steel Complex which is of the largest manufacturing plant in Libya.

# Chapter 8

# Measuring Productivity in the Iron and Steel Industry in Libya

## 8.1. Introduction

Through the previous chapter we noted that the metal industries section recorded the largest level of productivity compared to other sections in the manufacturing sector, and through the available data proved that the iron and steel industry accounted for the greatest share of the value of this sector's products. Therefore, it is necessary to shed light on the measurement of productivity in the most important institution in the metal industries section, namely the iron and steel industry. This gives us a good idea about the most important public factory working in the manufacturing sector, enabling this study to determine the level of efficiency by which domestic investment is spent and used. Defining and measuring productivity criteria in the manufacture of iron and steel facilitates a definition of how the production units in the manufacturing sector are run in order to achieve their objectives. Thus, this shows us a clear vision about the feasibility of investment in this sector, which is the main subject of this study.

The iron and steel industry in Libya began with the creation of a scrap smelter in Tripoli in 1976, with a production capacity of 21000 tons annually. After that came the establishment of the Iron and Steel Complex in Misurata, which began production in 1990; one of the most important goals in establishing this complex was the utilization of local raw materials available in the south of the country and the application of the policy of encouraging exports which were urged by the government in the 1970s and 1980s. It should be noted that there are also a series of small steel plants owned by the private sector, which produce finished products of steel such as metal furniture, screws, some spare parts for cars and other small products made from iron and steel.

## 8.2. General Approaches

I) The objectives of the establishment of the iron and steel industry in Libya:

According to the Government's view, the establishment of an iron and steel industry in Libya is a fundamental element of the establishment of industrial development, to take advantage of raw materials available locally. However, developing such an industry has goals associated with the importance of iron and steel from an economic perspective, and here we will halt at the most important of these advantages

II) The economic importance of the iron and steel industry:

a) Economic importance in terms of backward and forward linkages: Iron and steel industry is one of the important basic industries, which creates an industrial and economic structure, this is due to its linkages (forward and backward) in the economy.

Every industry has forward and backward linkage with other industries related by different proportions. Backward linkage (back interdependence) is defined as the proportion of a particular industry needs derived from other industries' products (upstream). Forward linkage (forward interdependence), is the ratio of products of a particular industry which are supplied to other industries (downstream) (see Table 8-1).

These ratios are usually used to indicate the importance of a particular industry and the extent of their interdependence with other industries. (Tawiri, 2000).

b) The importance of the iron and steel industry in economic development: There is a clear relationship between the volume of iron and steel used and achieved economic development: the volume of demand for iron and steel products shows the status of economic development.

The establishment of this industry works to increase and establish other industries. As exemplified by the Latin American experience, once an iron and steel industry is added locally, there is considerable expansion in the domestic steel market (Tawiri, 2000), mining industry, machine-building, railways, ships, bridges, and transportation. (Iron and Steel Bulletin, No. 11).

c) The relationship between the rate of per capita income and per capita consumption of iron and steel: When considering the figures for average per capita consumption of steel in both the advanced industrial countries and developing countries, it is clear that whenever there is an increase of per capita income, there is an increase of steel product consumption. This is an indirect way; the volume of demand for steel products is derived from the demand for industrial products which are manufactured by the iron and steel industry. This demand appears in the average per capita of steel consumption of a year, which reflects the standard of people's living in the community, in this case, where individuals can use a larger number of cars, machinery, transportation, construction, and expansion in construction. Table 8-2 shows that per capita consumption of steel in the industrialized countries is higher than in developing countries, for example, per capita consumption of steel in Afghanistan is 1 kg per year, in contrast, is 685 kg per year in the U.S. Table 8-3 shows steel consumption in selected countries of the world.

d) The cost of the iron and steel industry:

The iron and steel industry is considered a capital-intensive industry. It requires substantial investment to be established, and the fixed costs are basic in this industry. The fixed costs are very large compared with the variable costs, unlike the case with other industries.

This industry is very expensive, but an expenditure of huge investments in this industry will stimulate the overall economy, and create a series of economic interactions within countries which adopt this industry.

**Table (8-1)***

**Ratios of Forward and Backward Linkages of Selected industries****

| Sector | Backward Linkage % | Forward Linkage % | Total |
|---|---|---|---|
| Iron & Steel | 66 | 78 | 144 |
| Non-ferrous metals | 61 | 81 | 142 |
| Paper Products | 57 | 78 | 135 |
| Petroleum Products | 65 | 68 | 133 |
| Coal Products | 63 | 67 | 130 |
| Chemicals | 60 | 69 | 129 |
| Fabric | 67 | 57 | 124 |
| Rubber products | 51 | 48 | 99 |
| Printing & Publishing | 49 | 46 | 95 |

Source: * Journal of Social Cooperation, No. 12, the fourth year in April 1993, Doha, p. 33.

** Ratios in this table are the results of a study on industrial interdependence in four industrialized countries are: USA, Japan, Italy and Norway. This study was by a team from UN.

**Table (8-2)**
**Per Capita Consumption of Steel in Selected Countries**

(Kg)

| Countries | Per Capita | Countries | Per Capita |
|---|---|---|---|
| USA | 685 | Sudan | 6 |
| UK | 422 | Germany | 579 |
| Sweden | 623 | Kuwait | 363 |
| Spain | 188 | Lebanon | 104 |
| Pakistan | 8 | Iraq | 50 |
| Nigeria | 5 | Hungary | 307 |
| Netherlands | 347 | Greece | 94 |
| Turkey | 26 | France | 359 |
| Egypt | 21 | Cuba | 34 |
| Syria | 32 | Afghanistan | 1 |

Source: Ajameya, 1998.

**Table (8-3)**
**Apparent Steel Use in Selected Countries (2007)**

Million metric tons finished steel products

| Countries | | Countries | |
|---|---|---|---|
| France | 16.5 | UK | 13.0 |
| Germany | 38.3 | USA | 108.2 |
| Italy | 37.0 | Egypt | 5.2 |
| Netherlands | 4.1 | China | 408.3 |

Source: World Steel Association. 2008. P.19.

III) Justifications for the establishment of an iron and steel industry in Libya:

Many of the fundamentals necessary for an iron and steel industry are available in Libya, such as the following:

- Iron and steel ore: There is iron and steel ore in Libya in large quantities in the south of the country. Total resources are estimated at 3525 million tons. Table (8-4) shows the chemical composition of these reserves.

**Table (8-4)**
**Chemical Composition of Iron Ore in Libya**

| Region | Chemical Composition | | | | Reserves Million Ton. |
|---|---|---|---|---|---|
| | Iron | Silica | Aluminium | Phosphate | |
| Tarout | 49.0 | 10.90 | 4.90 | 0.94 | 160 |
| Western Brak | 50.5 | 7.05 | 4.60 | 1.05 | 480 |
| Ashkida | 451.75 | 6.15 | 4.90 | 0.92 | 475 |
| Other regions | 30.50 | 5.51 | 4.11 | 1.57 | 2410 |
| Total | | | | | 3525 |

Source: Iron & Steel Strategy. Journal of Industry. Tripoli: Industrial Research Centre, 1998, No. 2, pp. 12-15.

-Limestone: Libya has large quantities of limestone, which is used as a catalyst to remove impurities from the ore during the production of iron and steel.

-Dolomite is used as a thermal insulator in the smelting of iron; there are large quantities in Libya.

-Oil is used in the manufacture of iron and steel, and Libya has large reserves of it.

-Natural Gas is available in Libya in large quantities; a pipeline was established from Brega to Misurata to transport natural gas to the Iron and Steel Complex.

-Domestic demand for steel products:

The first analytical study conducted to estimate the expected local consumption of iron and steel was in 1970. Estimates of the expected growth rates up to 2010 were based on the expectations of demand for steel in other countries, similar in their economy to Libya. On the basis of that, projected consumption quantities of iron and steel were calculated as shown in the Table 8-5.

**Table (8-5)**
**Estimation of Demand for Steel Products in Libya**

| Year | 1990 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| Consumption of Steel (thousand ton) | 2000 | 3250 | 3400 | 3900 | 4600 |
| Per capita Consumption (Kg) | 410 | 460 | 500 | 527 | 550 |
| Crude Steel (thousand ton) | 2300 | 3000 | 3750 | 4400 | 5200 |

Source: Kamel, 1993. P.16.

The latest study to assess the local demand for iron and steel products was in 1990 which summarized the local market demand of steel to be 7057.52 tons (Journal of Arab Steel, 1990). However, studies show that the volume of demand is steadily increasing and that the establishment of iron and steel industry will benefit the national economy.

### 8.3. Indicators and productivity criteria in the Iron and Steel Complex in Libya:

#### 8.3.1. Criterion performance compared to plan:

Table 8-6 shows the actual and planned production in the Iron and Steel Complex, as well as the criterion of the performance to plan during the period from 1990 to 2008 at constant prices for the year 1997 (this criterion was calculated as mentioned at the previous section). 1998 recorded the lowest percentage which was 66.23%, while in 2005 the plan scored the largest percentage, amounting to 97.85%. It is worth mentioning that the overall average for this criterion (performance to plan) was 87.23%, which is significant when compared to other factories at the level of the manufacturing sector in Libya.

**Table (8-6)**
**Criterion Performance Compared to Plan in the Libyan Iron & Steel Company**

Millions L.D

| Year | Production Value | | Criterion Performance Compared to Plan % |
|---|---|---|---|
| | Target | Actual | |
| 1990 | 108.801 | 98.854 | 90.86 |
| 1991 | 161.719 | 150.958 | 93.35 |
| 1992 | 194.637 | 166.496 | 85.54 |
| 1993 | 200.998 | 194.406 | 96.72 |
| 1994 | 203.585 | 187.827 | 92.26 |
| 1995 | 196.834 | 180.014 | 91.45 |
| 1996 | 200.083 | 193.828 | 96.87 |
| 1997 | 227.398 | 193.998 | 85.31 |
| 1998 | 306.582 | 203.063 | 66.23 |
| 1999 | 257.627 | 212.128 | 82.34 |
| 2000 | 281.213 | 221.193 | 78.66 |
| 2001 | 301.824 | 232.840 | 77.14 |
| 2002 | 272.629 | 249.786 | 91.62 |
| 2003 | 339.201 | 280.312 | 82.64 |
| 2004 | 361.375 | 320.318 | 88.64 |
| 2005 | 407.085 | 398.330 | 97.85 |
| 2006 | 526.706 | 477.352 | 90.63 |
| 2007 | 622.79 | 543770 | 87.31 |
| 2008 | 780.70 | 604070 | 77.38 |

Source: Libyan Iron & Steel Compoany. Planning Admenstration Report (2010).

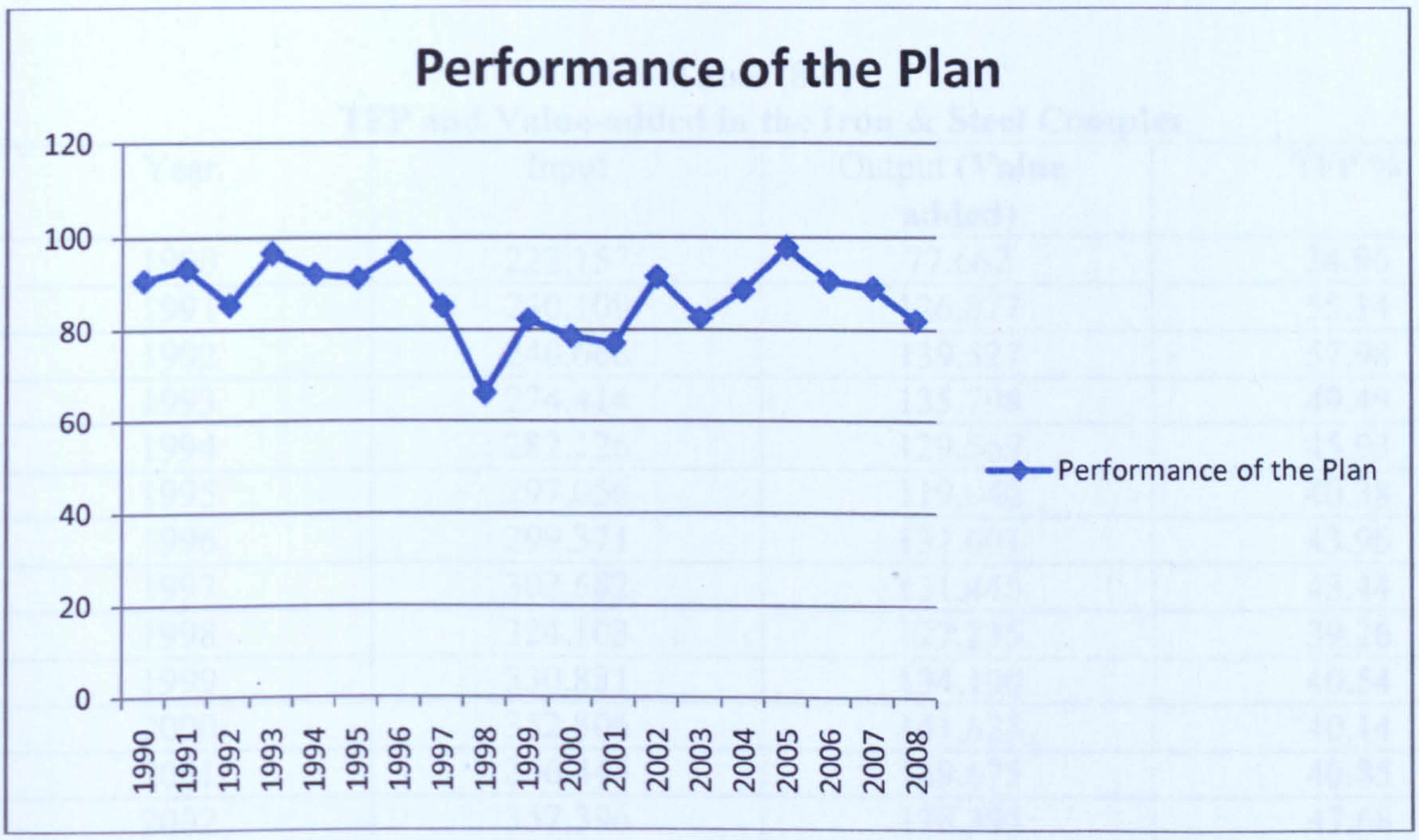



**Figure (8-1) Performance Criterion of Plan Index for the Iron & Steel Complex (1990-2008).**

### 8.3.2. Value Added and TFP

We have already seen that TFP at the level of the metal industry branch showed a marked rise compared to other branches in the manufacturing sector, since the iron and steel industry dominates the metal industry branch, so the TFP in the iron and steel industry ranges between 35% and 85%. As 1990 is of beginning of operation years in the Complex, therefore it does not reflect the real situation of productivity. 1998 recorded the lowest productivity and the reason for this is due to an increase of the proportion of costs included in the calculation of value added. The highest percentage was recorded in 2008 which amounted to 84%, and the value-added reached LD 521.388 million. Table 8-7 shows that TFP witnessed a gradual increase from 1998 (lowest) to 2008 (highest).

**Table (8-7)**
**TFP and Value-added in the Iron & Steel Complex**

| Year | Input | Output (Value-added) | TFP % |
|---|---|---|---|
| 1990 | 222.157 | 77.662 | 34.96 |
| 1991 | 230.109 | 126.877 | 55.14 |
| 1992 | 240.666 | 139.527 | 57.98 |
| 1993 | 274.414 | 135.798 | 49.49 |
| 1994 | 282.126 | 129.569 | 45.93 |
| 1995 | 297.056 | 119.940 | 40.38 |
| 1996 | 299.371 | 131.601 | 43.96 |
| 1997 | 302.582 | 131.446 | 43.44 |
| 1998 | 324.103 | 127.235 | 39.26 |
| 1999 | 330.821 | 134.100 | 40.54 |
| 2000 | 352.806 | 141.625 | 40.14 |
| 2001 | 366.444 | 149.675 | 40.85 |
| 2002 | 357.396 | 170.394 | 47.68 |
| 2003 | 377.074 | 213.082 | 56.51 |
| 2004 | 411.333 | 250.962 | 61.01 |
| 2005 | 448.563 | 310.590 | 69.24 |
| 2006 | 491.177 | 392.202 | 79.85 |
| 2007 | 548.807 | 447.928 | 81.62 |
| 2008 | 613.504 | 521.388 | 84.99 |

Source: By the researcher from the data obtained from Planning Administration in the Iron & Steel Complex.

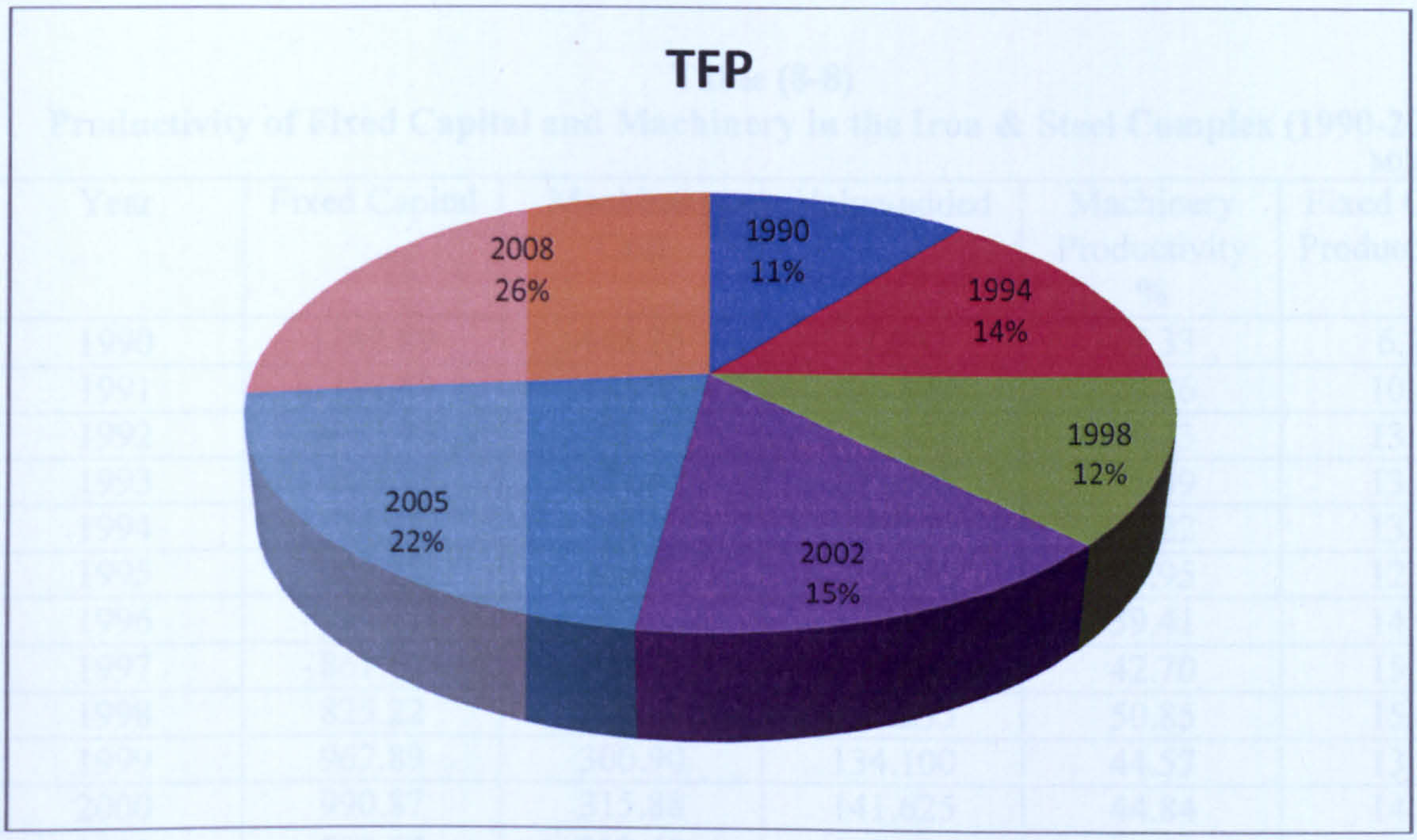



**Figure (8-2) TFP in the Iron & Steel Complex in six different years.**

### 8.3.3. Partial Factor Productivity:

**First: Productivity of Fixed Capital and Machinery:**

The cost of machinery productivity shown in Table 8-8 refers to returns of the amounts spent on machinery and capital equipment that contributed to the production process. Fixed capital productivity showed the proportion contributed by the other fixed assets in the production process.

**Table (8-8)**
**Productivity of Fixed Capital and Machinery in the Iron & Steel Complex (1990-2008)**

Millions L.D

| Year | Fixed Capital | Machinery Cost | Value-added | Machinery Productivity % | Fixed Capital Productivity% |
|---|---|---|---|---|---|
| 1990 | 1242.89 | 448.25 | 77.662 | 17.33 | 6.25 |
| 1991 | 1192.89 | 424.98 | 126.877 | 29.86 | 10.64 |
| 1992 | 1062.90 | 401.70 | 139.527 | 34.73 | 13.13 |
| 1993 | 1022.91 | 378.42 | 135.798 | 35.89 | 13.28 |
| 1994 | 985.38 | 390.00 | 129.569 | 33.22 | 13.15 |
| 1995 | 941.28 | 261.00 | 119.940 | 45.95 | 12.74 |
| 1996 | 901.11 | 333.96 | 131.601 | 39.41 | 14.60 |
| 1997 | 861.67 | 307.81 | 131.446 | 42.70 | 15.25 |
| 1998 | 825.22 | 250.22 | 127.235 | 50.85 | 15.42 |
| 1999 | 967.89 | 300.90 | 134.100 | 44.57 | 13.85 |
| 2000 | 990.87 | 315.88 | 141.625 | 44.84 | 14.29 |
| 2001 | 995.07 | 312.43 | 149.675 | 47.91 | 15.04 |
| 2002 | 991.88 | 319.92 | 170.394 | 53.26 | 17.18 |
| 2003 | 988.69 | 327.41 | 213.082 | 65.08 | 21.55 |
| 2004 | 985.50 | 400.98 | 250.962 | 62.59 | 25.47 |
| 2005 | 982.30 | 474.55 | 310.590 | 65.45 | 31.62 |
| 2006 | 979.11 | 548.12 | 392.202 | 71.55 | 40.06 |
| 2007 | 980.78 | 589.76 | 447.928 | 75.95 | 45.67 |
| 2008 | 965.67 | 671.40 | 521.388 | 77.66 | 53.99 |

Source: By the researcher from the data obtained from Planning Administration in the Iron & Steel Complex.

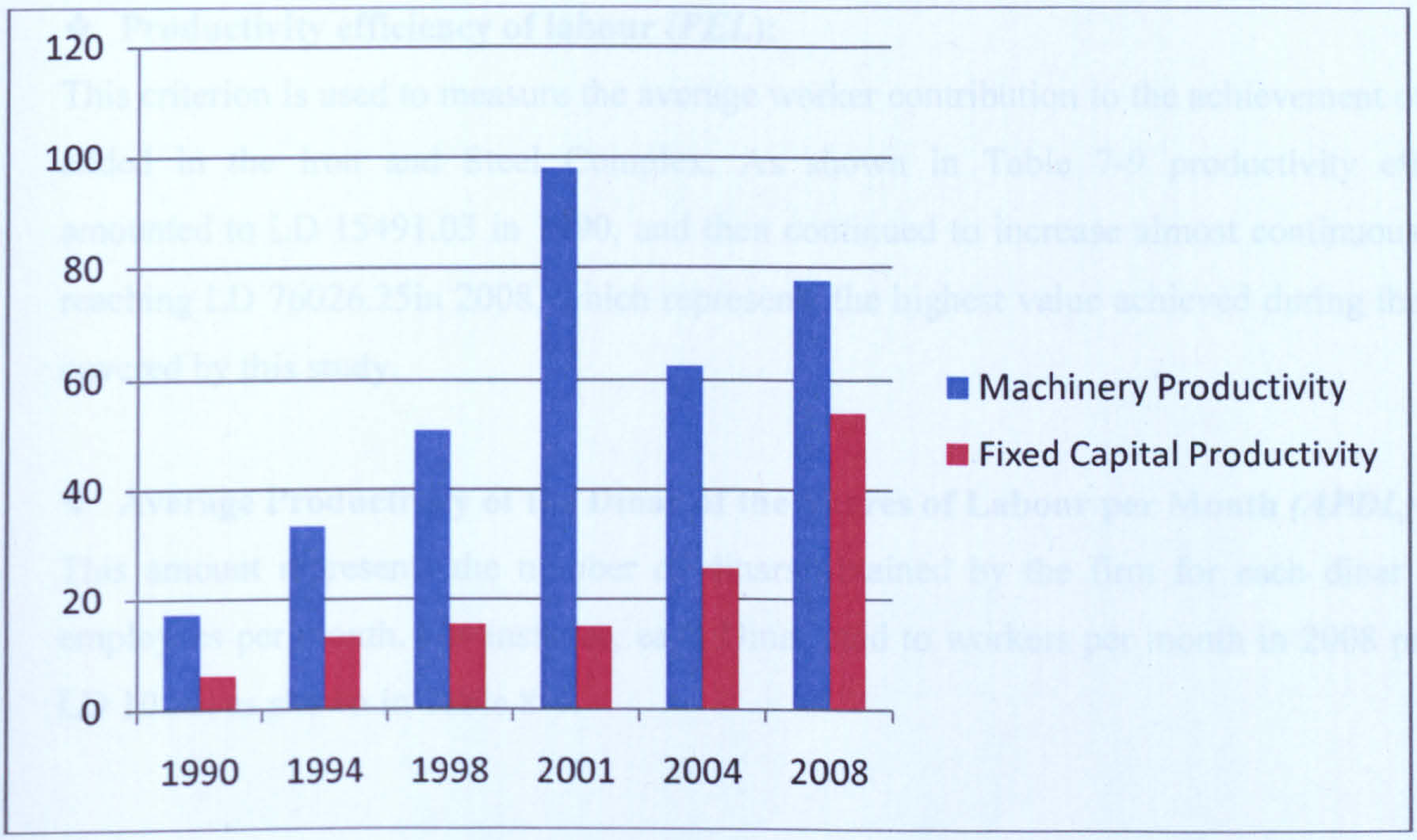



**Figure (8-3) Productivity of Fixed capital and Machinery in the Iron & Steel Complex (1990-2008).**

**Second: Labour Productivity:**

As mentioned previously, partial productivity of labour reflects the relationship between the value of output and the work element. The criteria used are as follows:

❖ **Labour productivity per month (in dinars) (*LPP*):**

This criterion is used to measure the contribution of a worker in the production value per month in the Iron and Steel Complex. The highest value reached by this criterion was in 2008, where the contribution of labour to output value amounted to LD 7340.21 per month. This was due to the real value of production being high, in addition to an increase in the average total labour force being relatively low. These indicators and the rates of labour productivity in the Iron and Steel Complex are considered relatively high when compared to other factories in the manufacturing sector, for example, which did not exceed LD 7000 per month in cement manufacturing, LD 2500 in a textile factory.

❖ **Productivity efficiency of labour (*PEL*):**

This criterion is used to measure the average worker contribution to the achievement of value-added in the Iron and Steel Complex. As shown in Table 7-9 productivity efficiency amounted to LD 15491.03 in 1990, and then continued to increase almost continuously until reaching LD 76026.25in 2008, which represents the highest value achieved during the period covered by this study.

❖ **Average Productivity of the Dinar of the Shares of Labour per Month *(APDL)***

This amount represents the number of dinars obtained by the firm for each dinar paid to employees per month. For instance, each Dinar paid to workers per month in 2008 produced LD 10.56, as shown in Table 8-9.

**Table (8-9)**
**Indicators and Criteria of Labour Productivity**

L.D

| Year | Labour Force* | Salaries & Wages (millions) | LPP | PEL | APDL |
|---|---|---|---|---|---|
| 1990 | 5013 | 9.364 | 1643.18 | 15491.03 | 10.56 |
| 1991 | 5123 | 13.378 | 2455.40 | 24764.58 | 11.28 |
| 1992 | 5334 | 14.871 | 2601.17 | 26157.99 | 11.20 |
| 1993 | 5142 | 20.146 | 3150.62 | 26409.61 | 9.65 |
| 1994 | 5554 | 32.119 | 2818.19 | 23328.9 | 5.85 |
| 1995 | 5697 | 24.435 | 2633.17 | 21053.22 | 7.37 |
| 1996 | 5797 | 26.864 | 2786.33 | 22701.52 | 7.22 |
| 1997 | 6029 | 28.937 | 2681.46 | 21802.32 | 6.70 |
| 1998 | 6160 | 31.107 | 2747.06 | 20655.08 | 6.53 |
| 1999 | 6291 | 30.941 | 2809.94 | 21316.17 | 6.86 |
| 2000 | 6422 | 33.604 | 2870.25 | 22053.15 | 6.58 |
| 2001 | 6553 | 34.758 | 2960.98 | 22840.64 | 6.70 |
| 2002 | 6674 | 33.168 | 3118.89 | 25531.03 | 7.53 |
| 2003 | 6694 | 31.298 | 3489.59 | 31831.71 | 8.96 |
| 2004 | 6701 | 42.074 | 3983.46 | 37451.41 | 7.61 |
| 2005 | 6714 | 52.659 | 4944.02 | 46260.1 | 7.56 |
| 2006 | 6745 | 54.419 | 5897.60 | 58147.03 | 8.77 |
| 2007 | 6814 | 57.287 | 6650.16 | 65736.44 | 9.49 |
| 2008 | 6858 | 57.227 | 7340.21 | 76026.25 | 10.56 |

Source: By the researcher from the data obtained from Planning Administration in the Iron & Steel Complex.
*Average = (employment in beginning of year + employment in end of year) / 2.

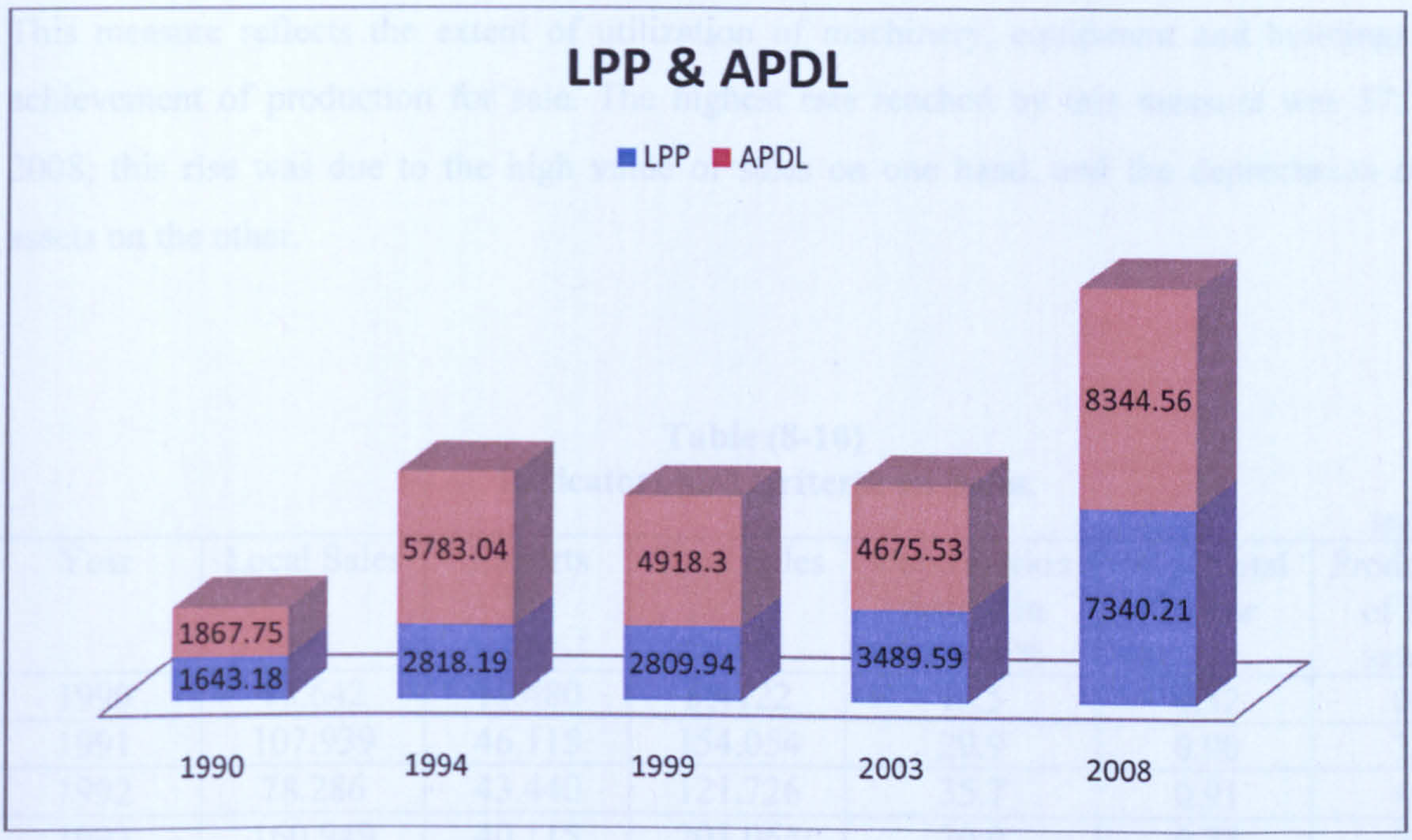



**Figure (8-4) LPP & APDL in the Iron & Steel Complex (1990-2008).**

**Third: Criteria of Sales Productivity:**

**I) Degree of Export Contribution:**

By comparing exports in the period 1990-2008 as shown in the Table 8-10, it is noted that the highest value was LD 553.934 in 2008 by 46.1% with total value of sales in the same year of LD1202.753. However, the highest value in terms of the export criterion was 64% in 2004, which represented about half of the 2008 sales in general.

**II) Contribution of the Project's Exports to Total Exports of the Manufacturing sector:**

This criterion is used to measure the contribution of the exports of the Iron and Steel Complex to the manufacturing sector's gross exports. This percentage saw a marked rise during the years of study because of the fact that exports of this plant's products are the overwhelming majority of the manufacturing sector's exports.

### III) Productivity of Fixed Assets:

This measure reflects the extent of utilization of machinery, equipment and buildings in the achievement of production for sale. The highest rate reached by this measure was 57.36% in 2008; this rise was due to the high value of sales on one hand, and the depreciation of fixed assets on the other.

**Table (8-10)**
**Indicators and Criteria on Sales**

Millions L.D

| Year | Local Sales | Exports | Total Sales | Contribution degree in Export % | % of Total Sector | Productivity of Fixed assets % |
|---|---|---|---|---|---|---|
| 1990 | 73.642 | 11.480 | 85.122 | 13.5 | 0.32 | 0.92 |
| 1991 | 107.939 | 46.115 | 154.054 | 29.9 | 0.90 | 3.87 |
| 1992 | 78.286 | 43.440 | 121.726 | 35.7 | 0.91 | 4.09 |
| 1993 | 160.949 | 40.115 | 201.064 | 20.0 | 0.73 | 3.92 |
| 1994 | 125.814 | 21.650 | 147.464 | 14.7 | 0.35 | 2.20 |
| 1995 | 152.577 | 69.354 | 221.931 | 31.3 | 0.91 | 7.37 |
| 1996 | 143.970 | 42.945 | 186.915 | 23.0 | 0.56 | 4.77 |
| 1997 | 102.018 | 46.260 | 148.278 | 31.2 | 0.60 | 5.37 |
| 1998 | 104.043 | 56.176 | 160.219 | 35.1 | 0.73 | 6.81 |
| 1999 | 148.558 | 53.727 | 202.285 | 26.6 | 0.54 | 5.55 |
| 2000 | 140.706 | 65.259 | 205.965 | 31.7 | 0.59 | 6.59 |
| 2001 | 115.868 | 72.680 | 188.548 | 38.5 | 0.61 | 7.30 |
| 2002 | 124.993 | 100.387 | 225.380 | 44.5 | 0.75 | 10.12 |
| 2003 | 161.513 | 110.514 | 272.027 | 40.6 | 0.74 | 11.18 |
| 2004 | 200.992 | 357.953 | 558.945 | 64.0 | 0.90 | 36.32 |
| 2005 | 322.387 | 326.022 | 648.409 | 50.3 | 0.81 | 33.19 |
| 2006 | 408.675 | 417.765 | 826.440 | 50.5 | 0.94 | 42.67 |
| 2007 | 515.109 | 417.785 | 932.894 | 44.8 | 0.94 | 42.60 |
| 2008 | 648.819 | 553.934 | 1202.753 | 46.1 | 0.96 | 57.36 |

Source: By the researcher from the data obtained from Planning Administration in the Iron & Steel Complex.

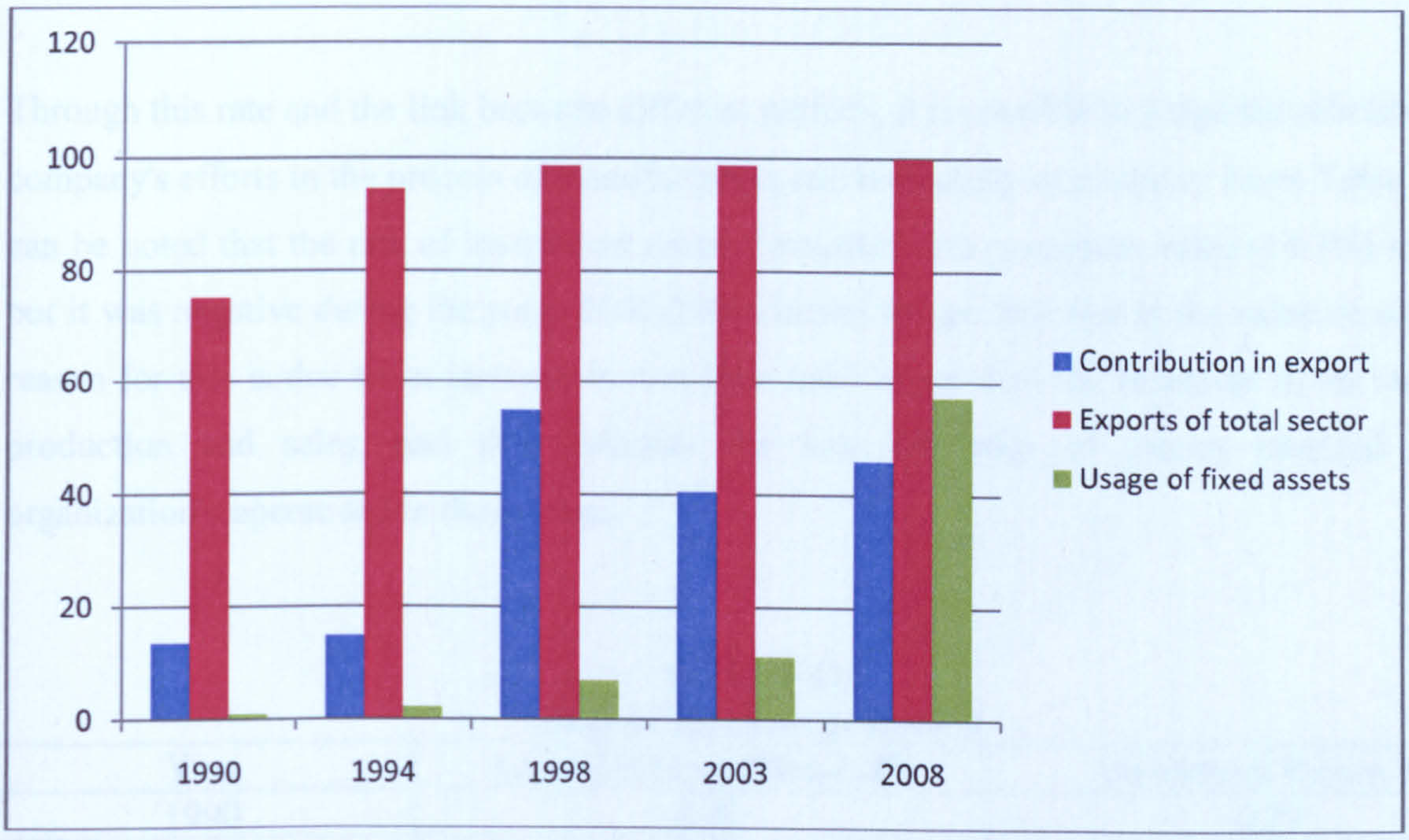



**Figure (8-5) Productivity of Sales in the Iron & Steel Complex (1990-2008).**

**Fourth: Financial criteria:**

**I) Profitability by using rate of investment return:**

Profitability measured by the ratio of gross profit to gross fixed assets is used as a criterion to assess the performance of industrial facilities if the goal is to maximize profit (Brigham & Ehrhardt, 2007). However, if the absolute size of profit is not considered the basis for the performance of the enterprise, it is advisable to measure performance using the rate of profitability. There are many criteria to measure profitability; the most important of them is rate of investment return. This criterion is important in terms of measuring the performance of industrial investment, it reflects the profitability and efficiency of investment on the project, and takes the following formula:

$$rate\ of\ investment\ return = \left(\frac{profit}{invested\ capital}\right) X100$$

Through this rate and the link between different periods, it is possible to judge the efficiency of a company's efforts in the process of manufacturing and marketing its products. From Table 8-11 it can be noted that the rate of investment return amounted to a maximum value (14.7%) in 2008, but it was negative during the years 2000-2001 despite the gradual rise in the value of sales, the reason for this is due to an increase in cost item rates larger than the increases in the values of production and sales, and this indicates the low efficiency of money invested in the organization's operations in those years.

**Table (8-11)**
**Rate of Investment Return**

| Year | Gross Profit (**million L.D**) | Investment Return % |
|---|---|---|
| 1990 | -4.82 | -0.39 |
| 1991 | 39.82 | 3.34 |
| 1992 | 45.29 | 4.26 |
| 1993 | 39.94 | 3.90 |
| 1994 | 24.26 | 2.46 |
| 1995 | 6.21 | 0.66 |
| 1996 | 16.83 | 1.87 |
| 1997 | 11.69 | 1.36 |
| 1998 | 6.27 | 0.76 |
| 1999 | 8.96 | 0.93 |
| 2000 | -3.74 | -0.38 |
| 2001 | -2.95 | -0.30 |
| 2002 | 23.59 | 2.38 |
| 2003 | 34.88 | 3.53 |
| 2004 | 40.65 | 4.13 |
| 2005 | 68.56 | 6.98 |
| 2006 | 105.99 | 10.83 |
| 2007 | 122.30 | 12.47 |
| 2008 | 141.95 | 14.70 |

**Source: By the researcher from the data obtained from Planning Administration in the Iron & Steel Complex.**

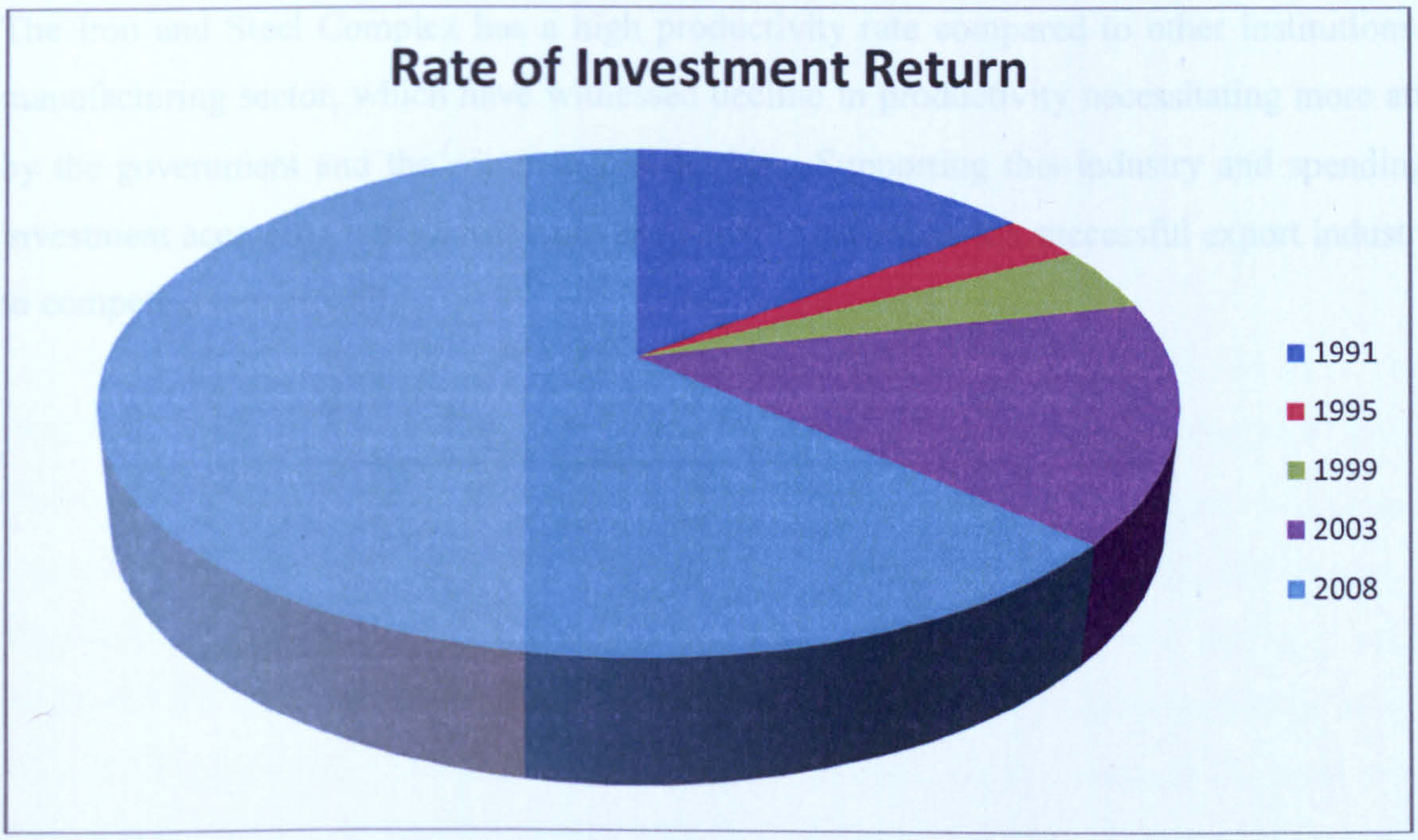



**Figure (8-6) Rate of Investment Return in the Iron & Steel Complex (1991-2008).**

## 8.4. Summary

The demand for iron and steel is derived from the demand for goods that use this material, on this basis, the changes that occur in the structure of industrial production reflect negatively or positively on the iron and steel industry. Technical developments have recently reduced the economic demand for steel in developed countries in some form, but in the case of Libya, steel is still in the process of building infrastructure including buildings, railways. Other goods use iron as a raw material in their manufacturing operations, thereby generating a growing demand for industry iron and steel products.

The iron and steel industry in Libya has resources which made it an industry more likely to be competitive compared to some other industries, and Libya is ranked the third country after Algeria and Mauritania at the level of MENA countries in terms of the availability of iron ore reserves. In addition there is the availability of oil and natural gas in large quantities, which are key inputs to the steel industry, as a result of that; it should be an important industry in supporting the national economy.

The Iron and Steel Complex has a high productivity rate compared to other institutions in the manufacturing sector, which have witnessed decline in productivity necessitating more attention by the government and the competent authorities. Supporting this industry and spending more investment according to its advantages and benefits can make it a successful export industry, able to compete internationally.

# Chapter 9

# Analysis and Empirical Results

## 9.1. Introduction

This chapter presents the results of the empirical study; and discusses the main empirical findings of this study by analysing the estimated and computed results. The ADF and PP unit root tests and cointegration test are all carried out in this chapter. Furthermore, it describes the models used in this study. This chapter also explains the sources of data used to carry out the empirical work of this study. This chapter is divided into three main sections; section 9.2 describes the function of domestic investment in the public manufacturing sector, which deals with the study determinants affecting this function in the Libyan economy. The domestic private investment determinants model is estimated in section 9.3. In addition, the relationship between economic growth and domestic investment in the Libyan economy is identified in section 9.4 by showing the impact of domestic investment on economic growth in Libya.

## 9.2. Model of Determinants of Domestic Investment in the Libyan Public Manufacturing Sector

### 9.2.1. Description of Variables and Data

The most important variables of the model are used for interpreting the changes in manufacturing investment in Libya, specified on the basis of previous applied studies. The dependent variables which will be used in this section are gross public domestic fixed capital formation (domestic public investment in the manufacturing sector as the first equation).

This study has relied on the results of the analysis of some previous studies for selecting explanatory variables.

#### I) Value-added in the Manufacturing Sector

According to the definition of the OECD, (2009, p. 60), "gross value added is defined as output minus intermediate consumption and equals the sum of employee compensation, gross operating surplus of government and corporations, gross mixed income of unincorporated enterprises and taxes on products". The results of some studies (Bigsten et al., 1997; Looney, 1997; Omar, 2002) have indicated that value-added is an important factor which has a positive impact on public manufacturing investment. This study used the value-added generated in the manufacturing sector, because it gives a real picture of manufacturing activity and reflects the reality in this sector in the Libyan economy. The growth of manufacturing sector investment has been mentioned by Looney, (1997), Mohamed, (1997) and Devarajan et al., (2002), who concluded that the value added in the manufacturing sector contributes to encouraging investment in this sector. Thus, a negative relationship is expected between this variable and domestic investment in the Libyan manufacturing sector.

**II) Oil Revenues**

The studies by Omar, (2002); Mohamed, (1997); Tabibian, (2003) gave great importance to the availability of finance which is realized from oil revenues, because oil revenues have a strong impact on manufacturing investment. Investment in the Libyan economy depends on oil revenues, which means, we expect that an increase in oil revenues will encourage investment in the manufacturing sector of the Libyan economy.

**III) Government's Annual Appropriation to the Manufacturing Sector**

Mohamed's study (1997) emphasised the role of the Government's annual appropriation for investment in manufacturing and the products of manufacturing for its major direct impact on the desired level of investment in the manufacturing sector.

There is no doubt that these appropriations granted by the Government to support the industrial sector have a positive impact on investment in this sector, increasing allocations in order to support development and investment projects, leading to positive effects on investment in the manufacturing sector.

**IV) Real GDP in the Manufacturing Sector:**

There is a positive relationship between real GDP and investment in the public manufacturing sector; according to a study of Omar (2002). There is consensus among economists on the existence of a direct correlation between investment and the growth of real GDP. Neo-Keynesian and Neo-classical investment theory suggest investment is positively related to real GDP. This relationship can be derived from the model of flexible acceleration (see chapter 2 in this study), which assumes a production function with a fixed relationship between the desired capital and changes in GDP. According to what has been raised above, this study expected that real GDP in the public manufacturing sector has a positive relationship with public investment in the manufacturing sector.

**V) Capital Goods and Machinery Imports:**

A country's import of capital goods and machinery is an important determinant for investment: the import of machinery and capital goods helps to stimulate and increase the volume of investment. So the relationship between investment and imports of machinery and capital goods is expected to be positive according to some empirical studies such as Omar, 2002 and Mileva, 2008.

**VI) Labour Force in the Manufacturing Sector:**

The labour force is considered as one of the most important determinants of investment because it is positively related to GDP. A planned and appropriate increase in the labour force leads to increased production, and thus surplus production will lead to increased savings, which have a positive impact on increasing investment.

A series of applied studies have proven that employment has a positive effect on investment in the manufacturing sector and its growth (Seruvatu and Jayraman, 2001; Soderbom & Teal, 2006; Ndikumana, 2005), therefore, a positive relationship is expected by this study between this variable and domestic investment in the public manufacturing sector. Some of the studies addressed the effect of labour on the various aspects of employment, some of them examined the impact of real unit labour cost on investment in the manufacturing sector, and others only studied the impact of employment and its increase. This study used the total amount of employment in the private manufacturing sector, because of the difficulty of obtaining accurate and real data on unit labour cost during a long time series.

Through previous studies and analysis of the key variables of the Libyan economy, it is noted that the determinants of public investment in the manufacturing sector are: real oil revenue; real value-added generated in the manufacturing sector; real Government's annual appropriation for investment in the manufacturing sector; real public investment in the manufacturing sector lagged one year; real GDP in the manufacturing sector; real capital goods and machinery imports; labour force in the Manufacturing sector

**Data:**

The study is limited to economic developments and manufacturing investment in the period from 1962 to 2008, and data variables are given in their real value and are expressed in monetary units in Libyan dinar at 2000 prices. This effort to adjust data in monetary units into constant prices removes the inflation effect. Using the statistics on real GDP and nominal GDP, an implicit index of the price level for the year can be calculated; this index is called the GDP deflator. The GDP deflator can be viewed as a conversion factor that transforms real GDP into nominal GDP. Deflation is defined as a fall in the overall price level. In order to abstract from changes in the overall price level, the GDP price deflator is used as an indicator of the economy's average price level. All variable are used in logarithmic form. This study covered the time period (1962-2008) because there is no data available before 1962 in the Libyan data resources, and because monthly or quarterly data are not available, this study is based on annual data.

While the study attempts to identify the factors which control domestic investment in the manufacturing sector, the study information is collected from many references as can be seen from Table 9-1, books, periodicals, articles and bulletins related to the study. Also, data and statistics are collected from reports and publications for various years on industrial investment issued by the General Authority for Investment and Ministry of General Planning. This is in addition to the Investment Promotion Boards in Libya, the Ministry of Industry, Ministry of Economy, Central Bank of Libya, General Planning Council, General Authority for Information and Documentation in Libya, World Development Database, and UNCTAD, and other sources relevant to this topic of study.

**Table (9-1)**

**Variables, Definitions and Sources***

| Variable | Definition | Source |
|---|---|---|
| DGIM | Real domestic fixed capital formation in public manufacturing sector | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| VDM | Real value-added in the manufacturing sector | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| OILR | Real oil revenues | Central Bank of Libya (1962-2008) |
| GAIN | Real government's annual appropriation given to the manufacturing sector | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| GDPM | Real Gross Domestic Product in the manufacturing sector | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| MACHIM | Real capital goods and machinery imports | Central Bank of Libya (1962-2008) |
| MANLAB | Size of labour force in the manufacturing sector measured as absolute number of labour | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| PRIVATE | Real domestic fixed capital formation in private manufacturing sector | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| EXCH | Real exchange rate (US Dollar exchange specified by the Central bank of Libya) | Central Bank of Libya (1962-2008) |
| OPEN | Economic openness level (sum of exports and imports as a share real GDP) | Central Bank of Libya (1962-2008) |
| PCGDP | Real per-capita GDP | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| CRED | Real credits given to the domestic private manufacturing sector | Central Bank of Libya (1962-2008) |
| I | Real domestic fixed capital formation in the economy | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |
| L | Size of labour force in the Libyan economy | Ministry of Planning (1962-2000) & General Planning Council (2001-2008) |

*Variables showed in this table belong to the three models in the applied study.

### 9.2.2. The Model

The study provides the justification for the use of the methodology of econometrics to be applied later in this study. Using the regression model employed by the majority of specialists in econometrics, and using economic theory, the extent to which the model can be relied upon in the analysis of results can be estimated. If it is proved that the model is not satisfactory, then it can be improved in different ways according to econometrics theory (Barrett, 2001), until a model is formulated that we are sure is satisfactory.

An econometrics model is applied to test the basic hypotheses of the study. With respect to the model of this study, economic theory assumes through the investment theories that investment depends on certain determinants. To determine the existence of a relationship or non-existence of a relationship between the variables used, and to determine the type of this relationship as linear or non-linear, this study adopted the ordinary least squares method (OLS). This method is used to estimate economic relationships because it gives the best linear unbiased estimator, employing the theoretical basis of this method, which will estimate the public manufacturing investment equation of the independent variables mentioned above.

This study relies on a descriptive analytical approach to analyze and describe the most important determinants of investment in the manufacturing sector in the Libyan economy, and to analyze the important aspects factors affecting these variables. In addition, the study adopts the traditional applied methodology in econometrics for the purpose of testing the extent of moral determinants of investment and its impact on the manufacturing sector, by using a time series analysis to determine the degree of stability of those parameters and the nature and direction of the causal relationship between independent and dependent variables.

Regarding the equation of Public Investment in the Manufacturing Sector, the model assumed the general mathematics as the following formula:

$$DGIM = f\{VDM, OILR, GAIN, GDPM, MACHIM, MANLAB\} \qquad (9-1)$$

where:

*DGIM* = Real domestic investment in the public manufacturing sector (fixed capital formation).

*VDM* = Real value-added in the manufacturing sector.

*OILR* = Real oil revenues.

*GAIN* = Real government's annual appropriation given to the manufacturing sector.

$GDPM$ = Real GDP in the manufacturing sector.

$MACHIM$ = real capital goods and machinery imports.

$MANLAB$ = Size of labour force in the manufacturing sector.

When using the OLS estimation method, and by taking the logarithms of equation (9-1), we apply the model that is similar to equation (9-1) and rewrite it as:

$$\ln DGIM = \alpha + \beta_1 \ln VDM + \beta_2 \ln OILR + \beta_3 \ln GAIN + \beta_4 \ln GDPM + \beta_5 \ln MACHIM + \beta_6 \ln MANLAB + e \qquad (9-2)$$

Logarithmic transformations of variables are very popular in econometrics for a number of reasons; firstly many economic time series data exhibit a strong trend, second, taking the natural logarithm of a series effectively linearizes the exponential trend (if any) in the time series data since the long function is the inverse of an exponential function (Asteriou and Hall, 2007). A third advantage is that it allows the regression coefficient to be interpreted as elasticities. Since this study is dealing with time series data, we preferred to take a log of the variables to avoid cumbersome modelling.

Where e represents a random error of the equation which assumes its value is normally distributed in arithmetic mean = *zero,* and fixed variance $\sigma^2(\mu_1 \sim N(0))$. These assumptions are important to obtain unbiased and efficient estimates for each parameter of the model $(\alpha, \beta_1, \beta_{2,}, \beta_3, \beta_4, \beta_5, \beta_6)$.

This regression model reflects the elasticity of independent variables to domestic investment in the public manufacturing sector. Therefore, the elasticity of independent variables for *DGIM* becomes respectively: $\beta_1, \beta_{2,}, \beta_3, \beta_4, \beta_5, \beta_6$.

To prove that, assume that the function of the study model is:

$$DGIM = \alpha.\beta_1 VDM.\beta_2 OILR.\beta_3 GAIN.\beta_4 GDPM.\beta_5 MACHIM.\beta_6 MANLAB \qquad (9-3)$$

Where the elasticity of real value-added to domestic investment in the public manufacturing sector is:

$$\epsilon_{VDM}=\frac{\partial DGIM}{\partial VDM}\cdot\frac{VDM}{DGIM} \qquad (9-4)$$

By differentiating domestic investment in the public manufacturing sector from the real value-added in the manufacturing sector, we obtained:

$$\frac{\partial DGIM}{\partial VDM}=\beta_1[\alpha VDM.OILR.GAIN.GDPM.MACHIM.MANLAB].VDM \qquad (9-5)$$

By compensation in the numerator from the relation (9-1), we obtained:

$$\frac{\partial DGIM}{\partial VDM}=\beta_1 X\left(\frac{DGIM}{VDM}\right) \qquad (9-6)$$

And by compensation for the value of $\left(\frac{\partial DGIM}{\partial VDM}\right)$ in the form of elasticity above, we obtained:

$$\epsilon_{VDM}=\beta_1 X\left(\frac{VDM}{DGIM}\right)X\left(\frac{DGIM}{VDM}\right) \qquad (9-7)$$

After dividing, become: $\epsilon_{VDM}=\beta_1$, and so is the case with the other variables elasticity.

### 9.2.3. Testing and Empirical Estimation

**First: Introduction**

This section of this study is concerned with analysing the relationship between real public investment in the manufacturing sector and its determinants during the period (1962-2008). The study adopted a time series analysis and ensured that the latter was stationary by using the Unit Root Test.

The current values of the variables are converted into real terms in 2000 constant by using the price index (GDP deflator). The year 2000 was chosen as a base year in order that it possesses economic stability characteristics; it also has been adopted as a base year in national income accounts by the Central Bank of Libya and the General Planning Council.

GDP in the manufacturing sector is removed from the model. GDP, as an output variable, is generally explained by investment (input), but the order cannot be reversed in this model due to its insignificant results. GDP should be considered as an endogenous variable. As a result, the estimation would be enormously complicated. Also, value added in the manufacturing sector is excluded due to a failure to obtain enough data covering the period of study, and this was one of the problems faced by the researcher.

By introducing one by one the proposed independent variables (GDP in the manufacturing sector, oil revenues, annual appropriation, imports and labour) in the estimation model to examine their "gross effect" respectively, each variable showed a significant and positive effect on investment. However, by estimating the whole model, the sign of GDP turns negative (see Tables 9-2 and 9-3). That means there is important correlation between GDP and some other variables. This is another reason why GDP was removed from the model. Therefore, multicollinearity between the explanatory variables of the model is not considered influential on the validity of the estimation of that model. According the Anderson-Darling Normality Test, all the variables are normally distributed, which means there is no difference between the data and normal data.

**Table (9-2)**
**Correlation matrix**

| | Real investment in the public manufacturing sector | Real GDP in the manufacturing sector | Real oil revenues | Real annual appropriation for investment in the manufacturing sector | Real capital goods and machinery imports |
|---|---|---|---|---|---|
| Real GDP in the manufacturing sector | 0.680* (0.000) | | | | |
| Real oil revenues | 0.775* (0.000) | 0.591*** (0.000) | | | |
| Real annual appropriation for investment in the manufacturing sector | 0.807* (0.000) | 0.376*** (0.009) | 0.709*** (0.000) | | |
| Real capital goods and machinery imports | 0.876* (0.000) | 0.768*** (0.000) | 0.886*** (0.000) | 0.735*** (0.000) | |
| Labour force in the manufacturing sector | 0.396*** (0.006) | 0.895*** (0.000) | 0.232 (0.117) | 0.004 (0.980) | 0.435*** (0.002) |

Note: All variables are in logarithms. Figures in brackets are $p$ values. *** Significant at 1%; ** significant at 5%; * significant at 10%.

**Table (9-3)**
**Gross effect of each variable and estimation of the whole model**

Dependant variable: Log of real investment in the public manufacturing sector

| Independent Variables | Gross effect | Whole model |
|---|---|---|
| Log of real GDP in the manufacturing sector | 1.041*** (6.22) | -1.611** (-2.50) |
| Log of real oil revenues | 1.151*** (8.22) | 0.168 (0.83) |
| Log of real government's annual appropriation for investment in the manufacturing sector | 0.728*** (9.16) | 0.539*** (5.75) |
| Log of real capital goods and machinery imports | 1.728 (12.19) | 1.401*** (3.45) |
| Log of labour force in the manufacturing sector | 0.839 (2.89) | 2.120*** (3.10) |
| Constant | | -11.289*** (-3.39) |
| Adjusted $R^2$ | | 0.872 |
| Number of observations | | 47 |

Note: t-statistics in brackets. *** Significant at 1%; ** significant at 5%; * significant at 10%.

**Second: Unit Root Test using ADF and Phillips-Perron (PP)**

The Unit Root Test is an important step in time series analysis. In the case of nonstationary model variables, the degree of integration is determined. If the time series are nonstationary at the same level, it is difficult to achieve a long-term relationship between the variables of the study. The ADF test indicates that none of the variables are stationary in their level, but are stationary in the first differences. This means that the variables are integrated of order 1 or $I$ (1). Therefore, it is possible to move on to the next step, attempting to detect if any of these variables co-integrate.

Tests for a unit root have attracted a considerable amount of attention in applied econometric studies. One important reason is that these tests can help to evaluate the nature of the nonstationarity that many macroeconomic data exhibit.

Many empirical studies have been conducted to show that several macroeconomic variables have structures with a unit root (Xiao and Phillips, 1998). The most commonly used tests for a unit root is the Dickey–Fuller test.

The Dickey–Fuller test (1979) is based on the regression of the observed variable on its one period lagged value, sometimes including an intercept and time trend. According to Xiao and Phillips, (1998, p. 27) " the Dickey–Fuller t-test for a unit root, which was originally developed for autoregressive (AR) representations of known order, remains asymptotically valid for a general ARMA process of unknown order". This t-test is usually called the Augmented Dickey–Fuller (ADF) test.

If the series are non-stationary, a cointegration relationship should exist to ensure the presence of long-run relationship between the levels of the variables. Otherwise, regressions can be spurious and economically meaningless because of the common trends shared by the variables. As Table (9-4) shows, all variables are first-difference stationary *I(1)* and therefore contain a unit root.

**Table (9-4)**
**ADF Test Statistics for Variables**

| Variables | Critical Value | | Level | | 1st Level | |
|---|---|---|---|---|---|---|
| | Trend | Trend & Intercept | Trend | Intercept | Trend | Intercept |
| ***lnDGIMt*** | 1% -3.50 | -4.17 | -2.03 | -2.07 | -5.44 | -5.48 |
| ***lnGAINt*** | | | -2.38 | -2.36 | -4.21 | -4.21 |
| ***lnMACHIMt*** | 5% -2.92 | -3.51 | -1.26 | -1.39 | -5.73 | -5.66 |
| ***lnMANLABt*** | | | -0.70 | -0.91 | -4.89 | -4.86 |
| ***lnOILRt*** | 10% -2.60 | -3.18 | -1.79 | -1.79 | -6.69 | -6.60 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.

Besides the ADF test, all variables are first-difference stationary I (1) by using Phillips-Perron for unit root test as came be seen in Table 9-5. Therefore, a long-run relationship between the dependant variable and independent variables exists only if they are cointegrated.

**Table (9-5)**
**Phillips-Perron Test Statistics for Variables**

| Variables | Critical Value | | Level | | 1st Level | |
|---|---|---|---|---|---|---|
| | Trend | Trend & Intercept | Trend | Intercept | Trend | Intercept |
| $lnDGIM_t$ | 1% -3.50 | -4.17 | -2.37 | -2.07 | -5.44 | -5.45 |
| $lnGAIN_t$ | | | -2.01 | -1.97 | -4.21 | -4.21 |
| $lnMACHIM_t$ | 5% -2.92 | -3.51 | -1.49 | -1.67 | -5.78 | -5.72 |
| $lnMANLAB_t$ | | | -0.75 | -1.48 | -4.96 | -4.92 |
| $lnOILR_t$ | 10% -2.60 | -3.18 | -2.06 | -2.10 | -6.69 | -6.60 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.

**Third: ECM Estimation**

From the analysis above it appears that there are five variables which do not present statistical or economic problems and are integrated of the same difference I~I(1) (domestic investment in the public manufacturing sector, Government's annual appropriation given to the manufacturing sector, capital goods and machinery imports, labour force in the manufacturing sector and oil revenues). This indicates that these time series move together over time and there is a long run time period known as cointegration regression. The cointegration equation is estimated by the Johansen-Juselius method for cointegration.

**I) Cointegration Error Correction Model by Using the Johansen Approach**

The Engle-Granger test is sufficient if the number of variables in the model is only two, but if they are more than two, it is preferable to use the Johansson cointegration test. Johansen, (1988); Johansen and Juselius, (1990) are used to confirm the relationship in the long run equilibrium between domestic investment in the public manufacturing sector and its determinants in this study. Before moving on to the cointegrtaion test, the optimal number of lags must be established. The important point of the autoregressive model (var) is the number of lag's order of variables. A chosen appropriate lag length of the variables could create the best model with uncorrelated and homosedastic[1] residuals. The optimal lag length can be selected from computed data as the minimum value of the Akaike Information Criterion (AIC) and Schwartz Criterion (SC) statistics. As shown in Table 9-6, the Schwarz Information Criterion indicates that 1 is the optimal number of lags.

**Table (9-6)**
**Results from the VAR Lag Order Selection Criteria**

| Lag | AIC | SC |
|---|---|---|
| 0 | 9.675149 | 9.884122 |
| 1 | 1.549626 | 2.803459* |
| 2 | 1.246436 | 3.54513 |
| 3 | 1.16159 | 4.505145 |
| 4 | -0.26803 | 4.120383 |
| 5 | -0.27255 | 5.16073 |
| 6 | -2.115204* | 4.362934 |

* Indicates lag order selected by the criterion.
AIC: Akaike information criterion.
SC: Schwarz information criterion.

[1] In statistics, a sequence or a vector of random variables is homoscedastic if all random variables in the sequence or vector have the same finite variance.

The next step is to conduct the Trace and Maximum Eigenvalue tests in order to determine whether there is a relationship between the variables in the long run or not. As all variables are determined I(1), the cointegration test is performed for the long run relationship among series by using Johansen cointegration test.

The cointegration test described in Table 10-6 shows that the null hypothesis (r = 0) cannot be accepted, which states that there is no cointegration equation at a significant level (5%), but also the null hypothesis ($r \leq 1$) cannot be rejected at significant level (5%). Therefore, there is only one cointegration equation between investment and labour from one side and growth from another.

**Table (9-7)**

**Cointegration Test Results by Using Johansen Approach**

| No. Of CE(s) | Eigenvalue | Trace 0.05 | | P. Value** | Max-Eigen 0.05 | | P. Value** |
|---|---|---|---|---|---|---|---|
| | | Statistics | Critical | | Statistics | Critical | |
| r=0 | 0.7184 | 85.46* | 69.81 | 0.0017 | 57.04* | 33.87 | 0.0001 |
| r≤1 | 0.3274 | 28.42 | 47.85 | 0.7949 | 17.84 | 27.58 | 0.5078 |
| r≤2 | 0.1238 | 10.57 | 29.79 | 0.9704 | 5.94 | 21.13 | 0.9839 |

Trace & Max-eigenvalue tests indicate 1 cointegration equation at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level.
**Mackinnon-Haug-Michels (1999) p-values.

The cointegration equation using the Johansson test is as seen in Table 9-8. In the light of the results of the error correction model this table, it is noted that the correction error variable is significant $\varepsilon_{t-1}$ at 1% level, with the expected negative indication. This also confirmed the long-run equilibrium relationship in the model. The value of the error correction coefficient (-0.16) indicates that per-capita GDP adjusts toward its equilibrium value in each time period by 16%. In other words, domestic investment in the public manufacturing sector corrects the imbalance of its equilibrium value which remainder of each past period about 16%. That is, when domestic investment during the short-run in the period (t-1) diverts from its equilibrium value in the long run, it is corrected by about 16% of this deviation in the period (t). In other words, this percentage of correction reflects a low adjusting speed towards equilibrium, in the sense that domestic investment in the public manufacturing sector takes approximately 6.25 years (1/0.16) towards the equilibrium value after the impact of any shock in the model as a result of a change in its determinants.

By using the results of the estimating model in Table 9-8, the elasticises of domestic investment in the public manufacturing sector to its determinants in the long and short-run were obtained. The equation indicates that the estimated parameters have the expected signs, which means domestic investment (DGIM) is directly affected by (GAIN, MACHIM, OILR and MANLAB). DGIM is more flexible to GAIN than the other variables in the long-run. From the results we note that an increase in GAIN by 1 unit leads to a direct increase in DGIM by 0.24 % in the short run, and continues its impact in the long run until it reaches 2.18%. This indicates effect of the adoption of domestic investment in the manufacturing sector on the size of GAIN. As for the impact of MACHIM, the study found that an increase in the size of MACHIM by 1 unit leads to an increase in DGIM by 0.77% in the short-run and 0.82% in the long-run. The increases in the rates of employment and oil revenue in the Libyan economy have little impacts on DGIM in general. Accumulation of the amount of labours in some production locations over the required period led to a small increase in domestic investment. The modest impact of oil revenues on domestic investment in the manufacturing sector may be due to the indirect relationship between them through appropriation to the manufacturing sector: an increase in oil revenues directly leads to an increase in appropriations. For this reason, it might have been better if this variable had been excluded. That could be translated through the elasticity of domestic investment in the manufacturing sector to changes in oil revenues, which was much higher in the case of the long run than in the short run.

**Table (9-8)**
**Results from Vector Error Correction Model**

| Cointegration Equation | | | Short-run Dynamics | | |
|---|---|---|---|---|---|
| **Cointegration Vector** | Coefficients | T. Statistics | VEC* Equation | Coefficients | T. Statistics |
| $lDGIM_{t-1}$ | 1 | - | $\Delta lDGIM_t$ | -0.16 | -3.42 |
| $lGAIN_{t-1}$ | 2.18 | 13.08 | $\Delta lGAIN_t$ | 0.24 | 3.71 |
| $lMACHIM_{t-1}$ | 0.82 | 8.45 | $\Delta lMACHIM_t$ | 0.77 | 5.73 |
| $lMANLAB_{t-1}$ | 0.035 | 3.45 | $\Delta lMANLAB_t$ | 0.16 | 0.44 |
| $lOILR_{t-1}$ | 0.094 | 7.11 | $\Delta OILR_t$ | 0.08 | 7.89 |
| **Constant** | 2.51 | - | | | |

*denotes Vector error correction.

The results of the long-term relationship obtained by the Johansen approach are compatible with economic theory for the explanatory variables, the results were significant as well except for labour in the short run, in addition, the results indicate that these variables affect domestic investment in the manufacturing sector more than labour, which indicates that Government's annual appropriations for investment in the manufacturing sector, capital goods & machinery imports and oil revenues are somewhat driving domestic investment in the Libyan manufacturing sector. Results also indicated that the cointegration vector coefficients, which describe the long-run relationship are significant, because the value of likelihood = 648.29.

**II) Statistical Examination of the Model's Residuals:**

To ensure the absence of econometric problems in the error correction model, several tests have been used as shown in Table 9-9; they found that the model has exceeded all residuals statistics tests, such as condition for normality distribution by using the Jarque-Bera test, and is free from serial correlation using an LM test up to the third degree. In addition, there is no variance until the third degree by using ARCH test or by using White test. Moreover, there is no restriction error in the model by using Ramsey RESET Test.

**Table (9-9)**
**Statistics Examination of the Model's Residuals**

| Statistics | Estimated Value | Probability |
|---|---|---|
| Normality (Jarque-Bera) | 1.13 | 0.944 |
| Breusch-Godfrey Serial Correlation LM Test | [1]* 1.83<br>[2] 1.67<br>[3] 2.05 | 0.306<br>0.344<br>0.196 |
| ARCH Test | [1] 0.156<br>[2] 0.063<br>[3] 0.156 | 0.362<br>0.701<br>0.416 |
| White Heteroskedasticity Test | [no cross terms]: 0.918<br>[cross terms]: 1.378 | 0.540<br>0.275 |
| Ramsey RESET Test | [1] 0.504<br>[2] 0.584<br>[3] 1.890 | 0.481<br>0.779<br>0.238 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.
*Number inside parentheses indicates to number of lags included.

**Fourth: Cointegration and Causality Test**

This study used the Granger causality test which takes into consideration the time series properties of the data to examine the causal relationship between variables. According to Granger, (1988), the existence of cointegration between domestic investment and its determinants contains a causal relationship in one direction at least, but determining the direction of causality in the short and long term between the variables under study requires estimating (VECM) to determine the direction of the relationship between the variables and analyze the behaviour of the relationship in the short-term. Engle-Granger explained the introduction of the Granger traditional test of causality in the error correction model (ECM). If the variables in the integrated model (VAR) are common, the model can be used for vector error correction (VECM) derived from a form VAR in order to determine the direction of causality and estimate the speed of adjustment of any imbalance in the short term to balance long-term relationship between domestic investment in the public manufacturing sector and the explanatory variables. Table 9-10 shows causality results based on a vector error correction model.

**Table (9-10)**
**Causality Results based on Vector Error Correction Model (VECM)**

| Error Correction: | *D(lnDGIM)* | *D(lnGAIN)* | *D(lnMACHIM)* | *D(lnMANLAB)* | *D(lnOILR)* |
|---|---|---|---|---|---|
| *CointEq1* | -0.16<br>[-3.42] | -0.24<br>[-3.71] | 0.77-<br>[- 5.73] | -0.16<br>[ -0.44] | -0.08<br>[ -7.89] |
| *D(lnDGIM(-1))* | -0.16<br>[-0.71] | 0.56<br>[ 1.89] | -0.42<br>[-0.94] | 0.58<br>[ 0.44] | -4.95<br>[-1.29] |
| *D(lnGAIN(-1))* | 0.50<br>[ 2.62] | 0.05<br>[ 0.22] | 2.35<br>[ 6.44] | -0.24<br>[-0.23] | 8.97<br>[ 2.87] |
| *D(lnMACHIM(-1))* | -0.14<br>[-1.87] | -0.21<br>[-2.15] | -0.50<br>[-3.37] | -0.11<br>[-0.24] | -4.34<br>[-3.36] |
| *D(lnMANLAB(-1))* | -0.06<br>[-2.15] | -0.03<br>[-0.84] | -0.35<br>[-6.51] | 0.046<br>[ 0.28] | -0.63<br>[-1.36] |
| *D(lnOILR(-1))* | -0.001<br>[-0.18] | -0.004<br>[-0.51] | -0.049<br>[-3.88] | 0.003<br>[ 0.10] | 0.023<br>[ 0.21] |
| *C* | 0.48<br>[ 1.62] | 0.37<br>[ 0.97] | 3.06<br>[ 5.31] | 2.57<br>[ 1.51] | 20.34<br>[ 4.11] |
| **R-squared** | 0.27 | 0.24 | 0.71 | 0.017 | 0.72 |
| **Adj. R-squared** | 0.16 | 0.13 | 0.67 | 0.013 | 0.67 |
| **F-statistic** | 3.43 | 3.81 | 15.92 | 0.11 | 6.41 |

Figures in parentheses are t-values.

Results in Table 9-10 show that the changes in the Government's annual appropriation for investment in the manufacturing sector helps in explaining the changes in domestic investment in the manufacturing public sector, that means that the annual appropriation is causing domestic investment in the manufacturing sector, according to the concept of Granger. The statistics value of F (3.81) is statistically significant at a level 1%. The same results occurred with capital goods & machinery imports (F, 15.92) and oil revenues (F, 6.41), while the changes in labour force in the manufacturing sector do not help in explaining the changes in domestic investment in the manufacturing sector as the value of F statistics (0.11) is less than the critical value of F. Accordingly, there is a causal relationship with one direction from annual appropriation for investment in the manufacturing sector, capital goods & machinery imports and oil revenue to domestic investment in the manufacturing sector in the short term.

Regarding the long term relationship, T-test for the parameters showed that changes in the explanatory variables help in explaining changes in domestic investment in the public manufacturing sector at a significance statistic level of 1%, excluding labour force where T-statistics is insignificant = 0.44, this means that changes in labour force in the manufacturing sector do not help in explaining changes in domestic investment in the same sector.

### 9.2.4. Findings and Discussions

Stationarity test results using unit root tests showed that variables in the model are not stationary at the level but stationary at the first differences.

When variables are cointegrated there is a long-term equilibrium relationship between variables of the study, which means that the variables not so far from each other where they show similar behaviour.

The coefficient of residuals in the error correction model is negative and statistically significant, this indicates that domestic investment would take 16% of time (6.25) years for a shock to be completely absorbed by the system.

Results of the cointegration test and error correction model are compatible with economic theory; they showed the positive impact of explanatory variables on domestic investment in the Libyan public manufacturing sector. Elasticity in the long term was greater than in the short term, results showed that the flexibility of domestic investment in the manufacturing sector to changes in the volume of government appropriations was bigger in the long term, but also they showed a low flexibility in the short term. This is due to the annual appropriations needing enough time to yield results, and since this indicates that the adoption of investments in the manufacturing sector on such appropriations granted by the Government, this is consistent with the results of Mohamed's study (1997) which showed that annual appropriations have a significant impact on investments in the manufacturing sector. Capital goods & machinery imports has a positive impact on domestic investment in the manufacturing sector, which means that part of these imports go directly to the manufacturing sector, and contribute to increasing in investment in this sector. However, applied studies have concluded this result such as Omar (2002) and Arbelaez & Echavarria (2002). The modest impact of oil revenues on domestic investment in the manufacturing sector may be due to the indirect relationship between them through appropriation to the manufacturing sector, whereby an increase in oil revenues directly leads to an increase in appropriations. The study by Omar (2002) concluded that oil revenues have a strong influence on domestic investment in the public manufacturing sector, but this may be due to it depending on a short time series (1980-2002), therefore, this period does not reflect the conditions of the use of time series methods in econometrics.

On the contrary of the study of Soderbom and teal (2000) which concluded that there is an important relationship between size of labour and domestic investment in the manufacturing sector, results showed that changes in labour force in the manufacturing sector do not help in explaining the changes in domestic investment in the manufacturing sector. The public sector in Libya is suffering from many problems which reduce its efficiency and hinder development. Using most of the labour force in the public sector reached a peak rate in 1995 equal to 77% of the total workforce. This high percentage suggests inefficiency in the Libyan labour force. However, there is a causal relationship with one direction from annual appropriation for investment in the manufacturing sector, capital goods & machinery imports and oil revenue to domestic investment in the manufacturing sector in the short term and long term on both.

## 9.3. Model of Domestic Investment in the Libyan Private Manufacturing Sector

### 9.3.1. Description of Variables and Data

The most important variables of this model are used for interpreting the changes in manufacturing investment in Libya, specified on the basis of previously applied studies. The dependent variables which will be used in this section are gross domestic fixed capital formation in the private manufacturing sector (domestic private investment in the manufacturing sector as second equation) (see for example Baskaya, 1986; Sikwila, 1992; Valdkhan, 2006; Lesotlho, 2006). This study has relied on the results of the analysis of some previous studies for selecting the explanatory variables.

**I) Domestic investment in the public manufacturing sector**

This is a key determinant of private investment in developing countries. Although there is a relative importance of public investment to private manufacturing investment, its impact is non-specific. On one hand, an expansion in public investment can be a stimulant for increased private investment for example through investment in infrastructure, on the other, the public sector can be viewed as a competitor to the private sector in its use of available financial resources (this is a result of the crowding out effect). The private sector may suffer from competition for available financial resources in an economy experiencing a continuing deficit in its national budget, which means a negative impact by public investment on private investment. The following studies: Asante, 2000; Jayraman, 2001; Acosta and Loza, 2003; Moshi and Kilindo, 1991; Ndikumana, 2005; Lesotlho, 2006, found that public investment competes with private investment. But the study by Erden, 2006 showed the importance of public investment to stimulate investment in the private sector. Therefore, this study rules out the existence of the crowding out effect and limits itself to the impact of investment in infrastructure, due to its positive impact on private investment in the manufacturing sector.

**II) Real Exchange Rate:**

According Wang, (2003, p.70,) "a rise in the exchange rate in terms of the exporting country's currency over the importing country's currency implies a depreciation -of the exporting country's currency, while a decline implies an appreciation of the exporting country's currency". Manufacturing investment depends on government grants of foreign currency for the import of machines and equipments. This applies to both the public and private sectors. Given the importance of imports of intermediate and capital goods in Libya, the use of the resources of foreign exchange and the exchange rate is one of the most important determinants of private manufacturing investment in the Libyan economy. Therefore, where the need arises for foreign exchange to pay for imports, the exchange rate affects the investment decision. A reduction in the real exchange rate leads to a decline in the real value of the wealth of the private sector, and therefore, to a decrease in private investment during the impact of that reduction on general price levels (Abduladem, 2003; Nair, 2003; Ndikumana, 2005).

**III) Openness Level:**

Dealing with international trade is one of the determinants of the private investment function in developing countries (Amanja and Morrissey, 2006), including Libya. International trade reflects the impact of the openness level of a country on economic growth and stability in the domestic economy. Openness level will be used in this study to reflect the impact of international trade on the size of private investment in the manufacturing sector.

A decline in openness level will lead to an increase in the cost of imports relative to GDP, at the same time leading to a decrease in the real value of exports. This will lead to a deficit in the trade balance, which will affect the stability of the domestic economy, and this will adversely affect private investment in the manufacturing sector. Openness level has a positive impact on investment behaviour (see Al-Hakami, 2003; Abduladem, 2004; Acosta and Loza, 2003).

We expect the economic openness level to have a positive role in the behaviour of private investment in manufacturing. The dependence of the Libyan economy on international trade as a source of income, and the subsequent increase in domestic resources and foreign exchange reserves, and its importance as a source to meet the needs of the community for consumer and capital goods, is expected to lead to increased investment in the private manufacturing sector.

**IV) Labour in the Private Manufacturing Sector:**

A series of applied studies have proven that employment has a positive effect on private investment in the manufacturing sector and its growth (Al-Gannam, 2004; Seruvatu and Jayraman, 2001; Ndikumana, 2005), therefore, a positive relationship is expected by this study between this variable and domestic investment in the private manufacturing sector. Some of the studies addressed the effect of labour of the various aspects of employment, some of them examined the impact of real unit labour cost on investment in the manufacturing sector, and others only studied the impact of employment and its increase. This study will use the level of employment in the manufacturing sector because of the difficulty of obtaining accurate and real data on unit labour costs. And with regard to the difficulty of obtaining the level of employment in the private manufacturing sector, it was replaced with the total amount of employment in the manufacturing sector.

**V) Per-capita GDP:**

Some studies such as (Jayaraman, 2001; Abduladem, 2004; Moshi and Kilindo, 1991; Sheriff, 2005; Lesotlho, 2006) showed that GDP growth leads to an increase in investment, and that it is a strong determinant of private investment sector. Increasing per-capita GDP is essential for private investment; it plays an important role in the explication of the pattern of private investment. This leads to an expected positive correlation between this variable and domestic investment in the private manufacturing sector.

**VI) Credits to the private manufacturing sector:**

Credit given to the private manufacturing sector by banks is used as an independent variable in this study. Banks provide an important source of financing private investment, especially in developing countries where the private sector is characterized by SMEs, in contrast with developed countries where major companies rely on self-financing and proceeds of the sale of new shares. Studies showed that there is a positive relationship between private investment and credit in the countries covered by the studies (Wai & Wong, 1992; Taher, 2000; Al-Hakami, 2003; Aysan, 2006; Erden & Holcombe, 2006). The effect of credit to the private sector on private investment is expected to be positive. Private firms in developing countries rely heavily on bank credit as a source of financing (Ouattara, 2004).

### 9.3.2. The Model

Through previous studies and analysis of key variables of the Libyan economy, it is noted that the determinants of private investment in the manufacturing sector are: exchange rate; real per-capita GDP; public investment in the manufacturing sector; economic openness level; labour in the manufacturing sector; credit given to the private manufacturing sector.

$$PRIVATE_t = f(DGIM_t, PCGDP_t, OPEN_t, MANLAB_t, CRED_t, EXCH_t) \qquad (9-8)$$

Where:

PRIVATE = Real domestic investment in the private manufacturing sector.

DGIM = Real domestic investment in the public manufacturing sector.

PCGDP = Real Per-capita GDP in the economy.

OPEN = Economic openness level, $= \frac{exports+imports}{GDP} X\ 100$

MANLAB = Size of labour force in the manufacturing sector.

CRED = Real credits given to the domestic private manufacturing sector.

EXCH = Real exchange rate, (U.S dollar exchange specified by the Central Bank of Libya-US$/L.D).

### 9.3.3. Testing and Empirical Estimation

**First: Introduction**

This section of this study is concerned with analysis of the relationship between real private investment in the manufacturing sector and its determinants during the period 1962-2008. It adopted a time series analysis and the detection of its stationarity by using the Augmented Unit Root test (ADF). The current values of the variables are converted into real terms at year 2000 constant prices by using the price index. The current values of the variables are converted into real terms at 2000 constant by using the price index, as mentioned in section 9.3.1.

After introducing one by one the proposed independent variables (real domestic investment in the public manufacturing sector, real per-capita GDP, openness level, labour in the manufacturing sector and exchange rate) in the estimation model to examine their "gross effect" respectively, each variable showed a significant and positive effect on investment. However, by estimating the whole model, the effects of investment on the public manufacturing sector and openness level became insignificant (see Table 9-11). Credit given to the domestic private manufacturing sector showed a negative and weak effect in both cross and whole models, which may due to missing many observations of this factor, this was a reason to remove it.

**Table (9-11)**

**Gross Effect on Each Variable and Estimation of the Whole Model**

Dependent variable: Log of domestic investment in the private manufacturing sector.

| | Gross effect | Whole model |
|---|---|---|
| Log of domestic investment in the public manufacturing sector | 0.77* (1.79) | -0.87*** (-3.11) |
| Log of per capita GDP | 0.71*** (4.34) | 0.67*** (3.04) |
| Log of openness level | 1.84*** (4.60) | 0.39** (2.39) |
| Log of labour in the manufacturing sector | -0.423** (-2.63) | 0.30** (2.74) |
| Log of credits given to the private manufacturing sector | -3.84 (-1.34) | -2.56 (-1.50) |
| Exchange rate | 0.39* (1.88) | 0.26*** (3.08) |
| Constant | | 2.50* (1.89) |
| Adjusted $R^2$ | | 0.825 |

Note: T-statistics in brackets. ***Significant at 1%. **Significant at 5%. *Significant at 10%.
Number of observation = 47.

**Second: Unit Root Test by Using ADF and PP**

As Table 3 shows, all variables (except credit) are first-difference stationary *I (1)* and therefore contain a unit root. A long-run relationship between the dependant variable and independent variables exists only if they are cointegrated. The evidence favours the hypothesis of cointegration, as shown at the bottom of Table 9-12. Credit given to the domestic private manufacturing sector is stationary at level *I (0)* by using ADF and PP; which is another reason for it to be discarded.

**Table (9-12)**
**ADF Test Statistics for Variables**

| Variables | Critical Value | | Level | | 1st Level | |
|---|---|---|---|---|---|---|
| | Trend | Trend & Intercept | Trend | Intercept | Trend | Intercept |
| ***lnPRIVATt*** | 1% -3.50 | -4.17 | -2.32 | -2.07 | -7.17 | -7.11 |
| ***lnDGIMt*** | | | -2.03 | -2.07 | -5.44 | -5.48 |
| ***lnMANLABt*** | | | -0.70 | -0.91 | -4.89 | -4.86 |
| ***lnPCDGPt*** | 5% -2.92 | -3.51 | -1.79 | -2.38 | -6.50 | -6.46 |
| ***lnOPENt*** | | | -1.40 | -1.81 | -6.93 | -6.94 |
| ***lnEXCHt*** | | | -0.53 | -2.00 | 4.07 | 3.97 |
| ***lnCREDt*** | 10% -2.60 | -3.18 | -3.48 | -6.07 | -2.38 | -0.56 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.

Tables 9-13 presented the results for the testing of stationarity for variables by using Phillips-Perron test. The results show that the null hypothesis of nonstationarity cannot be rejected when variables are in their level. However, after taking first differences all variables become stationary.

**Table (9-13)**
**Phillips-Perron (PP) Test Statistics for Variables**

| Variables | Critical Value | | Level | | 1st Level | |
|---|---|---|---|---|---|---|
| | Trend | Trend & Intercept | Trend | Intercept | Trend | Intercept |
| ***lnPRIVATt*** | 1% -3.50 | -4.17 | -2.32 | -2.72 | -7.18 | -7.11 |
| ***lnDGIMt*** | | | -2.37 | -2.07 | -5.44 | -5.45 |
| ***lnMANLABt*** | | | -0.75 | -1.48 | -4.96 | -4.92 |
| ***lnPCDGPt*** | 5% -2.92 | -3.51 | -1.77 | -2.42 | -6.50 | -6.46 |
| ***lnOPENt*** | | | -1.38 | -1.99 | -6.94 | -6.96 |
| ***lnEXCHt*** | | | 0.21 | -1.05 | -5.19 | -5.47 |
| ***lnCREDt*** | 10% -2.60 | -3.18 | -8.51 | 14.12 | -1.45 | -3.44 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.

**Third: ECM Estimation**

**I) Cointegration ECM by Using Johansen Approach:**

From the analysis above it appears that there are six variables which do not contain statistical or economic problems and are integrated at the same difference I~I (1) (domestic investment in the private manufacturing sector, domestic investment in the public manufacturing sector, per-capita GDP, openness level, labour force in the manufacturing sector and exchange rate in the Libyan economy) which indicates that these time series move together over time and there is a long run time period known as cointegration regression. As shown in Table 9-14, the Schwarz Information Criterion indicates that 1 is the optimal number of lags.

**Table (9-14)**
**Results from the VAR Lag Order Selection Criteria**

| Lag | AIC | SC |
|---|---|---|
| 0 | 9.062574 | 9.310812 |
| 1 | -0.59419 | 1.143483* |
| 2 | -1.15421 | 2.072896 |
| 3 | -1.13981 | 3.576722 |
| 4 | -1.553 | 4.652965 |
| 5 | -4.225466* | 3.469929 |

* Indicates lag order selected by the criterion.
AIC: Akaike information criterion.
SC: Schwarz information criterion.

Table 9-15 shows the results of Trace and Max-Eigen tests for the proposed model, we can deduce from that the number of cointegration vectors = 1 at statistical significance level 5%. This means that domestic investment in the private manufacturing sector is co-integrated with the real exchange rate, labour force in the manufacturing sector, domestic investment in the public manufacturing sector, per-capita GDP and openness level in the economy. This result also means there is a linear stationary relationship between domestic investment in the private manufacturing sector and its determinants, and this emphasizes that there is a long-term equilibrium relationship between variables.

**Table (9-15)**
**Cointegration Test Results by Using Johansen Approach**

| No. Of CE(s) | Eigenvalue | Trace 0.05 | | P. Value | Max-Eigen 0.05 | | P. Value |
|---|---|---|---|---|---|---|---|
| | | Statistics | Critical | | Statistics | Critical | |
| r=0 | 0.660459 | 121.8415 | 95.75366 | 0.0003 | 48.60728 | 40.07757 | 0.0044 |
| r≤1 | 0.480448 | 73.23419 | 69.81889 | 0.026 | 29.46549 | 33.87687 | 0.1537 |
| r≤2 | 0.378212 | 43.7687 | 47.85613 | 0.1149 | 21.38199 | 27.58434 | 0.2538 |

*denotes rejection of the hypothesis at the 0.05 level.

**ECM Estimation:**

The existence of a cointegration between the model's variables means that adding an error correction coefficient to the estimated model will improve the predictability of domestic investment in the private manufacturing sector. Table 9-16 shows the results of estimating the error correction model, and notes that error correction coefficient is significant at the statistical significance level 1%; this outcome indicates that there is a long term equilibrium relationship between domestic investment in the private manufacturing sector and its determinants.

Jones & Joulafaian (1991) pointed out that the lagged values of change in independent variables represent the impact of the causal relationship in the short term, while the error correction coefficient represents the effect of the causal relationship in the long term. Moreover, F statistics (4.03) shows that there is a long term significant relationship between explanatory variables and domestic investment in the Libyan private manufacturing sector.

**Table (9-16)**
**Results from Vector Error Correction Model**

| Cointegration Equation | | | Short-run Dynamics | | |
|---|---|---|---|---|---|
| **Cointegration Vector** | Coefficients | T. Statistics | VEC^ Equation | Coefficients | T. Statistics |
| ***lnPRIVATEt-1*** | 1 | - | ***ΔlnPRIVATEt*** | -0.14 | -2.67*** |
| ***lnDGIMt-1*** | -7.14 | -5.20*** | ***ΔlnDGIMt*** | -0.39 | -1.93* |
| ***lnMANLABt-1*** | 3.04 | 1.63 | ***ΔlnMANLABt*** | 0.16 | 1.26 |
| ***lnEXCHt-1*** | 5.24 | 3.35*** | ***ΔlnEXCHt*** | 0.19 | 4.59*** |
| ***lnPCGDPt-1*** | 6.00 | 1.95* | ***ΔlnPCGDPt*** | 0.80 | 1.93* |
| ***lnOPENt-1*** | 0.93 | 4.23*** | ***ΔlnOPENt*** | 0.25 | 3.46*** |
| ***Constant*** | 25.00 | - | | | |

^denotes Victor error correction.
*Significant at 10%.
***Significant at 1%.

**II) Statistical Examination of the Model's Residuals:**

The model has exceeded all residuals statistics test which are shown in Table 9-17. Several tests have been used; they found that the model has exceeded all residuals statistics tests, such as the condition for normality distribution by using the Jarque-Bera test, and is free from serial correlation using an LM test up to the third degree. In addition, there is no variance until the third degree by using ARCH test or by using White test. Moreover, there is no restriction error in the model by using Ramsey RESET Test.

**Table (9-17)**
**Statistics Examination of the Model's Residuals**

| Statistics | Estimated Value | Probability |
|---|---|---|
| Normality (Jarque-Bera) | 1.54 | |
| Breusch-Godfrey Serial Correlation LM Test | [1]* 1.115<br>[2] 0.517<br>[3] 0.465 | 0.321<br>0.615<br>0.407 |
| ARCH Test | [1] 0.243<br>[2] 0.233<br>[3] 0.270 | 0.171<br>0.882<br>0.860 |
| White Heteroskedasticity Test | [no cross terms]: 1.69<br>[cross terms]: 1.35 | 0.442<br>0.840 |
| Ramsey RESET Test | [1] 1.651<br>[2] 1.080<br>[3] 1.490 | 0.132<br>0.239<br>0.387 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.
*Number inside parentheses indicates to number of lags included.

## 9.3.4. Findings and Discussions

The factors affecting domestic investment in the private manufacturing sector as explained by the results above are domestic investment in the public manufacturing sector, per-capita GDP, openness level and exchange rate. The results showed that investment is adversely and strongly affected in the longer term by changes that take place in domestic public investment in the manufacturing sector, where elasticity was high, which shows the competition factor between private and public sectors. This is consistent with the results of studies by Moshi & Kilindo, (1991); Patnaik & Joshi, (1997); Abduladem, (2004) ; Lesotlho, (2006) and Aysan, (2006). This also implies that the public sector absorbs most investment and competes against the private sector in investment projects in the manufacturing sector. For example, the establishment of an iron & steel complex in the city of Misurata in Libya led to the closure or determined the activity of a number of steel mills in the private sector. One reason for this is that there is no coordination between the two sectors in the production and sale of products in the local market, which is dominated by the public sector. The important role played by public investment is proposed to determine the complementary or competitive relationship among private investment and public investment. Public investment may compete with private investment in the manufacturing sector, both through the allocation of more resources for public investment, or the public manufacturing sector could be a competitor to the private manufacturing sector through the implementation of projects within the manufacturing sector (Abduladem, 2004). Because the Libyan government has pursued a policy of increasing its budget deficit by reducing investment available to the private sector, and simultaneously reducing public investment in infrastructure, this led to the existence of a negative and competitive relationship between private and public investment in the manufacturing sector (see Dagger, 2004 and section 4.4 in this study).

The exchange rate also had a strong effect on domestic private investment in the manufacturing sector, but the results were in contrast to economic theory, because the effect was positive in the long and short term. An increase in exchange rate leads to a rise in domestic investment in the private manufacturing sector, this is due to the government raising exchange rates gradually since its orientation towards an economic openness policy, which means that increases in exchange rates coincided with a government decision to allow the private sector gradually to engage in economic activities that had hitherto been monopolized by the public sector. This result is consistent with the findings of Baskaya, (1986); Asante, (2002) and Abduladem, (2004). Moreover, the real exchange rate affects private investment in the manufacturing sector through the channels of supply and demand. From the demand side, increasing value of the real exchange rate may lead to increases in the real value of the private sector's wealth, and thus encourage private spending (Abduladem, 2004). Therefore, an increase in domestic absorption encourages private companies to increase their investment through the impact of an accelerator mechanism (Aysan, 2006). From the supply side, an increase in the real exchange rate reduces the price of exportable products (expressed in national currency) compared with price of products are not exportable; this may encourages investment in the manufacture of non-exportable goods, and thus reduces investment in the manufacture of exportable goods. This is what happened in the Libyan private manufacturing sector. Exchange rate plays an important role in explaining the behaviour of private investment in the Libyan manufacturing sector.

The impact of per capita GDP was as expected and similar to the result of the study by Sheriff, (2005); it has a positive and strong influence on domestic private investment in the manufacturing sector. This reinforces the conclusion that the private sector in the Libyan economy depends largely on the growth of per capita GDP in financing its projects, especially small businesses that do not require huge funds, of which there are many in Libya.

Also openness has a positive impact on domestic investment (Abdel-Aal & Abdul-Ghani, (2002); Alhakami, 2003; Lesotlho, 2006), and the relationship between trade liberalization and volume of trade is positive (Faini, 2004). This means that a greater degree of openness of a country in the world leads to more purchasing of its products, and this leads indirectly to encouraging and increasing private sector investment. An increased trade openness level leads to a growth in imports, especially imports of manufacturing that raise the ratio of investment in this sector.

Labour force in the manufacturing sector has a positive but weak impact on domestic investment, a conclusion that depends on the t-statistics and on flexibility in both long and short terms.

## 9.4. The Impact of Domestic Investment on Economic Growth in the Libyan Economy

### 9.4.1. Description of Variables and Data

This study aimed to identify the impact of domestic investment as a determinant of growth in the Libyan economy during the period 1962-2008. Cobb-Douglas Function was used to analyze the relationship between real per-capita GDP and its most important determinants as described in Cobb-Douglas function. Properties of time series of the model variables have been analyzed by using several tests for determining the integration level of each time series separately.

The study is limited to economic developments and domestic investment in the period from 1962 to 2008, and data variables are given in their real value and are measured at constant prices for the year 2000.

While the study attempts to identify the factors which control domestic investment in the Libyan economy through applying Cobb Douglas function, the study information is collected from many references, books, periodicals, articles and bulletins related to the study. Also, data and statistics are collected from report and publications for various years on investment issued by the General Authority for Investment and Ministry of General Planning. This is in addition to the Investment Promotion Boards in Libya, the Ministry of Industry, Ministry of Economy, Central Bank of Libya, General Planning Council, General Authority for Information and Documentation in Libya, World Development Database, and UNCTAD, in addition to some other sources relevant to this topic of study.

### 9.4.2. The Model

An econometrics model is applied to test the basic hypotheses of the study. With respect to the model of the study, economic theory assumes through growth theories that economic growth depends on certain determinants. To investigate the existence or non-existence of the relationship between the variables used, and to determine whether this relationship is linear or non-linear, this study adopted the ordinary least squares method (OLS). This method is used to estimate economic relations, because it gives the best linear unbiased estimator, based on the theoretical framework of this method, which estimates the economic growth equation of the independent variables mentioned above. This study relied on a descriptive analytical approach to analyse and describe an important determinant of growth in the Libyan economy, and to analyse the important aspects related to economic growth and the factors affecting these variables. In addition, the study adopted the applied traditional methodology in econometrics for the purpose of testing the extent of a significant determinant of growth and its impact by using time series analysis to determine the stability of the degree of this parameter and the nature and direction of the causal relationship between independent and dependent variables.

A number of theories such as Harrod-Domar and Neoclassical theory, have referred to investment rate as a determinant for economic growth. This study adopted the classical theory model of growth represented in the Cobb-Douglas model (Nerlove, 1965) by introducing the domestic investment factor in the equation instead of capital stock to investigate the effect of domestic investment on economic growth in Libya and compare it with the impact of another important factor, which is the labour force. Classical theory recognized that the sources of growth include capital, labour and technology, and the proportion of each variable can be identified through the production function (Cobb-Douglas) as in the following equation:

$$Y = AK^{\alpha} L^{1-\alpha} \qquad (9\text{-}9)$$

Where:

$\alpha$ is the share capital of the value of production, and (1- $\alpha$) is the share of labour in the value of production

This equation can be shown in the following format:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha.\frac{\Delta K}{K} + (1-\alpha)\frac{\Delta L}{L} \qquad (9-10)$$

In other words, the rate of growth in GDP can be determined by the rate of growth in A, K and L. Because the change in capital stock is equal to investment, i.e. $\Delta K = I$ the form of the equation can also be written as follows:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha.\frac{I}{Y} + (1-\alpha)\frac{\Delta L}{L} \qquad (9-11)$$

Given that $\Delta A/A$ reflects the residual part of the basic equation; the regression equation is as follows:

$$GDP\ growth = \beta_1 \frac{I}{Y} + \beta_2 L^{\cdot} + e \qquad (9-12)$$

Where:

$\beta_1$ is the share of capital in the value of production, $\beta_2$ is the share of labour in the value of production, and e = error term.

Real per capita GDP can be used instead of GDP growth, and by taking the logarithms of equation (9-12), and because this study focused on the impact of domestic investment on economic growth, then we get:

$$LnY = \alpha + \beta_1 LnI + \beta_2 LnL + e \qquad (9-13)$$

Where:

$\alpha$ = constant coefficient

Y = real per-capita GDP in the Libyan economy

I = real domestic investment in the Libyan economy

L = size of labour force in the Libyan economy

e = error correction.

In this study, the time series during the period 1962-2008 was used to determine the impact of investment on growth in the Libyan economy. Per-capita GDP, investment and labour force are calculated from data in constant prices (2000=100) and national currency unit.

There is a positive relationship between real GDP and investment; this is according to the studies of Frankel, (1997) and Omar, (2002). In terms of explanatory variables and their relationship with a dependent variable, there is consensus among economists on the existence of a direct correlation between investment and the growth of real GDP. Neo-Keynesian and neo-classic investment theory suggests investment is positively related to the growth of real GDP. This relationship can be derived from the model of flexible acceleration (Sikwila, 1992), which assumes a production function with a fixed relationship between the desired capital and changes in GDP. According to what has been raised above, investment is expected to have a positive relationship with the rate of growth in GDP.

A series of applied studies have proven that employment has a positive effect on growth (Al-Gannam, 2004; Amin, 2002; Wang & Yao, 2001). Other studies have looked at other aspects of employment, such as the number of hours worked and salary costs. This study will use data concerning the number of workers, following the work of Knatiwada & Sharma (2002).

### 9.4.3. Testing and Empirical Estimation

**First: Introduction**

This section of the study is concerned with analysis of the impact of domestic investment on economic growth assimilated in real per capita GDP during the period 1962-2008. It adopted a time series analysis and the detection of its stationary by using the Augmented Unit Root test (ADF). The current values of the variables are also converted into real terms in year 2000 constant prices by using the price index.

**Second: Unit Root Test by Using ADF and PP**

This study analyzed the relationship between real per-capita GDP and domestic investment during the period 1962-2008. It adopted a time series analysis and the detection of its stationarity by using the Augmented Dicky-Fuller (ADF).

For the importance of identifying the gap used in the unit root tests, we used standard ADF test. In the case of non-stationary of the model variables, we determine the degree of integration. If the time series are non-stationary at the same level, thus, it is difficult to achieve a long-term relationship between the variables of the study. The ADF test indicates that none of the variables are stationary in their level, but are stationary in the first differences (Table 9-18). This means that the variables are integrated of order 1 or I (1). Therefore, it is possible to move on to the next step, attempting to detect if any of these variables co integrate.

**Table (9-18)**
**ADF Test for Variables**

| Variables | Level | | | 1st Level | | |
|---|---|---|---|---|---|---|
| | Critical V. | Intercept | Trend | Critical V. | Intercept | Trend |
| ***lnYt*** | 1% -3.58 | -1.79 | -2.38 | 1% -4.17 | -6.50 | -6.46 |
| ***lnIt*** | 5% -2.92 | -0.995 | -2.03 | 5% -3.51 | -4.98 | -4.92 |
| ***lnLt*** | 10% -2.60 | -1.97 | -2.04 | 10% -3.18 | -4.22 | -4.35 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.

Table 9-19 presents the results for the testing of stationarity for variables by using Phillips-Perron test. The results show that the null hypothesis of nonstationarity cannot be rejected when variables are in levels. However, after taking first differences, all variables become stationary.

**Table (9-19)**
**PP Test for Variables**

| Variables | Level | | | 1st Level | | |
|---|---|---|---|---|---|---|
| | Critical V. | Intercept | Trend | Critical V. | Intercept | Trend |
| ***lnYt*** | 1% -3.58 | -1.77 | -2.42 | 1% -4.17 | -6.50 | -6.46 |
| ***lnIt*** | 5% -2.92 | -1.06 | -1.75 | 5% -3.51 | -4.94 | -4.89 |
| ***lnLt*** | 10% -2.60 | -2.07 | -2.77 | 10% -3.18 | -8.14 | -8.05 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.

After making sure the time series of the model's variables in this study are not stationary in the level but stationary in the first difference, and then making sure all of them are co-integrated, it is expected that there is a long-term relationship between real per-capita GDP (lnY) and the explanatory variables (domestic investment (lnI) and labour force (ln L).

**Third: ECM Estimation**

**I) Cointegration ECM by using Johansen Approach:**

Engle-Granger test is sufficient if the number of variables in the model is only two, but if they are more than two, it is preferable to use Johansson cointegration test, (Johansen, 1988; Johansen and Juselius, 1990). This is used to confirm the relationship in the long run equilibrium between economic growth and its determinants in this study (investment and labour).Table 9-20 shows the Trace and Maximum Eigenvalue tests results in order to determine whether there is a relationship between the variables in the long run or not.

**Table (9-20)**
**Cointegration Test Results by Using Johansen Approach**

| No. Of CE(s) | Eigenvalue | Trace 0.05 | | P. Value | Max-Eigen 0.05 | | P. Value |
|---|---|---|---|---|---|---|---|
| | | Statistics | Critical | | Statistics | Critical | |
| r=0 | 0.4146 | 33.48* | 29.79 | 0.018 | 23.02* | 21.13 | 0.026 |
| r≤1 | 0.2066 | 10.46 | 15.49 | 0.246 | 9.95 | 14.26 | 0.214 |
| r≤2 | 0.0117 | 0.50 | 3.84 | 0.467 | 0.50 | 3.84 | 0.476 |

*denotes rejection of the hypothesis at the 0.05 level.

Cointegration test described in Table 9-21 showed that we cannot accept the null hypothesis ($r = 0$), which states that there is no cointegration equation at statistics level of 5%, but we also cannot reject the null hypothesis ($r \leq 1$) at statistics level of 5%. Accordingly, there is only one cointegration equation between investment and labour from one side and growth from another.

The cointegration equation by using the Johansson test is as seen in Table 10-20.

**Table (9-21)**
**Results from Vector Error Correction Model**

| Cointegration Equation | | | Short-run Dynamics | | |
|---|---|---|---|---|---|
| **Cointegration Vector** | Coefficients | T. Statistics | VEC* Equation | Coefficients | T. Statistics |
| ***LYt-1*** | 1 | - | *ΔLYt* | -0.39 | -3.31 |
| ***Lit-1*** | 0.73 | 6.19 | *ΔLIt* | 0.44 | 2.19 |
| ***Lit-1*** | 0.40 | 2.41 | *ΔLLt* | 0.17 | 1.14 |
| ***Constant*** | 57.0 | - | | | |

*denotes Vector error correction.

**II) Statistics Examination of the model's Residuals:**

The Table 9-22 shows the absence of econometric problems in the error correction model by using the Jarque-Bera test, LM test, ARCH test, White test and Ramsey RESET test. This means that residuals are normally distributed, free from serial correlation problem, have no variance and no restriction error in the model.

**Table (9-22)**
**Statistics Examination of the Model's Residuals**

| Statistics | Estimated Value | Probability |
|---|---|---|
| Normality (Jarque-Bera) | 1.25 | 0.530 |
| Breusch-Godfrey Serial Correlation LM Test | [1]* 1.99<br>[2] 1.66<br>[3] 1.44 | 0.834<br>0.931<br>0.945 |
| ARCH Test | [1] 0.028<br>[2] 0.609<br>[3] 0.338 | 0.156<br>0.168<br>0.129 |
| White Heteroskedasticity Test | [no cross terms]: 0.230<br>[cross terms]: 0.415 | 0.235<br>0.165 |
| Ramsey RESET Test | [1] 1.961<br>[2] 1.682<br>[3] 1.187 | 0.217<br>0.219<br>0.390 |

All regression estimations and test results are obtained by using Eviews 6 econometric software.
*Number inside parentheses indicates to number of lags included.

In the light of the results to the error correction model in Table 9-21, it is noted that the correction error variable is significant at ($\varepsilon_{t-1}$) 1% level, with the expected negative indication. This also confirmed the long-run equilibrium relationship in the model. The value of the error correction coefficient (-0.39) indicates that per-capita GDP adjusts toward its equilibrium value in each time period by 39%. In other words, pre-capita GDP corrects the imbalance of its equilibrium value which remains of each past period about 38%. That is, when per-capita GDP during the short-run in the period (t-1) diverts from its equilibrium value in the long run, it is corrected by about 38.6% of this deviation in the period (t). In other words, this percentage of correction reflects a low adjusting speed towards equilibrium, in the sense that per-capita GDP takes approximately 2.6 years (1/0.39) towards the equilibrium value after the impact of any shock in the model as a result of a change in its determinants (investment, labour). The explanatory power of the equation $AdjR^2$ : (0.44) implies that 44% of the variation in per-capita GDP is explained by these explanatory variables, and the remainder (56%) is due to other variables.

By using the results of estimating model in Table 9-21 we obtained the elasticity of per-capita GDP to its determinants in the long and short-run. The equation indicates that the estimated parameters have the expected signs, which means per-capita GDP is directly affected by investment and labour. Per-capita GDP is more flexible to investment than labour in the short and long-run. From the results we note that an increase in investment by 1unit lead to a direct increase in per-capita GDP by 0.44%, and continues its impact in the long run until it reaches 0.73%. This may be indicative of the adoption of per-capita GDP partly on the size of the domestic investment. As for the impact of labour, the study found that an increase in the size of labour by 1unit leads to an increase of per-capita GDP by 0.17% in the short-run and 0.40% in the long-run. An increase in the rate of employment in the Libyan economy has little impact on economic growth in general. Accumulation of the amount of labour in some production locations over the required level led to a decline in productivity. This is according to the law of diminishing returns, which states that as equal quantities of one variable factor are increased, while other factor inputs remain constant, a point is reached beyond which the addition of one more unit of the variable factor will result in a diminishing rate of return and the marginal physical product will fall (Gorman, 2003).

The results of the long-term relationship obtained by the Johansen approach are compatible with economic theory for both variables (investment and labour), the results were significant as well except for labour in the short run, in addition, the results indicate that investment affects growth (reflected in per-capita GDP) more than labour, this indicates that investment is somewhat driving growth in Libya. Results also indicated that the cointegration vector coefficients, which describe the long-run relationship are significant, because the value of likelihood = 275.47.

**Fourth: Cointegration and Causality Test**

This study used the Granger causality test, which takes into consideration the time series properties of the data to examine the incidence of investment driving growth in Libya. The application of the Granger causality test confirms the relationship between investment and real per-capita GDP in the Libyan case, as confirmed by Barro, (1991), and Amanja & Morrissey, (2006).

Results showed that changes in investment help in explaining the changes in per-capita GDP, or domestic investment causes economic growth, according to Granger's concept, the calculated value of F (5.30) is statistically significant at a level (1%), while the changes in per-capita GDP do not lead to changes in investment as the value of F statistics (2.01) is less than the critical value of F. Accordingly, there is a causal relationship with one direction from investment to per-capita GDP in the Libyan economy. In addition, there is a single direction between labour and per capita GDP which suggests that per capita GDP is causing labour, where the statistical value of F is equal to 5.52.

### 9.4.4. Findings and Discussion

The study aimed to analyze the relationship between investment and economic growth expressed in real per capita GDP in Libya in the long run and test if there is a short-run relationship.

•Time series analysis showed that the variables are stationary at its first level of statistics level 5%, and stationarity test for residuals indicated the variables of the study are free of unit root at the first difference of 1%, and they are integrated of the level I (0). In addition, Maximum Eigenvalue and Trace Tests indicated to the existence of one equation for cointegration, thus, the cointegration tests indicated the existence of a long-run equilibrium relationship between investment and economic growth.

•A causality test indicated the existence of a causal relationship in the long and short terms of investment and growth, changes in investment help to explain the changes in economic growth as resulted by some applied studies such as Alabdeli, (2005); Amanja & Morrissey, (2006) and Ghani & Din, (2006), which can be justified by investing part of oil revenue in some of the projects leading to an increase in the average per capita GDP which enhances the opportunities for economic growth. There is also a single direction between labour and per capita GDP which declared that per capita GDP is causing labour, where the statistics value of F was equal to 5.52. This was due to the increase in growth rates leading to a revitalization of the economy, increasing employment opportunities and attracting labour to the Libyan economy.

•Per-capita GDP is more flexible to investment than labour in the short and long-run (the same result is shown by the study of Amin, 2002). This may be indicative of the adoption of per-capita GDP partly on the size of the domestic investment. As for the impact of labour, the study found that an increase in the rate of employment in the Libyan economy has little impact on economic growth in general. Accumulation of the amount of labour in some production locations over what was required led to a decline in productivity. This is according to the law of diminishing returns, which states that as equal quantities of one variable factor are increased, while other factor inputs remain constant, a point is reached beyond which the addition of one more unit of the variable factor will result in a diminishing rate of return and the marginal physical product will fall (Gorman, 2003).

Therefore, domestic investment is expected to play an important role in stimulating economic growth rates in Libya, especially with the policy of openness which the country witnessed in this period. That might be possible if the Government encourages more private domestic investment projects, which should not be neglected at the expense of a trend towards FDI.

# Chapter 10

# Conclusions

## 10.1. Introduction

This study adopted econometric quantitative methods to test the direction of economic relations between variables, and tests have been conducted concerning the stationarity of time series, cointegration, and an error correction model and causality test. This study used the Johansen test for cointegration in the context of the error correction model to detect the extent of integration, stability and the existence of long-term relationship between variable. The aim of this chapter is to summarise the main findings of the study and to draw some general conclusions. The remainder of the chapter is structured as follows. Section 11.2 is reconsideration of the research objectives. Section 11.3 describes the contributions of the research to knowledge. The main obstacles of to the study are discussed in section 11.4. Section 11.5 contains recommendations. A number of potential areas for further research are suggested in section 11.6.

## 10.2. Reconsideration of the Major Research Objectives

The aims of the research reported in this thesis were threefold as follow; firstly, to examine the domestic investment climate in Libya; secondly, to estimate and analyze the patterns and determinants of domestic investment in the manufacturing sector; and thirdly, to investigate the impact of domestic manufacturing investment upon the Libyan economy. Despite several studies that focus on investment in developing countries, there has been minimal research into the behaviour of domestic investment decisions in the Libyan economy. This thesis was an attempt to address this gap in the literature. To this end three models have been presented.

To achieve these aims, the study has employed four types of econometric tests, namely; Unit root tests, Cointegration test, Error correction models and Granger causality test. Each of these objectives has been tested as follows:

### 10.2.1 Research Objective one:

-To estimate and analyse the patterns and determinants of domestic investment in the public manufacturing sector.

To achieve this aim, a time series model was developed and estimated covering the period from 1962-2008. This model covered the determinants affecting domestic investment in the Libyan public manufacturing sector. Unit root test by using ADF and PP, cointegration test, ECM and causality test were used in this section.

Section 9.2 in chapter 9 gives details of the cointegration results for domestic investment in the public manufacturing sector which is cointegrated. Therefore, the test for the long-run indicates a long-run positive relationship between domestic investment in the public manufacturing sector and its main determinants.

The results in section 9.2 in chapter 9 for the error correction model show that there is a short-run relationship with respect to domestic investment in the public manufacturing sector because the ECM coefficient is negative and statistically significant. The findings from long-run and short-run have shown that the Government's annual appropriations given to the manufacturing sector and capital goods & machinery imports are somewhat driving domestic investment in the Libyan manufacturing sector, that they are its main determinants and they are affecting it with one positive direction. The results suggest that appropriations are a more important determinant of domestic investment in the public manufacturing sector.

### 10.2.2 Research Objective: Two

-To estimate and analyse the determinants of domestic investment in the private manufacturing sector.

To achieve this aim we can adopt the econometric techniques that were used in the previous objective to examine the determinants of domestic investment in the private manufacturing sector, based on previous applied studies, using time series data for the period 1962-2008 for the Libyan economy.

The result from section 10.3 in chapter 9 revealed that: all the variables are stationary in first difference and integrated of order I(1). Also, the results from testing for cointegration between domestic investment in the private manufacturing sector and the explanatory variables are cointegrated and there is a long equilibrium relationship, established by using the maximum likelihood approach. Also, the estimated results of the short-run relationship show that there is a short-run relationship because the ECM coefficients are negative and significant.

The results showed that factors determining and affecting domestic investment in the private manufacturing sector, as explained by results in section 9.3.4, are domestic investment in the public manufacturing sector, per-capita GDP, openness level and exchange rate.

The results showed that investment is adversely and strongly affected in the longer term by changes that take place in domestic public investment in the manufacturing sector which shows the competition factor between the private and public sectors, confirming the findings of previous studies (Moshi & Kilindo, 1991; Patnaik & Joshi, 1997; Abduladem, 2004 and Lesotlho, 2006).

### 10.2.3 Research Objective: Three

-To investigate the impact of domestic investment upon the Libyan economy.

The section aimed to analyze the relationship between domestic investment and economic growth expressed in real per capita GDP in Libya in the long run, and also to test if there is a short-run relationship. Time series analysis showed that the variables are stationary at their first level. In addition, Maximum Eigenvalue and Trace Tests indicated to existence of a long-run equilibrium relationship between investment and economic growth. The results found that per-capita GDP is more flexible to domestic investment than labour in the short and long-run, domestic investment was found to be significant for economic growth, confirming the findings of previous studies of economic growth (Frankel, 1997; Mallick, 2002; Alabdeli, 2005; Amanja & Morrissay, 2006 and Ghani & Din, 2006).

Granger causality test was also used for testing the causation between the variables in order to achieve this aim. Causality test indicated the existence of a causal relationship in the long and short terms of domestic investment and growth, and changes in investment help to explain the changes in economic growth. That means domestic investment affects economic growth in the Libyan economy.

### 10.2.4. Research Objective: Four

-To measure and analyse productivity in the manufacturing sector, and focus on studying the most important industry in the sector.

To achieve this aim we adopted several measurements of productivity with their various ramifications, in order to measure productivity at the level of sections of the manufacturing sector, and also at the level of the iron and steel industry which recorded high levels of productivity compared with other industries in the manufacturing sector of the Libyan economy.

The results showed the decrease in total productivity in most branches of the manufacturing sector and failure to achieve annual target plans. Important reasons that led to this failure are the following: a) Lack of indicators of productivity standards in most of the factories of the manufacturing sector, which led to a failure to take appropriate decisions when planning future productivity. b) Lack of full awareness of the concept of productivity among the decision makers in productive facilities led to negative results on the policy of making production plans. c) The absence of routine and preventive maintenance of production lines resulted in a lack of available production capacity utilization.

Decline in the value of production of the manufacturing sector in some years is due to the low level of prices set by the Government, as well as rises in the value of some cost items such as costs of production materials and labour costs due to increased number of workers, all these led to a low value-added in the sector, and thus a lower absolute efficiency of production, which resulted in a decrease in ratios of different productivity criteria.

The metal industry section scored the best rates of productivity compared with other branches; this section depends on the Iron and Steel Complex, which constitutes about 90% of the production capacity of the metallurgical industry.

## 10.3. Contributions of the Study to Knowledge

This sub-section highlights the main contributions of this study to economic literature.

Manufacturing investment as a domain of study is not new; but what is new is the environment (domestic and international) that gives new dimensions to this subject. Studying the impacts and determinants of manufacturing investment in Libya is new, especially following the reform policies of the 1990s. The research is new in terms of analysing some new factors such as capital goods and machinery imports, size of labour force in the manufacturing sector, real exchange rate and economic openness level; and their effect on determinants, including the location of manufacturing investment for Libya in particular.

This study has made a significant original contribution to knowledge. Specifically, it fills the gap in the domestic investment area of Libyan growth studies by testing investment behaviour in the Libyan economy. Also, this study has explained the long-run and short-run relationship between domestic investment and economic growth, as well as undertaking a causality analysis between the relevant variables.

This study contributes to knowledge in macroeconomics. It enlarges the understanding of the Libyan economy and fills gaps in economic theory by investigating the relationship between different measures of domestic investment and its determinants.

### 10.4. The main obstacles faced by the research:

No study is perfect, and this study is no exception. Specifically, it faced the following limitations:

1 The researcher encountered a problem of limited data. Data on Libya is limited, especially for the period 1962-1970, where the researcher was forced to assemble this data from different sources. For example, data that were not obtained included items such as value-added in the manufacturing sector, and data that were obtained but suffering from a lack of precision included items such as credits given to the private manufacturing sector.

2 There was a difference in the quality of data from several sources, some data differ between one source to another, and this is the case in developing countries in general.

3 A comparative study in the future between Libya and some other similar economically countries can be worked by using panel data and cross sections method.

### 10.5. Recommendations

-We recommend the competent authorities in Libya to provide reliable economic data; this data should be overseen and linked with competent international organizations such as the World Bank and UNCTAD, for example.

-As stated in the results of econometric analysis of domestic investment determinants, the annual appropriations primarily, and then imports of capital goods, have a strong impact on domestic investment in the public manufacturing sector, therefore, the government should take account of these variables in drawing up the policy of domestic investment in this sector, and in developing economic and social plans in the future.

-As public investment has a negative impact on private investment in the manufacturing sector and competes with it, it is recommended the Government should intervene in making both sectors complementary to each other, through coordination between them, and assigning certain targets to each sector, for instance, by subsidising public sector producers and products that need huge capital inputs, and leaving small and medium industries for the private sector to manufacture.

-Exchange rate has a strong impact on domestic investment in the private manufacturing sector, therefore, we recommend the Central Bank of Libya to study the policy of determining exchange rate policy in setting economic and monetary policies which lead to results in favour of national economic stability, and which do not contradict the policy of encouraging private sector investment.

-The private sector in manufacturing depends primarily on the level of GDP in financing its investments, therefore, we recommend creating various sources of funding, and giving loans and credits through economic feasibility studies which are required to be successful.
An increased trade openness level helps to activate investment in the manufacturing sector, accordingly, we recommend reducing tariff restrictions on imports of the manufacturing sector of intermediate goods and capital, and facilitating the procedures for obtaining import licenses to factories of the private manufacturing sector.

-The results of this study state that domestic investment can have a positive and influential role in economic growth in Libya, we recommend establishing investment projects and encouraging local private sector investment. Moreover, enough attention should be given to foreign investment projects.

-We recommend the Ministry of Industry to spread the concepts of productivity to all workers in the manufacturing sector, and to brief them over the course of production processes. However, the focus of the planning system must be to ensure it is successful in all production processes, and to ensure optimal use of resources and the basic elements of production such as labour, raw materials and equipment.

- It is necessary to develop the mechanism of the manufacturing sector and its development due to it being an important and fundamental pillar in development strategy. Contribution of this sector in GDP is limited, therefore, the Government should give importance to this sector to contribute to the national economy, and should work to increase the degree of productivity in this sector depending on capital intensity and qualified technical employment, and channel investments into this sector to enable it to assume its responsibility towards the national economy.

-Government needs clarity of economic objectives concerning investments, and to determine its choices in light of the next stage of development, and to identify priorities for the sectors which needed investments (especially productive sectors such as manufacturing) is the way to achieve the success of the investments and investment policies. Government's roles in this context is reflected in the provision of available natural resources in the country at competitive prices, and facilitating the importation of production inputs by reducing tariffs, or by providing subsidized prices, and directing the banking sector to provide funds for this sector.

-Regarding conciliation between the public and private sectors, the government should stimulate the participation of the private sector in determining the nature of current and future challenges they face, through the achievement of major economic reforms, and gradually continuing the trend towards privatization provided that there is a joint contribution between private and public sectors in reaching stable rates of growth in GDP.

-Considering that Libya is moving towards marketization, the manufacturing sector can take an important role in expanding and supporting this market. Government should carry out policies mentioned earlier such as "combining the use of foreign capital and domestic one", and "investors gain benefits from their investments", it should encourage and support diverse economic elements, such as foreign investment, and the domestic investment of private investors take part in the development of manufacturing sector and activate the local market.

-The Iron and Steel Complex has a high productivity rate compared to other institutions in the manufacturing sector which is witnessing decline in productivity, making it the sector most in need of greater attention by the government and competent authorities. Support for this industry according to its advantages and benefits can make it a successful export industry, able to compete internationally.

**10.6. Suggestions for Future Research**

In this subject, it is advantageous to mention some suggestions concerning future studies of domestic investment in the manufacturing sector in Libya.

1 In the future an attempt could be made to further disaggregate the data to examine the relationship between domestic investment and other variables which could not be obtained.

2 I suggest studies of the determinants of domestic investment in various sectors. Due to lack of such studies as these, the Government cannot make a comprehensive evaluation of the determinants of domestic investment to determine the viability of several policy options.

3 Because the Libyan environment was the focus of this study, it would be interesting to duplicate it in other Arab countries or to do a comparative study, so that comparisons could be drawn, especially as these Arab countries have many similarities to the Libyan environment. It is possibly to conduct a study using panel data and cross sections methods to investigate the determinants of domestic investment at the level of sectors and countries at the same time.

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## APPENDICES

### Appendix (A1)

**Law No. 5 for the Year 1997 Concerning**
**Encouragement of Foreign Capitals Investment**

**Article (1)**

The aim of this law is to attract investment of foreign capital in investment projects within the framework of the general policy of the State and of the objectives of economical and social development and in particular:

- Transfer of modern technology.
- Training the Libyan technical personnel.
- Diversification of income resources.
- Contribution to the development of the national products so as to help in their entry into the international markets.
- Realization of a local development.

**Article (2)**

This law shall apply to the investment of the foreign capital held by Libyans and the nationals of Arab and Foreign States in investment projects.

**Article (3)**

In the application of this law, unless the context otherwise requires, the following words and phrases shall have the meanings assigned opposite each:

1. Jamahiriya means The Great Socialist People's Libyan Arab Jamahiriya.
2. The law means the law of Foreign Capitals Investment Encouragement.
3. The Secretary means The Secretary of the General People's Committee for Planning, Economy and Commerce.
4. Authority means Libyan Foreign Investment Board.
5. The Executive Regulation means the regulation issued for the implementation of the provisions of this law.
6. The Foreign Capital means the total financial value brought into the Great

Jamahyria whether owned by Libyans or foreigners in order to undertake an investment activity.

7. Project means any economic enterprise established in accordance with this law the result of its work is the production of goods for end or intermediate consumption, or investment goods, or the export or provision of service, or any other enterprise approved as such by the General People's Committee.

8. Investor means any natural or juridical entity national or non-national, investing in accordance with the provisions of this law.

**Article (4)**

This law regulates the investment of foreign capital brought into the Jamahiriya in any of the following forms:

- Convertible foreign currencies or substitutes thereof brought through official banking methods.
- Machinery, equipment, tools, spare parts and the raw materials needed for the investment project.
- Transport means that are not locally available.
- Intangible rights; such as patents, licenses, trademarks and commercial names needed for the investment project or operation thereof.
- Reinvested part of the profits and returns of the project.

The Executive Regulation shall regulate the manner for the evaluation of the in kind portions used in the formation of the capital designated for investment in Libya.

**Article (5)**

There shall be established an Authority to be known as "Libyan Foreign Investment Board" having its own independent juridical personality, under the jurisdiction of the General People's committee for Planning, Economy and Commerce. The Authority shall be established by a decision from the General

People's Committee upon a proposition by the Secretary stating the Authority's legal domicile, its secretary and members of its management committee.

The Executive Regulation shall regulate the meetings of the Authority and the administrative procedures required for establishing the project.

## Article (6)

The Authority shall work for the encouragement of foreign capitals investment and promotion for the investment projects by various means; in particular it shall:

1. Study and propose plans to organize foreign investment and supervise foreign investments in the country.
2. Receive the applications for foreign capital investments to determine whether they satisfy the legal requirements and the feasibility study for the project and then submit its recommendations to the Secretary accordingly.
3. Gather and publish information and conduct economic studies relevant to the potentials of investments in the projects that contribute to the economic development of the country.
4. Take proper actions to attract foreign capitals and promote the chances of investment through various means.
5. Recommend exemptions, facilities or other benefits for the projects that are considered important for the development of the national economy, or recommend the renewal of the exemptions and benefits as provided for in the law for further periods of time. It shall submit its recommendations to the relevant authority.
6. Consider without prejudice to the right of the investor to petition and litigate complains petitions or disputes lodged by the investors resulting from the application of this law.
7. Study and review periodically the investment legislations, propose improvement thereof and submit same to the concerned authority.
8. Perform any other functions assigned to it by the General People's Committee.

## Article (7)

The project is required to realize all or some of the following:

- Production of goods for export or contribution to the increase of export of such goods or substitute imports of goods in total or in part.
- Make available positions of employment for Libyan manpower, train and enable some to gain technical experience and know-how. The Executive Regulation shall set the conditions and terms of employment of Libyan manpower.
- Use of modem technology or a trade mark or technical expertise.

- Provision of a service needed by the national economy or contribute to the enhancement or development of such service.
- Strengthen the bonds and integration of the existing economic activities and projects or reduce the cost of production or contribute in making available materials and supplies for their operations.
- Make use or help in making use of local raw materials.
- Contribute to the growth and development of the remote or underdeveloped areas.

**Article (8)**

Investment is permissible in those areas: Industry; health; tourism; services; agriculture; and any other area determined by a decision from the General People's Committee according to a proposal from the Secretary.

**Article (9)**

The permit for foreign capital investments shall be granted by the Authority after the issuance of the Secretary's decision approving the investment.

**Article (10)**

Projects established within the framework of this law shall enjoy the following benefits:

A) An exemption for machinery, tools and equipment required for execution of the project, from all custom duties and taxes, and taxes of the same impact.

B) An exemption for equipment, spare parts and primary materials required for the operation of the project, from all custom duties and custom taxes imposed on imports as well as other taxes of the same impact for a period of five years.

C) Exemption of the project from the income taxes on its activities for a period of five years as from the date of commencement of production or of work, depending on the nature of the project. This period shall be extendable by an additional duration of three years by a decision from the General People's Committee upon a request of the same by the secretary. Profits of the project will enjoy these exemptions if reinvested. The investor shall be entitled to carry the losses of his project within the years of exemption to the subsequently ears.

D) Goods directed for export shall be exempted from excise taxes and from the fees and taxes imposed on exports when they are exported.

E) The project shall be exempted from the stamp duty tax imposed on commercial documents and bills used.

Exemptions mentioned in parts A, B, and D of this Article do not include the fees imposed in consideration of services such as harbour, storage and handling dues.

### Article (11)

Equipment, machinery, facilities, spare parts and primary material imported for the purpose of the project may neither be disposed of through sale or abandoned without the approval of the Authority and after payment of custom duties and taxes imposed on importation thereof; nor be used for purposes other than those licensed therefore .

### Article (12)

The investor shall have the right to:

A) Re-export invested capital in the following cases:

- End of the project's period.
- Liquidation of the project.
- Sale of the project in whole or in part.
- Elapse of a period of not less than five years as of the issuance of the investment permits.

B) Re-transfer the foreign capital abroad in same form in which it was first brought in after the elapse of a period of six months as of its importation in cases where difficulties or circumstances out of the investor's control prevent its investment.

C) It is permissible to transfer annually the net of the distributed profits realized by the project and interest thereof.

D) The investor has the right to employ foreigners whenever the national substitute is not available.

- The foreign employees who come from abroad have the right to transfer abroad a percentage of their salaries and wages and any other benefits or rewards given to them within the framework of the project.

- Conditions and terms regarding the implementation of this Article shall be set by the Executive Regulation.

**Article (13)**

The project shall not be subject to registration at the commercial register nor at the register of the Importers and Exporters; the Executive Regulation will set the procedures of the registrations at the Authority.

**Article (14)**

A project established in the local development areas or a project which contributes to food security or a project which uses installation and means conducive to save energy or water or contributes to the protection of environment, will enjoy the exemption mentioned in parts B) and C) of Article 10 of this Law for an additional period by a decision from the General People's Committee upon a proposal from the Secretary. The Executive Regulation will set the terms and conditions according to which the project could be considered as achieving these goals.

**Article (15)**

Not with standing ownership laws in force, the investor shall be entitled to hold title for land use. The investor may also lease such land, construct buildings thereon and be entitled to own any property or lease thereof required for establishment or operation of the project; all as per the terms and conditions set in the Executive Regulation.

**Article (16)**

The investor shall have the right to open for his project an account in convertible currencies at a commercial bank or at the Libyan Arab Foreign Bank.

**Article (17)**

Ownership of the project may be transferred in whole or in part to another investor with the approval of the Authority; the new owner will replace its predecessor in all rights, undertakings and obligations arising there from in accordance with the provisions of this law and other legislations in force. The Executive Regulation shall set the terms and conditions for the transfer of ownership.

### Article (18)

In case it is proven that the investor has violated any provisions of this law or the executive regulation; the authority shall issue a warning to the investor to rectify the violations within a period of time specified therein. In case of failure by the investor to adhere thereto, the secretary, upon a recommendation by the Authority, may:

- Deprive the project from some of the benefits provided for in this law.
- Oblige the investor to pay double the exemptions granted to him.

### Article (19)

The permit of the project may be withdrawn or the project finally liquidated in the following cases:

- Failure to start or complete the project in accordance with the terms and conditions set by the Executive Regulation;
- Violation of the general provisions of this law and Executive Regulation;
- Repetition of violations. All in accordance with the procedures specified by the Executive Regulation.

### Article (20)

The investor shall be entitled to petition in writing against any decision affecting him as per article 18 or article 19 of this law, or against any disputes arising because of the implementation of the provisions of this law within thirty days as of the date of notifying him by a delivery guaranteed letter; the Executive Regulation shall specify the proper authority to which petitions should be submitted and processes of petition.

### Article (21)

The investor should:

- Maintain regular books and records for the project.

- Prepare an annual budget and profit and loss account audited by a chartered accountant as per the conditions set forth in the Commercial Law.

**Article (22)**

The employees of the Authority designated by a decision from the secretary shall have the power of the judicial officers to control the enforcement of this law and to unveil and record the violations and refer same to the competent authority; for this purpose the said employees shall be entitled to inspect the projects and check the books and records relevant to their activities.

**Article (23)**

The project may not be nationalized, dispossessed seized, expropriated, received, reserved, frozen, or subjected to actions of the same impact except by force of law or court decision and against an immediate and just compensation provided that such actions are taken indiscriminately; the compensation will be calculated on the basis of the fair market value of the project in the time of action taken. The value of the compensation in convertible currencies may be transferred within a period not exceeding one year and according to the rate of exchange prevailing at the time of transfer.

**Article (24)**

Any dispute arising between the foreign investor and the state, due to the investor's act or to actions taken by the state, shall be referred to a court having jurisdiction in the Jamahiriya except where there is a bilateral agreement between the Jamahiriya and the state to which the investor belongs or where a multi - lateral agreements to which the Jamahiriya and the state to which the investor belongs are parties that provide for relevant reconciliation or arbitration, or there is a special agreement between the investor and the state containing provisions in regard to an arbitration clause.

**Article (25)**

Foreign investments in existence on the date of issuance of this Law shall enjoy the privileges and exemptions provided for herein.

**Article (26)**

Provisions of this law shall not apply to foreign capital invested or to be invested in petroleum projects as per the provisions of law number 25 of 1955, as amended.

**Article (27)**

The executive regulation to this law will be issued by a decision from the General People's Committee upon a proposal from the Secretary.

**Article (28)**

Law number 37 of 1968 regarding investment of foreign capitals in Libya is hereby repealed and so are any other provisions that may contradict the provisions of this law.

**Article (29)**

This law shall be published in the Official Gazette and in the different media and be effective as of its publication in the Official Gazette.

Source: CBL, available at: http://www.cbl-ly.com/bb2.htm (in Arabic and in English)

**Appendix (A2)**

**Law No. 9, 2010 on Investment Promotion created by General People's Congress**

**Article (1) - Definitions**

While enforcing this Law, the following words and phrases shall have the relevant meanings thereof, unless associated meanings may otherwise state.

1. **The State:** The Great Socialist People's Libyan Arab Jamahiriya
2. **Administrative Authority:** the appropriate administrative authority concerned with the implementation of this Law.
3. **The Secretary:** The Secretary of the sector to which the administrative authority belongs.
4. **Executive Regulation:** The regulation to be issued with the purpose of enforcement of the provisions of this Law.
5. **Foreign Capital :** The financial value in the form of cash, property, *moral* or material, in the foreign currency equivalent that is brought into the country, either owned by Libyans or foreigners, with the purpose of conducting an investment activity.
6. **National Capital :** The financial value in the form of cash, property, *moral* or material, in the domestic currency equivalent, which forms part of the investment project's capital of a Libyan national or *artificial* entity – either its capital is fully owned by Libyan nationals or *artificial entities.*
7. **Investment Project:** Any investment activity that meets the conditions stated as per this Law, regardless of their legal form.
8. **Privatization:** means transfer of ownership of companies, production and service units, wholly or partially owned by the state, public *artificial entities* or private sector.
9. **The investor:** every *natural, artificial* national or foreign person, who invests in accordance with the provisions of this Law.

**Article (2) - Area covered by this Law**

This law applies to national, foreign, or joint venture capital jointly invested in the areas targeted by this Law.

**Article (3) - The objectives of the Law**

The Law aims at the promotion of national and foreign capital investment, with the purpose of setting up investment projects, within the scope of the state's general policy and the objectives of economic and social development, in order to particularly ensure achievement of the following goals :

(1) Technically upgrade and qualify Libyan cadres and elevate their efficiency, in order to acquire advanced skills in addition to opening employment opportunities.

(2) Endeavour to introduce know-how and technology and thereof inserted into the Libyan economy.

(3) Contribution towards setting up, developing or rehabilitating economic, service and production units, in a manner that asists such units to compete and be introduced into the world markets.

(4) Achievement of development in the relevant area

(5) Increase and diversify income sources

(6) Control energy consumption

(7) Utilize locally available raw materials

**Article (4) - Forms of Investment**

This Law classifies the investment of national and foreign capital, which is involved in forming the project's capital in one of the following ways:

(1) Local currency, transferrable foreign currencies or their equivalent, brought in by one of the official banking methods.

(2) Machine, equipment, devices, transport means, spare parts, raw material required for the execution and preparation of the investment project.

(3) Ethical rights such as patents, licensing, trademarks, and commercial names necessary to establish or operate the investment project.

(4) Re-invested portion of the project's interests and revenues either in the same project or in another.

The Executive Regulation coordinates the method designed to assess the material and moral assets, and to re-invest the interests.

**Article (5) - Authority responsible for the Law's application**

An appropriate administrative authority shall be set up to execute the provisions of this Law ; a designation and organizing decision, thereof, shall be made by the General People's Committee, in accordance with a recommendation from the Secretary.

**Article (6) -Assignments of the Authority responsible for the Law's application**

The administrative authority shall be responsible for encouraging investment of national and foreign capital and merchandizing investment projects via different m methods ; in particular, the following:

(1) Studies and proposals of plans organizing investment and privatization, including the preparation of a comprehensive investment map for all areas of investment and available investment opportunities, permitted within the investment areas brought
about, as per this Law.

(2) Collection of investment applications, verifying that the aforesaid applications meet the objectives of this Law and the fulfillment of terms, conditions and rules ; a study of the economic feasibility of the investment project, confirming that all conditions are met with respect to national and foreign investments conducted subject to the provisions of this Law.

(3) Collection and publishing of information; involvement in the preparation of economic studies relating to the project's investment capabilities, which contribute to the country's economic development.

(4) Adopting methods capable of attracting national and foreign capital and publicity campaigns of investment opportunities via the
different media outlets.

(5) Provision of integrated "window service" to facilitate the investor's license application, approvals and other services necessary for the investment project.

(6) Periodic study of investment legislation and review thereof and submission of proposals related to development in this respect to the Secretary.

(7) Take necessary procedures to execute the public policies for the elaboration of the ownership base, privatization of public companies and production units.

(8) Any other assignments, as designated by the General People's Committee, for this administrative authority.

**Article (7) - Conditions to be fulfilled for investment projects**

The project shall fulfill all or part of the following:

(1) Transfer and introduction of expertise and know-how, modern technology, technical expertise or intellectual property right.

(2) Support of ties and integration between the activities and the outstanding economic projects or the reduction of production costs or a contribution towards providing operation items and facilities thereof.

(3) Exploitation or assisting in utilizing local raw materials

(4) Contribution towards the development of remote areas.

(5) Production of commodities for export or a contribution towards increasing the exports thereof ; alternatively, taking such measures that would, either totally or partially, avoid the import of commodities.

(6) Offering services required by the national economy; alternatively, a contribution towards the improvement, development or rehabilitation thereof.

(7) Provision of employment opportunities for the Libyan labour force, of not less than 30%, along with endeavours to provide training courses for such labour, allowing acquisition of technical skills and expertise. The Executive Regulation specifies the terms and conditions for the employment of national and foreign manpower.

**Article (8) - Areas of Investment**

Investment shall be in all production and service areas. The Executive Regulation shall determine the areas of production and services, which are not covered by this Law, or which are restricted to Libyans only, or by way of partnership between Libyans and foreigners ;

additionally , to determine the percentage of each side's contribution in the project, the legal form of the project and the minimum capital that conforms with the nature of the activity.

### Article (9) - Permission for Investment

Permission to set up, develop, restore, run, or operate an investment project shall be issued under a decision by the Secretary, based on an offer from the administrative authority. This authority shall be solely concerned with the issuance of all licenses and necessary approvals for the investment project, in order that such licenses and permissions shall satisfy from the need for / shall negate the requirement for any other licenses or permissions required under the effective legislation. The Executive Regulation shall specify the conditions and rules for the issuance of licenses and permissions.

### Article (10) - Privileges and Exemptions

The investment project, subject to the provisions of this Law, shall enjoy the following privileges:

(1) Exemption of the machinery, equipment and apparatuses necessary for the execution of the project, from all taxes, customs duties, import fees, service charges and other fees and taxes of a similar nature. However, exemptions stated, as per this clause, shall not include fees levied for services as port, demurrage or handling fees.

(2) Exemption of facilities, spare parts, transport means, furniture, requirements, raw materials, publicity and advertising items, related to the operation and management of the project, for a period of 5 years, from all fees and taxes, whatsoever their type or source.

(3) Exemption of commodities, produced for export, from production tax, customs duties and such charges imposed on exports.

(4) Exemption of the investment project from income tax for any activity, for a duration of 5 years, the calculation of which shall commence from the date of the permission for licensing the engagement in the activity.

(5) Exemption of the returns of shares and equities, arising from the distribution of the investment project's interests, during the period of exemption, as well as interests arising from the merger, sale, division or change of the legal form of the project, from all types of taxes and levies, provided these occur during the period of exemption.

(6) Exemption of interest arising from the project's activity if re-invested.

(7) Exemption of all documentary records, registers, transactions, agreements that are made, ratified, signed or used by the investment project, from the stamp duty payable in accordance with the effective legislation.

The investor may carry forward the losses that the project may incur during the exemption years to the following years.

The Executive Regulation of this Law shall decide the conditions and rules necessary for the execution of this Article.

### Article (11) - Transactions in machines and equipment

There shall be no transactions that lead to the sale or discharge of machinery, equipment, furniture, transport means, apparatuses, spare parts, raw material and operation facilities imported for the purpose of the project, unless under the consent of the administrative authority and after fulfilment of all payable fees and customs duties decided for the importation of such items.

### Article (12) - Investor's Rights

The investor shall have the right in the following:

(1) Open a bank account, in favour of his project, in the local currency or foreign currency with one of the banks operating in the country.

(2) Receive financial loans from local and foreign banks and financial institutions, according to the legislation in effect.

(3) Re-export the invested foreign capital, in the case of the termination of the project's duration, liquidation, or sale thereof, either in part or in whole.

(4) Should difficulties or circumstances, beyond the control of the investor, prevent the foreign capital's investment after the elapse of 6 months from the date of such capital's import, the said foreign capital shall be transferred abroad in the same manner as it was originally brought in.

(5) Transfer distributable annual net interests and revenues achieved by the foreign capital invested in the project

(6) Recruit foreign manpower in the case that national manpower is not available.

(7) Issuance of residence visas renewable for 5 years, the duration of the project, and multiple exit/re-entry visas.

**Article (13) - Foreign employees**

Expatriate employees shall have the right to transfer their salaries and any other privileges offered to them, within the investment project, outside Libya. They shall enjoy exemption from customs duties relating to their personal effects. The afore mentioned will be in accordance with the stipulations of the Executive Regulation.

**Article (14) - Investment Record**

Without prejudice to the provisions and stipulations of the Trade Register, the administrative authority will establish a special register to be called "Investment Records", in which all investment projects will be registered indicating the legal frame of such projects, size of investments, type of business, names and nationalities of owners and shareholders and the percentage of expatriate workers therein.

The Executive Regulation shall specify the rules and procedures of registration in the Investment Record.

**Article (15) - Additional Privileges and Exemptions**

It may be possible, in accordance with a decision from the General People's Committee, under a proposal from the Secretary, to offer for the investment projects, tax privileges and exemptions for a period, not exceeding 3 years, or other additional privileges, if those projects prove that:

(1) They contribute to the achievement of food security.

(2) Utilise measures that are capable of achieving abundance in energy or water or contribute to environment protection.

(3) Contribute to the development of the area.

The Executive Regulation shall specify the classification of the rules and provisions taking into account that the project is one that fulfils these aforementioned considerations.

### Article (16) - Privatization of Economic Units

The economic units targeted for privatization, whether the units are developed, rehabilitated, managed or operated, which attain the goals and fulfil the conditions included per this Law, shall enjoy all privileges and exemptions stated herein, provided that a decision thereof shall be made by the General People's Committee.

### Article (17) - Rental of Estates

As an exemption from the effective legislation related to privatization, the investor shall have the right to rent the necessary properties, in order to set up or operate the project, either public or private properties, which shall be according to the conditions and stipulations specified by the Executive Regulation.

### Article (18) - Authorities over the project

It may be possible to transfer the ownership of the project, either wholly or partially to another investor, with the consent of the administrative authority. The new owner shall replace the previous owner, with respect to the rights and obligations incumbent upon him, in accordance with the provisions of this Law and other legislation in effect. The Executive Regulation shall specify the conditions and stipulations under which the transfer of ownership takes place.

### Article (19) - Violations

If it is proved that the investor has committed a violation of any of the provisions of this Law, in the first instance, he shall be warned by the administrative authority to fix the violation within a suitable period to be specified. In the case that the investor fails to do so, the administrative authority shall have the right to deprive the project of some of the privileges and exemptions decided, as per this Law, or to withdraw his license or refer the matter to the judiciary authority concerned to compel the investor to settle what he was previously exempted from.

### Article (20) - Withdrawal of the License

The permissions and licenses issued for the project may be withdrawn or its final liquidation effected, under the following circumstances :

(1) Failure to commence the execution of the project, or failure to complete the execution within the specified completion date, without any justification.

(2) Violation of the provisions of this Law

The aforementioned shall be in accordance with the rules, conditions and procedures specified by the Executive Regulation of this Law.

**Article (21) - Complaint**

The investor shall have the right to make a written complaint against any decision that may be made against him due to a violation of the provisions of this Law, within 30 days from the date of the written notification served on him and confirmed by a signed receipt. The

Executive Regulation shall specify the authority to which this complaint shall be lodged, the complaint procedures and the period required for the final resolution.

**Article (22) - Accounting documents of the project**

The owner of the project must retain legal documents and final accounts necessary for the project according to the effective legislation, as well as the preparation of an annual budget and final accounts authenticated by a legal accountant, in accordance with the conditions indicated as per the Commercial Activity Law and the professional standards.

**Article (23) - The project's guarantee**

It is not allowed to nationalize the project or privatize, take by force, confiscate, impose custody, freeze, or subjugate to procedures having the same effect, except under a judicial decision and for a fair compensation, provided that these procedures shall be taken in a non discriminatory manner. The compensation shall be computed on the basis of a fair market value of the project at the time when the measure is to be taken. It is permissible to transfer the value of the compensation, in a transferable currency in a period not exceeding one year from the date of issue of a law or a decision on the prevailing exchange rates.

**Article (24) - Settlement of Disputes**

Any dispute that may arise between the foreign investor and the state, which may be attributed to the investor or due to procedures taken against him by the state, shall be forwarded to the appropriate courts of the state, unless if there are mutual agreements between the state and the investor's state or multilateral agreements to which the investor's state is a party thereof, including texts relating to reconciliation or arbitration or special agreement between the investor and the state stipulating arbitration as a condition.

**Article (25) - Fees for services**

A decision shall be made by the Secretary, in accordance with a proposal from the administrative authority, to determine the fees payable by the investor for presenting the services.

**Article (26) - Judicial control officer**

The personnel of the administrative authority, who are appointed under a decision from the appropriate Secretary, shall be entitled to occupy the capacity of Judicial Control Officers authorized to superintend the execution of this Law's provisions, detect any violations and submit to the authorities concerned. In order for them to fulfil this purpose, they are authorized to inspect investment projects and go through the books and documents relating to its activity. Other control and inspection authorities concerned shall report to the administrative bodies and coordinate with them before carrying out any inspection or superintendence work on the investment projects licensed for investment in accordance with the provisions of this Law.

**Article (27) - Exceptions within the scope of this Law**

The provision of this Law shall not apply on national and foreign capitals invested or will be invested in oil and gas projects.

**Article (28) - Validity of legislation organizing the economic activity**

The provisions of legislation organizing the economic activity shall be applicable on those who are subject to the provisions of this Law, this is with regard to matters that are not covered herewith.

**Article (29) -Executive Regulation**

The Executive Regulation of this Law shall be issued under a decision from the General People's Committee in accordance with an offer from the Secretary.

**Article (30) - Annulment of previous laws**

Law no. 5, 1996, on promotion of foreign capitals' investment and amendments, Law no. 6, 2007, on investment of national capitals, Article 10 of Law no. 7, 2004, on tourism, shall be revoked, as any other ruling that violates the provisions of this Law shall be revoked.

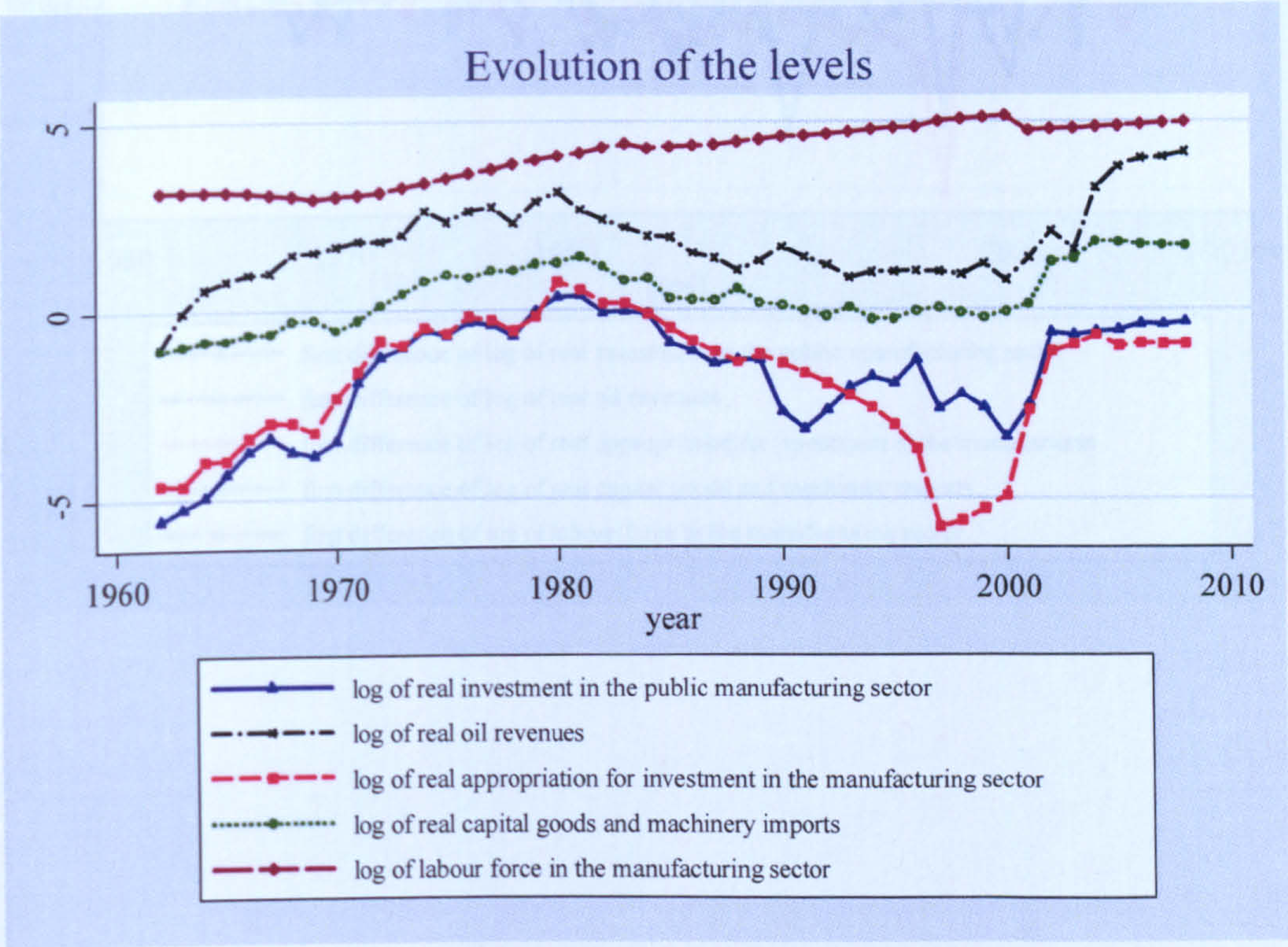
The provisions of this Law shall be valid for all investment projects, acts, events relating thereto and those outstanding ones in accordance with the aforesaid laws per this Article during the time of issuance of this law, this shall be without violation to the privileges and exemptions offered before its issuance. The executive regulations and decisions issued in accordance with the provisions of the said laws shall be into force in a manner that shall not withstand the provisions of this Law, up until the Executive Regulation of this Law is issued.

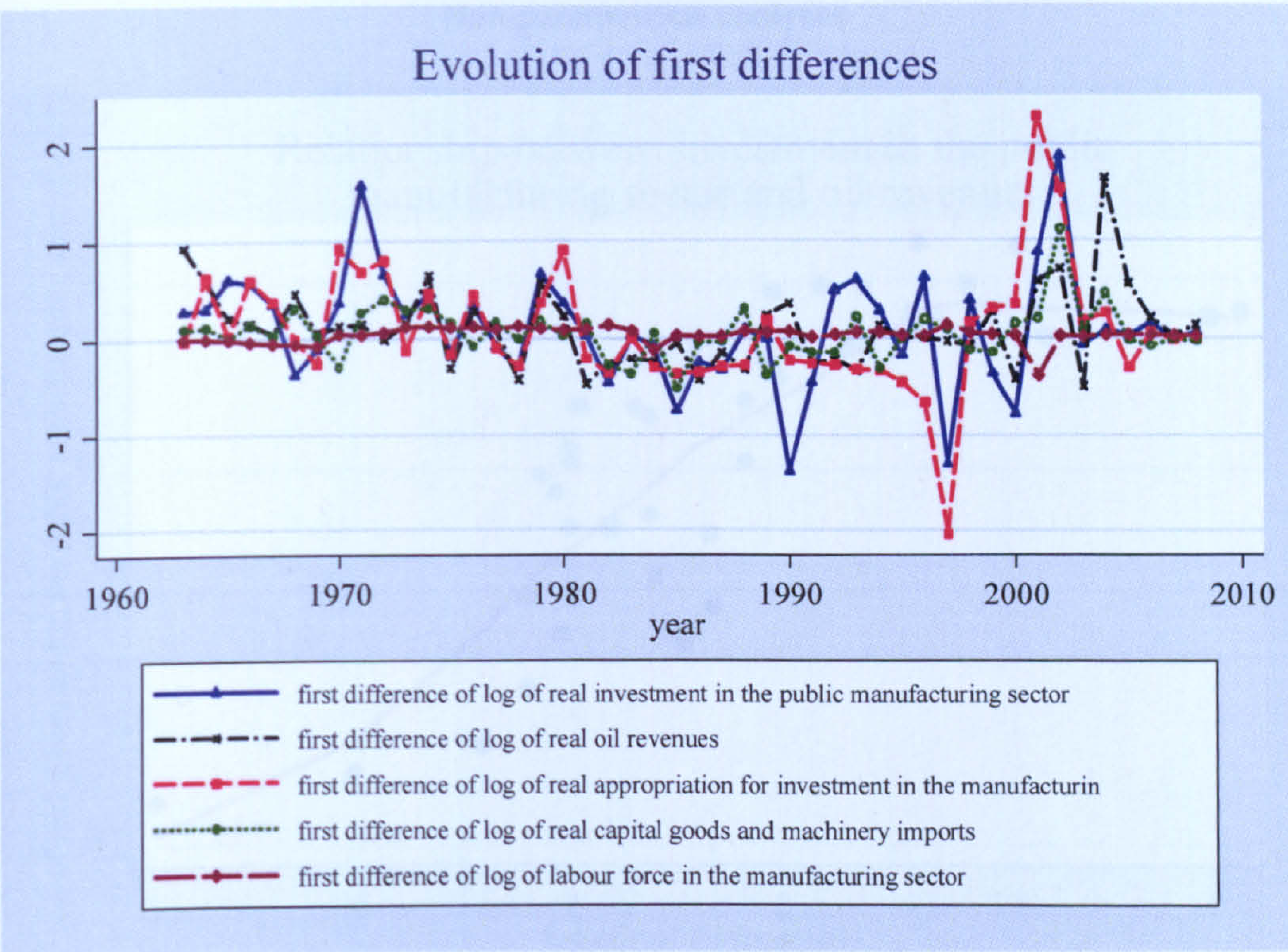
**Article (31) -Publication of the Law**

This Law shall enter into force as of the date of publication per the Official Gazette.

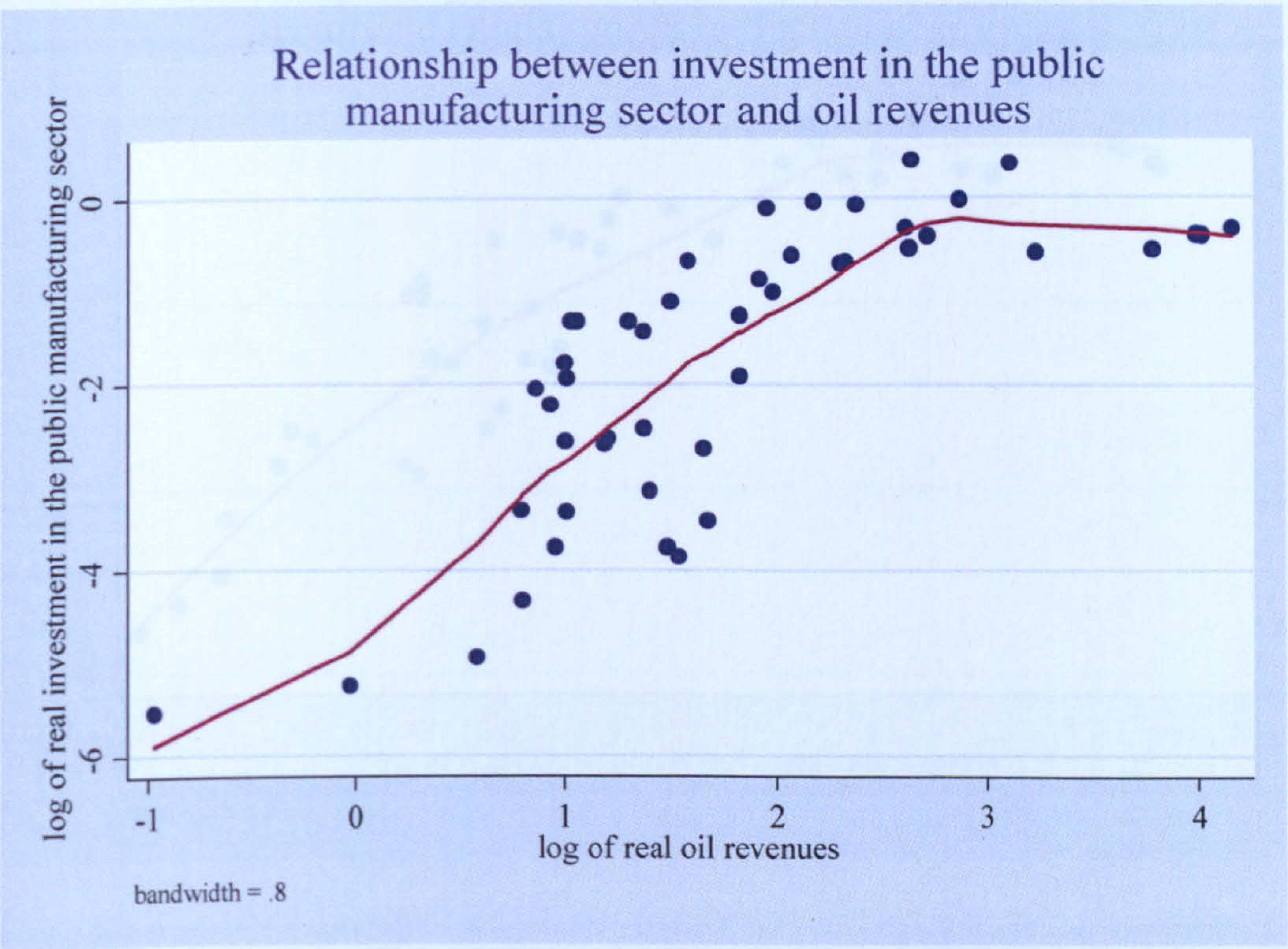
Source: LIB, available at: http://investinlibya.ly/PDF/Law%20No.9_En.pdf (in English).

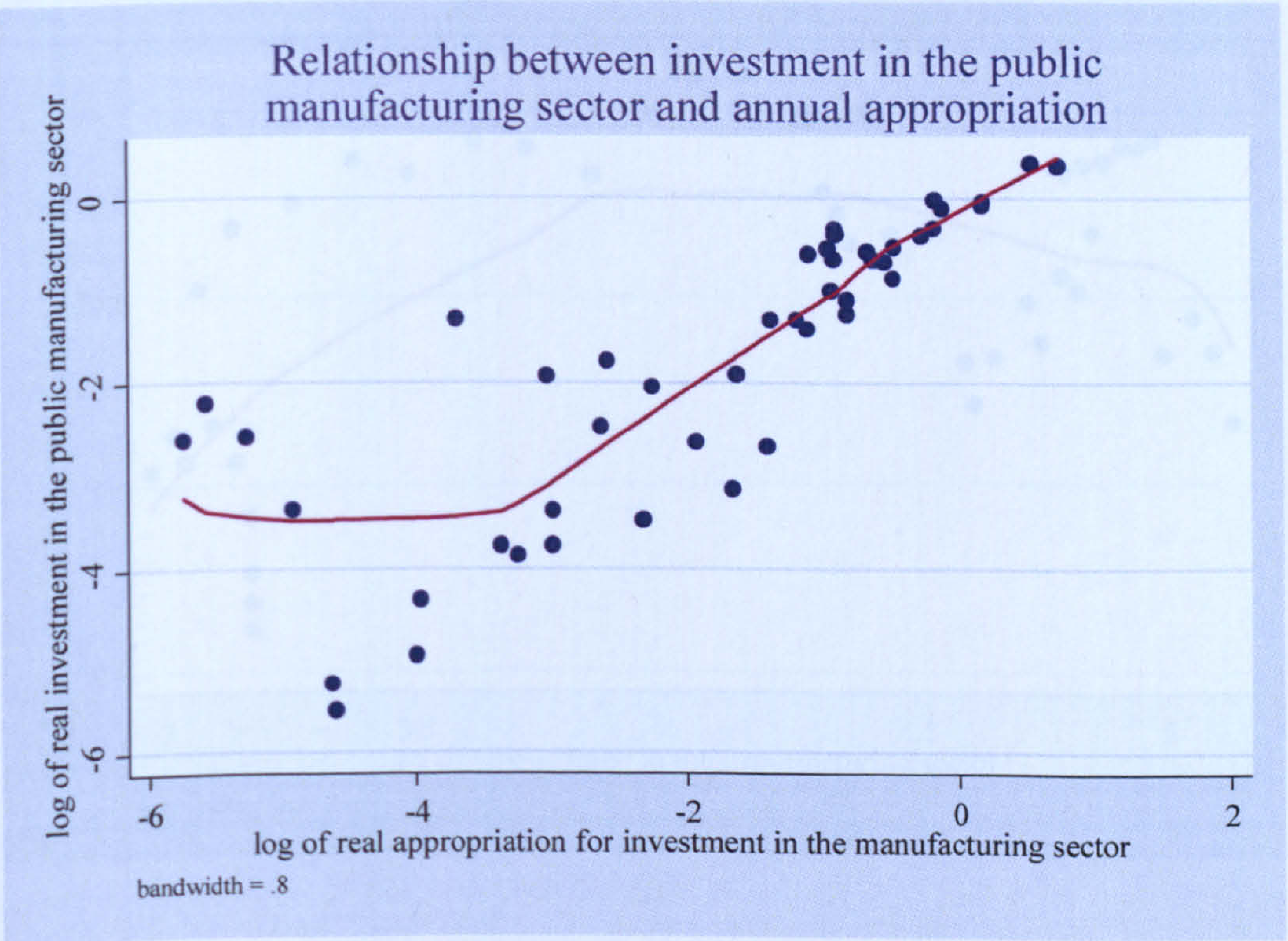
## Appendix (B) Graphics

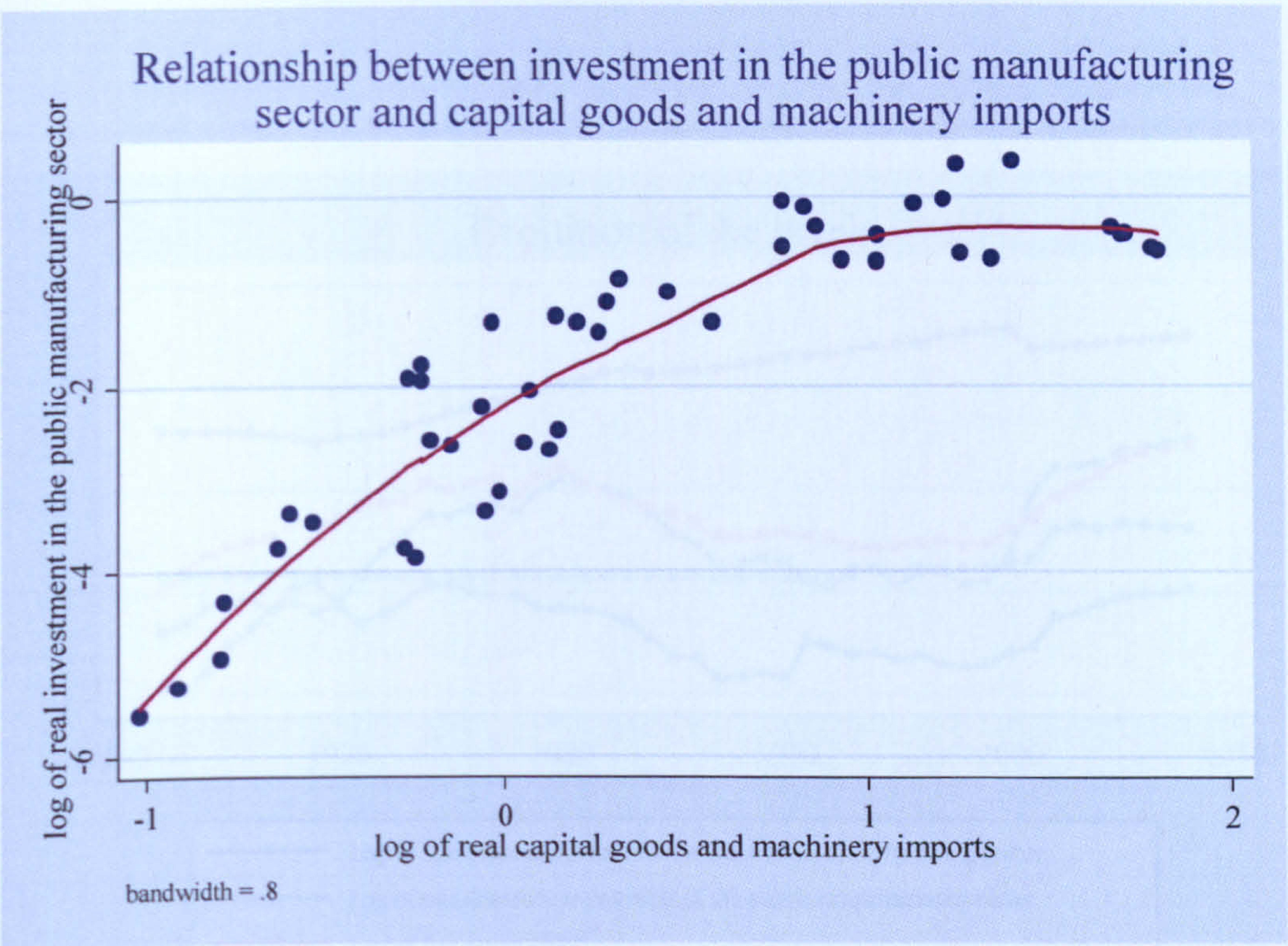


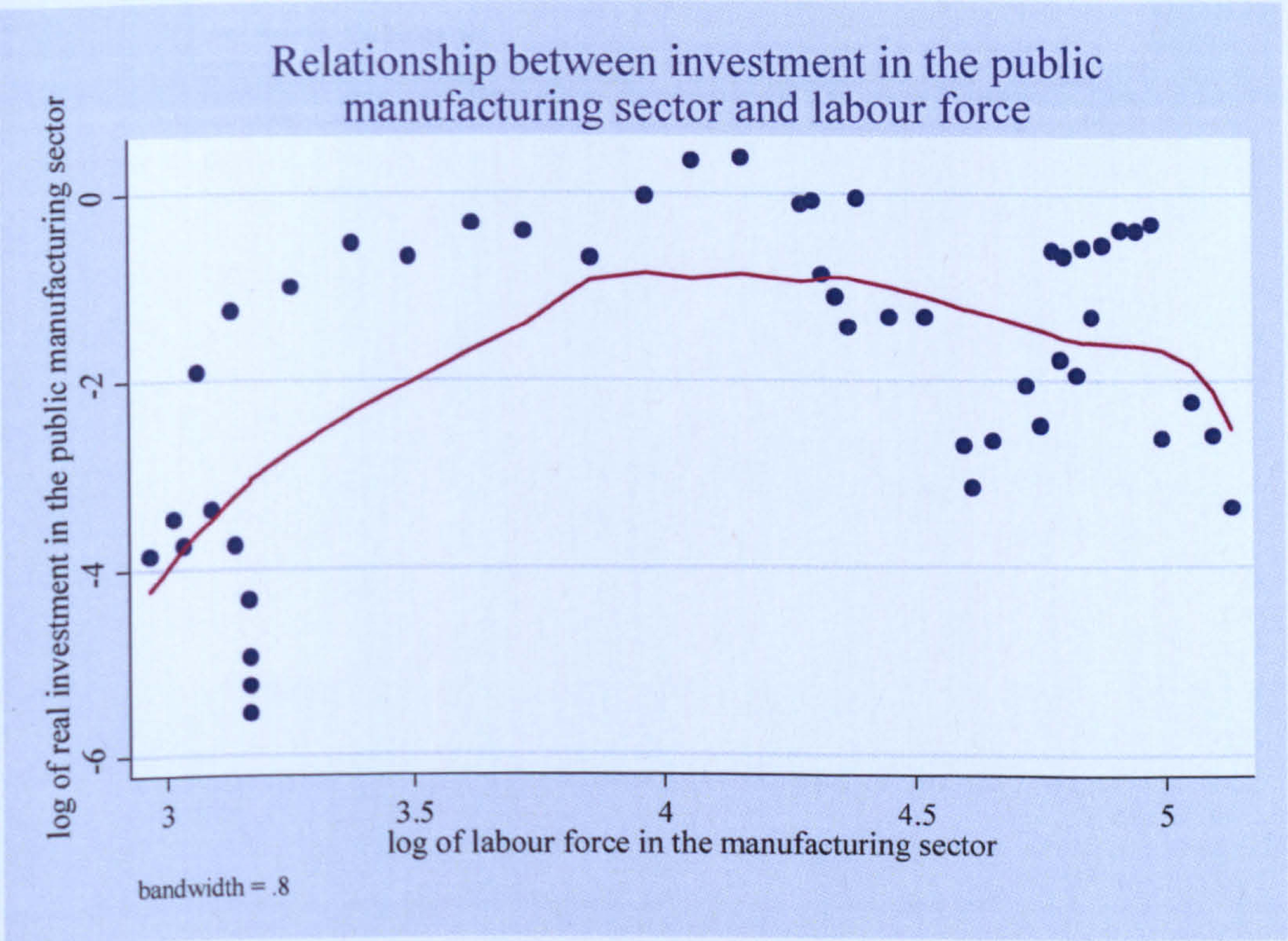

Evolution of first differences
2
1
0
-1
-2
1960
1970
1980
1990
2000
2010
year
first difference of log of real investment in the public manufacturing sector
first difference of log of real oil revenues
first difference of log of real appropriation for investment in the manufacturin
first difference of log of real capital goods and machinery imports
first difference of log of labour force in the manufacturing sector

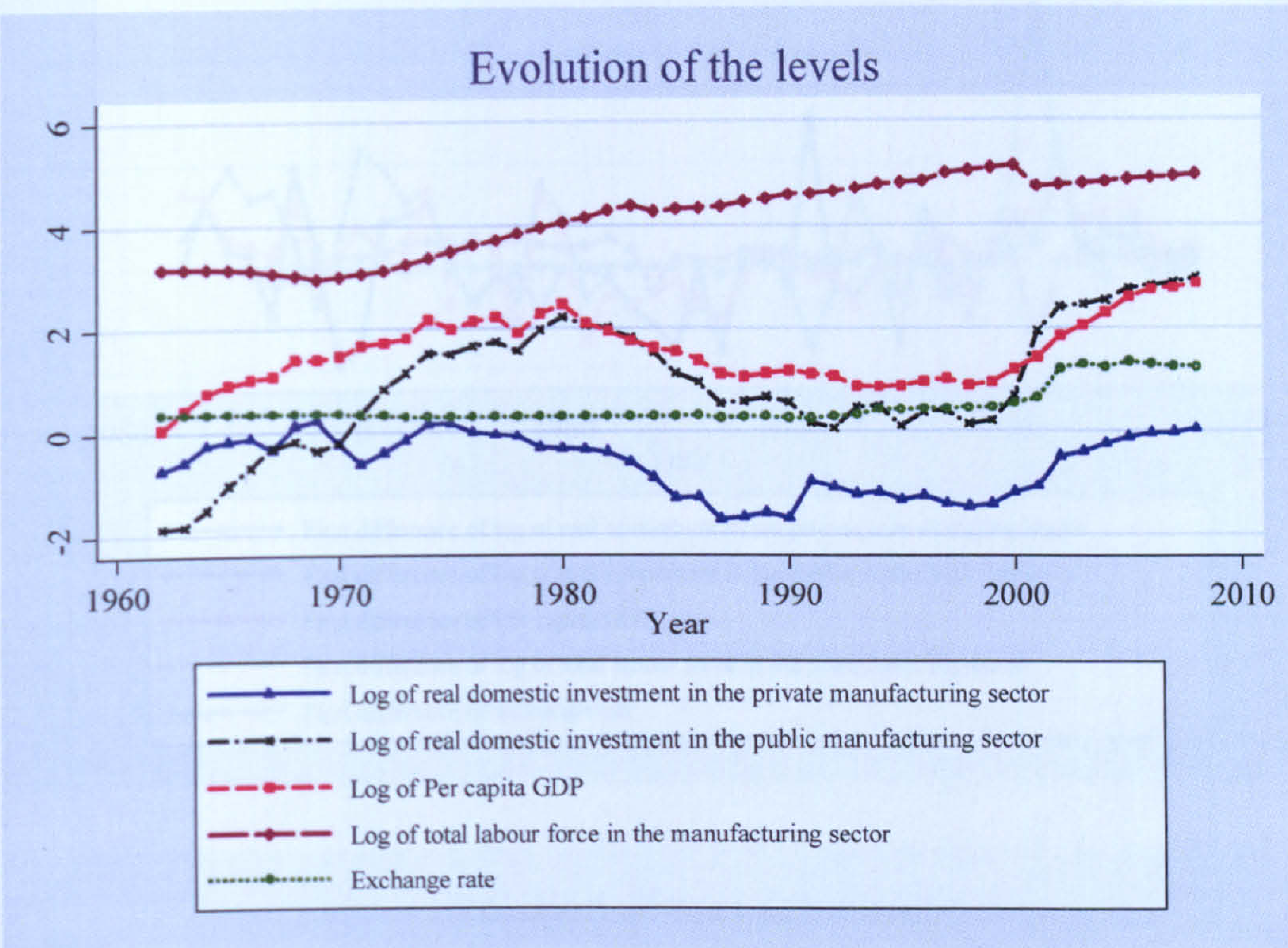
## Non-parametrical analyses

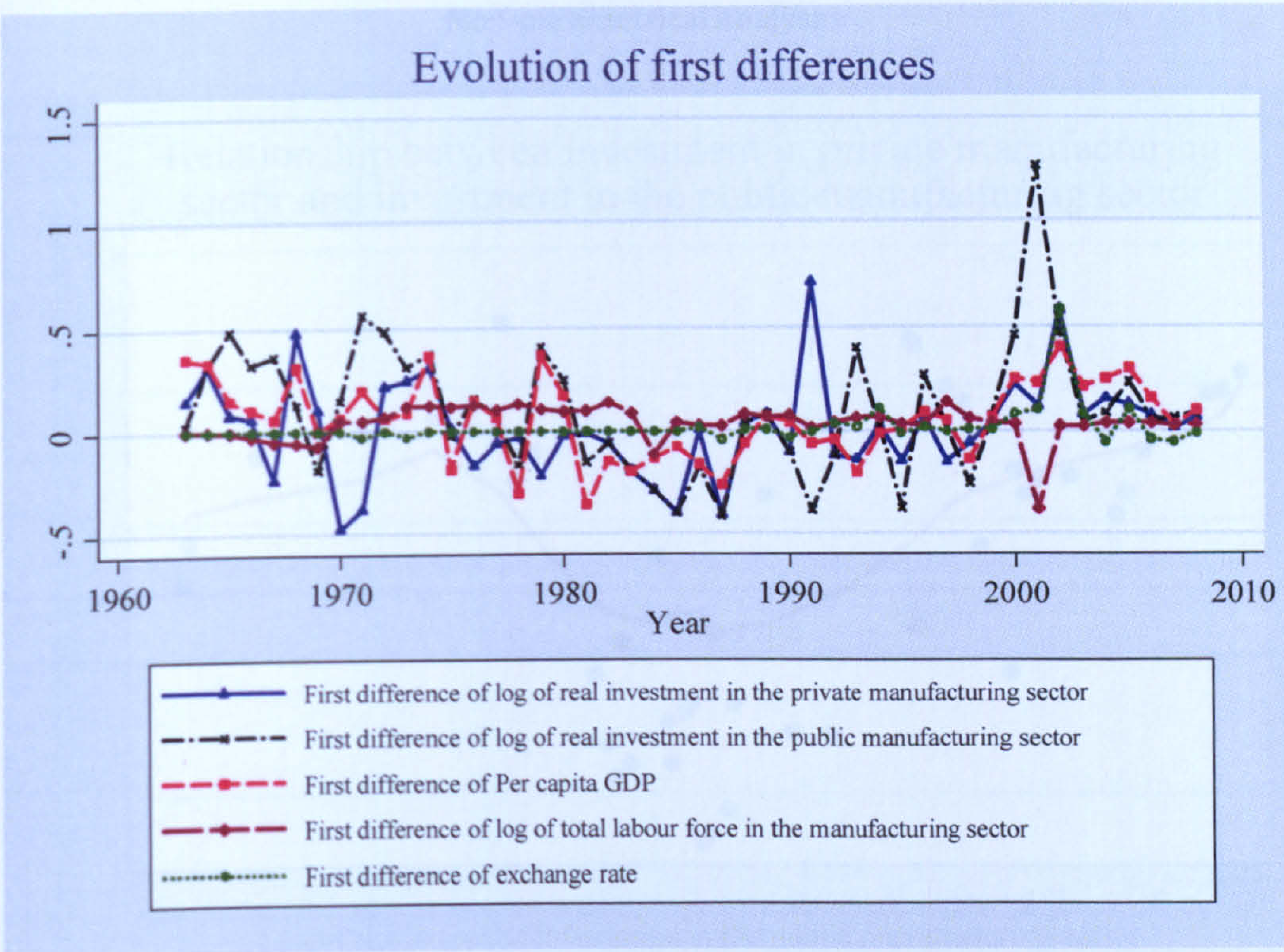


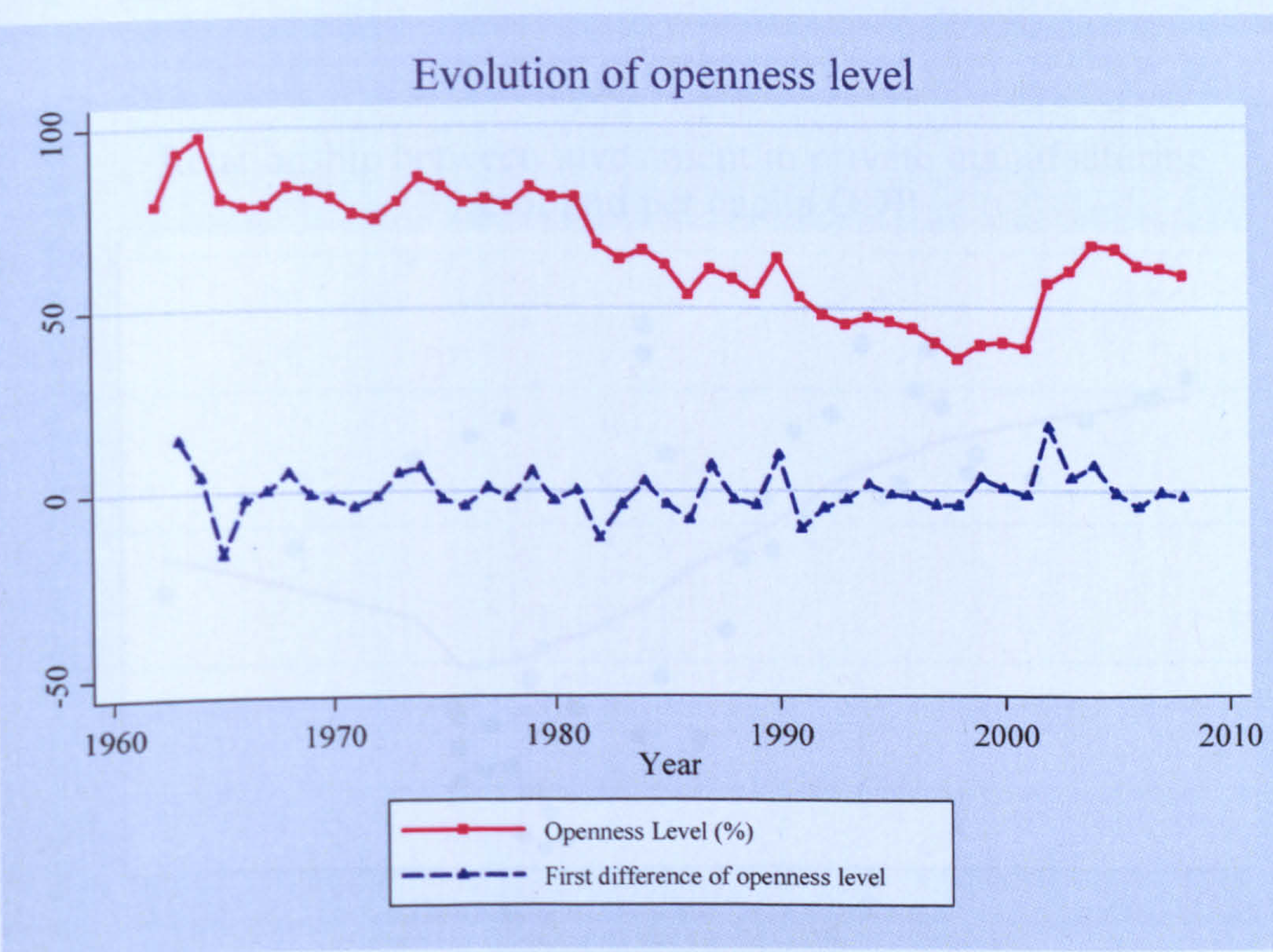



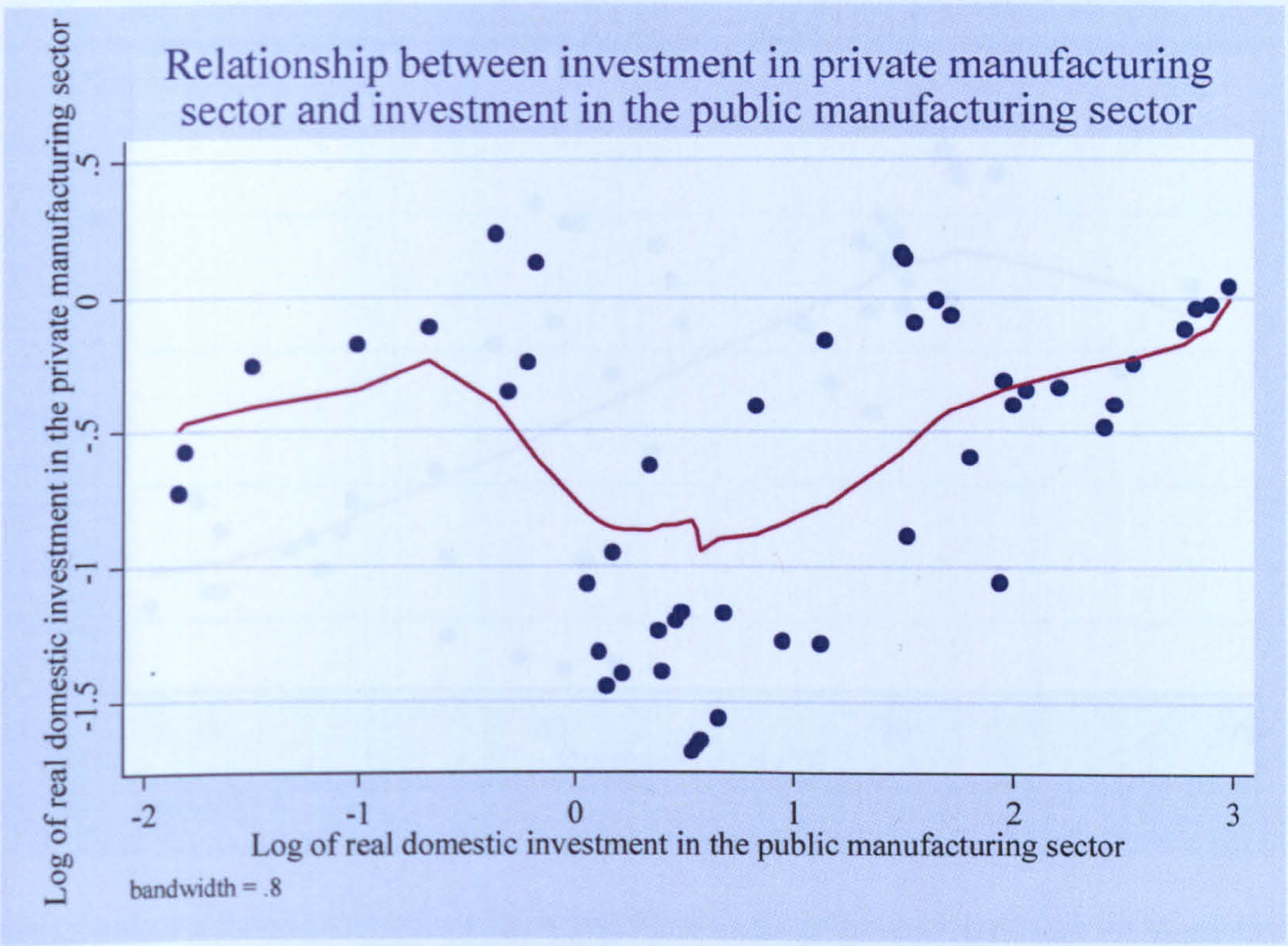

Relationship between investment in the public manufacturing sector and capital goods and machinery imports
log of real investment in the public manufacturing sector
0
-2
-4
-6
-1
0
1
2
log of real capital goods and machinery imports
bandwidth = .8

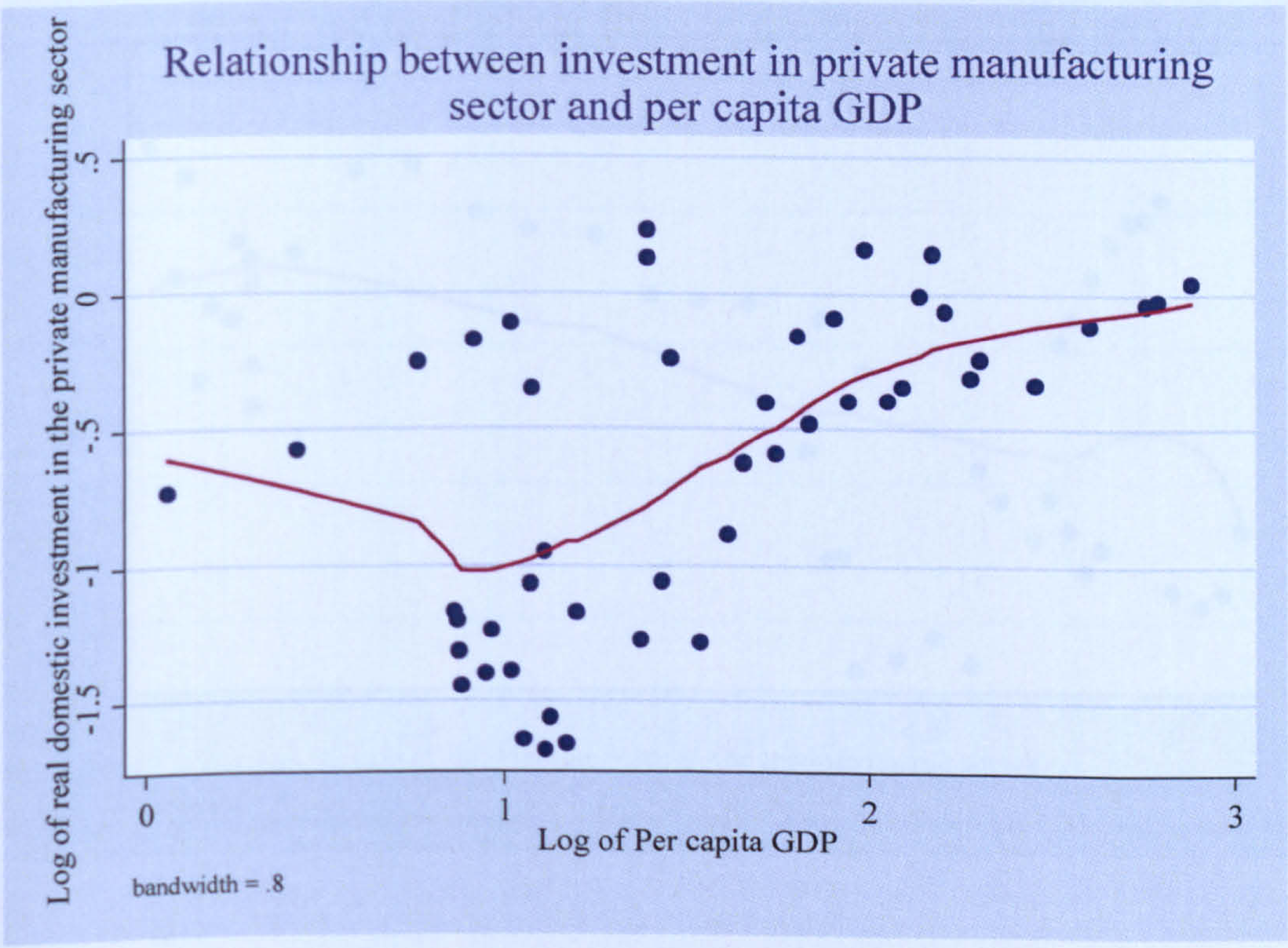

Relationship between investment in the public manufacturing sector and labour force
log of real investment in the public manufacturing sector
0
-2
-4
-6
3
3.5
4
4.5
5
log of labour force in the manufacturing sector
bandwidth = .8

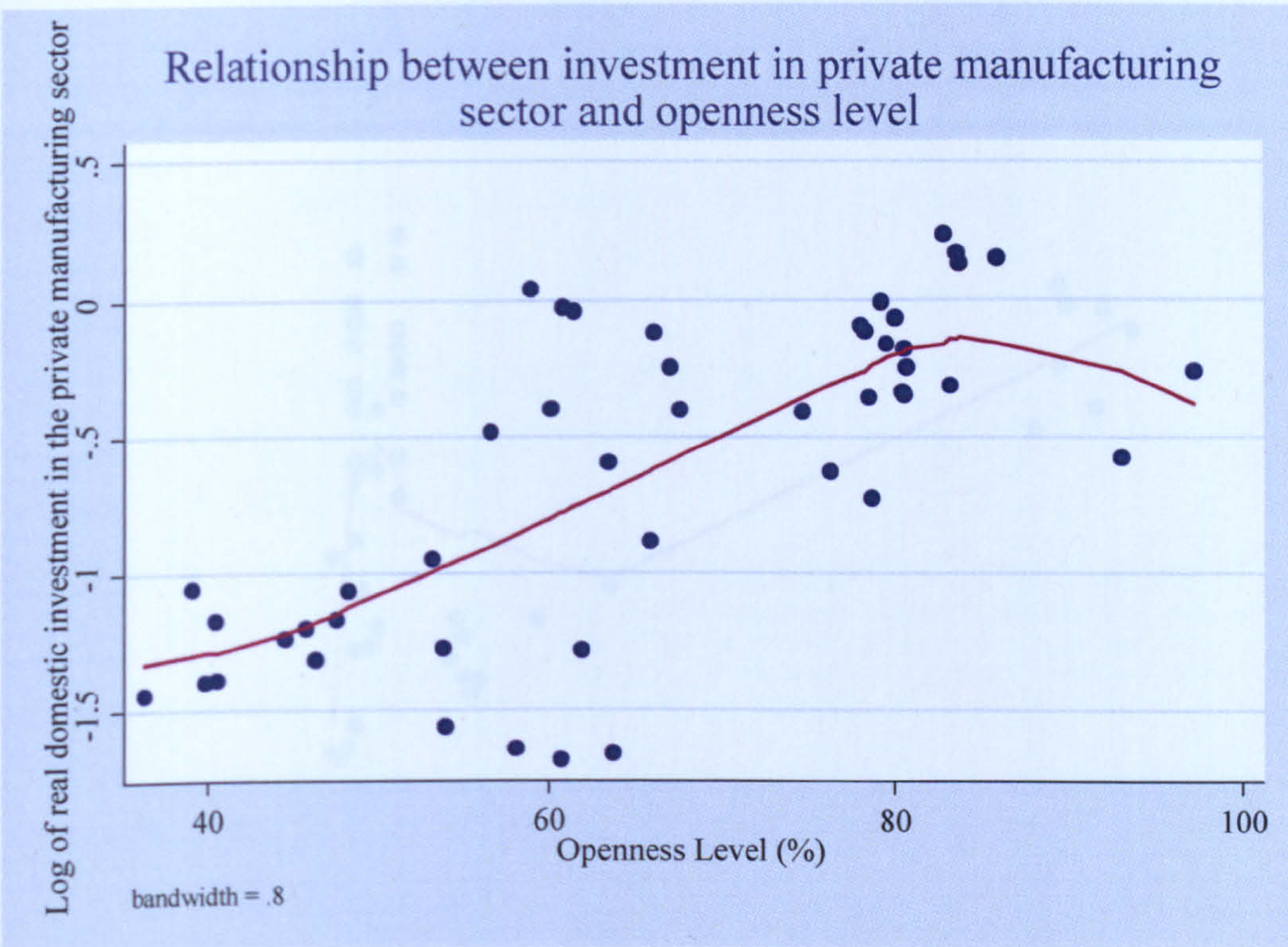

Evolution of the levels
-2
0
2
4
6
1960
1970
1980
1990
2000
2010
Year
Log of real domestic investment in the private manufacturing sector
Log of real domestic investment in the public manufacturing sector
Log of Per capita GDP
Log of total labour force in the manufacturing sector
Exchange rate

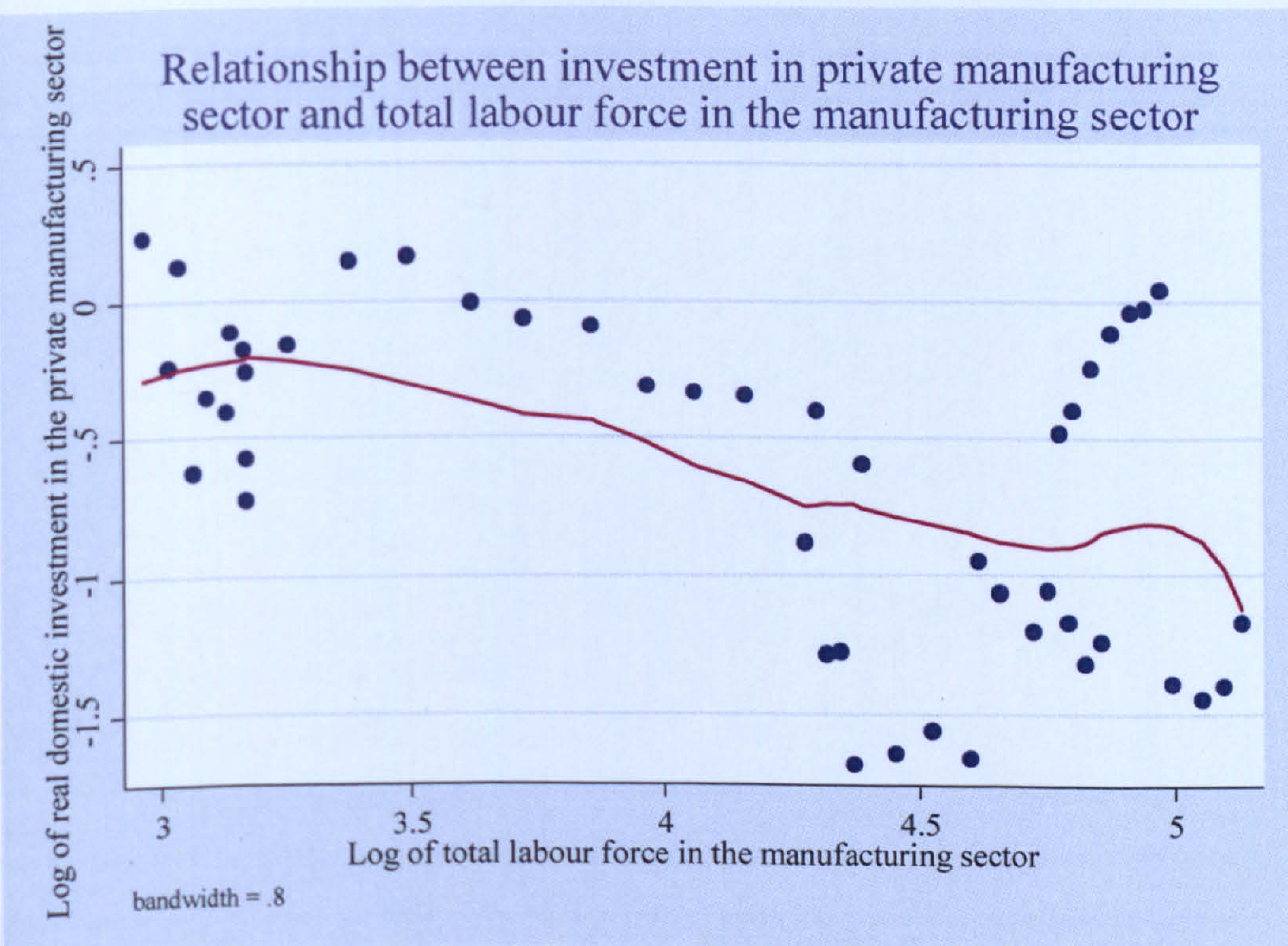

Evolution of first differences
-.5
0
.5
1
1.5
1960
1970
1980
1990
2000
2010
Year
First difference of log of real investment in the private manufacturing sector
First difference of log of real investment in the public manufacturing sector
First difference of Per capita GDP
First difference of log of total labour force in the manufacturing sector
First difference of exchange rate

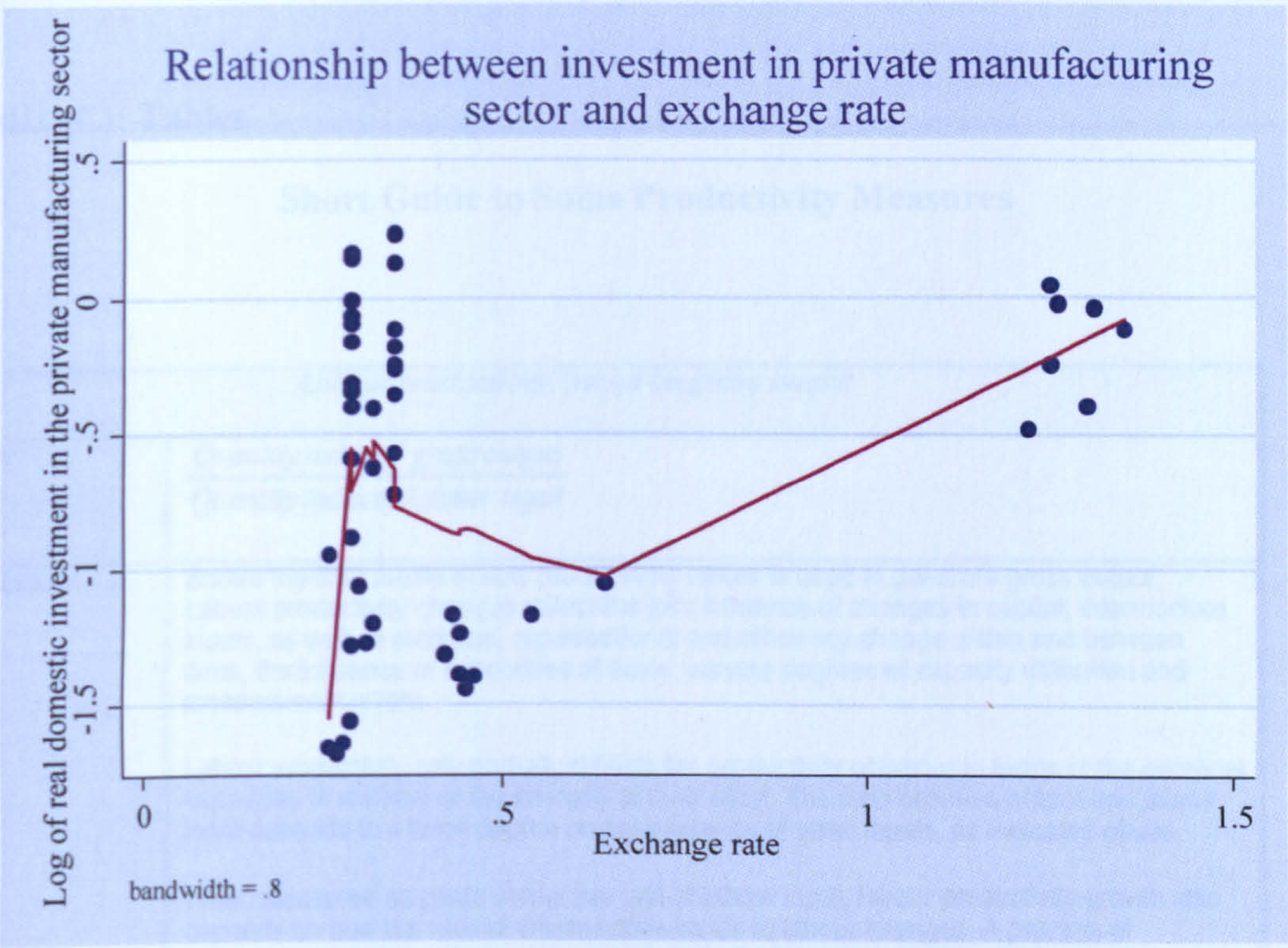

Evolution of openness level
-50
0
50
100
1960
1970
1980
1990
2000
2010
Year
Openness Level (%)
First difference of openness level


Relationship between investment in private manufacturing sector and investment in the public manufacturing sector
Log of real domestic investment in the private manufacturing sector
.5
0
-.5
-1
-1.5
-2
-1
0
1
2
3
Log of real domestic investment in the public manufacturing sector
bandwidth = .8


Relationship between investment in private manufacturing sector and per capita GDP
Log of real domestic investment in the private manufacturing sector
.5
0
-.5
-1
-1.5
0
1
2
3
Log of Per capita GDP
bandwidth = .8


Relationship between investment in private manufacturing sector and openness level
Log of real domestic investment in the private manufacturing sector
.5
0
-.5
-1
-1.5
40
60
80
100
Openness Level (%)
bandwidth = .8


Relationship between investment in private manufacturing sector and total labour force in the manufacturing sector
Log of real domestic investment in the private manufacturing sector
.5
0
-.5
-1
-1.5
3
3.5
4
4.5
5
Log of total labour force in the manufacturing sector
bandwidth = .8


Relationship between investment in private manufacturing sector and exchange rate
Log of real domestic investment in the private manufacturing sector
.5
0
-.5
-1
-1.5
0
.5
1
1.5
Exchange rate
bandwidth = .8

## Appendix (C): Tables

### Short Guide to Some Productivity Measures

| *Labour productivity, based on gross output* | |
|---|---|
| Definition | $\frac{\textit{Quantity index of gross output}}{\textit{Quantity index of labour input}}$ |
| Interpretation | Shows the time profile of how productively labour is used to generate gross output. Labour productivity changes reflect the joint influence of changes in capital, intermediate inputs, as well as technical, organisational and efficiency change within and between firms, the influence of economies of scale, varying degrees of capacity utilisation and measurement errors.<br><br>Labour productivity only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their effort. The ratio between output and labour input depends to a large degree on the presence of other inputs, as indicated above.<br><br>When measured as *gross* output per unit of labour input, labour productivity growth also depends on how the ratio of intermediate inputs to labour changes. A process of outsourcing, for example, implies substitution of primary factors of production, including labour, for intermediate inputs. Gross-output based labour productivity rises as a consequence of outsourcing and falls when in-house production replaces purchases of intermediate inputs. Obviously, this does not reflect a change in the individual characteristics of the workforce, nor does it necessarily reflect a shift in technology or efficiency. Although *some* efficiency gain should be expected as a consequence of input substitution, it cannot be captured by the measured change in labour productivity. MFP measures are required for this purpose.<br><br>Because labour productivity measures reflect the combined effects of changes in capital inputs, intermediate inputs and overall productivity, they do not leave out any direct effects of technical change, be they embodied or disembodied. The former operates via capital goods and intermediate inputs and so affects labour productivity; the latter generally enhances production possibilities for a given set of inputs and so also affects labour productivity. |
| Purpose | Gross-output based labour productivity traces the labour requirements per unit of (physical) output. It reflects the change in the input coefficient of labour by industry and can help in the analysis of labour requirements by industry. |
| Advantages | Ease of measurement and readability. In particular, the gross-output measure requires only prices indices on gross output, not on intermediate inputs as is the case for the value-added based measure. |
| Drawbacks and limitations | Labour productivity is a partial productivity measure and reflects the joint influence of a host of factors. It is easily misinterpreted as technical change or as the productivity of the individuals in the labour force. |

OECD Manual, 2001. Measuring Productivity. Measurement of Aggregate and Industry-Level Productivity Growth. pp. 14-18.

| Labour productivity, based on value added | |
|---|---|
| Definition | $\dfrac{\textit{Quantity index of value added}}{\textit{Quantity index of labour input}}$ |
| Interpretation | Shows the time profile of how productively labour is used to generate value added. Labour productivity changes reflect the joint influence of changes in capital, as well as technical, organisational and efficiency change within and between firms, the influence of economies of scale, varying degrees of capacity utilisation and measurement errors.<br><br>Labour productivity only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their effort. The ratio between output and labour input depends to a large degree on the presence of other inputs, as mentioned above.<br><br>In comparison with labour productivity based on gross output, the growth rate of value-added productivity is less dependent on any change in the ratio between intermediate inputs and labour, or the degree of vertical integration. For example, when outsourcing takes place, labour is replaced by intermediate inputs. This leads to a fall in value added as well as a fall in labour input. The first effect raises measured labour productivity; the second effect reduces it. Thus, value-added based labour productivity measures tend to be less sensitive to processes of substitution between materials plus services and labour than gross-output based measures.<br><br>Because labour productivity measures reflect the combined effects of changes in capital inputs, intermediate inputs and overall productivity, they do not leave out any direct effects of technical change, be they embodied or disembodied. The latter operates via capital goods and intermediate inputs and so affects labour productivity; the former generally enhances production possibilities for a given set of inputs and so also affects labour productivity. |
| Purpose | Analysis of micro-macro links, such as the industry contribution to economy-wide labour productivity and economic growth.<br><br>At the aggregate level, value-added based labour productivity forms a direct link to a widely used measure of living standards, income per capita. Productivity translates directly into living standards, by adjusting for changing working hours, unemployment, labour force participation rates and demographic changes.<br><br>From a policy perspective, value-added based labour productivity is important as a reference statistic in wage bargaining. |
| Advantages | Ease of measurement and readability. |
| Drawbacks and limitations | Labour productivity is a partial productivity measure and reflects the joint influence of a host of factors. It is easily misinterpreted as technical change or as the productivity of the individuals in the labour force. Also, value-added measures based on a double-deflation procedure with fixed-weight Laspeyres indices suffer from several theoretical and practical drawbacks. |

| Capital-labour MFP based on value added | |
|---|---|
| Definition | $$\frac{\textit{Quantity index of value added}}{\textit{Quantity index of combined labour and capital input}}$$ Quantity index of combined labour and capital input = Quantity index of (different types of) labour and capital, each weighted with its current-price share in total value added. |
| Interpretation | Capital-labour MFP indices show the time profile of how productively combined labour and capital inputs are used to generate value added. Conceptually, capital-labour productivity is not, in general, an accurate measure of technical change. It is, however, an indicator of an industry's capacity to contribute to economy-wide growth of income per unit of primary input. In practice, the measure reflects the combined effects of disembodied technical change, economies of scale, efficiency change, variations in capacity utilisation and measurement errors. When the capital input measure is an aggregator of detailed types of assets, each weighted by their respective user cost, and based on capital goods prices that reflect quality change, the effects of embodied technical change are picked up by the capital input term, and only disembodied technical change affects MFP. |
| Purpose | Analysis of micro-macro links, such as the industry contribution to economy-wide MFP growth and living standards, analysis of structural change. |
| Advantages | Ease of aggregation across industries, simple conceptual link of industry-level MFP and aggregate MFP growth. Data directly available from national accounts. |
| Drawbacks and limitations | Not a good measure of technology shifts at the industry or firm level. When based on value added that has been double-deflated with a fixed weight Laspeyres quantity index, the measure suffers from the conceptual and empirical drawbacks of this concept. |

| Capital productivity, based on value added | |
|---|---|
| Definition | $$\frac{\textit{Quantity index of value added}}{\textit{Quantity index of capital input}}$$ |
| Interpretation | The capital productivity index shows the time profile of how productively capital is used to generate value added. Capital productivity reflects the joint influence of labour, intermediate inputs, technical change, efficiency change, economies of scale, capacity utilisation and measurement errors.<br><br>Like labour productivity, capital productivity measures can be based on a gross-output or a value-added concept. The same reasoning as for labour productivity applies between gross-output and value-added based measures in the case of outsourcing and changing vertical integration: value-added based capital productivity measures tend to be less sensitive to processes of substitution between intermediate inputs and capital than gross-output based measures.<br><br>When capital input is measured in its theoretically preferred form, *i.e.* as a flow of services adjusted for changes in the quality of investment goods, the capital measure translates embodied technical change (rising or falling quality of capital goods) into a larger or smaller flow of constant-quality capital services. Thus, rising quality of capital goods implies a larger amount of capital services. For the same rate of output growth, this implies a fall in capital productivity.<br><br>Capital productivity has to be distinguished from the rate of return on capital. The former is a physical, partial productivity measure; the latter is an income measure that relates capital income to the value of the capital stock. |
| Purpose | Changes in capital productivity indicate the extent to which output growth can be achieved with lower welfare costs in the form of foregone consumption. |
| Advantages | Ease of readability. |
| Drawback and limits | Capital productivity is a partial productivity measure and reflects the joint influence of a host of factors. There is sometimes confusion between rates of return on capital and capital productivity. |

| *KLEMS Multifactor productivity* | |
|---|---|
| Definition | $$\frac{\text{Quantity index of gross output}}{\text{Quantity index of combined inputs}}$$ Quantity index of combined inputs = Quantity index of (different types of) labour, capital, energy, services, each weighted with its current-price share in total gross output. |
| Interpretation | Shows the time profile of how productively combined inputs are used to generate gross output. Conceptually, the KLEMS productivity measure captures disembodied technical change. In practice, it reflects also efficiency change, economies of scale, variations in capacity utilisation and measurement errors. When capital and intermediate input measures are aggregators of detailed types of assets and products, each weighted by their respective share in total cost, and based on prices that reflect quality change, the effects of embodied technical change are picked up by the capital and intermediate inputs terms, and only disembodied technical change enters the MFP measure. |
| Purpose | Analysis of industry-level and sectoral technical change. |
| Advantages | Conceptually, KLEMS-MFP is the most appropriate tool to measure technical change by industry as the role of intermediate inputs in production is fully acknowledged;<br>"Domar" aggregation of KLEMS-MFP across industries provides an accurate picture of the contributions of industries to aggregate MFP change. |
| Drawback and limitations | Significant data requirements, in particular timely availability of input-output tables that are consistent with national accounts;<br>Inter-industry links and aggregation across industries more difficult to communicate than in the case of value-added based MFP measures. |

## ADF Test for Variables

Null Hypothesis: LDGIM has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.20383 | 0.206 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDGIM has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.07099 | 0.5585 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDGIM) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.44125 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDGIM) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.48115 | 0.0001 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LGAIN has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.38896 | 0.1618 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LGAIN has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.36298 | 0.4099 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LGAIN) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.21037 | 0.0013 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LGAIN) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.21461 | 0.0071 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LMACHIM has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.26603 | 0.6374 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LMACHIM has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.39398 | 0.8497 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LMACHIM) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.73421 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LMACHIM) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.66764 | 0.0001 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LMANLAB has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.70806 | 0.8345 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LMANLAB has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.91643 | 0.9453 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LMANLAB) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.89095 | 0.0002 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LMANLAB) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.86688 | 0.0015 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOILR has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.79081 | 0.3803 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOILR has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.79645 | 0.6903 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOILR) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.69144 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOILR) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.60334 | 0 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LPRIVAT has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.32988 | 0.1673 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LPRIVAT has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.07612 | 0.2315 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LPRIVAT) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -7.1742 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LPRIVAT) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -7.11295 | 0 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LPCGDP has a unit root

Exogenous: Constant

Lag Length: 6 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.79971 | 0.1651 |
| Test critical values: | 1% level | -3.60559 | |
| | 5% level | -2.93694 | |
| | 10% level | -2.60686 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LPCGDP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 6 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.38991 | 0.409 |
| Test critical values: | 1% level | -4.205 | |
| | 5% level | -3.52661 | |
| | 10% level | -3.19461 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LPCGDP) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.50808 | 0.0003 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LPCGDP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.4649 | 0.0021 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOPEN has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.40878 | 0.5699 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOPEN has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.81097 | 0.6837 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOPEN) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.93283 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOPEN) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.94351 | 0 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LY has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.79054 | 0.3805 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LY has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.38929 | 0.3801 |
| Test critical values: | 1% level | -4.17058 | |
| | 5% level | -3.51074 | |
| | 10% level | -3.18551 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LY) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.50677 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LY) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.46677 | 0 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.99583 | 0.7472 |
| Test critical values: | 1% level | -3.58115 | |
| | 5% level | -2.92662 | |
| | 10% level | -2.60142 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LI has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.03795 | 0.5652 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.98123 | 0.0002 |
| Test critical values: | 1% level | -3.58474 | |
| | 5% level | -2.92814 | |
| | 10% level | -2.60223 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LI) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.92991 | 0.0012 |
| Test critical values: | 1% level | -4.17564 | |
| | 5% level | -3.51308 | |
| | 10% level | -3.18685 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LL has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.97026 | 0.2983 |
| Test critical values: | 1% level | -3.59662 | |
| | 5% level | -2.93316 | |
| | 10% level | -2.60487 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LL has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 4 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.04428 | 0.5607 |
| Test critical values: | 1% level | -4.19234 | |
| | 5% level | -3.52079 | |
| | 10% level | -3.19128 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LL) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.22947 | 0.0018 |
| Test critical values: | 1% level | -3.59662 | |
| | 5% level | -2.93316 | |
| | 10% level | -2.60487 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LL) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic based on SIC, MAXLAG=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.35274 | 0.0066 |
| Test critical values: | 1% level | -4.19234 | |
| | 5% level | -3.52079 | |
| | 10% level | -3.19128 | |

*MacKinnon (1996) one-sided p-values.

## Cointegration Test Results

Date: 05/18/10 Time: 13:11
Sample (adjusted): 1966 2008
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend
Series: LDGIM LGAIN LMACHIM LMANLAB LOILR
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.718486 | 85.46004 | 69.81889 | 0.0017 |
| At most 1 | 0.327482 | 28.42901 | 47.85613 | 0.7949 |
| At most 2 | 0.123869 | 10.57708 | 29.79707 | 0.9704 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.718486 | 57.04224 | 33.87687 | 0.0001 |
| At most 1 | 0.327482 | 17.84193 | 27.58434 | 0.5078 |
| At most 2 | 0.123869 | 5.94662 | 21.13162 | 0.9839 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Date: 03/26/11 Time: 16:45
Sample (adjusted): 1964 2008
Included observations: 45 after adjustments
Trend assumption: Linear deterministic trend
Series: LPRIVAT LDGIM LLABMAN LEXCH LPCGDP LOPEN
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.660459 | 121.8415 | 95.75366 | 0.0003 |
| At most 1 | 0.480448 | 73.23419 | 69.81889 | 0.2006 |
| At most 2 | 0.378212 | 43.76877 | 47.85613 | 0.1149 |
| At most 3 | 0.208712 | 18.9274 | 29.79707 | 0.4982 |
| At most 4 | 0.166743 | 8.393226 | 15.49471 | 0.4243 |
| At most 5 | 0.004094 | 0.184616 | 3.841466 | 0.6674 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.660459 | 48.60728 | 40.07757 | 0.0044 |
| At most 1 | 0.480448 | 26.46549 | 33.87687 | 0.1537 |
| At most 2 | 0.378212 | 21.38199 | 27.58434 | 0.2538 |
| At most 3 | 0.208712 | 10.53417 | 21.13162 | 0.6934 |
| At most 4 | 0.166743 | 8.20861 | 14.2646 | 0.3579 |
| At most 5 | 0.004094 | 0.184616 | 3.841466 | 0.6674 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

**Vector Error Correction Estimates**

Date: 04/05/11 Time: 15:43

Sample (adjusted): 1965 2008

Included observations: 44 after adjustments

Standard errors in ( ) & t-statistics in [ ]

| Cointegrating Eq: | CointEq1 |
|---|---|
| LDGIM(-1) | 1 |
| LGAIN(-1) | -2.18073 |
| | -0.12434 |
| | [-13.8239] |
| LMACHIM(-1) | -0.82455 |
| | -0.62349 |
| | [-8.45240] |
| LMANLAB(-1) | -0.03545 |
| | -0.26059 |
| | [ -3.45354] |
| LOILR(-1) | -0.09423 |
| | -0.36205 |
| | [ -7.11428] |
| C | 2.514132 |

| Error Correction: | D(LDGIM) | D(LGAIN) | D(LMACHIM) | D(LMANLAB) | D(LOILR) |
|---|---|---|---|---|---|
| CointEq1 | -0.16319 | 0.244724 | 0.772938 | 0.162617 | 0.085166 |
| | -0.16254 | -0.16736 | -0.05857 | -0.02253 | -0.09149 |
| | [-3.42804] | [3.71647] | [ 5.73200] | [0.44407] | [7.89091] |
| D(LDGIM(-1)) | -0.16413 | -0.75982 | -0.0911 | 0.110228 | -0.12492 |
| | -0.25872 | -0.26639 | -0.09324 | -0.03586 | -0.14563 |
| | [-0.63439] | -2.85226] | [-0.97714] | [ 3.07425] | -0.85778] |
| D(LDGIM(-2)) | -0.00983 | -0.49308 | -0.11291 | 0.023382 | 0.050924 |
| | -0.29439 | -0.30312 | -0.10609 | -0.0408 | -0.1657 |
| | [-0.03339] | -1.62668] | [-1.06425] | [ 0.57312] | 0.30732] |

| | | | | | |
|---|---|---|---|---|---|
| D(LGAIN(-1)) | 0.340579 | 0.715293 | 0.203451 | -0.06352 | 0.06682 |
| | -0.2203 | -0.22683 | -0.07939 | -0.03053 | -0.124 |
| | [ 1.54599] | 3.15344] | [ 2.56271] | [-2.08052] | 0.53888] |
| D(LGAIN(-2)) | -0.06489 | 0.191691 | 0.222793 | -0.00585 | -0.10134 |
| | -0.2752 | -0.28335 | -0.09917 | -0.03814 | -0.1549 |
| | [-0.23578] | 0.67650] | [ 2.24652] | [-0.15329] | -0.65421] |
| D(LMACHIM(-1)) | 0.087161 | 0.890887 | 0.043569 | -0.05663 | 0.360665 |
| | -0.50373 | -0.51866 | -0.18153 | -0.06981 | -0.28353 |
| | [ 0.17303] | 1.71766] | [ 0.24001] | [-0.81116] | 1.27204] |
| D(LMACHIM(-2)) | 0.112971 | 0.707411 | 0.418792 | 0.059005 | 0.846679 |
| | -0.46996 | -0.48389 | -0.16936 | -0.06513 | -0.26452 |
| | [ 0.24039] | [1.46193] | [ 2.47283] | [ 0.90597] | 3.20078] |
| D(LMANLAB(-1)) | -1.15881 | 0.257531 | -0.5779 | 0.095046 | -1.6664 |
| | -1.24211 | -1.27893 | -0.44762 | -0.17214 | -0.69914 |
| | [-0.93294] | [0.20137] | [-1.29107] | [ 0.55215] | -2.38350] |
| D(LMANLAB(-2)) | 0.103873 | 0.119989 | 0.6051 | 0.251079 | 1.137208 |
| | -1.22274 | -1.25898 | -0.44064 | -0.16945 | -0.68824 |
| | [ 0.08495] | [0.09531] | [ 1.37324] | [ 1.48170] | [1.65235] |
| D(LOILR(-1)) | -0.10108 | -0.40899 | -0.02645 | 0.030632 | -0.15325 |
| | -0.24904 | -0.25642 | -0.08975 | -0.03451 | -0.14018 |
| | [-0.40588] | -1.59498] | [-0.29468] | [ 0.88756] | -1.09325] |
| D(LOILR(-2)) | 0.073704 | 0.104912 | -0.12165 | -0.0385 | -0.05874 |
| | -0.22924 | -0.23603 | -0.08261 | -0.03177 | -0.12903 |
| | [ 0.32152] | [0.44448] | [-1.47263] | [-1.21171] | -0.45526] |
| C | 0.09371 | 0.009722 | 0.023764 | 0.023768 | 0.058384 |
| | -0.11632 | -0.11977 | -0.04192 | -0.01612 | -0.06547 |
| | [ 0.80560] | [0.08117] | [ 0.56689] | [ 1.47441] | [0.89171] |
| R-squared | 0.278764 | 0.242802 | 0.718076 | 0.017048 | 0.724855 |
| Adj. R-squared | 0.166566 | 0.130953 | 0.67304 | 0.013033 | 0.067523 |
| Sum sq. resids | 0.02495 | 0.03409 | 0.004883 | 0.094458 | 0.007764 |
| S.E. equation | 0.012499 | 0.009172 | 0.002707 | 0.007954 | 0.016611 |
| F-statistic | 3.431665 | 3.815104 | 15.92574 | 0.112479 | 6.413438 |
| Log likelihood | 648.2976 | 756.4356 | 834.8782 | 738.3456 | 843.8782 |
| Akaike AIC | 1.914145 | 1.972567 | -0.12711 | -2.0384 | 0.764716 |

| | | | | | |
|---|---|---|---|---|---|
| Schwarz SC | 2.400742 | 2.459164 | 0.359487 | -1.5518 | 1.251313 |
| Mean dependent | 0.071961 | 0.070762 | 0.055952 | 0.041022 | 0.081312 |
| S.D. dependent | 0.542103 | 0.652013 | 0.269211 | 0.086035 | 0.396236 |

| | |
|---|---|
| Determinant resid covariance (dof adj.) | 4.99E-07 |
| Determinant resid covariance | 1.02E-07 |
| Log likelihood | 2217.387 |
| Akaike information criterion | 2.115204 |
| Schwarz criterion | 2.803459 |

**VEC Residual Serial Correlation LM Tests**

Null Hypothesis: no serial correlation at lag order h

Date: 04/05/11 Time: 15:48

Sample: 1962 2008

Included observations: 44

| Lags | LM-Stat | Prob |
|---|---|---|
| 1 | 1.83685 | 0.3065 |
| 2 | 1.67402 | 0.3448 |
| 3 | 2.05712 | 0.1965 |

Probs from chi-square with 25 df.

**Ramsey RESET Test:**

| | | | |
|---|---|---|---|
| F-statistic | 0.504286 | Probability | 0.481643 |
| Log likelihood ratio | 0.574557 | Probability | 0.448454 |

Test Equation:

Dependent Variable: LDGIM

Method: Least Squares

Date: 04/05/11 Time: 18:10

Sample: 1962 2008

Included observations: 47

## Manufacturing plants possessed to private sector

| Possessed Plants | Establishment date | Activity | Site | Products | Number Of workers | Plant value Thousands | Status |
|---|---|---|---|---|---|---|---|
| Yefren for Aluminium | 1992 | Metal & engineering Industry | Yefren | Doors & Widows | 5 | 25.229 | Suspended |
| Canned Food | 1976 | Food Industry | Khomos | Juice & Jam | 28 | 602.554 | Suspended |
| Wool Industries | 1983 | Textiles | Ben Waled | Woven Carpets | 397 | 16485.368 | Partly Operating |
| Tin Cans | 1976 | Metal & engineering | Jafara | Tin Cans | 94 | 1933.582 | Suspended |
| Dairy Products | 1988 | Food Industry | Benghazi | Milk & Yogurt | 73 | 6600.000 | Suspended |
| Mineral Water | - | Food Industry | Tripoli | Mineral Water | 191 | 14016.000 | Operating |
| Welding Tools | 1978 | Metal & engineering | Tripoli | Welding Wires | 11 | 34.696 | Suspended |
| 7 October for Milk | 1975 | Food Industry | Tripoli | Milk & Yogurt | 41 | 250.000 | Operating |
| Perfume | 1989 | Chemical Industries | Tripoli | Perfumes & Industrial Detergents | 16 | 320.000 | Suspended |
| Ben-Ghashir for Shoes | 1990 | Leather Industries | Tripoli | Leather shoes & Sneakers | 134 | 529.526 | Partly Operating |
| Khomos for Aluminium | 1988 | Metal & engineering | Khomos | Doors & Widows | 12 | 127.638 | Partly Operating |
| Tripoli for Gas | 1978 | Chemical Industries | Tripoli | Medical & Industrial Gases | 36 | 695.729 | Operating |
| Benghazi for Bikes | 1979 | Metal Industries | Benghazi | Bicycle | 1333 | 571.420 | Operating |
| Fishing Boats | - | Wood | Tubrok | Fishing Boats | 15 | 199.723 | Partly Operating |
| Al-Baida for Plastic | 1982 | Chemical Industries | Al-Baida | Pipes & Plastic Bags | 30 | 780.000 | Operating |
| Metal Industries Complex | 1981 | Metal & engineering | Benghazi | Various Metal Products | 46 | 1650.249 | Operating |
| Darna for Furniture | 1992 | Wood | Darna | Furniture | 214 | 142.949 | Operating |
| Qarabulli for Plastic | 1981 | Chemical Industries | Qarabulli | Plastic Products | 167 | 29498.405 | Operating |
| Al-Jabal for Foods | 1982 | Food Industry | Al-Baida | Juice & Jam | 34 | 1100.000 | Operating |
| Misurata for Shoes | 1974 | Leather Industries | Misurata | Various Shoes | 195 | 4154.566 | Partly Operating |
| Misurata for Furniture | 1994 | Wood | Misurata | Compressed Wood | 55 | 4557.089 | Partly Operating |
| Tripoli's | 1978 | Textiles | Tripoli | Textiles & | 14 | 1706.691 | Suspended |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Textile | | | | Clothing | | | |
| Air Compressors | 1991 | Metal & engineering | Misurata | Air Compressors | 25 | 1042.461 | Partly Operating |
| Tajoura for Trailers | 1978 | Metal & engineering | Tajoura | Trailers & Agricultural Equipments | 160 | 289.306 | Suspended |
| Misurata for Textiles | 1992 | Textiles | Misurata | Textiles & Clothing | 134 | 3165.134 | Partly Operating |
| Arab Company for Cement | 1988 | Building Materials | Khomos | Cement | 3354 | 600000.000 | Operating |
| Al-Swani for Metal Industries | 1983 | Metal & engineering | Tripoli | Metal Products | 68 | 169.568 | Suspended |
| Benghazi for Furniture | 1996 | Wood | Benghazi | Furniture | 84 | 4513.869 | Operating |
| Janzour for Dairy Products | - | Food | Tripoli | Dairy Products | 36 | 200.000 | Operating |
| Al-Swani for Furniture | 1985 | Wood | Tripoli | Furniture | 167 | 8050.000 | Partly Operating |
| Khomos Dairy | 1980 | Food | Khomos | Milk & Yogurt | 70 | 626.500 | Partly Operating |
| Fish Canning-Sibrata | 1979 | Food | Sibrata | Cans of Sardines & Tuna | 42 | 3500.500 | Operating |
| Misurata for Soap | 2003 | Chemical Industries | Misurata | Soap Powder | 68 | 151.000 | Operating |
| Serman for Plastic | 1984 | Chemical Industries | Serman | Plastic Products | 59 | 7150.000 | Partly Operating |
| Misurata for Refrigerators | 1983 | Electrical Industries | Misurata | Refrigerators & Freezers | 48 | 4306.000 | Partly Operating |
| Jafara for Cardboard | 1981 | Wood | Tripoli | Paper & Cardboard | 39 | 6525.000 | Partly Operating |
| Al-Amal for Refrigerators & Ovens | 1978 | Electrical Industries | Tripoli | Refrigerators & Ovens | 66 | 3075.000 | Partly Operating |
| Ghasoul for Soap | 1962 | Chemical Industries | Tripoli | Soap Powder | 202 | 6952.000 | Operating |
| Tajoura for Heaters | - | Electrical Industries | Tripoli | Electric Heaters | 70 | 3750.000 | Operating |
| Fish Canning-Zliten | 1979 | Food | Zliten | Tuna & Sardines Cans | - | 1820.000 | Suspended |
| Fruits & Vegetables Canning | 1978 | Food | Tripoli | Juice, Jam & Legume | 97 | 2561.452 | Operating |
| Tubrok for Shoes | 1989 | Leather Industries | Tubrok | Various Shoes | 42 | 138.771 | Suspended |
| Tomato Canning-Sebha | 1976 | Food | Sebha | Tomato Paste | 7 | 251.462 | Upgrading |
| Darna for Shoes | 1990 | Leather Industries | Darna | Various Shoes | 72 | 129.218 | Partly Operating |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Libyan Cement Co. | 1965 | Building Materials | Benghazi | Cement | - | 300000.000 | Operating |
| General Co. for Wires | 1976 | Electrical Industries | Benghazi | Electrical Wires | 872 | 75990.600 | Operating |
| General Co. for Pipes | 1979 | Electrical Industries | Benghazi | Irrigation Pipes | 1257 | 30789.500 | Operating |
| Wax & Chalk Co. | 1978 | Chemical Industries | Tripoli | Wax & Chalk | 44 | 209.212 | Suspended |
| Mergib for Plant Pesticides & Detergents | - | Chemical Industries | Khoms | Plant Pesticides & Detergents | 15 | 1411.108 | Suspended |
| Vegetables Canning-Derj | 1976 | Food | Naluot | Tomato Paste | 8 | 107.357 | Seasonal |
| Jefra for Cleaners | 1997 | Chemical Industries | Sukna | Cleaning Materials | 4 | 197.146 | Suspended |
| Tripoli's Aluminium | 1991 | Metal & engineering | Tripoli | Doors & Windows | 101 | 400.627 | Partly Operating |
| Building Materials-Al-Swani | - | Building Materials | Tripoli | Building Materials | 244 | 9896.880 | Operating |
| Tajoura Tannery | 1972 | Leather Industries | Tripoli | Various Shoes | 20 | 752.357 | Partly Operating |
| Garyan's Aluminium | 1994 | Metal & engineering | Garyan | Doors & Windows | 5 | 48.669 | Partly Operating |
| National Co. | 1979 | Food | Benghazi | Soft Drinks | 889 | 21650.000 | Operating |
| Fish Canning-Benghazi | 1985 | Food | Benghazi | Tuna & Sardines Cans | 108 | 121.802 | Suspended |
| Khomos' Textile | 1979 | Textile | Khomos | Cloths | 5 | 30.212 | Suspended |
| Electrical Equipments-Benghazi | 1979 | Electrical Industries | Benghazi | Washing Machines & Refrigerators | 56 | 3816.640 | Operating |
| Gas Benghazi | 1974 | Chemical Industries | Benghazi | Medical & Industrial Gases | 27 | 2743.091 | Operating |
| Darna's Garments | 1974 | Textile | Darna | Garments | 183 | 2061.835 | Partly Operating |
| Azizeya's Glass | - | Building Materials | Tripoli | Glass & Ground Industry | - | 2132.800 | Operating |
| General Co. for Furniture | - | Wood | Benghazi | Furniture | 27 | 668.098 | Operating |
| Enma for Pipes | - | Metal & engineering | Tripoli | Various Pipes | 370 | 22180.500 | Operating |
| Enma for Engineering | 1995 | Metal & engineering | Tripoli | Metal Towers | 473 | 35600.800 | Operating |
| Baby Food | 1978 | Food | Tripoli | Baby Food | 56 | 969.931 | Partly Operating |

Source: Public Manufacturing Companies possessed to Private Sector. General Authority for Investment and Ownership. (2010).

**TFP in the metal Industry Branch**

| Year | Actual production (1) | Costs | | | | | | | Input | Output value added | TFP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Requirements (2) | Maintenance (3) | Spare parts (4) | Administrative (5) | Other (6) | Operating (7) | Depreciation (8) | (9) (2+3+4+5+6+7+8) | (10) (1-(2+6)) | 10/9 % |
| 1997 | 237821.0 | 195665.8 | 1203.3 | 307.8 | 21793.0 | 18069.0 | 100967.8 | 46015.3 | 384022.00 | 190602.40 | 50 |
| 1998 | 248352.0 | 210987.8 | 1423.6 | 250.2 | 19101.0 | 30863.8 | 109863.3 | 57362.5 | 429852.20 | 189565.90 | 44 |
| 1999 | 258883.0 | 226309.8 | 1643.9 | 564.0 | 12385.0 | 43658.6 | 118758.8 | 58349.6 | 461669.70 | 198889.50 | 43 |
| 2000 | 269414.0 | 241631.8 | 1864.2 | 630.2 | 20715.0 | 56453.4 | 127654.3 | 56556.9 | 505505.80 | 210992.90 | 42 |
| 2001 | 279945.0 | 256953.8 | 2084.5 | 758.3 | 21074.8 | 56382.5 | 136549.8 | 59388.1 | 533191.80 | 218472.40 | 41 |
| 2002 | 290476.0 | 272275.8 | 2304.8 | 886.4 | 21833.5 | 56311.6 | 128972.5 | 52607.8 | 535192.40 | 235563.40 | 44 |
| 2003 | 280312.0 | 278990.5 | 2525.1 | 1014.5 | 23114.6 | 56240.7 | 159086.8 | 37340.0 | 558312.15 | 240446.90 | 43 |
| 2004 | 335398.0 | 293417.1 | 2745.4 | 1142.6 | 24108.0 | 56169.8 | 189201.0 | 35939.2 | 602723.10 | 296713.40 | 49 |
| 2005 | 413234.0 | 438843.7 | 2965.7 | 1270.7 | 26716.0 | 56098.9 | 219315.3 | 37896.0 | 783106.25 | 372372.30 | 48 |
| 2006 | 510644.0 | 417370.3 | 3186.0 | 1398.8 | 32138.0 | 56028.0 | 249429.5 | 32780.0 | 792330.60 | 474678.00 | 60 |
| 2007 | 686692.0 | 534396.9 | 3406.3 | 1526.9 | 38849.0 | 67871.0 | 279543.8 | 37445.0 | 963038.85 | 645840.70 | 67 |
| 2008 | 849656.0 | 703906.0 | 3626.6 | 19678.5 | 40834.8 | 79714.0 | 309658.0 | 35589.3 | 1193007.19 | 810440.07 | 68 |

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.

## TFP in Cement & Building Materials Branch

| Year | Actual production (1) | Costs | | | | | | | Input | Output value added (10) (1-(2+6)) | TFP 10/9 % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Requirements (2) | Maintenance (3) | Spare parts (4) | Administrative (5) | Other (6) | Operating (7) | Depreciation (8) | (9) (2+3+4+5+6+7+8) | | |
| 1997 | 169876.5 | 147718.7 | 476.0 | 876.1 | 4129.8 | 2101.9 | 152342.5 | 37750.3 | 345395.3 | 131650.2 | 38 |
| 1998 | 157654.9 | 137091.2 | 432.1 | 765.7 | 5189.0 | 2876.2 | 145542.7 | 35034.4 | 326931.3 | 122188.4 | 37 |
| 1999 | 171137.0 | 148814.8 | 543.7 | 900.0 | 4352.5 | 2010.0 | 156468.8 | 38030.4 | 351120.2 | 132562.9 | 37 |
| 2000 | 169876.0 | 147718.3 | 467.8 | 997.8 | 5252.2 | 2132.3 | 155543.9 | 37750.2 | 349862.5 | 131658.0 | 37 |
| 2001 | 176954.0 | 153873.0 | 545.8 | 876.2 | 6398.3 | 2008.0 | 145656.7 | 39323.1 | 348681.2 | 137085.1 | 39 |
| 2002 | 166543.0 | 144820.0 | 876.8 | 908.7 | 51665.0 | 3462.8 | 154321.0 | 37009.6 | 393063.9 | 128656.6 | 32 |
| 2003 | 129686.0 | 112770.4 | 1065.3 | 1087.1 | 8579.5 | 3876.2 | 144324.6 | 28819.1 | 300522.2 | 99801.6 | 33 |
| 2004 | 196006.2 | 170440.2 | 1293.3 | 1133.3 | 62105.2 | 6548.2 | 154342.8 | 43556.9 | 439419.9 | 151156.0 | 34 |
| 2005 | 225185.0 | 195813.0 | 876.8 | 899.6 | 12009.6 | 3876.8 | 142311.0 | 50041.1 | 405828.0 | 174267.1 | 42 |
| 2006 | 93718.0 | 81493.9 | 432.5 | 987.0 | 876.9 | 2987.3 | 154461.1 | 20826.2 | 262064.9 | 72459.3 | 27 |
| 2007 | 385360.0 | 335095.7 | 534.8 | 876.0 | 654.8 | 3800.0 | 183986.8 | 85635.6 | 610583.6 | 299189.6 | 49 |
| 2008 | 433772.0 | 377193.0 | 433.9 | 856.6 | 772.5 | 3873.6 | 184583.8 | 96393.8 | 664107.3 | 336944.3 | 50 |

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.

## TFP in Chemical Industry Branch

| Year | Actual production (1) | Costs | | | | | | | Input | Output value added | TFP 10/9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Requirements (2) | Maintenance (3) | Spare parts (4) | Administrative (5) | Other (6) | Operating (7) | Depreciation (8) | (9) (2+3+4+5+6+7+8) | (10) (1-(2+6)) | % |
| 1997 | 198370.0 | 352521.8 | 87.0 | 512.2 | 498.8 | 489.6 | 298.8 | 36067.3 | 390475.5 | 162215.7 | 41 |
| 1998 | 197964.0 | 276541.1 | 67.8 | 487.8 | 434.3 | 413.0 | 234.0 | 35993.5 | 314171.5 | 161902.7 | 51 |
| 1999 | 112183.0 | 278981.6 | 115.0 | 432.1 | 653.3 | 512.0 | 112.0 | 20396.9 | 301202.9 | 91671.1 | 30 |
| 2000 | 100965.3 | 287651.1 | 212.8 | 643.3 | 876.6 | 512.7 | 267.0 | 18357.3 | 308520.8 | 82395.2 | 26 |
| 2001 | 84062.0 | 298612.8 | 128.0 | 898.7 | 767.0 | 765.3 | 250.0 | 15284.0 | 316705.8 | 68650.0 | 21 |
| 2002 | 68875.8 | 187266.4 | 120.0 | 876.0 | 22064.9 | 812.0 | 300.0 | 12522.9 | 223962.2 | 56232.9 | 25 |
| 2003 | 51344.0 | 46543.8 | 543.0 | 1001.1 | 17787.3 | 17488.1 | 374.3 | 9335.3 | 93072.9 | 41465.7 | 44 |
| 2004 | 59180.0 | 54378.2 | 7694.4 | 11571.4 | 21795.7 | 21169.0 | 400.0 | 10760.0 | 127768.7 | 40725.6 | 31 |
| 2005 | 61815.2 | 65434.2 | 4879.1 | 548.5 | 946.1 | 1533.8 | 299.9 | 11239.1 | 84880.7 | 45697.0 | 53 |
| 2006 | 69219.0 | 77659.8 | 876.0 | 234.8 | 811.5 | 1328.7 | 300.0 | 12585.3 | 93796.1 | 55757.7 | 59 |
| 2007 | 75348.0 | 87588.0 | 654.8 | 199.8 | 676.9 | 1123.6 | 342.0 | 13699.6 | 104284.7 | 60993.6 | 58 |
| 2008 | 86985.0 | 98516.2 | 261.6 | 185.5 | 542.3 | 918.5 | 303.6 | 15815.5 | 116543.2 | 70907.9 | 60 |

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.

## TFP in Textile & Furniture Industry Branch

| Year | Actual production (1) | Costs | | | | | | | Input | Output value added | TFP 10/9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Requirements (2) | Maintenance (3) | Spare parts (4) | Administrative (5) | Other (6) | Operating (7) | Depreciation (8) | (9) (2+3+4+5+6+7+8) | (10) (1-(2+6)) | % |
| 1997 | 155756.0 | 298124.7 | 298.0 | 710.0 | 2678.9 | 54.2 | 27171.1 | 28319.3 | 357421.1 | 127138.7 | 46 |
| 1998 | 171739.0 | 299182.9 | 376.0 | 871.0 | 2688.2 | 71.7 | 26816.5 | 31225.3 | 361353.4 | 140137.7 | 74 |
| 1999 | 41577.0 | 140343.8 | 498.0 | 787.0 | 2697.5 | 89.3 | 26461.8 | 7559.5 | 178547.9 | 33519.5 | 28 |
| 2000 | 38562.8 | 120987.8 | 456.0 | 987.0 | 2706.9 | 106.8 | 26107.1 | 7011.4 | 158363.0 | 31095.4 | 28 |
| 2001 | 25522.0 | 76543.9 | 242.1 | 1518.0 | 2716.2 | 124.4 | 25752.5 | 4640.4 | 111537.4 | 20639.5 | 29 |
| 2002 | 38655.8 | 87087.4 | 296.7 | 1518.0 | 2725.5 | 95.8 | 25397.8 | 7028.3 | 124799.6 | 31330.8 | 40 |
| 2003 | 9248.2 | 82658.4 | 450.0 | 1109.1 | 2734.8 | 198.2 | 25043.2 | 1681.5 | 114525.2 | 7116.7 | 10 |
| 2004 | 8751.5 | 92875.3 | 309.0 | 1008.8 | 2744.2 | 190.0 | 24688.5 | 1591.2 | 124006.9 | 6851.3 | 09 |
| 2005 | 7144.0 | 79076.8 | 406.0 | 1265.8 | 3078.1 | 200.1 | 27843.0 | 1298.9 | 113708.7 | 5439.1 | 09 |
| 2006 | 9046.0 | 60345.9 | 500.0 | 1776.8 | 2657.9 | 234.1 | 19300.3 | 1644.7 | 86909.7 | 6901.3 | 13 |
| 2007 | 8018.0 | 58098.0 | 657.3 | 1341.1 | 2008.0 | 200.0 | 22454.8 | 1457.8 | 86538.0 | 5902.9 | 12 |
| 2008 | 5831.0 | 46949.0 | 604.4 | 1619.1 | 3325.8 | 243.7 | 25609.3 | 1060.2 | 79614.4 | 4166.4 | 12 |

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.

## TFP in Food Industry Branch

| Year | Actual production (1) | Costs | | | | | | | Input | Output value added | TFP 10/9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Requirements (2) | Maintenance (3) | Spare parts (4) | Administrative (5) | Other (6) | Operating (7) | Depreciation (8) | (9) (2+3+4+5+6+7+8) | (10) (1-(2+6)) | % |
| 1997 | 93212.0 | 76285.9 | 1127.9 | 418.1 | 3384.1 | 2075.6 | 235651.7 | 37284.8 | 356228.1 | 54799.3 | 15.0 |
| 1998 | 104052.0 | 86894.2 | 1141.2 | 495.5 | 3537.1 | 2185.3 | 260950.6 | 41620.8 | 396824.7 | 61290.0 | 15.0 |
| 1999 | 199580.0 | 177502.5 | 1154.5 | 572.9 | 3690.1 | 2295.0 | 286249.5 | 79832.0 | 551296.5 | 118593.5 | 21.5 |
| 2000 | 192340.0 | 178110.8 | 1167.8 | 650.3 | 3843.1 | 2328.8 | 311548.4 | 76936.0 | 574585.3 | 114236.2 | 19.8 |
| 2001 | 174516.0 | 158719.1 | 1181.1 | 727.7 | 3996.1 | 2651.4 | 336847.3 | 69806.4 | 573929.2 | 103528.5 | 18.0 |
| 2002 | 228008.8 | 179327.4 | 1194.4 | 805.0 | 4149.2 | 3087.4 | 362146.2 | 91203.5 | 641913.2 | 135610.8 | 21.0 |
| 2003 | 253098.4 | 201935.7 | 1207.7 | 856.0 | 4302.2 | 2987.3 | 387445.1 | 101239.4 | 699973.4 | 150651.3 | 21.5 |
| 2004 | 297657.5 | 480544.0 | 1200.0 | 987.0 | 5002.8 | 2118.8 | 412744.0 | 119063.0 | 1021659.6 | 177394.5 | 17.4 |
| 2005 | 322015.0 | 301152.3 | 1207.8 | 1009.8 | 4653.0 | 2334.8 | 438042.9 | 128806.0 | 877206.6 | 192001.2 | 21.8 |
| 2006 | 360408.0 | 343006.8 | 1300.0 | 1324.0 | 3456.0 | 2873.0 | 458658.8 | 144163.2 | 954781.8 | 214944.8 | 22.5 |
| 2007 | 549626.0 | 499876.5 | 1320.0 | 879.0 | 5200.0 | 3903.8 | 498006.8 | 219850.4 | 1229036.5 | 328455.6 | 26.7 |
| 2008 | 718673.0 | 604223.4 | 1210.4 | 1399.7 | 5494.4 | 3305.0 | 509256.6 | 287469.2 | 1412358.7 | 429993.4 | 30.4 |

Source:: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.

## TFP in Electrical & Engineering Industry Branch

| Year | Actual production (1) | Costs | | | | | | | Input | Output value added | TFP 10/9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Requirements (2) | Maintenance (3) | Spare parts (4) | Administrative (5) | Other (6) | Operating (7) | Depreciation (8) | (9) (2+3+4+5+6+7+8) | (10) (1-(2+6)) | % |
| 1997 | 154605.0 | 158765.4 | 130.0 | 95.6 | 623.3 | 578.0 | 6563.7 | 61842.0 | 228598.0 | 92633.0 | 40.5 |
| 1998 | 173691.0 | 166765.9 | 140.0 | 85.0 | 765.0 | 1100.0 | 7131.6 | 69476.4 | 245463.9 | 104074.6 | 42.4 |
| 1999 | 182179.0 | 176568.7 | 194.7 | 89.0 | 856.0 | 1230.0 | 7699.5 | 72871.6 | 259509.5 | 109112.7 | 42.0 |
| 2000 | 197732.3 | 178966.9 | 150.0 | 100.1 | 1564.9 | 685.1 | 8267.4 | 79092.9 | 268827.3 | 118489.4 | 44.0 |
| 2001 | 59086.0 | 145767.9 | 150.1 | 98.0 | 697.3 | 3234.0 | 8835.3 | 23634.4 | 182417.0 | 35301.5 | 19.4 |
| 2002 | 103359.7 | 210078.7 | 189.8 | 100.3 | 2215.2 | 534.0 | 10234.0 | 41343.9 | 264695.9 | 61826.0 | 23.4 |
| 2003 | 109773.0 | 215113.0 | 253.7 | 91.4 | 1987.6 | 3446.0 | 9500.0 | 43909.2 | 274300.9 | 65610.1 | 23.9 |
| 2004 | 72354.0 | 20001.6 | 291.3 | 123.0 | 2213.5 | 505.3 | 9644.0 | 28941.6 | 61720.3 | 43121.1 | 69.9 |
| 2005 | 11287.6 | 10002.3 | 220.9 | 196.7 | 3210.6 | 5860.8 | 10987.0 | 4515.0 | 34993.4 | 6551.6 | 18.7 |
| 2006 | 147327.0 | 354002.7 | 180.7 | 259.6 | 2470.0 | 5901.0 | 12330.0 | 58930.8 | 434074.8 | 88215.5 | 20.3 |
| 2007 | 188109.0 | 419782.6 | 200.0 | 290.1 | 4504.0 | 6241.0 | 13673.0 | 75243.6 | 519934.3 | 112665.4 | 21.7 |
| 2008 | 222071.0 | 439531.6 | 130.0 | 320.6 | 6538.0 | 6131.3 | 15016.0 | 88828.4 | 556495.9 | 133112.6 | 23.9 |

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2008.