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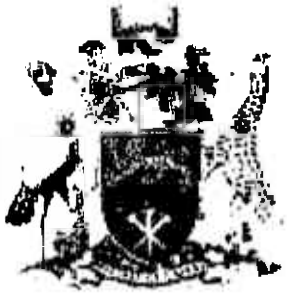

SCHOOL OF ECONOMICS

IMPACT OF GOVERNMENT PURCHASES ON GROWTH OF PHARMACEUTICAL INDUSTRY IN KENYA

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DECLARATION

This research paper is my original work and to the best of my knowledge has not been presented for the award of a degree in any other University.

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To God almighty, to my parents, to my loving wife Patricia and children – Mina and Jonah. Thank you for the inspiration and support.

ABSTRACT

Our study set out to establish the determinants of growth of the local pharmaceutical industry in Kenya, measured in terms of employment levels. The focus of the study is primarily on the role of government purchases. We single out government purchases due to the government's role as the single largest buyer of pharmaceuticals in the domestic market. Previous studies arrived at the conclusion that industries patronized by government as a client exhibit higher rates of growth compared with industries that are not patronized by government. They attribute this effect to the fact that sustained government purchases can guarantee stable incomes and high profits to industries.

We carried out the analysis using a differenced-log model with four lags, and time series data covering the period 1981 – 2010. Besides government purchases of pharmaceuticals, other variables included in the analysis are exchange rates, interest rates, imports, and a proxy for technological improvements in the industry. Our analysis finds a negative and significant coefficient for the government purchases variable, indicating that government purchasing behavior has a negative impact on growth of the local pharmaceutical industry.

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ABBREVIATIONS AND ACRONYMS

COMESA	Common Market for Eastern and Southern Africa
DC	Developing Country
EPZA	Export Processing Zones Authority
GDP	Gross Domestic Product
ITC	International Trade Center
KEMSA	Kenya Medical Supplies Agency
KNBS	Kenya National Bureau of Statistics
LDC	Less Developed Country
MDC	More Developed Country
MNC	Multinational Corporation
OECD	Organization for Economic Cooperation and Development
SME	Small and Micro Enterprise
UNIDO	United Nations Industrial Development Organization
WTO	World Trade Organization

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Kenya's pharmaceutical industry has about 45 licensed manufacturers appearing in the register of the Pharmacy and Poisons Board, of which only 26 are active (Republic of Kenya, 2010). Presence of multinationals in the local industry is limited to one (Glaxosmithkline Kenya Limited). Other players in the domestic industry are either fully or partially owned by locals. Leading companies in the domestic industry are Universal Corporation Limited which has 70% shareholding from the Finland Development Finance Company – Finfund; Regal Pharmaceuticals with 35% foreign ownership, and Beta Healthcare which is partially owned by Shely's Pharmaceuticals of Tanzania. Most of the companies base their manufacturing activities in and around the capital Nairobi (UNIDO, 2010). Collectively the industry employs about 3,340 people (KNBS, 2011). Majority (65%) of these employees work in direct production (EPZ, 2005), suggesting use of labour intensive technologies. Typical activities of the industry include, compounding and repacking medicines, repackaging already formulated medicines as well as processing bulk drugs into doses using mostly imported active ingredients and exipients (EPZA, 2005). Manufacturing capabilities of the local industry are summarized in Table 1.

Table 1: Manufacturing Capabilities

Research and Development for discovering new active substances	No
Production of pharmaceutical starting materials (APIs)	No
The production of formulations from pharmaceutical starting material	Yes
The repackaging of finished dosage forms	Yes

Source: Kenya Pharmaceutical Country Profile (2010)

The domestic health consumer market is estimated to be worth about Ksh19.2 billion annually, and studies carried out by the Ministry of Medical Services in year 2010, indicated that the local industry supplied approximately 20% of the local market. The local industry is also an active participant in the Common Market for East and Southern Africa (COMESA), supplying approximately 50% to the regions market (EPZA, 2010).

In the year 2010, manufacturing output for Kenya was estimated at approximately Ksh861 billion or about 30% of the GDP of Ksh2.5 trillion (KNBS, 2010). A precise share of the local pharmaceutical industry in manufacturing sector output has not been determined, but estimation can be arrived at from studies conducted by UNIDO (2008). The UNIDO study found that in 2008, the industry contributed about Ksh8 billion to manufacturing sector output which translates to about 1% of the entire manufacturing sector output in that period. The same study further established that the local pharmaceutical industry imports about 80% to 95% of their inputs, with local value addition of 50% to 60%.

Pharmaceutical industry products seek to address society health care needs, making them vital to the wellbeing of any county's population. Availability of pharmaceutical products thus becomes a focus for national welfare initiatives. From this perspective, the pharmaceutical industry is clearly a "strategic" component of any development initiative. In this study, we focus on the Kenyan pharmaceutical industry because of this strategic importance to the country's health sector. The health sector is in itself a significant component under the social pillar of the country's long-term development strategy; Vision 2030.

Demand for pharmaceuticals produced locally is generated from individual purchases by private citizens, the government largely through its purchasing agency KEMSA, and export demand. The Government through its procuring agency KEMSA purchases medicines and distributes to over 4,000 dispensaries and 511 health facilities around the country that are run by the government and faith based organizations. Some of the large health facilities such as Kenyatta National Hospital, issue their own tenders for supply of medicines. It is estimated that KEMSA purchases about 30% of all prescription drugs in the domestic market (UNIDO, 2010). All government purchases are carried out through national and international tenders.

In more developed economies, government purchases account for at least 5% of GDP while in DC's government purchases account for at least 9% of GDP (Brulhart and Trionfetti, 2004), this percentage is much higher in LDC's, as demonstrated in the study by Kamau and Odhiambo (2003), where Uganda's public sector purchases accounted for 30% of the GDP. With ever increasing size and scope of governments, their contribution to demand in home markets has become important. In East Africa, an analysis of government (Kenya, Uganda and Tanzania) budgets by Kamau and Odhiambo (2003) shows rising levels of government spending on goods and services. It is therefore paramount to ensure effectiveness of such public expenditures and in a bid to promote growth of local productive sectors some developing country governments have come up with legal and regulatory measures to direct public purchases towards sectors of the economy that are deemed strategic. Section 227 of the constitution of Kenya, states that the public procurement system in Kenya shall be structured in a manner that provides for categories of preference in the allocation of contracts. This clause in the constitution recognizes how public sector spending can be used to create or increase demand in the domestic market, spur growth of home industries and promote research and development. In recent times, public procurement is

no longer viewed as an operational activity, but as a strategic tool that can be used to deliver government policy (Caldwell, et al 2004).

Kenya like other developing countries has been opposed to the WTO agenda to subject public procurement in developing country economies to international competition, because such a move would require governments in developing countries to extend national treatment to foreign suppliers. Through a ministerial declaration to the WTO in October 2001, Kenya on behalf of the African group upheld this position by declaring that procurement decisions of developing country governments should not be a subject of debate in the WTO and should be maintained as part of the sovereign rights of developing country governments (Odhiambo and Kamau 2003).

A growing population (now at approximately 40 million according to the Economic Survey of 2011), increasing participation of government in procurement of pharmaceuticals, changes in technology, changes in financing options, and regional integration initiatives are some of the factors expected to have an impact on local pharmaceutical producers.

1.2 Statement of the Problem

Kenya's domestic market for pharmaceuticals is worth approximately Ksh19 billion of which about 30% or Ksh5.6 billion represents the share of local producers. The government is an important player in the local pharmaceutical market, purchasing medicines through national tenders and distributing free or reselling at subsidized rates to approximately 36% of the country's poorest households. Government therefore stands out as the single largest buyer of pharmaceuticals in the domestic market, and this makes it an important source of demand in the

domestic pharmaceutical market. In 2005 the Public Procurement and Disposal Act, and Regulations, introduced a 15% margin of preference for public procurement of goods manufactured in Kenya; through this framework it is expected that where practicable, at least 15% of purchases by public entities will comprise locally manufactured goods – these are goods with at least 50% local value added.

The pharmaceutical market is a source of products that are essential for health, yet unaffordable to majority of individual consumers, hence the dominant presence of government as a buyer of pharmaceuticals in the domestic market. Despite the dominant government presence, the response of pharmaceutical manufacturers to government purchases of pharmaceuticals is not known. Also, the extent and impact of initiatives that offer preferences and reservations to local manufacturers is not known.

These initiatives (preferences and reservations) point to an increasing role of government as a buyer in the domestic market. It is therefore important to assess how government purchasing behavior influences growth of local industries. Outcomes from this study could inform existing policies or lead to design of new policies aimed at promoting growth of local industries.

1.3 Objectives of the Study

This study seeks to establish how government purchasing behavior influences growth of the local pharmaceutical industry in Kenya.

Specifically, this study seeks to:

i. determine and quantify the relationship between government purchases of pharmaceuticals and growth in terms of employment, of the local pharmaceutical industry;

ii. provide policy recommendations based on the findings of the study.

The remainder of the paper is organized as follows; section 2 reviews the literature, while section 3 presents the methodology to be used. Section 4 outlines the data and its sources, and section 5 presents the empirical analysis and discusses the results. Section 6 discusses recommendations for policy and points out areas for further research.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Access to product markets is a key determinant for any country's industrial future. Like most developing countries, majority of firms in Kenya are small and medium sized, and some of the major problems they face include access to local, regional and global markets; and consequently limited opportunity to improve on standards and capacity. This literature review brings together studies which demonstrate how access to markets particularly where government is a major buyer has impacted on industry output and employment, alongside economic conditions such as access to finance, and exchange rates.

2.2 Review of Theoretical Literature

Public finance literature indicates that governments purchase items for their own use, for use by government agencies, or for donation or resell to other parties; to influence market prices for the benefit of targeted groups; or to create employment by increasing demand for specific items. In underdeveloped economies social overheads, skilled labour, capital equipment and machinery are typically in short supply; key industries either do not exist or need to be expanded. Public expenditure can be directed towards creation and maintenance of social overheads, creation of human skills through investments in education and training, provision of infrastructure to support selected economic activity, and stimulation of private sector investments through purchases. In these ways, governments can accelerate the process of capital accumulation. Policies that promote purchases of locally produced goods will increase levels of effective demand thus expanding markets and stimulating growth of output from domestic industries. When such

demand is directed towards output from small and medium sized industries, it can result in creation of more employment, due to the labour intensive nature of such industries (Bhatia, 2003).

Governments will purchase for reasons other than direct consumption, a factor which sets government purchases apart from purchases by other economic agents. This secondary purpose when making purchases is motivated by the scale of government purchases, and the impact that such purchases can have on a country's productive sectors. Government purchases can therefore serve as policy instruments (Baumol, 1974).

In government procurement, strategic purchasing occurs when governments opt to purchase from specific industries in a bid to stimulate innovation in the products or services of those industries. This kind of purchasing is typically carried out within sectoral policies (Edler et al., 2007). China for example, has implemented a policy that explicitly discriminates against foreign owned companies when purchasing high technology products. This approach in public procurement is a component of catch a up strategies aimed at promoting innovative capacities of local firms.

Keynesian diagnosis of developed market economies suggests causality between deficiency of effective demand, low marginal propensity to consume and low marginal efficiency of investment. Keynes therefore advocated for additional public spending as a means of injecting purchasing power in markets and stimulating investment and consumption. He observed that free and advanced markets were prone to fluctuations in income, employment and prices. For these reasons advanced capitalist economies frequently experience recessions and bubbles and need to deploy anti-cyclical measures (Bhatia, 2003).

2.3 Review of Empirical Literature

The large scope of government purchases suggests that it can be used by governments as a strategic policy tool. Organisation for Economic Cooperation and Development (OECD) countries spend 10-12% of their GDP on their respective private sectors (Brulhart and Trionfetti, 2000). The importance of government purchases has been realized and at a multilateral level, the more developed economies have been pushing for liberalization of purchasing decisions in public procurement. Evidence of movement in this direction is seen in the General Agreement on Trade and Tariffs (GATT) protocol signed in 1978, and Government Procurement Agreement (GPA), signed amongst 22 countries at the 1994 WTO Uruguay round, and which came into force in 1996 (Hoekman and Marroidis, 1997).

Multilateral rules notwithstanding, Brulhart and Trionfetti (2000), argue that in most developed countries, public sector purchases from the private sector account for more than 10% of GDP and governments in developed countries will typically favour local suppliers. In their analysis they postulate that determinants of industry location like factor endowments, market access and intermediate inputs will have a strong impact on industry location if the level of government purchase in that industry is low, however if the level of government purchases is high, then these determinants become less important. They acknowledge that discriminatory government purchases can be welfare reducing, they however focus only on the positive aspects of discriminatory purchases. In their study the ratio of share of government imports (MG) against the share of private sector imports (MP) was examined to establish whether there was a home bias in EU economies in the 1980's. The ratio was found to be small ranging from 0.26 to 0.89,

which indicated a home bias in EU public purchases – a trend that persisted through the 1990's. Brulhart and Trionfetti's analysis generally concludes that government purchases if big in size will influence specialization or the location of industry thereby overriding the effects of factor endowments.

In less developed and developing countries, government purchases account for the largest single domestic market. The International Trade Center (ITC) experience with less developed countries indicates that government purchases in these countries can account for 50-70% of imports (Wittig, 1998). Government purchasing behavior will therefore have a direct bearing on economic growth and development. In this context, the African Development Bank and the World Bank have placed much emphasis on assisting less developed and developing countries to review their public procurement systems. As a consequence, most countries in the African region are today implementing reforms in their public procurement systems.

Measurement of public procurement in East Africa faces, conceptual and technical challenges (Odhiambo and Kamau, 2003). Conceptually some governments define public procurement as purchases by central government and local authorities only, while other also include in this definition, purchases by parastatals. Technically, the data may not be reliable as it is collected and stored in varying formats and the central authorities overseeing procurement do not keep such data. To address this problem of absence of reliable data, Troinfetti (2000), presented an approach for estimating the scope of government purchases, using available published data. The approach notes that procurement is a component of government expenditure and governments spend on goods, works, and services. To estimate the scope of government purchases the approach therefore nets out "social transfers, pension transfers, interest on public debt, public

sector wage bill, subsidies and purchases of military materials" from the total public expenditure. Using a similar approach, Odhiambo and Kamau (2003), found that in Kenya and Tanzania, public procurement accounted for 8% of GDP on average over the period 1999 – 2001. In the same period, the Kenya government budget as a percentage of GDP stood at approximately 35%. In Uganda, government purchases were estimated at approximately 30% of GDP. Uganda's government budget was also high at approximately 49% of GDP on average over the period 1999 – 2001. The high figures for Uganda are attributed to reconstruction projects following years of civil strife that destroyed many facilities and enterprises. In Kenya and Tanzania, procurement reforms supported by the World Bank were initiated on the background of addressing challenges of inefficiency and corruption, while in Uganda the procurement reforms were perceived as a policy package focusing on strategies to eradicate poverty through appropriate policy frameworks and the directing of government spending to strategic economic sectors.

Public procurement policies can be used to create demand for new products or processes or to make latent consumer demands more imminent (Geroski, 1990). Innovation occurs when firms engage in value analysis and engineering to meet consumer needs. Procurement policies which demand new products that are beyond the existing capacity of local industry are therefore likely to stimulate development of higher innovation and production capacities in the targeted industries. Other policies that have been used to promote industrial innovation include, regulations which establish standards that must be met by producers; tax incentives or subsidies for innovative industries; and government investment in infrastructure and facilities such as universities and laboratories. Success of these policies has been mixed. Tax incentives have been abused where firms classify all kinds of expenditure as research and development in order to

attract this incentive; direct subsidies on the other hand have been observed to follow projects that failed to attract private investments; regulations and standards on the other hand have been observed to promote compliance without necessarily resulting in innovations (Edler and Georghiou, 2007). To highlight the possible impacts of procurement policy, it has been observed that private research and development expenditure in the USA increases with sales but appears to respond more to increases in sales to government, than to increases in non-government sales (Geroski, 1990) – this reaction to government purchases stems from the observation that government purchases guarantee stable volumes and profit.

Procurement policy focuses not only on the efficiency of the procurement process but also on the effectiveness of procurement in meeting national goals and objectives. Thus governments will often use their purchases as a policy tool, favoring domestic over foreign suppliers. By doing so governments seek to transfer tax revenues to citizens, increase employment and reduce imports. The USA is unique among industrialized countries due its buy national legislation (Buy America Act of 1933) – it is the only developed nation with an explicit procurement legislation requiring federal governments and agencies to give preference to local producers (Thurbon and Weiss, 2006).

Traditionally the US government has used its purchases to develop its domestic industries, and to support their growth to a level where the American companies become highly competitive on the global scene. Multinational companies such as IBM, Motorola, Lockheed, Boeing and Caterpillar, benefited immensely in their formative stages from US government contracts and thus owe their high level of capitalization and rapid growth to such government contracts; they continue to feature prominently in US government contracts. In the 1950's the IBM computer

company derived over 50% of its revenues from government contracts, this governmental support was instrumental in placing the company ahead of its competitors (Thurbon and Weiss, 2006). Government purchases contribute to growth of the local industry's capacity to export particularly where such purchases increase the capital base of the domestic industry, laying foundations for global expansion.

Recent models of public expenditure examine the role of such spending and distinguish between the roles of consumption and investment expenditures. One such contribution by Barro's (1988) to modeling growth suggests that equilibrium growth responds to government purchasing behavior. Government purchasing behavior among other explanatory variables is found to explain why different countries with initially similar conditions diverge temporarily in their subsequent growth performance (Wiederhold, 2009). Government purchases may constitute a significantly large percentage of total demand in strategic sectors of national interest such as environment protection, defense, transport and medicine. In other industries, however, government purchases could be insignificant.

A recent study by Nhabinde and Schoeman (2007) on the impact of government consumption in South Africa, postulates that if government consumption is directed towards purchase of goods from the domestic market then there is a possibility that government consumption will have a positive impact on domestic output. The study follows Barro (1981) and Devereux and Love (1995) theoretical models to arrive at the conclusion that government consumption may have positive effects on steady state output in South Africa.

Government investment and consumption have been shown to have a positive and causal effect on growth. Guirrero and Eliot (2010) examined the relationship between government spending (consumption and investment) and GDP growth in Japan. Their study found fiscal policy to have been effective in keeping off a more severe balance sheet recession in the 1990s. When the Japanese bubble burst in the 1990s, government consumption was at 20% of GDP, this figure rose to 24% by 1999, and fell to 22% before the recession of 2007-2009. Stability in the period appears to have been supported more by government consumption expenditure than government investment expenditure. In this study of the Japanese economy, Guirrero and Parker (2010) analyzed quarterly data of GDP, government consumption and government investment from 1955 to 2009. The data used was time series and was assessed for stationarity, cointegration and granger causality. The results indicated that government purchases positively influence growth, and further that government investment was not more effective compared to government consumption. From this study, government consumption impact on GDP appears to be just as important as government expenditure on infrastructure (investment).

Studies on specialization suggest that countries will specialize in industries that are predominantly patronized by government as a client - 'the pull effect'. Such home bias further prevents concentration of industries in certain parts of the globe since respective governments can deploy own policies to attract and grow industries, subsequently lowering the overall degree of international specialization - 'spread effect' (Brulhart and Trionfetti, 2001). Brulhart and Trionfetti used the new trade theory models of Krugman and Helpman to assess input – output data for the EU over a period of 15 years (1970 – 1985). They conclude that – in many cases, where a government is a dominant purchaser of a specific good, the country will be more likely to specialize on production of that good. They also established that the effect of government

demand on international specialization is stronger than the effect of private demand, and that this outcome is typical for a sector with increasing returns to scale and monopolistic competition.

Similar findings to those of Brulhart and Trionfetti are expressed in a study of European Union economies by Schutzs (2005), who finds a positive relationship between decentralization of expenditure and specialization, and from the findings infers that a region with a relatively high expenditure rate compared to the national level, attracts specific sectors resulting in a higher specialized production structure.

Public procurement for innovation frameworks are built on the premise that procurement should not only be seen as an indirect support measure for development, but should also be seen as a direct vehicle for promoting innovation and industries, and thus growth and development. Traditionally, the more developed countries have supported industrial development initiatives from the perspective of public procurement for innovation or PPFI (Kattel and Lamber 2010). PPFI has been defined as an instance in which a government agency places an order for a product which does not exist but which can be developed within a reasonable period of time (Edquist and Homen, 2000). Kattel and Lamber (2010) show that due to the complex nature of PPFI, developing countries may lack the policy capacity to implement direct PPFI policies and that they should mix PPFI with soft public procurement for innovation measures (i.e. industrialization policies) as the latter allows for policy learning to take place through experimentation and is less prone to rent seeking and capture by interest groups. PPFI advances the notion that development needs specific long-term potential in terms of learning curves, home market expansion and exports. Such activities provide dynamic increasing returns that in turn create possibilities for continuous upgrading through educational, labour markets and other

policies. This approach contributed to the East Asian economic success (Kattel and Lamber, 2010). Innovation theory and the history of economic development demonstrate that public procurement for innovation not only leads to global technological revolutions, but can also serve as a systematic tool for catching up. Developed countries have extensively used PPFI to gain their dominance in world markets.

Empirical studies support hypothesis of the neoclassical model indicating that an increase in government demand will raise output and employment significantly, but will lower real product wages and productivity slightly. This hypothesis is however not fully upheld by the New Keynesian Model where the anticipated outcome is more employment but reduced productivity and insignificant impact on real wages. On the other hand, for the increasing returns model all the variables (employment, real wages, productivity) are hypothesized to trend upwards. Nekarda and Ramey (2010) study the industry level effects of government purchasing where they analyze transmission mechanisms of government spending on the aggregate economy. They create a panel data set that matches output and labour variables to shifts in industry specific government demand. They find that government purchases occur more in some industries than in others, which implies that different industries register different results in their performance following changes in government spending.

A study of the US economy by Westhues and Zald (1971) supports the hypothesis of Galbraith (1967) of the "mature corporation." The mature corporation has the government as its biggest client. Such corporations are usually large in size, employ advanced technologies, are highly capitalized, are well organized and pay higher wages. Using 1963 data of thirty two industries in the USA, they observe that stability, prosperity and growth are associated with organizations

predominantly patronized by government as a client, to a greater extent than organizations whose clients are predominantly in the private sector.

In addition to market access, the prevailing business environment also has an impact on firm output and employment. An empirical study of Kenyan firm's growth by Nkurunziza (2004), finds that access to credit supports growth of firms. Nkurunziza uses interest rates as a proxy for credit. He establishes a positive relationship between firm growth and use of credit, and concludes that firms that have accessed credit will tend to grow faster than their counterparts who have not. Scarcity of credit, he argues, presents a significant challenge to survival of firms.

In the 1980's and 90's, many developing countries undertook economic reform programs which included liberalization of exchange rates. Free moving exchange rates, thus exposed these economies to exchange rate volatility. Large movements in exchange rates resulted in expansion of debt stocks especially in situations where there was foreign borrowing, and consequently falling domestic investments and falling growth rates. Using micro level panel data to assess the impact of exchange rate volatility on employment growth in Turkey, Demir (2010), finds that exchange rate volatility has a negative effect on employment growth in Turkeys manufacturing sectors.

2.4 Overview of Literature

In the various studies cited, government purchases are seen to impact positively upon the growth of industries that benefit from such purchases; specifically the effects are on industry output, employment, productivity and wage. In small economies with potential for specialization, such purchases have led to increased output, higher productivity and employment, and increased real

wages, which is consistent with the increasing returns model of Devereux et al (1996). Other than the US government, most governments do not have overt policies aimed at promoting discriminatory or targeted government purchasing, yet even in the absence of such policy, studies show that many governments especially those in the more developed countries use discriminatory purchasing as a means of promoting industrialization and growth. Brulhart and Trionfetti (1999) show that discriminatory purchasing by governments in the European Union, influenced industry location and specialization more significantly than factor endowments, market access and availability of intermediate inputs. In Asia, the Chinese government is aggressively pursuing a public procurement for innovation policy, whereby locally produced high technology products are preferred by government over imported high technology products.

In East Africa, it has been established that government purchases constitute a significant percentage of GDP (10% to 30%). Given this magnitude of spending, the role of government purchases in the economy, particularly its impact on growth of industries, sectors and the wider economy presents an important topic for researchers and for design of policies.

Studies by Nerkada and Ramey (2010); and Westhues and Zald (1971), are among the few that examine industry level effects of government purchases. Other studies carried out focus on the economy-wide effects of government purchases, and where they touch upon industry, the focus is to a large extent on defense industries. This study follows the work of Nerkada and Ramey, Westheus and Zald, by focusing on industry level impact of government purchases. Unlike most inquiries conducted on this subject, this study is based on a developing country context (Kenya) and is focused at the industry level (Kenya's pharmaceutical industry). This makes it relevant to formulation of policies for developing country industries.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Theoretical Framework

Economic literature takes different approaches in defining industrialization policy with each definition based on a specific type of government support for industrialization. A typical form of support for domestic industries has been through regulation which in most instances is hinged upon protectionism and includes erecting tariff and non-tariff barriers or subsidizing domestic industries. As part of industrial policies, governments may also engage in production of goods and services by setting up manufacturing enterprises that are either fully or partially owned by government. Government support for domestic industries has also been built into fiscal policies and implemented through government consumption activities targeted at specific sectors. Governments may also opt to provide direct financial support to specific industries or to influence financial markets in a manner that will promote growth of specific industries.

Outcomes of fiscal policy changes simulated using IS-LM curves indicate that government purchasing when applied in a stimulus package will increase aggregate demand and output in the economy; when this happens, even with the price level unchanged, there will be an increase in the demand for money, that will raise interest rates which partially off-sets the impact of the government purchases, by reducing investments. On the supply side, the price increase raises the demand for labour and employment rises despite the slight decline in real wages (Branson, 2006).

Most theories support the view that an increase in government purchases leads to a rise in output and employment. Neoclassical theory suggests that an increase in government demand raises an industry's relative output and employment, but could lead to decline in relative real wage and labour productivity. The neoclassical theory assumes perfect competition with diminishing returns to labour and thus predicts that an increase in government spending raises labour supply through a negative wealth effect i.e with rising demand, prices also rise, producers earn more profits and thus expand output, they offer higher money wages to attract and hire additional labour, but the increasing prices result in a reduction of real wages.

Our study focus is at the industry level, where we assess the relationship between the local pharmaceutical industry's growth and government demand for pharmaceuticals. The introduction of government demand in the analysis, as an explanatory variable is motivated by Barro (1988). Government demand is not the only factor influencing output from the local pharmaceutical industry, we therefore also include interest rates (as proxy for financing the industry), exchange rates (as proxy for the level of import prices given that up to 95% of inputs for this industry are imported), and a time trend variable (to represent technological progress) in our analysis. The pharmaceutical industry in Kenya has few players; costs of entry are high due to high regulatory fees and high costs of capital. Previous studies further indicate that capacity utilization in the local industry is not optimal. The local industry is therefore more likely to experience increasing returns and monopolistic competition. This scenario is typical for industries in developing countries (Branson, 2006).

3.2.0. The Model

Keynes in his General Theory of Employment presented an employment function of the form:

$$E = f(D) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where D is an amount of effective demand which when directed to a firm or industry will generate employment of amount E. Patinkin's analysis of the demand for labour supports this view from a supply side perspective by stating that a firm's demand for labour would fall if it is unable to sell its excess output (Branson, 2006).

Employment is frequently used as an indicator of growth for firms and industries (Daunfeldt et al, 2010). Since our main focus is to examine specific determinants of growth for the local pharmaceutical industry, our model formulation follows the same steps and introduces employment *(E)* in the local pharmaceutical industry as the dependent variable. The model specification suggests that growth in employment for the local pharmaceutical manufacturing industry is influence by government purchases of pharmaceuticals *(G)*, exchange rates *(XR)*, technology/time *(T)* pharmaceutical imports *(IM)* and interest rates *(R)*. The inclusion of government demand as an explanatory variable is motivated by Barro (1988). The relationship between the variables is presented as follows:

$$E = f(G, XR, R, T, IM) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From the foregoing, we specify a log-log relationship as follows:

$$lnE_t = \alpha_0 + \alpha_1 lnG_{t-4} - \alpha_2 lnXR_{t-4} - \alpha_3 lnR_{t-4} + \alpha_4 T - \alpha_5 lnIM_{t-4} + u_t \quad \ldots (3)$$

A log-log specification is chosen because its coefficients can be interpreted as direct estimates of elasticities. The coefficients α_1 α_2 α_3 α_4 α_5 are therefore the respective elasticities of the explanatory variables and α_0 is a constant. The data is annual and we specify a lag length of four (4) years for each explanatory variable except technology/time. The four year lag captures the delayed response of employment levels in the pharmaceutical industry following an increase or decrease in government purchases and movements in the other explanatory variables.

3.2.1. Definition of Variables

Growth in employment (E) is the dependent variable and represents the wage employment level in the local pharmaceutical industry, which includes casual employees, part-time workers, directors, and partners serving on a regular basic salary contract. We employ the number of employees as the measure of growth for the pharmaceutical industry in Kenya.

Government purchases of pharmaceuticals (G), refers to the approved expenditure in Kenya Shillings for purchase of pharmaceuticals by government. A strong presence of government in the pharmaceutical market is likely to send signals to producers, to either increase their production or venture into manufacture of specific products demanded by government.

Exchange rate (XR), is measured in terms of the value of Kenya shillings exchanging to the dollar. It is included in the equation as a proxy for input prices. A strong exchange rate implies cheaper import prices and is likely to favor increased importation of inputs as well as increased price competitiveness of locally manufactured goods. This could result in higher output and employment. A weak exchange rate will have the opposite effect of increasing input costs and

negatively impacting the performance of the industry relying on imported inputs. This makes the exchange rate variable a suitable proxy for variations in import prices.

Interest rate (R) is included in the equation, as a proxy for financing the industry. For purposes of this study, the applicable rate of interest is the lending rate. Rising interest rates imply higher costs for financing capital and operations, and could lead to a reduction of output and employment, while low interest rates could have the opposite effect.

A technology/time trend variable (T), which will be indicated by the number of observation periods, is introduced in the equation to resolve the challenge of spurious correlation. Its coefficient is expected to be positive.

Imports (IM) variable represents finished pharmaceuticals goods imported into the domestic market, measured in Kenya shillings. Imports compete with locally manufactured pharmaceuticals and are expected to influence output performance of the local manufacturers.

The error term (u) represents changes in output that are not accounted for by the explanatory variables presented in this equation.

3.2.2. Data Types and its Sources

The data used in the analysis is annual and covers the period from 1981 to 2010. Before using the data all series are converted into natural logarithmic form. Data on employment and pharmaceutical imports are obtained from the Statistical Abstracts of the KNBS. Statistics of government purchases of pharmaceuticals are constructed from the Ministry of Finance Estimates of Recurrent Expenditures. Exchange rates and interest rates are obtained from the Central Bank of Kenya Statistical Bulletins. Appendix 1 shows the data in its original form.

3.2.3. Descriptive Statistics

Most statistical methods can be used only on data with normal distribution. Such methods include *t-tests*, correlation, and regression. The descriptive statistics in Table 2 are used to check if the data displays a normal distribution.

Table 2: Summary Statistics of the Variables

VARIABLE	Mean	Median	Maximum	Minimum	Std. Dev.
LOG_EMPLOYMENT (E)	7.74	7.83	8.14	7.23	0.31
LOG_GOVERNMENT PPURCHASE (G)	20.61	20.53	23.14	18.71	1.20
LOG_EXCHANGE RATES (XR)	3.67	4.05	4.37	2.20	0.73
LOG_INTEREST RATES (R)	2.90	2.78	3.59	2.52	0.32
LOG_IMPORTS (IM)	21.90	22.33	24.05	19.68	1.40
Number of observations	30.00				

The table shows that the average log-employment in the pharmaceutical industry for the period of study is approximately 7.74. The lowest and highest log-employment levels in this period are shown to be 7.23 and 8.14 respectively, indicating a short range between the highest and lowest values. The standard deviation of ±0.31 tells us that the observations are narrowly concentrated about their mean within this range and, and have a normal distribution or bell shaped curve. On average, log-government demand for pharmaceuticals over the period is 20.61 with maximum and minimum values of 23.14 and 18.17 respectively, and a standard deviation of 1.20. The range is wider than for the previous data set, however the standard deviation of 1.20, indicates low level of dispersion of observations about their mean. The statistics suggest a normal distribution. The lowest log-exchange rate is 2.20 while the highest is 4.37, with a mean of 3.67. The standard deviation of 0.73, suggests concentration of observations about the mean. These statistics also suggest that the data has a normal distribution. Average log-interest rate over the period is 2.90, with a minimum of 2.52 and a maximum of 3.59. The standard deviation of 0.32

within this range suggest a relatively low level of dispersion of observations about the mean. Log-imports display a mean of 21.9 within a short range. The data indicates a normal curve and the standard deviation of 1.4 suggests that values are not highly concentrated about the mean.

The descriptive statistics show that the data has a normal distribution, there are no outliers and this makes the data suitable for analysis.

3.2.4. Econometric Methods

Equation *3* presents the hypothesized relationship between the local pharmaceutical industry's employment level and its determinants. To investigate this relationship we first check the equation for serial correlation. Evidence of serial correlation would require that we conduct cointegration analysis to establish the long-run equilibrium relationship between the variables. Cointegration analysis seeks to establish if two time series have a long-run equilibrium relationship. It is a preferred method of econometric analysis for time series due to the possibility that two time series could still have a significant long-run relationship even when they display serial correlation and spurious regression (Hendry and Juselius, 2000). In our analysis, we do not observe serial correlation, and therefore proceed with analysis of the data using Ordinary Least Squares (OLS). Prior to running the regression using OLS, unit root test are carried out on each time series used in the equation, to test for stationarity. The unit root tests reveal the order of integration of each series and therefore guides re-specification of the model. The steps we follow in our analysis are outlined below.

Test for serial correlation: Serial correlation is common in equations using time series data. The problem of serial correlation in time series is defined as a situation where the error term is

correlated with its lagged values such that corr$(\varepsilon_t, \varepsilon_{t-1}) \neq 0$. In this case, if we form an equation of the error term and it's lagged values i.e. $\varepsilon_t = \alpha_o \pm \alpha_1 \varepsilon_{t-1}$, the coefficient ($\alpha_1$) in the expression would be significant. Consequently in an equation where there is serial correlation due to the error term, the variation in the dependent variable is attributed to the activity in the error term and not necessarily the independent variable – in other words, the coefficient of the independent variable will be overstated if there is serial correlation. The regression is therefore said to be spurious because another factor other than the independent variable is causing the variation in the dependent variable. An important assumption of OLS is that the error terms are random (unpredictable), or that there is no correlation of error terms – serial correlation thus violates this assumption making it impractical to use OLS on time series data that exhibits serial correlation. To test for serial correlation, we use the Durbin Watson (DW) test, given by the formula:

$$DW = \frac{\sum (\varepsilon_t - \varepsilon_{t-1})^2}{\sum \varepsilon_t^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The *DW* test yields values ranging from 0 to 4. Values close to 0 imply positive serial correlation, such that if $DW = 0$, then the correlation coefficient (r^2) will be +1. Values close to 4 suggest negative serial correlation such that if $DW = 4$, then the correlation coefficient (r^2) will be -1. Values of *DW* that are close to 2 suggest that there is no serial correlation. Where the data does not display serial correlation, we proceed with OLS analysis.

Examination of the data: data that displays a time trend is non-stationary; hence a time series graphical plot of the data demonstrating a time trend is an indication that the data is non-

stationary. A scatter plot of the dependent and independent variables is also used to visually assess correlation, and the possibility of spurious regression.

Unit root test: the data must be non-stationary of degree one I(1), for the time series to have a long-run equilibrium relationship. Non-stationarity of degree one implies that the data has a unit root, such that when it is differenced once, it becomes stationary I(0). Where data is non-stationary as a result of the presence of unit roots, stationarity is achieved through a linear transformation such as differencing thus, $y_t - y_{t-1}$. Hence, where $y_t \sim I(1)$, then through differencing we achieve stationarity, so that $\Delta y_t \sim I(0)$. The Dickey-Fuller (DF) test is applied in tests for stationarity. The *DF* test assumes that the correlation coefficient rho (ρ) of a variable and its lagged values equals unity i.e. $\rho = 1$, in the linear transformation such that:

$$y_t = \alpha_0 + \rho y_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

The custom in econometric hypothesis testing is not to establish that the coefficient rho is equal to 1, but rather to check that this coefficient is not equal to zero i.e. $\rho \neq 0$. Due to this custom, Dickey and Fuller adjusted this transformation by subtracting y_{t-1} from both sides of the equation, such that:

$$y_t - y_{t-1} = \Delta y_t = \alpha_0 + \underbrace{(\rho-1)}_{\beta_1} y_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(6)$$

This expression demonstrates the effect of differencing (Δy_t) to achieve stationarity in the relationship between variable y_t and its lagged value y_{t-1}. In testing for a unit root, we therefore

test the null hypothesis $\{\beta_1 = 0\}$. Our tests reported in Chapter Four 'do not reject the null hypothesis' for all the time series. This confirms that all the series are non-stationary order one series. We therefore re-specify the model to be estimated by differencing each variable once to achieve stationarity before regressing using OLS.

OLS regression: OLS is used to estimate the re-specified model.

CHAPTER FOUR

4.0. EMPIRICAL ANALYSIS, RESULTS AND DISCUSSIONS

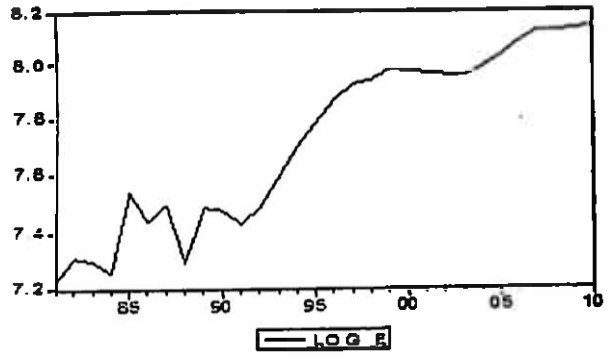
This chapter presents and discusses the results from analysis of the data. We make use of the econometric methods described in chapter three to evaluate the specified model and examine the relationships between employment levels in the pharmaceutical industry and its determinants.

4.1.0. The Results

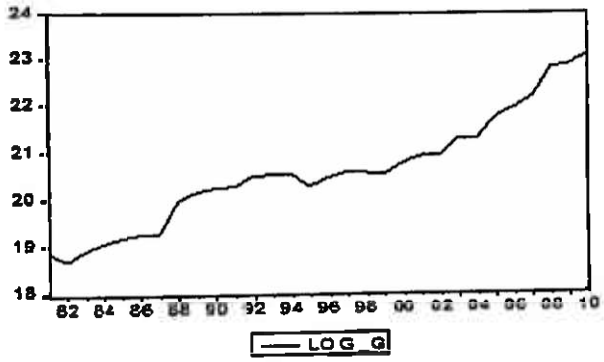
4.1.1. Graphic Examination of Data

Figure 1: Line Graphs (inspection for trends)

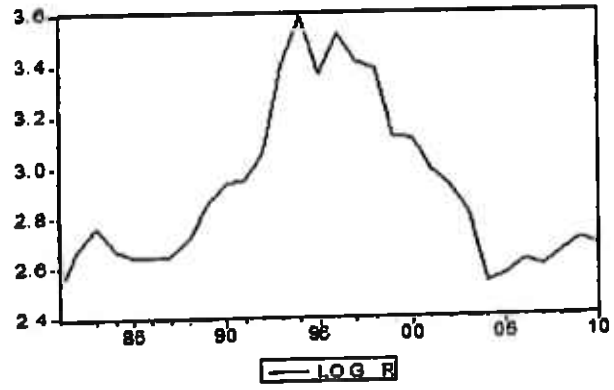
(a) LOG_EMPLOYMENT (E)



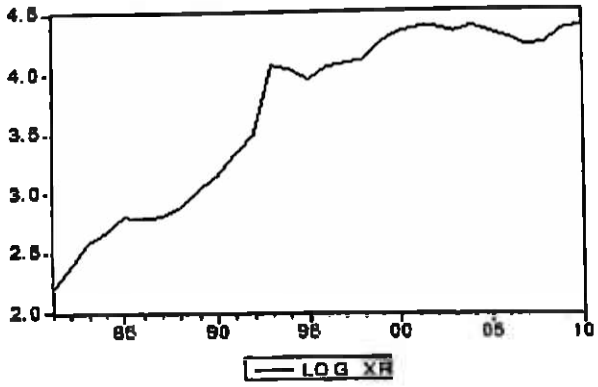
(b) LOG_GOVERNMENT PURCHASES (G)



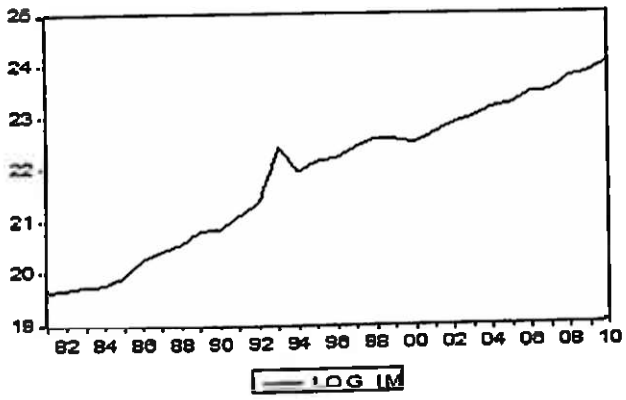
(c) LOG_EXCHANGE RATES (XR)



(d) LOG INTEREST RATES (R)



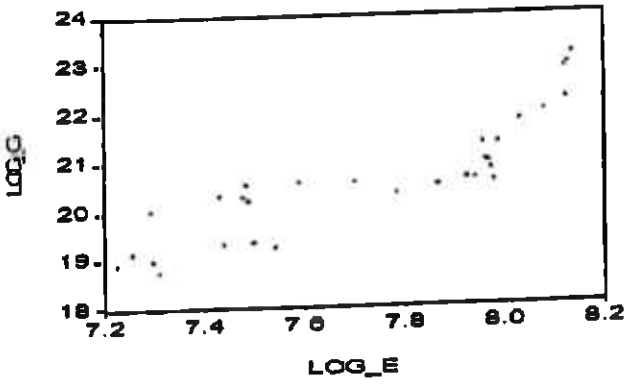
(e) LOG_IMPORTS (IM)



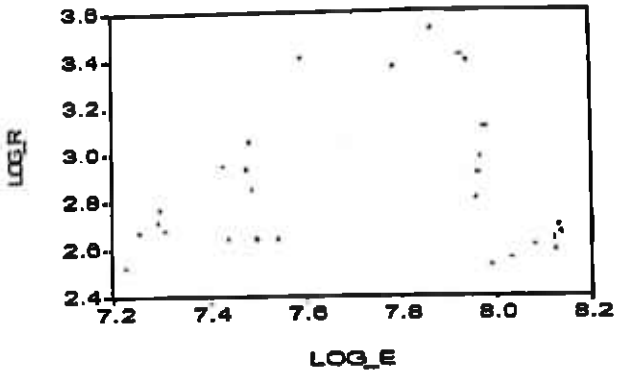
The line graphs in Figure 1, for log-employment (E), log-government Purchases of Pharmaceuticals (G), log-imports (IM) and log-exchange Rate (XR), are trending upwards with time, while that of log-interest Rates (R) trends upward for half of the period and then trends downwards in the second half of the period.

Figure 2: Scatter Plots (inspection for correlation)

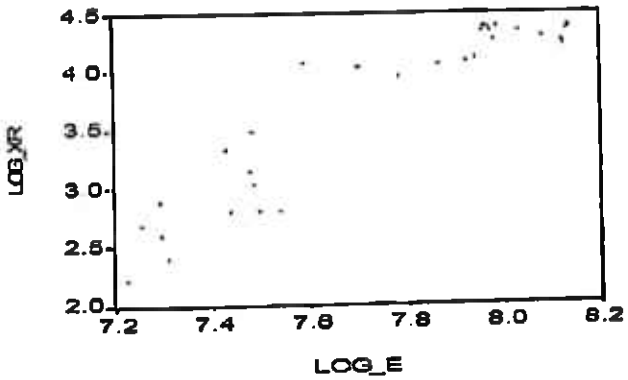
(a) LOG_EMPLOYMENT (E) AND LOG_GOVERNMENT PURCHASES (G)



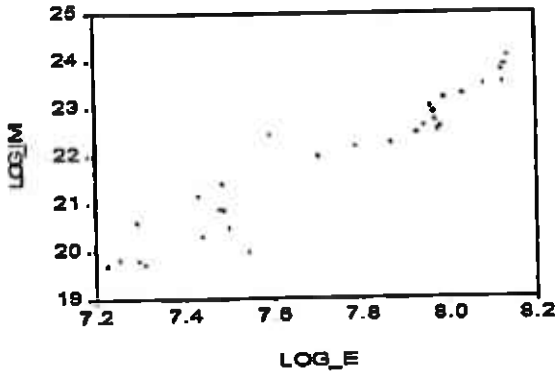
(b) LOG EMPLOYMENT (E) AND LOG INTEREST RATES (R)



(c) LOG_EMPLOYMENT (E) AND LOG_EXCHANGE RATES (XR)



(d) LOG EMPLOYMENT (E) AND LOG_IMPORTS (IM)



The scatter plots in Figure 2 show strong correlation between log-employment (E) and log-government (G); strong correlation between log-employment (E) and log-exchange rates (XR); strong correlation between log-employment and log-imports(IM); but weak correlation between log-employment (E) and log-interest rates (R).

Evidence of time trends depicted in the line graphs and that of correlation between variables depicted in the scatter plots suggest that we cannot rule out serial correlation and spurious regression. We therefore carry out the Durbin Watson test, to check for serial correlation.

4.1.2. Test for Serial Correlation

The regression results of equation 3 are shown in Table 3. We observe a *DW* statistic of approximately 1.3, which is not close to zero thus suggesting that there is weak or no serial correlation. The results however indicate strong correlation between the dependent and independent variables with correlation coefficient R^2 of 0.94, and adjusted R-squared of 0.92.

Table 3: *DW* Test for Serial Correlation

R-squared	0.937687
Adjusted R-squared	0.922109
Durbin-Watson stat	1.299042

The above test results suggest that 'serial correlation' is weak or absent and we may have a 'dynamically complete model'. In such a case, cointegration is not suitable for analysis of the model. To confirm this result (of no serial correlation) we carry out the Breusch-Godfrey serial correlation LM test, which is a more reliable test. Table 4 reports the results.

Table 4: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.77138*	Probability	0.559496
Obs*R-squared	4.203371	Probability	0.379182

The Breusch-Godfrey Serial Correlation LM Test reports a statistic of 0.77138, which falls in the critical region at the 1% level of significance i.e. $0.77138 < 5.57$ ($F^* < F$). We cannot reject the null hypothesis of "no serial correlation" and conclude that there is no serial correlation.

We therefore proceed with analysis of the model using OLS. In order to obtain OLS regression results that are meaningful, the series used in the regression must be stationary – *I(0)* series. A non-stationary series is made stationary through differencing and the decision of whether to difference the series or not is guided by the results of unit root tests which establish the order of integration

4.1.3. Unit Root Tests (Augmented Dickey Fuller Tests)

We use *Eviews Statistical Package* to run the ADF tests for non-stationarity of each of the four time series that make up our model. Since the data is annual, we indicate one lag to correct for autocorrelation in each series. The ADF tests in Eviews are carried out at level (with intercept and time trend) and at first difference (with intercept). Results of these tests are reported in Tables 5, 6, 7, 8 and 9.

Table 5: Unit Root Test for LOG_EMPLOYMENT (E)

At level				
ADF Test Statistic	-1.79039	1% Critical Value*	-4.3226	*Cannot reject null hypothesis of a unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-3.5796	
		10% Critical Value	-3.2239	
At first difference				
ADF Test Statistic	-3.92894	1% Critical Value*	-3.6959	*Rejects null hypothesis of unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-2.975	
		10% Critical Value	-2.6265	

Table 6: Unit Root Test for LOG_GOVERNMENT PURCHASES (G)

At level				
ADF Test Statistic	-0.66425	1% Critical Value*	-4.3226	*Cannot reject null hypothesis of a unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-3.5796	
		10% Critical Value	-3.2239	
At first difference				
ADF Test Statistic	-3.29567	1% Critical Value*	-3.6959	*Rejects null hypothesis of unit root at 5% and 10% level of significance*
		5% Critical Value	-2.975	
		10% Critical Value	-2.6265	

Table 7: Unit Root Test for LOG_INTEREST RATES (R)

At level				
ADF Test Statistic	-1.2393	1% Critical Value*	-4.3226	*Cannot reject null hypothesis of a unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-3.5796	
		10% Critical Value	-3.2239	
At first difference				
ADF Test Statistic	-2.94946	1% Critical Value*	-3.6959	*Rejects null hypothesis of unit root at 10% level of significance*
		5% Critical Value	-2.975	
		10% Critical Value	-2.6265	

Table 8: Unit Root Test for LOG_EXCHANGE RATES (XR)

At level				
ADF Test Statistic	-1.0104	1% Critical Value*	-4.3226	*Cannot reject null hypothesis of a unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-3.5796	
		10% Critical Value	-3.2239	
At first difference				
ADF Test Statistic	-3.30508	1% Critical Value*	-3.6959	*Rejects null hypothesis of unit root at 5% and 10% level of significance*
		5% Critical Value	-2.975	
		10% Critical Value	-2.6265	

Table 9: Unit Root Test for LOG_IMPORTS

At level				
ADF Test Statistic	-1.7783	1% Critical Value*	-4.3226	*Cannot reject null hypothesis of a unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-3.5796	
		10% Critical Value	-3.2239	
At first difference				
ADF Test Statistic	-4.21346	1% Critical Value*	-3.6959	*Rejects null hypothesis of unit root at 1%, 5% and 10% level of significance*
		5% Critical Value	-2.975	
		10% Critical Value	-2.6265	

**MacKinnon critical values for rejection of hypothesis of a unit root.*

The null hypothesis of a unit root is rejected if the *t-statistic* is less than the critical value, otherwise the 'null hypothesis cannot be rejected' or is 'accepted'. For all the variables, at levels we 'cannot reject the null hypotheses' of a unit root at any of the critical values (1%, 5%, 10%). However at first difference, for all the variables we 'reject the null hypotheses' of a unit root at the 5% and 10% critical values. These results confirm that all the variables represent non-stationarity of order one - *I(1)* series. It is therefore necessary to difference each series once in order to obtain stationary – *I(0)* series that will enable estimation of the model by OLS. This requires transformation (through differencing once) of variables of the model to be estimated. We therefore re-specify the model as follows:

$$\Delta lnE_t = \alpha_0 + \Delta lnG_{t-4} - \alpha_2 \Delta lnXR_{t-4} - \alpha_3 \Delta lnR_{t-4} + \alpha_4 T - \alpha_5 \Delta lnIM_{t-4} + u_t \quad ...(7)$$

In the re-specified, differenced-log form, the coefficients ($\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$) explain the relationship between the dependent (Employment – E) variable and the independent (Government purchases – G, Exchange Rates – XR, Interest Rates – R, Time – T and pharmaceutical Imports –IM) variables. We obtain estimates of the coefficients by regressing equation 7 using OLS.

4.1.4. Summary of Regression Results

Results of the regression of Equation 7 are reported in Table 10.

Table 10: Regression results (*t- statistics* in parenthesis)

Variable	Coefficient
Intercept	*7.145532 (146.9471)*
Government Purchases of Pharmaceutical (G)	*-0.221271 (-2.623966*)*
Exchange Rates (XR)	*-0.201184 (-1.106018)*
Interest Rates (R)	*-0.23268 (-1.750686**)*
Time (T)	*0.038383 (15.98636*)*
Pharmaceuticals Imports (IM)	*0.054184 (0.63652)*

R-squared	0.938718
Adjusted R-squared	0.922591
Durbin-Watson stat	1.782539
F-statistic	58.20804
Prob(F-statistic)	0.00000

**Denotes significance at 1%;* ***Denotes significance at 5%*

From the above regression results, we present the estimated equation as follows:

$$\Delta lnE_t = (7.15) - (0.22)\Delta lnG_{t-4} - (0.20)\Delta lnXR_{t-4} - (0.23)\Delta lnR_{t-4} + (0.04)T + (0.05)\Delta IM_{t-4} + u_t \ldots (8)$$

4.1.5. Interpretation of Results

The first difference of a log is equivalent to the proportionate change in the logged variable. Mathematically this is expressed as $\Delta logy_t = (y_t - y_{t-1})/y_t$, where y_t is the value of a variable in time t and y_{t-1} is the value of that variable in a previous time $t-1$. The expression $\Delta logy_t$ therefore represents the proportionate change or growth in y from one period to the next. From the

foregoing, the transformed estimated model (Equation 8) represents the relationships between growth of the dependent variable and growth of the independent variables.

The coefficient for growth in government purchases of pharmaceuticals *(G)* is significant at the 1% level. However contrary to our hypothesis, we find a negative relationship between growth in government purchases and growth of employment *(E)*. From the estimated equation, the coefficient of G is -0.22, indicating that a 1% increase in growth of government purchases is associated with a reduction of approximately 0.22% in growth of employment in the local pharmaceutical industry over a four year period.

Proportionate change in exchange rates *(XR)* is found to be statistically insignificant, but has a negative sign that supports the *apriori* expectation regarding exchange rates. The negative coefficient of *XR* at -0.20 suggests a negative influence of increasing imports on growth of employment in the local pharmaceutical industry.

The negative coefficient of the lending interest rate *(R)* variable supports the *apriori* expectation of a negative relationship between lending rates and growth of employment in the local pharmaceutical industry. The coefficient of -0.23 is found to be statistically significant at the 5% level. The coefficient implies that a 1% increase in lending rates is associated with a reduction of 0.23% in growth of employment in this industry over a four year period. The interest variable was introduced as a proxy for credit or financing for the industry. It is observed that rising interest rates reduce firm access to credit thus curtailing growth in firm's investment and subsequently in firm employment.

The technology and time trend *(T)* variable was introduced not only to act as a de-trending element in the model but also as a proxy for technological advances. With technological advances firms are expected to expand capacity leading to increased employment. The coefficient of *T* is found to be statistically significant, with positive sign as hypothesized. It is however small in magnitude, indicating that a 1% improvement in technology is associated with a 0.04% increase in employment in the pharmaceutical industry. Imports are found to be positively related with employment growth in the industry, but statistically insignificant.

The explanatory variables collectively explain 93% of the variation in the dependent variable as indicated by the *R-squared*. The *Adjusted R-squared* is positive and slightly smaller than the *R-squared*, suggesting that the model is a good fit i.e. the included independent variables have explanatory power over the dependent variable. The reported *DW-statistic* (1.78) is close to 2, suggesting that there is no spurious regression.

The *F-statistic* reported in the regression output, tests the null hypothesis that all slope coefficients other than the intercept are equal to zero. The *p-value* denoted by *Prob(F-statistic)* is the marginal significance level of the *F-test*. Since in our case the *p-value* is less than the significance level, we reject the null hypothesis that all the slope coefficients are equal to zero.

CHAPTER FIVE

5.0. SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1. Summary

Our study set out to establish the determinants of growth of the local pharmaceutical industry in Kenya, measured in terms of employment levels. The focus of the study is primarily on the role of government purchases. We single out government purchases due to the government's role as the single largest buyer of pharmaceuticals in the domestic market. Previous studies reviewed on the subject covered both developing and developed economies. Most of these studies arrived at the conclusion that industries patronized by government as a client exhibit higher rates of growth compared with industries that are not patronized by government. They attribute this effect to the fact that sustained government purchases can guarantee stable incomes and high profits to industries.

We carried out the analysis using a differenced-log model with four lags, and time series data covering the period 1981 – 2010. Besides government purchases of pharmaceuticals, other variables included in the analysis are exchange rates, interest rates, imports, and a proxy for technological improvements in the industry. Our analysis finds a negative and significant coefficient for the government purchases variable, indicating that government purchasing behavior has a negative impact on growth of the local pharmaceutical industry.

5.2. Conclusions

Results from the regression analysis point to the fact that government purchases have not supported growth of the local pharmaceutical industry. We find the coefficient for government purchases to be significant but negative implying that there is negligible participation by local

manufacturers in government tenders. This could be evidence of failure by government to effectively implement existing procurement laws and regulations that seek to increase participation of local firms in government tenders and thereby promote growth of local establishments. Also, government purchases of imported products that are in direct competition with the output of local firms could contribute to the negative coefficient. Government purchasing behavior in the domestic pharmaceutical market is therefore an import factor influencing growth of the local pharmaceutical industry, albeit negatively.

The negative relationship between exchange rates and employment in the industry though insignificant, suggests susceptibility to exchange rate fluctuations which could be linked to the local industry's dependence on imported inputs. This is consistent with the findings of Demir (2010). A negative and significant interest rate coefficient is consistent with findings by Nkurunzinza (2004) and others who find that growth of firms is curtailed by limited access to credit. We used lending interest rates as a proxy for credit, and established that higher interest rates will reduce growth. Our analysis confirms that access to credit is a determinant of growth for this industry. The technology variable is also found to be significant and positive. Its small size however suggests that the local industry may have limited capacity to effectively utilize technological resources, a phenomenon that is typical for industries in many developing countries.

5.3. Policy Implications and Recommendations

Interventions to stimulate growth in the local pharmaceutical industry should focus on improving access to markets, as well as access to credit and technological resources. Our study suggests that emphasis should be on policies that create demand for the output of the local pharmaceutical industry, and improving access to government tenders is one avenue of creating this demand.

Previous studies show that the positive effect of government demand on targeted industries can be more important than the effect of factor endowments. Access to market and type of market therefore stand out as key determinants of growth for the local industry and, policies aimed at increasing demand (particularly through government tenders) for the output of the local industry could be most effective in stimulating growth.

5.4. Areas for Further Research

Since year 2008, the Kenya government has pursued initiatives aimed at establishing and operationalizing frameworks supportive to private sector investments and growth. Some of these initiatives generally target local enterprises, and specifically enterprises owned by youths and disadvantaged groups. The Public Procurement and Disposal Act and Regulations, contains clauses that require public entities to extend preferences and reservations to prescribed groups. From the foregoing, more research needs to be carried out to assess the impact of these initiatives, specifically whether they are achieving their ultimate goal of creating more jobs among targeted groups, and increasing capacity of targeted industries. Economics is concerned with optimality of resource allocation decisions, hence, the real costs of extending preferences and reservations to prescribed groups should also be investigated, for purposes of improving such allocation decisions.

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APPENDICES

Appendix 1: Data

YEAR	GOVERNMENT PURCHASES (Ksh)	INTEREST RATES (%)	EXCHANGE RATES (Ksh/USD)	EMPLOYMENT (Numbers)	PHARMACEUTICAL IMPORTS (Ksh)
1981	158,640,000	12.42	9.05	1,378	353,860,000
1982	134,120,000	14.50	10.92	1,499	367,220,000
1983	171,060,000	15.83	13.31	1,481	392,320,000
1984	199,670,000	14.42	14.41	1,419	399,200,000
1985	222,450,000	14.00	16.43	1,892	466,280,000
1986	238,626,520	14.00	16.23	1,706	653,340,000
1987	246,186,000	14.00	16.45	1,812	764,460,000
1988	489,402,800	15.00	17.75	1,475	874,580,000
1989	577,000,540	17.25	20.57	1,793	1,123,560,000
1990	627,196,780	18.75	22.91	1,774	1,152,200,000
1991	650,734,840	19.00	27.51	1,691	1,507,680,000
1992	799,980,000	21.07	32.22	1,784	1,939,660,000
1993	826,988,660	29.99	58.00	1,987	5,471,100,000
1994	835,439,395	36.24	56.05	2,218	3,472,540,000
1995	646,795,680	28.80	51.43	2,412	4,245,327,320
1996	763,642,400	33.79	57.11	2,616	4,522,017,920
1997	875,291,800	30.25	58.73	2,776	5,563,045,000
1998	853,997,320	29.49	60.37	2,821	6,559,440,000
1999	819,368,600	22.38	70.33	2,934	6,378,660,000
2000	1,053,015,349	22.34	76.18	2,913	5,975,795,000
2001	1,216,654,395	19.67	78.56	2,897	7,187,738,000
2002	1,243,440,883	18.45	78.75	2,881	8,678,357,000
2003	1,779,161,026	16.57	75.94	2,866	9,728,239,000
2004	1,779,161,026	12.53	79.17	2,958	11,606,900,000
2005	2,852,475,797	12.88	75.55	3,088	12,536,366,000
2006	3,468,125,270	13.64	72.10	3,246	15,412,974,000
2007	4,436,909,661	13.34	67.32	3,389	15,948,212,000
2008	8,284,450,618	14.02	69.18	3,379	20,881,702,000
2009	8,976,545,046	14.80	77.35	3,409	22,994,491,000
2010	11,176,869,917	14.37	79.23	3,430	27,879,315,000