

UNIVERSITY OF NAIROBI

SCHOOL OF ECONOMICS

DETERMINANTS OF LOCATION OF MANUFACTURING FIRMS IN KENYA

NAME : CHARLES ATAMBA ELLY

REG NO : X50/82033/2012

A Research Paper submitted to the School of Economics in partial fulfillment for the requirements of the award of Masters of Arts (MA) Degree in Economics

November, 2014

DECLARATION

This research paper is my original work and has not been presented for a degree in any other university.

REG. NO. X50/82033/2012

Sign..... Date.....

This research paper has been submitted for examination with my approval as University Supervisor.

SUPERVISOR:

Sign:..... Date:.....

DEDICATION

This paper is dedicated to my wife, mum and dad.

ACKNOWLEDGEMENT

First my gratitude goes to God, the Almighty who enabled me to undertake this Masters Degree. Besides, my special appreciation goes to the University of Nairobi for granting me the opportunity for the two year post graduate study. I would also like to thank my supervisor Dr. Ongeri of the school of Economics, University of Nairobi for his invaluable contribution at various stages of writing this paper. His positive criticisms gave me the impetus to finish and produce quality work in time.

In addition, I am sincerely grateful to Prof. Kimuyu who also took his special time to guide me through this paper. Thanks also goes to the following family members and friends for their constant encouragement and moral/ financial support over the years Jackline Nthenya, John Musale, Lailac Ayoma, Phoebe Gor and Mary Kundu.

My final appreciation goes to all my colleagues (2012-2014) and the entire former Office of the Prime Minister for granting me the scholarship to undertake post graduate studies. Finally, let me make the usual disclaimer that much as I appreciate all other inputs, any mistakes solely remain mine.

TABLE OF CONTENTS

DECLARATION	i
LIST OF TABLES.....	vi
LIST OF FIGURES	vii
ABBREVIATIONS AND ACRONYMS	viii
ABSTRACT.....	1
CHAPTER ONE.....	2
INTRODUCTION	2
1.0 Background of the Study	2
1.2 Problem Statement	7
1.2 Objectives of the Study.....	8
1.3 Research Questions.....	8
1.4 Justification of the study	8
1.5 Organization of the study.....	9
LITERATURE REVIEW	10
2.0 Introduction.....	10
2.1 Theoretical Literature.....	10
2.2 Empirical Literature.....	12
CHAPTER THREE	17
RESEARCH METHODOLOGY.....	17
3.0 Introduction.....	17
3.1 Conceptual Framework.....	17
3.1.1 Number of MFs.....	18
3.1.2 Agglomeration Economies.....	18
3.1.3 Roads Availability	19
3.1.4 Cost of Land.....	19
3.2 Research Methodology	19
3.2.1 Empirical Model Specification	19
3.2.2 Econometric specification.....	22

3.3 Diagnostic tests	28
CHAPTER FOUR.....	31
DATA ANALYSIS AND RESULTS.....	31
4.1 Descriptive statistics	31
4.3 Correlation Results.....	34
4.4 Poisson Regression Results.....	35
4.5 Discussion of regression results.....	35
CHAPETR FIVE	37
CONCLUSION AND POLICY RECOMMENDATION, LIMITATION OF THE STUDY AND AREAS FOR FURTHER RESEARCH	37
5.1 Conclusion	37
5.2 Suggested Policy Recommendations	37
5.3 Limitations of the study	39
5.4 Areas for further research	39
REFERENCES	41
APPENDIX.....	44

LIST OF TABLES

Table 1: Variable Measurements	23
Table 2: Data Sources	30
Table 3: Summary statistics	31
Table 4: Shapiro-Wilk W test for normal data	32
Table 5: White Test Results	32
Table 6: First Test for Multicollinearity	33
Table 7: Second Test for Multicollinearity	33
Table 8: Correlation Table	34
Table 9: Poisson Regression	35

LIST OF FIGURES

Figure 1: Manufacturing sector contribution to GDP and employment	3
Figure 2: Percentage (%) distribution of MFs across Kenyan Counties	5
Figure 3: Number of MFs in every County	6
Figure 4: Conceptual Framework on Determinants of Industrial Location	17

ABBREVIATIONS AND ACRONYMS

CDM	Count Data Models
CLM	Conditional Logit Model
CRA	Commission on Revenue Allocation
DCM	Discrete Choice Models
EPZ	Exports Processing Zone
ERS	Economic Recovery Strategy
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GOK	Government of Kenya
ISIC	United Nations Standard Industrial Classification
KIHBS	Kenya Integrated Household Budget Survey
KIPPRA	Kenya Institute of Public Policy Research Analysis
KNBS	Kenya National Bureau of Statistics
MFs	Manufacturing Firms
MLE	Maximum Likelihood Estimates
NIPF	National Industrial Policy Framework
NIPF	National Industrial Policy Framework
PRM	Poisson Regression Model
SAPS	Structural Adjustment Programs
SEZ	Special Economic Zone
SID	Society for International Development
WSPs	Water Service Providers

ABSTRACT

Growth of the Manufacturing Sector is very essential for employment creation and economic growth. The contribution of Manufacturing Sector to economic growth in Kenya has not been very impressive, as evidenced by its contribution to the Gross Domestic Product (GDP). In the year 2013, Manufacturing Sector accounted for 8.9 per cent of the Gross Domestic Product (GDP) and provided 12.4 per cent of employment in the formal sector. The growth of the Manufacturing Sector which has been at an average of ten (10) percent has stagnated in the past five (5) years. At the moment, there exists uneven distribution in the number of Manufacturing Firms (MFs) located in Kenyan Counties, which has resulted in the disparity and un-equitable regional development. The key concern therefore, is to establish the source of such variation of Manufacturing Firms across Counties, given that the essence of devolution is to achieve balanced regional development. The study aims at investigating key drivers in setting up of Manufacturing Firms, the extent at which County activities influence location processes and patterns of Manufacturing Firms across the Kenyan Counties using Poisson Model and suggest policy recommendations that Counties might adopt for implementation. The results show that cost of land and access to electricity act as the overriding factors as far as location of MFs is concerned. However, what might be taken as astonishing is the realization of the negative and insignificant influence of water access. On the basis of these results, it can be taken that significance of cost of land and electricity access is in tandem with the tenets of location theory and partly neoclassical theory. Furthermore, it depicts the place of natural utilities and infrastructure in determining a firm's location.

CHAPTER ONE

INTRODUCTION

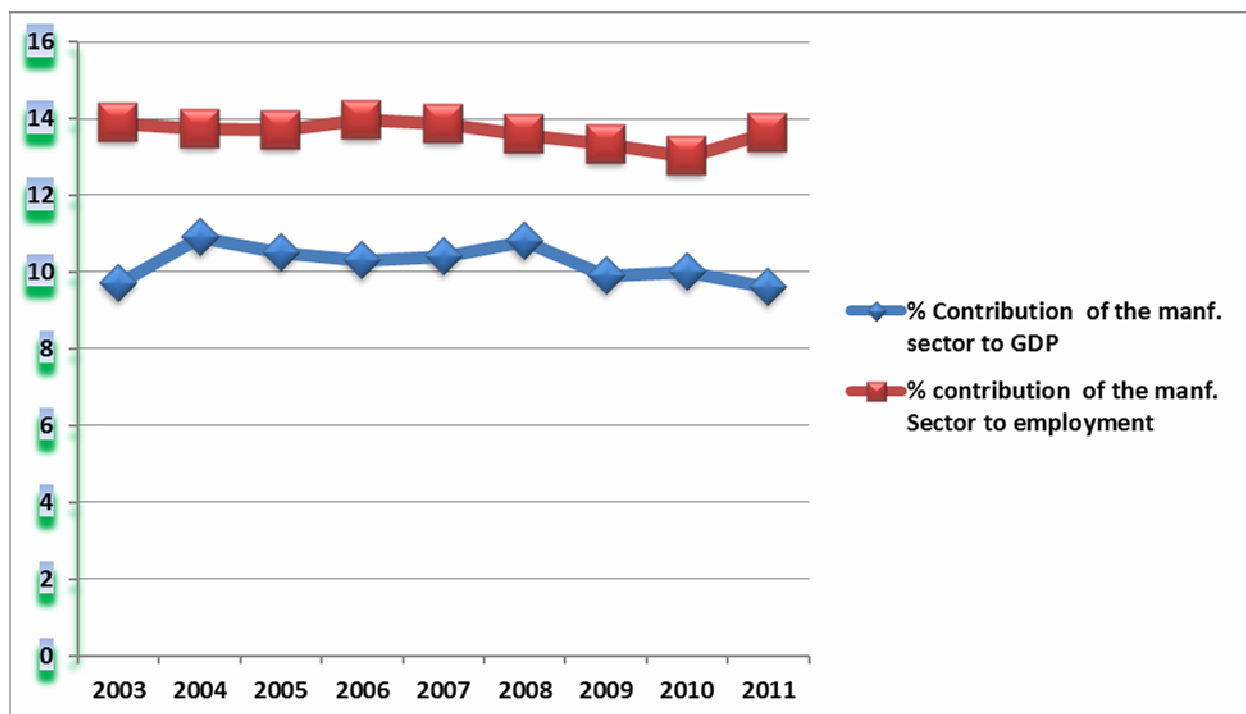
1.0 Background of the Study

According to National Industrialization Policy Framework (NIPF), (2011) the unemployment challenges that Kenya is facing can be addressed through industrialization; although this is happening in some counties like Uasin-Gishu and Nakuru, the same is not experienced in other counties. There is minimal industrialization in the majority of the Kenyan Counties.

According to Kenya's Vision 2030, the growth of manufacturing sector is very important in terms of employment creation and economic growth. Foremost, the contribution of manufacturing sector in Kenya to economic growth has not been very impressive as evidenced by its contribution to GDP which has stagnated around 10 percent for relatively long period (KNBS, various statistical surveys). For the period 2003 to 2010, the average contribution to GDP was 10.3% while the average contribution to total wage employment was 13.6 percent. A total of 191,212 persons were employed in the manufacturing sector as at the end of year 2010 (KNBS, 2011).

According to (KNBS, 2011) the contribution of the sector to economic growth and employment creation should be enhanced through the removing barriers in investment, infrastructural growth, use of technology, promotion of exports among other interventions. The main industries contributing to the sector's economic performance and employment creation are food manufacturing, beverages and tobacco, textile and clothing, leather, furniture, petroleum, paper and metal products (KNBS, 2011). Manufacturing sector's contribution to economic growth and employment creation from the year 2003 to the year 2011 is as illustrated in figure 1 below.

Figure 1- Manufacturing sector contribution to GDP and employment



Source: By Author

The manufacturing sector contribution to GDP worsened from 9.6 percent in the year 2011 to 9.2 per cent in the year 2012, while the growth rate deteriorated from 3.4 percent in the year 2011 to 3.1 per cent in the year 2012. These adverse changes are attributed to high costs of production, stiff competition from imported goods, high costs of credit, drought incidences during the first quarter of 2012, and uncertainties due to the year 2013 general elections (KNBS, 2013).

Influx of counterfeits and volatility in international oil prices continued to affect the performance of the sector. In the year 2012, the sector's growth continued improving across the three subsequent quarters compared to the first quarter. The food sub-sector recorded a decline of 0.3 per cent during the year 2012. Sub-sectors that recorded impressive growth performance in the year 2012 include motor vehicles 16.9 percent, beverages and tobacco 3.8 percent, rubber and plastic products 7.0 percent, paper and paper products 11.9 percent, electrical equipment 8.6 percent and textiles 10.0 percent (KNBS, 2013).

According to KNBS and SID (2013), Kenya has a large topographically varied land mass, which has endowed the country with a wide range of natural resources. Even despite lack of systematic environmental mapping and survey, the vast expanse of the Kenyan Counties is known to contain widespread reserves of natural resources, with great potential for mineral exploitation after the recent discoveries. Kenya is working towards the exploitation of numerous mineral resources such as gas, oil and coal to be found in Turkana, Wajir and Kitui Counties.

Majority of the other counties specifically rural based depend on agricultural products for both subsistence and commercial use. However, some of these Counties have been known for having significant resources of fossil fuels (oil, gas and coal) and have large biomass and bio-fuels potential. Indeed resource-based industries in Kenya Counties are recommended as one of the development strategy that should be encouraged in the utilization of Counties' significant resource assets to catalyze diversified industrial development in the country.

According to KNBS and SID (2013), Kenya has significant regional disparities in access to essential services such as infrastructure and water among others, resulting in regional variation in socio-economic outcomes. This is also demonstrated in the current uneven distribution in the number MFs located in Kenyan Counties. Some Counties have attracted over hundred MFs; while others have attracted zero firms (KNBS, 2010). This uneven distribution is further confirmed by National Industrial Policy Framework (NIPF, 2011), which indicates that MFs in Kenya have largely been concentrated in a few peri-urban and urban areas especially along Mombasa–Kisumu highway, resulting in disparity and un-equitable regional development. This study seeks to find out barriers that exist within some Counties that make them not attractive to MFs as their preferred locations for investments.

According to NIPF, 2011, the Government of Kenya aims at spurring economic growth through industrialization and create employment that will make the Manufacturing Sector lead in the contribution to GDP for sustainable better lives for Kenyans (see appendix 1). This will enhance a sustained growth of the industrial sector, by at least 15 per cent per annum by 2017. It is in this regard that the Government of Kenya creating appreciates the need for creating an enabling environment for a robust, diversified, fair competition field, cost and time conscious, and

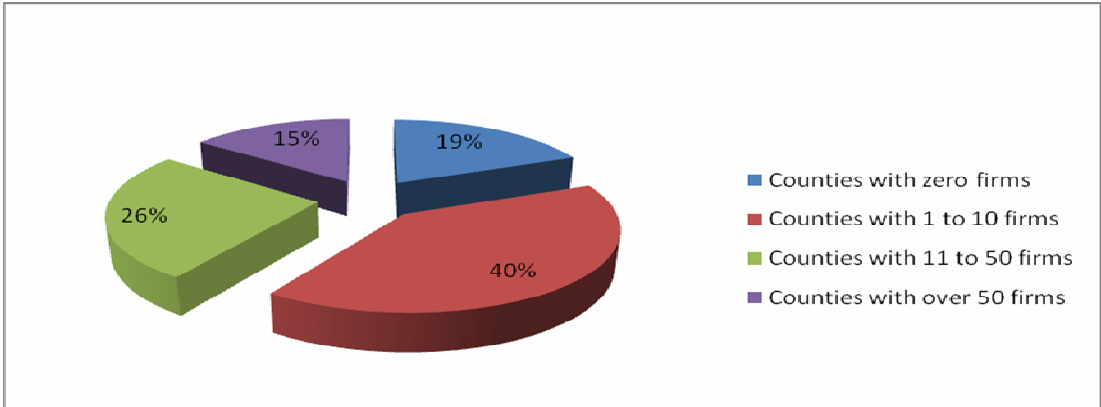
innovative industrial sector; that offers targeted incentive packages in priority sectors; and desires to have a country wide dispersal of industrial activities leading to regional/ county economic empowerment.

It is also a strategy that the NIPF (2011) highlights strategies that the Government of Kenya should employ to increase its industrial productivity and competitiveness as one of the key guiding principles for expanding and maintaining the domestic and export markets in a liberalized environment. The NIPF (2011) also recognizes the need to diversify and expand markets for industrial value added products so as to address supply side constraints with regard to product quality, volume and standards. This will enable Kenya to achieve equitable regional dispersion of industries throughout the country to accelerate the pace of development.

Considering the diverse national resource and climatic environments in which industries operate, the study complements an economy- wide analysis with a more spatially disaggregated one. This is by using a spatially explicit framework livelihood opportunities that can be successfully mapped on to development domains or areas that are relatively homogeneous regarding the distribution of certain important attributes, for example, market access, population density and natural resource environment. Other types of spatial analysis include mapping poverty and food insecurity levels, both of which highlight areas of a country or region that requires prior attention.

The percentage distribution of the number of MFs in Kenya is summarized in figure 2 below.

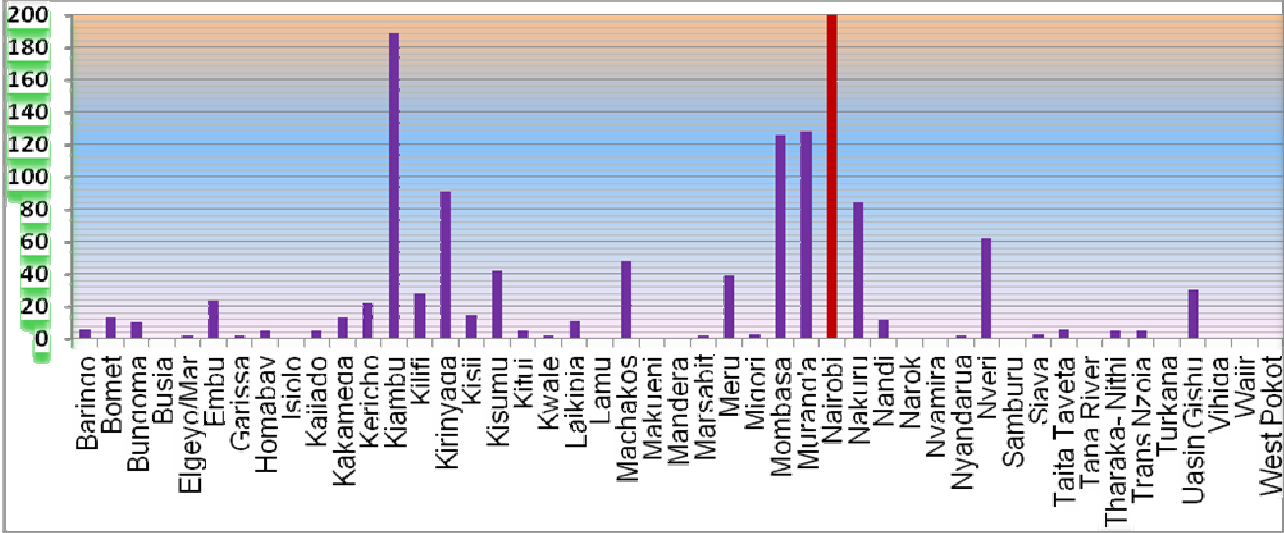
Figure 2- Percentage (%) distribution of MFs across Kenyan Counties



Source: By Author

Among the Counties that have not been able to attract even a single firm includes Tanariver, West Pokot, Samburu, Turkana, Wajir, Busia, Lamu and Isiolo. Nairobi County has the largest number of MFs with 1053 firms. Other Counties which have attracted over 50 MFs are Kiambu with 189 firms, Mombasa with 126 firms, Muranga with 128 firms, Kirinyaga with 91 firms, Nyeri with 62 firms and Nakuru with 84 firms. This is clearly shown in figure 3 below.

Figure 3: Number of MFs in every County



Source: By Author

Figure 3 above shows disparities on the MFs that exist among Kenyan Counties and yet the government uses devolution through Counties to tackle socio-economic problems.

1.1 Gaps in the Prevailing Kenya’s Industrial Policy Framework

According to NIPF (2011), industrial policies in Kenya have evolved through three distinct policy orientations starting with the import substitution policy that was embraced after independence in the year 1963. Thereafter an export led policy orientation and industrial development policies inspired by Structural Adjustment Programmes (SAPs) that dominated much of 1990s followed. Despite these efforts, uneven distribution of MFs still exists in Kenya.

However, in the late 2000’s new policy documents emerged. New industrial policies have tended to be based on the government priorities as spelt out in the three major policy documents namely: Economic Recovery Strategy (ERS) for Wealth and Employment Creation (2003-2007), the

Kenya Vision 2030, Sessional Paper No. 10 of 2012 on Kenya Vision 2030 and most recent the NIPF (2011-2015). Despite the implementation of the above mentioned policy documents huge variations in the number of MFs still exists. One common feature of both policy documents is the push for the growth of Industrial Manufacturing Clusters in Kenyan regions as a way of enhancing regional growth and employment; and as a prescription to reduction of variations in the number of MFs in Kenya's Counties.

1.2 Problem Statement

The primary aim of devolution in Kenya is to promote equitable social economic development and provide proximate, easily accessible services throughout Kenya (Constitution of Kenya, 2010). To achieve the objectives of devolution, Counties have been mandated to set their development agenda through handling a wide spectrum of functions geared towards addressing social economic challenges that affect them.

To tackle these challenges, Kenya's Vision 2030 prescribes the need to have a robust, diversified and competitive Manufacturing Sector that involves nurturing of region specific manufacturing clusters since different Kenyan regions are suitable for different types of manufacturing activities. However, despite this prescription, there continues to be huge variations and disparity in the number of MFs located in various Kenyan Counties as has shown in figure 2.

Therefore, the key concern is why should such huge variations in the number of MFs attracted across Kenyan Counties exist. It is equally puzzling that a quick analysis of the results for the manufacturing firm's census conducted in year 2009 reveals that eighty three (83) percent of the Counties have attracted less than the mean of forty four (44) MFs per County. Given that Counties are new units in Kenya, there is a knowledge gap on how various location characteristics may be impacting on the number of MFs attracted in a given County. It is therefore be critical to investigate factors that affect location of MFs in Kenyan Counties; as well as address the knowledge gap given that the growth of manufacturing sector is expected to tackle the problems of unemployment and poverty in all parts of the country.

1.2 Objectives of the Study

The main objective of this study is to determine factors that cause investor location variations in the across Kenyan Counties.

The specific objectives of the study are:

1. To analyze the relationship between locational decisions of MFs and County territorial characteristics in the investment set up of MFs among Kenyan Counties.
2. To determine how County location specific factors influence the number of MFs located in Kenyan Counties
3. To suggest policy recommendations for enhancing for enhancing the attraction and growth of MFs in Kenyan Counties.

1.3 Research Questions

This study strives to answer the following research questions:

1. How does County territorial characteristics influence MFs investments set ups in Kenya?
2. Is there a relationship between the number of MFs and County territorial characteristics in Kenya?
3. What is the relation between MFs locational decisions and County territorial characteristics in Kenya?

1.4 Justification of the study

Addressing unemployment and poverty is a national priority which requires urgent intervention measures (Kenya Vision 2030). Key among them is enhancing the growth of the Manufacturing Sector clusters in all Kenyan Counties. The growth of the sector is anchored on development of industrial enablers throughout the country. The enablers are to serve as seedbeds of Kenya's industrial takeoff; and ultimately propel the nation to be the preferred choice of basic manufactured goods in the international markets (Kenya Economic Report, 2013, NPIF 2011). Towards this end, it is important to diversify the number of MFs all over the Counties effectively examining the reasons which contribute to uneven distribution of the MFs. Consequently, this study seeks to investigate reasons for diverse variations and disparities in MFs in the advent of

devolution. It also seeks to bridge the knowledge gap that exists in the understanding of uneven distribution of MFs in Counties given that Counties are new units of administration in Kenya. The study also will contribute to research in the area of industrial location processes.

1.5 Organization of the study

This study is organized into five chapters, with Chapter One covering the background information, research problem and questions, objectives of the study and finally justification of the study. This is followed by Chapter Two which highlights theoretical literature, empirical literature and overview of literature. Chapter Three is on methodology covering conceptual framework, model specification, data type and sources. Later after gathering data and subsequently running analysis, Chapter Four highlight results and discussions followed by Chapter Five on conclusion and policy recommendations. References and appendix are covered in separate sections of the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

An industrial based economy displays the following features: an economic and institution that provides incentives for the efficient use of existing resources and the creation of new industries; entrepreneurial population that can enable and use available resources effectively; dynamic information on industrial enablers that facilitate investments; and efficient and innovative system comprising of manufacturing firms, science and research with think tanks that tap into the growing stock of local resources and assimilate them and adapt their usage towards fulfilling the local needs. This places counties collectively on a path of sustainable growth and development which will enhance beneficial integration into industrialization and the growth of the Manufacturing Sector at their levels.

The central role played by the National Government to facilitate the County Governments gives energy and the need for Counties to plan for a successful takeoff in building the manufacturing sector. Considering the diverse national resource and climatic environments in which industries operate, it is often necessary to complement an economy- wide analysis with a more spatially disaggregated one. Other types of spatial analysis include mapping poverty and food insecurity levels, both of which highlight areas of a country or region that requires prior attention.

2.1 Theoretical Literature

The theoretical approach focuses at an interaction between MFs and the territories in which these firms are located. The interactions can be local, regional or at national levels through different stages that a firm undergoes in its establishment.

According to Carton (1979 and 1983) and Bartik (1985) a firm passes through several stages, before being located at a specific locality. These stages could take place chronologically or achieved simultaneously, but they occur at the same time when the firm is created/located. The stages include: Decision about entering the market; Choice of firm's activity and technological and organizational level; choice of the area where the firm is going to be located.

Industrial location analysis is anchored in location theory which finds its roots in the works of Weber (1929), Isard (1956) and most recently by economic geographers and other scholars like Hayter (1997) and Combes *et al.* (2008) among others. According to Hayter (1997), the main theoretical approaches in regard to location theory are the classical, neoclassical, behavioral and institutional approaches (Hayter, 1997).

The four theoretical approaches are all applicable in location of a firm during the initial set up stages and also as the investor progress throughout his or her economic activities. For an investor to establish a firm at a specific location he or she should put in consideration factors of production, rationality for profits through information gathering and liaise with other economic agents for him or her to succeed in the investments.

According to Christaller (1966) and Hotelling, (1929) the Classical Location theory lays emphasis on access to markets, labor, transportation and raw materials as the key determinants of site selection; in understanding the role of production factors in the location decisions of manufacturing establishments. This implies that availability of factors of production leads to establishment of an industry. Further studies have found out that factors of production are not only the essential elements in establishment of a firm, but there exists more factors such as taxes, unionization, business climate and infrastructure which investors should focus on (Halstead and Deller 1997)

Under neoclassical theory, the decision setting involves rational agents choosing optimally a site among a set of finite alternatives. This implies that factors that attract firms in a given location are those affecting expected benefits derived from the decision to locate in a particular site and involves quantitative location characteristics such as land costs, transportation costs, agglomeration economies and human capital characteristics among others (Hayter, (1997), Arauzo and Manjon, (2011). The neoclassical approach is most related to classical location theory and centres its analysis on profit maximization and cost minimizing strategies.

The behavioral approach is distinguished from neoclassical approach since it calls into question the assumptions of rationality and perfect information arguing that firms have limited knowledge to take their location decisions in a world of uncertainty (Figuerendo et al 2002, Hayter, 1997,

Arauzo and Manjon, 2004). The behavioral approach therefore is concerned with internal factors like firms own circumstances e.g. firm size, age, entrepreneurial ability, relations with consumers, etc which can influence firm's location decisions (Figuerendo et al 2002, Hayter, 1997, Arauzo and Manjon , 2004). The behavioral approach deals with situations of imperfect information and uncertainty. The entrepreneur decision making process is based on non-economic factors.

Lastly, the institutional approach argues that firms are not isolated agents but operate within the framework having regional systems, governments, clients, competitors and other public policy institutions (Arauzo and Manjon, 2004 and 2011 and Hayter, 1997). Hence, these other institutions make decisions that potentially modify the attractiveness of sites. The institution approach maintains that in the location process, it is important to not only consider the firm that seeks a suitable location, but also the institution environment in that location. The institution environment includes: clients, suppliers, trade unions, other firms.

The above theoretical approaches concentrate so much on industrial location factors and locational territorial characteristics that make a firm to prefer investing in one location to another; this study endeavors to look at Kenyan Counties as a case study.

2.2 Empirical Literature.

Many researchers have analyzed the determinants of industrial locations using different tools. Some of these studies are discussed below.

A location model is used to provide a conceptual basis for specifying the manufacturing firm's establishment (Goetz, 1997; Henderson and McNamara, 1997 & 2000; Guimaraes *et al.*, 2004; Samik and Sanjoy, 2005 and Brown *et. al.*, 2009).

The locational model assumes that the general objective of the firm is to minimize cost and maximize on profits. The firm is organized according to its production processes and the production function is Leontief-type. Inputs used in the production process are assumed to be available in unlimited supply at given (fixed) prices independent of location. These inputs are either localized at a limited number of locations or universally available, either pure or weight-

losing materials; and which have a competitive price formation in the input markets, where by input prices are independent of production levels.

The model further assumes that the demand is fixed and concentrated at a limited number of known locations. There is competitive price formation given that prices at market are independent of production levels. Transport of the inputs is possible in any direction, and transport costs for materials or products are directly proportional to weight and distance, implying that in a flat plain and an absence of networks and distance, there is economies scale in transportation.

Weber (1929) found out that optimal location selection by a firm is a trade-off between transport costs of inputs to production facilities, and outputs to product markets. Further, according Isard (1956) and Hayter (1997), the ability of a given location to attract MFs depends on the characteristics of the location relative to the levels of the same characteristics in another location, an indication that the number of firms attracted in a given location may be consistent with location's comparative advantage. This means that for an investor to locate a firm in a certain geographical region, the decision is anchored on development of industrial enablers in that geographical area. The enablers are to serve as seedbeds of industrial takeoff; and ultimately propel the investor to prefer the location as his/her choice on the basis of factors such as land costs, transportation costs, agglomeration economies, human capital characteristics among others.

Therefore, location theory is concerned with the geographic location of economic activity and is often used as a framework for analyzing the firm's establishments in various locations and location decisions of manufacturing firms (Smith *et al.*, 1978; Barbosa *et al.*, 2004; Arauzo and Manjon 2007, Lambert and McNamara, 2008; Otsuka, 2008 and Brown *et al.*, 2009). Under location theory, various locations characteristics affect firm's establishments in those locations. As has been expounded in literature, location characteristics that attract MFs are enormous.

Mc Fadden (1974) used Conditional Logit Model in his study on the determinants of firm location. Applications of this model to the phenomenon of industrial location assume that profits differ between locations and that a firm decides on a location to maximize their profits. Carlton

(1979, 1983) used the same model in the analysis of location determinants in the United States metropolitan areas and concluded that location economies strongly influence a firm's decision. On consequent studies by Bartik (1985) using the same model he emphasized that the effects of unionization rates attracted foreign investments. These included variables such as access to markets, labour market conditions, taxes and promotional efforts.

In the context above, a firm passes through several stages before it locates to a certain territory. The study only concentrates on one stage, that's selecting the location. Some of the variables that attract influence the location of MFs includes infrastructural characteristics, input market characteristics, output market characteristics, labour characteristics and agglomeration economies (Badri, 2007; Arauzo and Manjon, 2004 and 2007; Basile, 2004; Cieslik, 2005; Samik and Sanjoy, 2005; Guimaraes *et. al.*, 2004 and Holl, 2004a).

Infrastructural characteristics includes cost of various means of transport, availability and cost of various means of communication, availability and cost of warehousing and storage facilities, accessibility and cost of electric power, accessibility and cost of water and availability of financial institutions and related financial costs. Input market characteristics include proximity, cost and size of raw materials and availability and cost of land. Output market characteristics are size of output market, distance and cost of transportation to the output market, preferences and potentiality for future expansion of output market. Labour characteristics are availability of labour, cost and skills of the labour force while agglomeration economies comprises of urbanization and localization economies.

Loveridge and Nizalov (2007) in their study on distribution of the firms in the construction sector and distribution of employment across the business size classes in the United States of America Counties; used Regression Analysis Model to estimate a panel of U.S, County level data from 1988 to 2000, and twelve annual observations. They also explored the implications of the distribution of firm sizes on economic growth for three multistate cultural zones that carry particular policy interest. The study found out that high poverty regions have distinct cultures, and historically poor development outcomes. The study also found out that the borderlands area that are composed of counties near the border with Mexico, where the modal response of 2000 Census ethnicity question indicated Hispanic descent. The area's economy was characterized by

low skill manufacturing, extensive agriculture and natural resource extraction, and it serves as a first stop for immigrants from Latin America.

Joes Maria Arauzo (2000) has used both Conditional Logit and Poisson model in his study on industrial location determinants, an application for Catalan Municipalities, to identify location patterns of firms. In his study the main source of data was Spanish Industrial Establishments Register, which has micro data for plant level for creation and location of new industrial establishments. The study revealed that the characteristics of each territory have an important influence on the location decisions of industrial establishments, which differ in each of the sectors considered. Such territorial characteristics and activities included: intensity of land use, use of energetic inputs, human capital requirements, which require a specific environment that is provided in a different way by each type of city. In other words the resources available in a big city were not the same as those in a smaller one.

The conditional logit model is a quite commonly used specifications in the industrial location literature. The point of departure is that for any establishment that wants to enter into a market, the profit function depends (partially) on his future location. That is, the entrant's establishment will choose its location in order to maximize profits, because profits are different in each location. Industrial location phenomenon is analyzed from location decisions. This means that an interaction between firms and their territories in which these firms are located are greater at the local levels rather than at regional or at national level.

In the study the Poisson model was used when the dependant variable was a count variable (the number of times that an industrial firm locates in a municipality). The number of alternatives in a conditional logit model equals the number of observations in a Poisson model. This implies that increasing alternative locations when we analyze the phenomenal at local level is not a problem. Another advantage of Poisson models is that nil observations do not imply modelisation problems unlike what happens with conditional logit models.

In regard to the choice of models used in industrial location, the study will use the Poisson Model because it is consistent with the idea of firms choosing optimal locations subject to standard constraints.

2.3 Overview of literature

According to the theoretical approaches discussed above, location determinants are different. For the neoclassical approach, firms make their location decisions by considering territorial characteristics that affect profits, such as transportation costs, labor costs and external economies. For the behavioral approach, firms make their location decisions by considering the personal aspects of entrepreneur and dealing with limited information mainly from nearby locations (Hayter, 1997, Arauzo and Manjon, 2011).

For the institutional approach, location decisions depend upon environmental characteristics such as wages, unionization, tax regulations, markets and network of cooperation. Territorial industrial location analysis varies significantly according to the territorial levels that are used in location manufacturing firms (Hayter, 1997, Arauzo and Manjon, 2011). In the perspective of the above theoretical approaches, there are both advantages and disadvantages of an industrial performance at any territorial level.

The above four theoretical approaches make a conclusion that location determinants vary according to the territorial level used in the analysis and conclude that the level at which an industrial establishment is made also affects performance and should be carefully selected.

The use of the standard Poisson regression model is justified on the grounds of the equivalence relation between the likelihood function of the conditional logit and the Poisson regression, which in practice means that the coefficients of the conditional logit model can be equivalently, estimated using a Poisson regression.

Poisson model is used when the dependent variable is a count. This implies that the model applies when increasing alternative locations when analyzing a phenomenon. When there is nil observation of a variable in a phenomenon it does not imply modelisation problems unlike conditional logit models.

CHAPTER THREE

RESEARCH METHODOLOGY

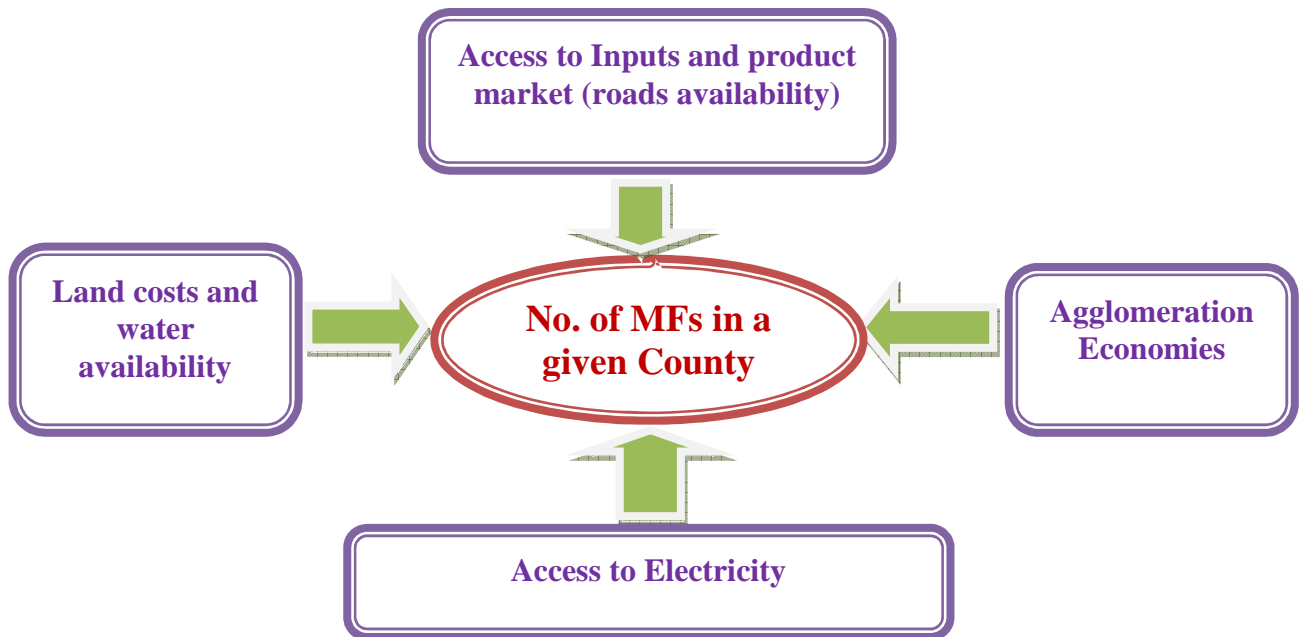
3.0 Introduction

This chapter provides a systematic description of the conceptual framework and research methodology that the study will use to answer questions described in chapter one of this research project. The methodology outlines on the empirical model specification, econometric specification, variable measurements data type and sources.

3.1 Conceptual Framework

The conceptual framework uses existing literature on industrial location by discussing the territorial levels that are used in location analysis. It explains how access to inputs and product market, land costs and water, agglomeration economies and insecurity level affect industrial location. However, this paper has conceptualized the following characteristics as to affect the number of MFs attracted in Kenyan Counties. The justification for their choice is elaborated in figure 4 below.

Figure 4: Conceptual Framework on Determinants of Industrial Location



Source: By Author

The conceptual framework analysis territorial variables affect the number of MFs located in a given county. This means that territorial variables such as access to input such as product market, roads availability, agglomeration economies, land costs and water availability and insecurity level may affect MFs location decisions.

3.1.1 Number of MFs

Number of MFs in a geographical location affects market competition in three broad ways that are reflected as follows: increasing the current (static) productivity of constituent firms or industries; increasing the capacity of cluster participants for innovation and productivity growth; and stimulating new business formation that supports innovation and expands the cluster.

No. of firms in a specific region can be explained by globalization of markets, technology, and supply sources; easier mobility; and lower transportation and communication costs. The nature of economies of agglomeration has shifted toward the cluster level and away from either narrower industries or urban areas. Location within a cluster can provide superior or lower cost access to specialized inputs such as water, electricity, agglomeration and roads connectivity. Given the inherent benefits of clusters, however, forces encouraging local supplier development and upgrading are strong, and constituent firms have an incentive to encourage entry of new suppliers or local investments by distant suppliers (Porter, Michael E. Economic 2000). The cluster of MFs that the study has used is illustrated in appendix 1.

3.1.2 Agglomeration Economies

In relation to agglomeration economies, focus on MFs per square area has been adopted by Rosenthal and Strange (2003), Figueiredo, et al., (2002), Bartic (1989) and Guimaraes (2004). Lambert *et al.*, (2009) where they divided the number of MFs with total number of business establishments in a County while Lambert et al. (2006) used the percentage of those employed in MFs per County in the analysis of how agglomeration economies affect a firm's location.

Cieslik (2005), used number of MFs while Akihiro (2008) and Henderson (2000) measured agglomeration economies by the number of MFs in a region divided by regional population. Finally, Arauzo and Manjon (2011) used number of workers in the industrial sector divided by area.

3.1.3 Roads Availability

In regard to roads availability, Cieslik and Ryan (2005) and Fernandez and Sharma (2012) used total length of the roads while Coughlin *et. al.*, used road length divided by area. In terms of empirical results, availability of road infrastructure has been found to influence firm's location decisions.

3.1.4 Cost of Land

In regard to measuring the cost of land, Figuerendo et al., (2002) used population density, Lambert & McNamara. (2009) used County area, while McNamara & Kriesel (1991) used price per acre of land. Muluvi, A. S (2011) used choice variable to proxy access to land as a factor under business environment. This has made land availability an essential factor to influence firm's location decisions.

3.1.5 Access to Electricity

The availability of electricity can drive a country's growth by allowing firms to take advantage of productivity enhancing technologies, the bulk of which are reliant on electricity (World Bank, 2011). Access to electricity is measured by looking at the ability to avail electricity that is adequate, available when needed, reliable, affordable, convenient, safe, for all required energy services across household (World Bank, 2014).

3.2 Research Methodology

3.2.1 Empirical Model Specification

This study borrows Poisson model used in a study undertaken by Maria Arauzo Carod, (2004) on Determinants of Industrial Location, An application for Catalan Municipalities. The aim of the study was to find out the main determinants of industrial location processes. He used local data (for Catalan municipalities) so as to better portray phenomena such as agglomeration economies (normally studied at a regional or national level). Both conditional logit model and Poisson model were used to identify location patterns of firms, and new industrial locational establishments. Although in his study Maria Arauzo Carod used both conditional logit model and Poisson model to identify location patterns of firms, and new industrial locational establishments; this study will endeavour to use Poisson model alone. Preference on Poisson model is due to aforesaid reasons mainly that it does not imply modelisation problems when

there is nil observations of a variable in a phenomenon. More so, it is able to cover analysis of this study with our dependent variable being count.

As indicated by Green (1998), the Poisson model is used when the dependent variable is a count variable (here the number of times that a firm locates in a County). Poisson model on industrial location analysis is illustrated in the study by considering two possible situations Guimaraes et al. (2000b) consider two possible situations:

1. Entrant decisions are formulated according to a vector of territorial variables shared by all entrants ($\sum z_{ij} = \sum z_i$).

Where z is a Vector representing territorial variables in a Count, i represent the firm that has taken the entrant decision in to a county, while j is the County where the firm has entered. This means that the territorial variable of a specific county will affect the number of manufacturing firms located in that county.

2. Entrant decisions are formulated according to a vector of territorial variables shared by group of entrants ($\sum z_{ij} = \sum z_{ig}$ for $g = 1, 2, \dots, G$). Where G denotes the number of groups). The number of firms located in a specific county can be firms that produce similar products or not depending on territorial variables which also affect their core business function and groupings.

In line with the first situation, site characteristics affect equally all the entrants, without distinguishing them. Therefore, the entrant establishments are homogeneous, because we are not considering specific characteristics of them.

In line with the second situation, different groups of entrants (G) are also affected in a different way by location characteristics. Grouping could be made by several criteria, like date of location, activity of the establishment or its size among others. By this way the study establishes entrant establishments' heterogeneity.

Considering that firms decide the County where they begin their activity following profits criterion (expected profits are not neutral to location). If we follow Guimaraes *et al* (2000a)

methodology, an industrial establishment i that attempts to be located in a County in Kenya should choose among the 47 Counties.

When this establishment i locates in a County j it reaches a profit level π_{ij} , which includes a deterministic term U_{ij} and a stochastic term ϵ_{ij} . Formally:

$$\pi_{ij} = U_{ij} + \epsilon_{ij} \quad (1)$$

The deterministic term U_{ij} takes care of all the variables that firms cannot be able to control and yet they affect the location and the profit made by that firm in a given county. The stochastic term takes care of other variables that affect the profit made by a firm located in a given county. Hence a firm will choose a location where it will make much profit bringing us to equation (2) below.

Hence, firm i will choose location j if:

$$\pi_{ij} > \pi_{ik}, \quad \forall k, k \neq j \quad (2)$$

This leads us to equation (3) where by the stochastic nature of the profit function implies that the probability that location j is selected by firm i equals

$$P(Y_i = j) = \text{Prob}(\pi_{ij} > \pi_{ik}) \quad \forall k, k \neq j \quad (3)$$

(Note that Y_i is a random variable that shows the selection made):

The same equation (3) can be written in another way bring us to equation (4) as follows: Each variable y_i is a random variable with Poisson distribution and with λ_i parameter (related to regressors x_i): λ_i can also relate to county characteristics.

$$P(Y_i = y_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!} \quad y_i = 0, 1, 2, \dots \quad (4)$$

y_i =The probability of a specific County characteristic to attract a firm in the County

λ_i =Parameter=Mean of specific firms being located in a County

Making equation (4) to be linear we introduce the $\ln \lambda_i$ hence bring us to equation (5)

Where most common representation of λ_i is:

$$\ln \lambda_i = \beta' x_i \quad (5)$$

Note that $\beta' x_i$ is a matrix given that it is similar to any other steps of finding OLS coefficients that requires the multiplication of β s with the independent variables i.e. Xs.

Awaited events are:

$$E[y_i|x_i] = Var[y_i|x_i] = \lambda_i = e^{\beta' x_i} \quad (6)$$

Equation (6) comes from finding the natural logarithm of equation (5). Equation (6) also has similar variance and expected value since tenets of Poisson model take the two as equal.

If we find the partial derivative of the expected value of λ_i then the equation is written as shown in equation 7

Hence:

$$\frac{\partial E[y_i|x_i]}{\partial x_i} = \lambda_i \beta \quad (7)$$

Now we consider that deterministic term (U_{ij}) of profit function (Equation 1) is a linear combination of m variables linked to location j :

$$U_j = \beta_1 X_j^1 + \beta_2 X_j^2 + \dots + \beta_m X_j^m \quad (8)$$

Selection of variables in equation (2) has been made in accordance with criteria of statistic availability and economic relevance, considering those are variables supposed to influence firm's profit level.

3.2.2 Econometric specification

Departing from previous considerations, we use two econometric specifications:

1. A Poisson model in which site vector of variables affects equally all entrants (Guimarães *et al.*, 2000b: situation 1).
2. A Poisson model in which site vector of variables affects entrants in a different way according to their characteristics (here, the characteristics measured are sectorⁱ and size of these establishments) (Guimarães *et al.*, 2000b: situation 2).

Relating to the first (Poisson for all entrants) and second specification's (Poisson for entrants grouped):

$$\log[E(y|x_1, x_2, \dots, x_k)] = \beta_0 + \beta_1 \text{ElectricityAccess}_j + \beta_2 \text{Agglomeration}_j + \beta_3 \text{Wateraccess}_j + \beta_4 \text{roadsavailability}_j + \beta_5 \text{Costofland}_j + \epsilon_j$$

(9)

The independent variables have been described in details in table 1 below, including their, measurements expected signs and justification for their use.

Equation 9 can also be written as shown in equation 10 to make it more linear.

$$Y = \beta_0 + \beta_1 X_{1j} + \beta_2 X_{2j} + \beta_3 X_{3j} + \beta_4 X_{4j} + \beta_5 X_{5j} + \epsilon_j \quad (10)$$

$Y = \text{Log} \{E(y/x_1, x_2, x_3, \dots, x_k)\}$ which is a natural logarithm

$X_1 = \text{Access to Electricity } j$

$X_2 = \text{Agglomeration } j$

$X_3 = \text{Water access } j$

$X_4 = \text{Roads availability } j$

$X_5 = \text{Cost of land } j$

$\epsilon_j = \text{error term } j$

$j = \text{is the favourable location for the firm}$

β_0, \dots, β_5 are the coefficients of the parameters.

Table 1: Variable Measurements

Variables	Measurement	Hypotheses & Expected sign	Justification for the choice of variable and the measurement adopted
Number of Manufacturing Firms	Location decisions and the territory's influence on firm's performance and location patterns (Aurazo 2004). Territories influence the economic activities that occur	H_0 : Log of Total MF is positive on all variables H_1 : Log of Total MF is not positive on all variables	The Number of Firms is the Dependent Variable. No. of firms in a specific region can be explained by globalization of markets, technology, and supply sources; easier mobility; and lower

	<p>within different locations. These activities have specific characteristics (intensity of land use, Access to Electricity, Agglomeration Economics and Water Availability requirements).</p>	<p><i>The expected sign is positive</i></p>	<p>transportation and communication costs. The nature of economies of agglomeration has shifted toward the cluster level and away from either narrower industries or urban areas. Location within a cluster can provide superior or lower cost access to specialized inputs such as water, electricity, agglomeration and roads connectivity (see appendix 1). Given the inherent benefits of clusters, however, forces encouraging local supplier development and upgrading are strong, and constituent firms have an incentive to encourage entry of new suppliers or local investments by distant suppliers. (Porter, Michael E. Economic 2000)</p>
<p>Access to Electricity- County Percentage of Households that Access Electricity</p>	<p>Percentage of the Households that have Access to Electricity</p>	<p>H₀: Access to electricity positively affects Total MFs H₁: Access to electricity does not positively affect Total MFs</p>	<p>According to KNBS (2010) Census of Industrial Production, unfavorable business environment including lack of access to electricity affects the manufacturing sector. According to a survey by the World Bank Enterprise, firms across the globe consider getting electricity to be amongst the biggest obstacles to their business. Not only can an unreliable electricity supply be</p>

		<i>The expected sign is positive</i>	<p>costly, it is also harmful to productivity.</p> <p>Problems with electricity supply negatively impacts the productivity of firms and the investments they make in their productive capacity.</p>
AGGLOMERATION- <i>agglomeration economies</i>	Percentage Urban Population	<p>H₀: <i>Agglomeration positively affects Total MFs</i></p> <p>H₁: <i>Agglomeration does not positively affect Total MFs</i></p>	<p>Agglomeration is the accumulation of business activity in and around a specific geographic area whose benefits includes access to external services at a lower cost (Cohen and Paul, 2005; Henderson and McNamara, 1997). Agglomeration economies can be measured through density productivity where you can compare wages and population density especially in areas where they are high such as urban centres. Wages, therefore, can be interpreted as telling us about the core determinants of urban productivity, and high wages in an area are usually interpreted as meaning that the area is unusually productive (Ciccone and Hall 1996).</p>
		<i>The expected sign is positive</i>	

<p>WATER ACCESS- water accessibility</p>	<p>Percentage households with access to improved water</p>	<p>H_0: Water Access positively affects Total MFs</p> <p>H_1: Water Access does not positively affect Total MFs</p>	<p>Given that among Kenyan industries, agro-processing has the largest share probably due to ample supply of raw materials from the expansive agricultural sector(GOK, 2011), and given that sustainable agricultural production in Kenya is primarily anchored on availability of water , then estimating the effect of this variable is of great importance. It is also critical to note that agricultural issues will be handled by County governments (Constitution of Kenya, 2010). The assumption is that the higher the densities for the households with access to improved water in a given County, the more the likelihood that that County has a larger access to water (water area coverage in KM²) for industrial use as compared to another County whose density is low.</p>
		<p>The expected sign is positive</p>	

<p>COST OF LAND- <i>cost of land</i></p>	<p>Population Density</p>	<p>H_0: <i>Cost of land positively affects Total MFs</i></p> <p>H_1: <i>Cost of land does not positively affect Total MFs</i></p> <hr/> <p><i>The expected sign is positive</i></p>	<p>Land, in an economic sense, is defined as the entire material universe outside of people themselves and the products of people. It includes all natural resources, materials, airwaves, as well as the ground. Firms search for sites where land costs are relatively lower (Bartic, 1985) so that they can acquire more space for current projects and future expansions (Henderson and McNamara, 1997 and Coughlin et al., 1991). Land value can be thought of as the relationship between a desired location and a potential user. The ingredients that constitute land value are utility, scarcity and desirability. These factors must all be present for land to have value hence measure the cost of land.</p>
<p>ROADS AVAILABILITY- <i>roads availability</i></p>	<p>Percentage number of Paved roads (total roads in the County).</p>	<p>H_0:<i>Road availability positively affects Total MFs</i></p> <p>H_1:<i>Road availability does not positively affect Total MFs</i></p>	<p>Lack of roads may lead to high costs in access to input market and product market. Road infrastructure encourages plant locations by creating access to factor and product markets (GOK, 2007 and Lambert and McNamara, 2009). The measurement adopted concurs with Cieslik and Ryan (2005) and</p>

		<i>The expected sign is positive</i>	Fernandez and Sharma (2012) that the following factors should be considered for you to measure availability of roads. They include: Road standard and condition, road signs, traffic conditions and congestions, regulations and maintenance. If they exist standard roads exist for industrial operations (Paved Roads)
--	--	--------------------------------------	--

3.3 Diagnostic tests

Diagnostic tests are used to check the linear regression assumptions and in our case, our linear regression model is estimated by OLS though in Poisson form and hence there is need to ascertain whether any of the assumptions required for OLS to be the best linear unbiased estimator (BLUE) are violated. These assumptions include the expectation that the model is linear, the expected value of the error term is zero, the variance of the error term is constant across all observations (homoscedasticity) and that the error term is normally distributed. Diagnostic testing plays a serious part in model evaluation, these include; normality test for the distribution of the residuals, the white test for Heteroscedastic errors and test for multicollinearity.

3.3.1 Normality Test

This study used Shapiro-Wilk W test to test for the normality of the variables used in the study. The null-hypothesis of this test is that the population is normally distributed. Thus if the p-value is less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population. In other words, the data are not normal. On the contrary, if the p-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected. In other words the value above 0.05 indicates normality, if the test is significant (less than), then the variable is non-normal.

3.3.2 Test for Heteroscedasticity

Heteroscedasticity is the tendency of having different variances for disturbance terms other than a uniform one i.e. a case of homoscedasticity (Gujarati, 2004). Hence, this problem violets one Classical Linear Regression assumption and lack of correction is likely to make estimators inefficient thereby adversely affecting inference. In order to detect heteroscedasticity, this study suggests the use of White's General Test whose procedure is as described below as per (Gujarati, 2004).

Begin with the null and alternative assumption where the former assumes that homoscedasticity exists (no heteroscedasticity) while the latter assumes heteroscedasticity exists. Hence, with an equation synonymous to equation (10), first estimate it and obtain its residuals ϵ_j . Then in the second step, run an auxiliary regression. This means that we run the squared residuals from the original regression are regressed on the original X variables or regressors, their squared values, and the cross product(s) of the regressors. Higher powers of regressors can also be introduced. Note that there is a constant term in this equation even though the original regression may or may not contain it. Then obtain the R^2 from this auxiliary equation. A depiction of this can be reviewed from equation (11) as follows:

$$\epsilon_j^2 = \beta_0 + \beta_1 X_{1j} + \beta_2 X_{2j} + \beta_3 X_{3j} + \beta_4 X_{4j} + \beta_5 X_{5j} + \beta_6 X_{6j} + \beta_1 X_{1j}^2 + \beta_2 X_{2j}^2 + \beta_3 X_{3j}^2 + \beta_4 X_{4j}^2 + \beta_5 X_{5j}^2 + \beta_6 X_{6j}^2 + v_j$$

(11)

The next step assumes that the product of the sample size (n) and the R^2 value follow a chi-square distribution with degrees of freedom equal to the number of regressors in the auxiliary regression though the constant term is not included.

Afterwards, a conclusion is made whereby if the calculated chi-square value exceeds the critical value, heteroscedasticity exists and on the contrary if the calculated value is lower than the critical value, heteroscedasticity does not exist.

However, it is vital to note that this study will use both STATA and GRETL software where the latter can execute this test directly.

3.3.3 Test for Multicollinearity

Multicollinearity like Heteroscedasticity is a violation of Classical Linear Regression assumption that no perfect or exact linear relationship exists between explanatory variables (Gujarati, 2004). Conceivably the importance of addressing the problem of multicollinearity is because its presence regression coefficients unstable coupled with large standard errors which means that coefficients cannot be estimated with utmost accuracy (Gujarati, 2004).

There are several measures that have been established as determinants of the presence of multicollinearity. This study will seek to use a simple criteria advocated by (Gujarati, 2004) It is taken that using STATA, one can run a Poisson regression (appropriate in our case) then input an appropriate command to get values for Variance Inflation Factor (VIF) and its Tolerance represented by $1/VIF$. The latter is often used to determine the degree of collinearity. The rule of the thumb is that variables whose VIF values are greater than 10 warrant further investigation for multicollinearity and synonymously a tolerance of less than 0.1 calls for further analysis.

In the event that an independent variable is found to have a linear relationship with another (others), this study seeks to use the remedy of dropping the variable until the remaining variables have no collinearity as suggested by (Gujarati, 2004).

3.3.4 Data Type and Sources

The study will draw data from secondary sources of information. Data collected will be both quantitative and qualitative in nature. Inference statistics will also be considered to test the relationship between independent and dependent variables. The study will use cross-sectional data gathered from various sources as elaborated in Table 2.

Table 2: Data Sources

Variable	Data source and year
Manufacturing firms	KNBS (Manufacturing Firm's Census, 2010)
Access to Electricity	KNBS (National Population and Housing Census, 2009)
Agglomeration	KNBS (National Population and Housing Census, 2009)
Water availability	KNBS (National Population and Housing Census, 2009)
Roads availability	KNBS (National Population and Housing Census, 2009)
Cost of land	KNBS (National Population and Housing Census, 2009)

CHAPTER FOUR
DATA ANALYSIS AND RESULTS

This chapter is divided into two parts. The first section contains descriptive statistics while the second section outlines the results of the tests for heteroscedasticity and multicollinearity.

4.1 Descriptive statistics

The table below shows the summary statistics of the variables used in the study. It is significant to note that Nairobi County was dropped making counties 46 other than 47 because it acted as an outlier.

Table 3: Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Manufacturing firms (%)	46	1.121708	1.894322	0	9.147425
Cost of land (%)	46	2.079901	1.082844	.2738742	4.47916
Agglomeration (%)	46	24.04783	17.03567	6.6	100
Water availability (%)	46	63.42826	15.13958	33.6	89.3
Roads availability (%)	46	6.845652	5.31784	0	28.6
Access to Electricity (%)	46	12.9587	12.48153	2.4	59

The mean of manufacturing firms in 46 counties is approximately 1% per county with the highest number of firms in a county being about 9% while some counties lack manufacturing firms. The cost of land on average ranks at 2.079901% with the highest level being 4.47916% while the least being 0.2738742%. Agglomeration on average ranks at 24.04783% with the maximum value being 100% while the least value is 6.6%. In the same line, water availability among the 46 counties ranks at 63.42826% with a standard deviation of 15.13958. Further analysis shows that the maximum value is 89.3% while the minimum value is 33.6%. Availability of roads tiers at 6.845652% on average coupled with a 5.31784% standard deviation level. In addition, some counties recorded no road accessibility while the highest accounted for 28.6%. Access to electricity had a mean of 12.9587% in the 46 counties with the highest county registering 59% of the same variable while the lowest ranked at 2.4%.

4.2 Normality Test

Table 4: Shapiro-Wilk W test for normal data

Variable	Observation	W	V	z	Prob>z
Manufacturing firms (%)	46	0.61766	16.843	5.993	0.00000
Cost of land (%)	46	0.94272	2.523	1.964	0.02476
Agglomeration (%)	46	0.74892	11.061	5.100	0.00000
Water availability (%)	46	0.96582	1.506	0.868	0.19264
Roads availability (%)	46	0.85215	6.513	3.977	0.00003
Access to Electricity (%)	46	0.74192	11.369	5.159	0.00000

From the table (4), it can be deduced that only water accessibility is normally distributed since its p-value is greater than 0.05. Other variables are not normally distributed following the criteria explained in Chapter 3.

4.3 Test for Heteroscedasticity

Executing a Whites General Test as an investigation of existence of heteroscedasticity using GRETL software gives the following results:

Table 5: Whites test results

	Coefficient	t-ratio	p-value
Constant	-1.03982	-0.1640	0.8707
Cost of land	1.20492	0.7478	0.4596
Agglomeration	0.0306037	0.2502	0.8039
Water availability	0.0113291	0.05218	0.9587
Roads availability	0.0271299	0.09074	0.9282
Access to Electricity	0.130294	0.9017	0.3734
Square of Cost of land	-0.247816	-0.7623	0.4510

Square of Agglomeration	-0.00177981	-0.9684	0.3395
Square of Water availability	-0.000361832	-0.2069	0.8373
Square of Roads availability	0.000787419	0.04328	0.9657
Square of Access to Electricity	0.00200184	0.6780	0.5022
Unadjusted R-squared = 0.319850			N=46
Test statistic: $TR^2 = 14.713109$, with p-value = $P(\text{Chi-square}(10) > 14.713109) = 0.142877$			

As explained in previous chapter, the point of concern when testing for heteroscedasticity is the value of the chi-square calculated vis-a-vis that the critical value. From table 5, it can be concluded that there is no heteroscedasticity in our model given the chi-square calculated value (14.713109) is less than the critical value (18.307) at 5% significance level. This in turn indicates that our model is reliable.

4.4 Test for Multicollinearity

Results for the Variance Inflation Factor (VIF) and its Tolerance ($1/VIF$) indicate that there is collinearity between agglomeration and other variables (refer to table 6).

Table 6: First Test for Multicollinearity

Variable	VIF	1/VIF
Agglomeration (%)	12.06	0.082893
Access to Electricity (%)	7.00	0.142799
Water access (%)	5.92	0.168885
Cost of land (%)	4.65	0.215077
Roads availability (%)	4.22	0.236922
Mean VIF	6.77	

From the table above, it can be noted that agglomeration is correlated with other variables given its VIF value is above 10 as opposed to other variables which agree with the rule of the thumb. Hence, as earlier suggested, this study seeks to drop agglomeration and running the test again as shown in table 7 below:

Table 7: Second Test for Multicollinearity

Variable	VIF	1/VIF
Water access (%)	5.21	0.192083
Cost of land (%)	4.65	0.215119
Roads availability (%)	3.63	0.275759
Access to Electricity (%)	3.30	0.303396
Mean VIF	4.19	

Table (7) shows that there is no correlation between the variables hence regressing them will give credible results. However before doing so, we can deduce expected relations between variables from the correlation results below.

4.3 Correlation Results

Table 8: Correlation table

	Total MFs (%)	Cost of land (%)	Water availability (%)	Roads availability (%)	Access to Electricity (%)
Total MFs (%)	1.0000				
Cost of land (%)	0.4453	1.0000			
Water availability (%)	0.1142	0.0995	1.0000		
Roads availability (%)	0.5525	0.2071	0.0205	1.0000	
Access to Electricity (%)	0.7566	0.2421	0.3671	0.5490	1.0000

Correlation results from table (8) indicate that all variables are positively related with total MFs though with a difference in their magnitudes. Access to electricity and road availability rank as the top two with 0.7566 and 0.5525 respectively while water availability is the mildest at 0.1142.

This minor effect of water extends to other variables perhaps suggesting that water availability is not a top priority when considering location for MFs. In general, access to electricity has a wide-spread effect on location gauging from its relation with other variables for instance with road availability at 0.5490.

4.4 Poisson Regression Results

Running a Poisson regression in line with equation (10) gives results as follows:

Table 9: Poisson Regression

Log Total MFs (%)	Coefficient	z	P>z	[95% Confidence Interval]	
Cost of land (%)	0.4087029	2.82	0.005	.1242356	.6931701
Water access (%)	-0.0245672	-1.78	0.075	-.0516418	.0025074
Roads availability (%)	0.0108855	0.34	0.731	-.0512149	.072986
Access to Electricity (%)	0.0479689	3.16	0.002	.0182248	.0777129
Constant	-0.3348164	-0.39	0.693	-1.999597	1.329965
Number of observations=46			Probability > chi2=0.000		
LR chi2(4)=61.39			Pseudo R-squared= 0.3794		
Log likelihood= -50.21174			$\chi^2_{(4,0.05)} = 9.488$		Z critical=1.65

This in equation form can be as follows:

$$\text{LogTotalMFs} = -0.3348164 + 0.0479689\text{ElectricityAccess}_j - 0.0245672\text{WaterAccess}_j + 0.0108855\text{roadavailability}_j + 0.4087029\text{Costofland}_j$$

(12)

4.5 Discussion of regression results

In general, the likelihood of locating a MF holding determining factors constant is negative with a magnitude of 0.3348164. This can be eluded as an indicator for the need of pull factors for investors to enter counties failure to which incidence of investment is null and void. However on its own, it is insignificant as the Z-calculated value (|0.39|) is less than the critical value (1.65) at 5% significance level.

Electricity access on the other hand impacts MFs positively as a unit increase in electricity access increases likelihood of establishing MFs in a region by about 4.8% percent. Additionally, the Z-test shows that electricity access is a significant determinant of location given the Z-calculated value (3.16) surpasses the critical value of 1.65 at 5% significance level.

Water access contradicts aforementioned prediction by indicating that it had a negative impact on location of MFs. It shows that a unit increase in water access decreases location of MFs by about 2.5%. Nevertheless, the Z-test proves it to be trivial as the calculated value (|1.78|) is less than the trivial value of 1.65 at 5% significance level.

In agreement with aforesaid prediction, availability of roads positively impacts location of MFs in that a unit increases in paved road availability increases location of MFs by about 1%. However, it is not a significant determinant of location of MFs as per the Z-test given the calculated value of 0.34 is less than the critical value of 1.65 at 5% level of significance.

The cost of land which as per definitions in the previous chapter includes all resources and utilities therein has a positive relationship with location of MFs. To be specific, a unit increase in cost of land increases likelihood of MFs location by 40.9%. Furthermore, it is a significant variable from the Z-test as the calculated value (2.82) exceeds the critical value at 5% significance level. This basically shows the influence of land in decision making of potential investors.

Also critical to mention is that all this model is significant from the LR $\chi^2(4) = 61.39$ value which exceeds the critical value of 9.488 at 5% significance level. Equally, the fact that Probability $> \chi^2 = 0.000$ reiterates the significance of this model as the p-value is less than 0.05 which is our significance level.

CHAPETR FIVE

CONCLUSION AND POLICY RECOMMENDATION, LIMITATION OF THE STUDY AND AREAS FOR FURTHER RESEARCH

5.1 Conclusion

This study sought to determine the pull factors for MFs among 46 counties in Kenya less Nairobi. So far from the results in the preceding chapter, cost of land and access to electricity act as the overriding factors as far as location of MFs is concerned. However, what might be taken as astonishing is the realization of the negative and insignificant influence of water access. Perhaps an explanation for this could be that firms are able to strive and drill water for their production or pre-empt that they must establish in counties with a large water base which makes water access trivial as far as location is concerned.

Furthermore, these results suggest that the significance of cost of land and electricity access is in tandem with the tenets of location theory and partly neoclassical theory. Moreover, it depicts the place of natural utilities and infrastructure in determining a firm's location. Empirically, studies in the US and Spain by Loveridge and Nizalov (2007) and Joes Maria Arauzo (2000) respectively point to related factors that need to be given top tier priority. It is for this that the study proposes the following policy recommendations.

5.2 Suggested Policy Recommendations

Attracting MFs is critical for industrial sector development and growth in Kenya. It is important to consider industrial enablers that act as seedbeds of Kenya's industrial takeoff. This can only happen if Counties position themselves to be preferred industrial destinations. Consequently, Counties should consider improving the following critical areas.

i). Land availability and accessibility

Since it is unlikely that land costs will reduce, the County Governments should consider leasing of land to MFs at a lower cost as an incentive. This will enable MFs to locate in Counties exhibiting more flexibility on land availability at a subsidized cost. Further, County Government should consider reducing land transaction costs associated with unclear and/ or bureaucratic acquisition procedures.

ii). Access to Electricity

Rural electrification should be encouraged, especially in most of the Counties which are still rural in nature. Electricity can be supplied to such areas through small scale auto generation, local independent grids, or a central regional or national grid (Cecelski and Glatt, 2009). Electricity is the backbone of industrial development of any county and is associated with provision of numerous services to people which directly enhances the quality and quantity of life through different economic activities undertaken in an area.

iii). Water availability

Given that 48.83 percent of most of MFs in Kenya are involved in agro-based processing (KNBS, 2010) and that sustainable agricultural production in Kenya is primarily anchored on availability of water (KNBS, 2012), then increasing water access in counties will go a long way in supporting agro-based processing industries. This can be done by ensuring that Water Service Providers (WSPs) supply industrial water at subsidized rates. In areas where such WSPs are inadequately covered, MFs can also be allowed to directly tap industrial water from sources within the counties. Further, counties can fund projects involving water-piping, drilling of boreholes and construction of dams.

iii). Agglomeration economics and establishment of industrial parks

County governments should support locations where firms have agglomerated through infrastructural support in order to further reduce firm's operating costs. Provision of external services to existing firms and other investments should be supported preferably at a subsidized cost. Also, designating special sites and providing infrastructural support will attract firms agglomerate around such sites.

Given that Counties have been mandated to handle trade issues and county planning (Constitution of Kenya 2010), they should purpose to develop industrial parks as models resembling Export Processing Zones (EPZs) and/ or Special Economic Zones (SEZs) to agglomerate firms and thus reap agglomeration economies.

Rural Counties where agglomeration economics level is low but land is cheap and available can capitalize on establishing such parks as a way of attracting MFs.

iv). Roads connectivity

Counties have the mandate to handle county public works hence channeling funds to projects that can increase local roads connectivity and availability. This is a positive strategy for attracting MFs and other investments. The National Government through its various roads authorities should sustain paved roads construction and repairs. Given that County Governments have the mandate to handle internal access roads, then such roads should be more cost effective, of high quality as well as easy to maintain and rehabilitate. Where MFs want to locate in an interior point where no roads are available, county governments can assist in road construction to create access. Maintenance of major roads will also enhance market access and reduce transportation costs. Further, support of other transport means to ease pressure on roads should be encouraged.

v). Establishment of County Industrial Policy

It is vital that Counties should come up with a County Industrial Policy from the onset. To complement this industrial policy, County Governments must initiate data collection for various social economic indicators to aid in implementation of the industrial policy and research. They should also initiate economic promotion with clear incentives framework in order to position the counties as the preferred investment destinations.

5.3 Limitations of the study

The main set-back of the study can be attributed to data availability. It is significant to note that better results might have been obtained had the data been in panel form. This is on the back-drop of wide-spread recommendations by Econometrics text books of the credibility of panel data besides the recognition that this data was for 2010. In addition, dropping of Nairobi County which according to KNBS (2010) had 1,090 MFs or 48% of the total MFs in Kenya could bias the results and make them non-representative. most of the data is also censored.

5.4 Areas for further research

The study has used data from KNBS 2009 Census from districts which have currently formed Counties and the data also affects investors decisions in a County, it is imperative that a further study is done once Counties are fully operational. To meet her industrialization objective as enshrined in Vision 2030, Kenya should consider making all counties attractive to MFs so as to

tap her potential. In this line, ex-post studies can consider a panel framework and look at the effect of government funding on location of MFs. Attention can also be channeled to reviewing the place of external economies of scale to location, something that agglomeration could have attempted to answer were it not linearly correlated to other variables.

REFERENCES

- Alanon, A. Arauzo-Carod, J.M. and Myro, R. (2007), "Accessibility, agglomeration and location," in *J.M. Arauzo-Carod and M. Manjon-Antolin, Chentelham: Edward Elgar*, pp. 247-267.
- Arauzo, Josep M. - (2004), "Determinants of industrial location. An application for catalan municipalities," *Papers in Regional Science*, 84, 105–120. (2008), "Industrial location at a local level: comments on the territorial level of the analysis," - *Journal of Economic & Social Geography* 99, 193-208.
- Arauzo-Carod, J.M. and Manjón-Antolín, M. (2011), "(Optimal) Spatial aggregation in the determinants of industrial location", *Small Business Economics*, forthcoming.
- Autant-Bernard, Corinne (2006), "Where do firms choose to locate their R&D? A Spatial Conditional Logit Analysis on French Data," *European Planning Studies*, 14, 1187–1208.
- Badri, A. M. (2007), "Dimensions of industrial locations factors", in *journal of business and public affairs*, vol. 1, issue 2.
- Bartik, Timothy J. (1985), "Business location decisions in the U.S," *Journal of Business and Economic Statistics*, 3, 14–22.
- Brown, J. P., Florax, R. M. & McNamara, K. T. (2009), "Determinants of investments flows in US manufacturing" working paper 09-10, Sept. 2009
- Cameron, A.C. and Trivedi P.K. (1998), *Regression Analysis of Count Data*, CUP.
- Cieslik, Andrzej. (2005a), "Location of foreign firms and national border effects: The case of Poland," *Journal of Economic & Social Geography*, 96, 287–297.
- Combes P. P., Mayer T. & Thisse J. F. (2008), *Economic Geography*, Princeton University Press, New Jersey.
- Coughlin, Cletus C. and Eran Segev (2000), "Location determinants of new foreign-owned manufacturing plants," *Journal of Regional Science*, 40, 323–351.
- Goetz, S. (1997) ,"State- and County-level determinants of food manufacturing establishment growth: 1987-93", *Amer. J. Agr. Econ* 79 (August 1997): pp. 838-50.
- GOK (2007), *Kenya Vision 2030: A Globally, Competitive and Prosperous Kenya*, Nairobi, Ministry of State for Planning, National Development and Vision 2030.
- GOK (2010), *The Constitution of Kenya, laws of Kenya*, Government printer, Nairobi.
- GOK (2011), *National Industrialization Policy Framework for Kenya*, Ministry of Industrialization.

GOK (2003), *Economic Recovery Strategy (ERS) for Wealth and Employment Creation (2003-2007)* Ministry of Planning, National Development and Kenya Vision 2030.

GOK (2012) *Sessional paper No. 10 of 2012 on Kenya Vision 2030*, Ministry of State for Planning, National Development and Vision 2030

Greene, William H. (1994), "Accounting for excess zeros and sample selection in Poisson and NB Regression Models," *Discussion Paper No. EC-94-10*, Department of Economics, New York.

Guimaraes, P., Figueiredo, O., and Woodward, D. - (2000), "Agglomeration and the location of Foreign Direct Investment in Portugal," *Journal of Urban Economics*, 47, 115–135.

Guimaraes, P., Figueiredo, O., and Woodward, D. - (2002), "Modeling industrial location decisions in US Counties," *Working paper series - 18*.

Guimaraes, P., Figueiredo, O., and Woodward, D. - (2004), "Location modeling and localization of Portuguese manufacturing", unpublished Manuscript, University Of South Carolina.

Gujarati, D.N. (2004). *Basic Econometrics (4th Edition)*. New York, USA, The McGraw-Hill Companies.

Hayter, Roger (1997), *The dynamics of industrial location. the factory, the firm and the production system*. Chichester, UK: Wiley.

Henderson, J. and McNamara K. T. (1997), "Community attributes influencing local food processing growth in the U.S. corn belt." *Can. J. Agr. Econ.* 45 235-50.

Henderson, J. R. & McNamara K. T. (2000), "The location of food manufacturing plant investments in corn belt Counties" in *Journal of Agricultural and Resource Economics*, Vol. 25, No. 2, pp. 680-697

Holl, Adelheid (2004a), Transport infrastructure, agglomeration economies, and firm birth. empirical evidence from Portugal. In: *Journal of Regional Science* Vol. 44 pp. 693-712.

Isard, W. (1956), *Location and space-economy; a general theory relating to industrial location, market areas, land use, trade, and urban structure*, Cambridge.

Kenya Institute for Public Policy Research Institute (KIPPRA), (2013) *Kenya Economic Report*, Nairobi Kenya

Kenya National Bureau of Statistics (KNBS) (2007), *Kenya Integrated Household Budget Survey, 2005/06, Volume I Basic Report*, Nairobi.

Kenya National Bureau of Statistics (KNBS) (2007), *National Population and Housing Census report 2009*, Nairobi.

Kenya National Bureau of Statistics (KNBS) (various), *Statistical Abstracts and Statistical Surveys* Government Printer, Nairobi.

Kenya National Bureau of Statistics (KNBS) and Society for International Development (SID) 2013, *Exploring Kenya's Inequality*, Nairobi.

Kenya National Bureau of Statistics (KNBS), *Manufacturing Firms Census report 2010*,

Lambert D. M. & McNamara K. T. (2009), "Location determinants of food manufacturers in the United States, 2000–2004: are nonmetropolitan Counties competitive?" in the *Journal of Agricultural Economics* 40, 617–630

Lambert, D.M., McNamara K. T., and Garrett M. I. (2006), "An application of spatial Poisson models to manufacturing investment location analysis," *Journal of Agricultural and Applied Economics*, 38, 105–121.

Lee, Y. (2008), "Geographic redistribution of US manufacturing and the role of state development policy". In: *Journal of Urban Economics* Vol. 64 pp. 436-450.

List, John A. (2001), "US County-level determinants of inbound FDI: Evidence from a Two-Step Modified Count Data Model," *International Journal of Industrial Organization*, 19, 953–973

Manjon, Miguel and Josep M. Arauzo (2007), "Locations and relocations: modelling, determinants, and interrelations," Working Paper No.6–2007 Department of Economics URV.

Marshall, Alfred (1890), *Principles of Economics*. MacMillan.

McFadden, Daniel. (1974), "Conditional logit analysis of qualitative choice behaviour," in P. Zarembka (ed.) *Frontiers in Econometrics*. Academic Press, pp. 105–142.

McNamara, K. T. & Kriesel, W. (1991), "A County level model of manufacturing plant recruitment with improved industrial site quality management", in *Southern journal of agricultural econ*, July 1991

Moomaw, R.L., Mullen, J.K. & Williams, M. (1995), "The interregional impact of infrastructure capital", in *Southern Economic Journal*, 61(3), pp. 830-45

Mullahy, J. (1997), "Heterogeneity, excess zeros, and the structure of count data models" in *Journal of Applied Econometrics* 12: pp. 337-350.

Muluvi, A. S. (2011), "Firm level determinants of investment in the Kenyan manufacturing firm" in the *current journal of economic theory* 3(3): pp 93-98.

Nairobi.

Ng'ang'a, J. C. & Njenga, G. (2010), "Determinants of regional disparity in Kenya", KIPPRA Discussion Paper No. 114 of 2010, Kippira

- Nyangito, H. O. & Ronge, E. E. (2000), “A review of Kenya’s current industrialization policy”, KIPPRA Discussion Paper No. 3 of 2000, Kippra
- Rosenthal, S.S. and Strange, W.C. (2003), “Geography, industrial organization and agglomeration” in *the Review of Economics and Statistics* Vol. 85 (2) pp. 377-393.
- RPED, (2004), *Investment climate assessment; in enhancing the competitiveness of Kenya’s manufacturing sector, the role of the investment climate.*
- Samik, V. L. & Sanjoy, C. (2005), “Industrial location and spatial inequality: theory and evidence from India” *Journal of review of development economics*, 9(1), pp. 47-68.
- Weber, A. (1929), *Theory of the location of industries*. The University of Chicago Press, Chicago [translated by Carl J. Friedrich].
- Winkelmann Rainer (2008), *Econometric analysis of count data*, Springer, Verlag Berlin Heidelberg
- Wojan, T.R. & Pulver, G.C. (1995), "Location patterns of high growth industries in rural Counties" *Growth and Change* 26: pp. 3-22.
- Woodward, Douglas P. (1992), “Locational determinants of Japanese manufacturing start-ups in the United States,” in *Southern Economic Journal*, 58, 690–708.

APPENDIX

Appendix 1: Classification of Industries by Activity and Number of People employed, June 2009

Activity	No of People Employed
-----------------	------------------------------

	Citizens	Non-Citizen	Total Employment
MINING AND QUARRYING	4,135	45	4,180
Mining of metal ores	60	-	60
Other mining and quarrying	4,071	45	4,116
Mining support service activities	4	-	4
MANUFACTURING			
MANUFACTURING	303,640	1,438	305,078
Manufacture of food products	119,805	250	120,055
Manufacture of beverages	7,701	32	7,733
Manufacture of tobacco products	1,024	26	1,050
Manufacture of textiles	31,823	98	31,921
Manufacture of wearing apparel	23,332	102	23,434
Manufacture of leather and related products	6,335	29	6,364
Manufacture of wood and of products of wood and cork except furniture; manufacture of articles of straw and plaiting	11,320	64	11,384
Manufacture of paper and paper products	7,825	53	7,878
Printing and reproduction of recorded media	9,202	51	9,253
Manufacture of coke and refined petroleum products	426	5	431
Manufacture of chemicals and chemical products	16,795	146	16,941
Manufacture of basic pharmaceutical products and pharmaceutical preparations	3,496	39	3,535
Manufacture of rubber and plastics products	16,136	91	16,227
Manufacture of other nonmetallic mineral products	7,103	54	7,157
Manufacture of basic metals	9,440	95	9,535
Manufacture of fabricated metal products, except machinery and equipment	10,231	110	10,341
Manufacture of computer, electronic and	36	-	36

optical products			
Manufacture of electrical equipment	2,027	9	2,036
Manufacture of machinery and equipment n.e.c	1,793	6	1,799
Manufacture of motor vehicles, trailers and semitrailers	3,372	60	3,432
Manufacture of other transport equipment	291	3	294
Manufacture of furniture	4,686	18	4,704
Other manufacturing	6,849	31	6,880
Repair and installation of machinery and equipment	2,592	66	2,658
Electricity, gas, steam and air conditioning supply	8,152	5	8,157
Water and Sewerage	7,426	-	7,426
Water collection, treatment and supply	7,003	-	7,003
Sewerage	70	-	70
Waste collection, treatment and disposal activities; material recovery	353	-	353
Total	323,353	1,488	324,841

Source: KNBS (2010) Basic Report on the 2010 Census of Industrial Production

As indicated in appendix 1 above, the majority of persons engaged in industry were Kenyan citizens accounting for 95 percent. The manufacturing sector accounted for about 94 percent of total employment within the industrial sector. A focus on the manufacturing industry shows that manufacture of food products subsector accounted for 39.4 percent of manufacturing employment, manufacture of textiles accounted for about 10.5 percent, manufacture of basic metals accounted for 3.1 percent, manufacture of food products subsector accounted for 16.8 percent and manufacture of computer and electronic accounted for less than 1 percent.
