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Factors Causing Variations in the Number of Manufacturing Investments across Kenyan Counties

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Abstract
Establishment of manufacturing firms in any given location is expected to impact positively on employment creation and poverty reduction. Kenyan counties are no exception hence for them to continuously address existing unemployment and poverty levels, attracting manufacturing firms becomes an important venture. However, all counties are not endowed the same way leading to variations in the number of manufacturing firms they have already attracted. This paper investigated the factors that cause these variations. The study employed Negative Binomial Regression model and has found out that insecurity level, agglomeration economies, availability of water, availability of roads and cost of land causes these variations. On strength of these findings, this study recommends on the need to reduce crime incidents in order to boost investor’s confidence, enhance roads availability and also ensure adequate water for industrial purposes across the counties. This can be done by availing more funds to both roads and water sectors. Further, provision of industrial parks with improved infrastructure around them will boost agglomeration economies for manufacturing firms and other investments. Also, since cost of land across counties may not reduce, leasing of industrial land to firms at a lower cost will attract and retain firms. It is envisaged that the recommendations herein will positively inform county leadership and if eventually actualized, counties will be on the right path towards addressing unemployment and poverty.

Introduction
Currently, there exists uneven distribution in the number of manufacturing firms (MFs) located in Kenyan counties as demonstrated by some counties having attracted over a hundred manufacturing firms (MFs) while others have attracted as few as zero firms (KNBS, 2010). This uneven distribution is further confirmed by National Industrial Policy Framework (NIPF, 2011), which indicates that MFs in Kenya has 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 is an indication that there may be barriers within some counties that make them not attractive to MFs as their preferred locations for investments. Stated otherwise, there exist some factors, which this paper investigated, that leads to variations in the number of MFs attracted across the counties. It is evident that Kenyan regions are not endowed the same way hence they exhibit various disparities (NIPF, 2011; Ng’ang’a and Njenga, 2010) which may be impacting in the number of MFs attracted across counties. The percentage distribution of the number of MFs in Kenya is summarized in figure 1 below.
Among the Counties that have not been able to attract even a single firm includes Tana River, 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. The rest of the counties have managed to attract between 1 and 49 firms as elaborated in figure 2 below.

As indicated by Combes et al., (2008), economists and geographers have always considered economic space as an outcome of a system of countervailing forces leading to economic landscape being characterized by disparities of varying degrees. As highlighted in figure 3, it is evident that some of these disparities may be impacting on the number of MFs attracted across Kenyan counties.
Contribution of manufacturing sector to economic growth and employment in Kenya

According to Kenya’s vision 2030, 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 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 by removing barriers in investment, infrastructural growth, use of technology, promotion of exports among other interventions. The main industries contributing to the sectors 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 is as illustrated in figure 4 below.

**Figure 4- Manufacturing sector contribution to GDP and employment**

![Graph showing manufacturing sector contribution to GDP and employment](image)
Following the enactment of the Kenya’s new constitution 2010, county governments have emerged as the new units of devolution. The primary aim of this devolution was to promote equitable social economic development and provide 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. As elaborated in Kenya’s vision 2030, some of the key social economic challenges affecting all counties and the nation at large are unemployment, poverty and slow economic growth.

To tackle these challenges, Kenya’s vision 2030 prescribes the need to have a robust manufacturing sector which 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 in the number of MFs located in various Kenyan counties. Nairobi county has attracted the highest number with 1053 firms followed by Kiambu County with 186 firms while some counties among them Wajir, Turkana and Samburu having been unable to attract even a single firm. This is clearly depicts huge variance and disparity.

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 83 percent of the counties have attracted less than the mean of 44 MFs per county. Secondly, given that counties are new units in Kenya, there is likelihood of existence of knowledge gap on how areas considered are suitable for different types of manufacturing clusters in all Kenyan regions (KNBS, 2011). The growth of the sector is expected to tackle the policy problems of unemployment and poverty in all parts of the country.

Addressing unemployment and poverty is a national priority which requires urgent intervention measures key among them enhancing the growth of manufacturing sector clusters in all Kenyan regions (KNBS, 2011). The growth of the sector is anchored on development of industrial enablers throughout the country which are to serve as seed beds of Kenya’s industrial take off (GOK, 2007) and ultimately propel the nation to be the preferred choice of basic manufactured goods in East and Central African markets.

**Materials and Methods**

As expressed by Arauzo and Manjon (2011) studies on location decisions of MFs are very heterogeneous in terms of theoretical approaches used, independent variables chosen and their measurements, methodlogies used and spatial areas considered. In this chapter therefore, synthesis of literature has taken into account this heterogeneity before finally giving an overview on what has been adopted for this paper.

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 neoclassical, behavioral and institutional approaches (Hayter, 1997).

Under neoclassical theory, the decision setting involves rational agents choosing optimally a site among a set of finite alternatives (Hayter, 1997). 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, human capital characteristics among others (Hayter, 1997, Arauzo and Manjon, 2011).

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 (Figueroendo 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 (Figueroendo et al., 2002, Hayter, 1997, Arauzo and Manjon, 2004).

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. Empirical evidence on this is provided by studies by Bartic (1985), Woodward (1992) and List and McHome (2000). Various empirical studies have used different methodological approaches, different variable measurements, different units of locations and even their findings have been different. The broad categories of spatial variables that attract 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 include 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 comprise of urbanization and localization economies.

In regard to the choice of models used in industrial location, Discrete Choice Models (DCM) and Count Data Models (CDM) have been used extensively. According to Arauzo and Manjon (2004 and 2007), Becker and Henderson (2000) and Guimaraes et al., (2004), the two models are consistent with the idea of firms choosing optimal locations subject to standard constraints. Under CDM, the unit of analysis is the location and the concern is the factors of that location that may affect location decisions while under DCM, the unit of analysis is the firm and the main concern is how certain characteristics of the firm e.g. size affect location decisions (McFadden, 1974, Arauzo and Manjon, 2007). Under CDM, studies by Cieslik and Ryan (2006), Arauzo and Manjon (2007), Barbosa et al., (2004) and Otsuka (2008) have used Poisson Regression Models (PRMs) while studies by Coughlin and Segev (2000); Cieslik (2005), Holl (2004); Henderson and McNamara (2000) and Arauzo (2008) used Negative Binomial Models (NBMs). Under DCM, studies by Bartic (1985), Woodward 1992 Guimaraes et al., (2002; 2004), McNamara and Kriesel (1991) used Maximum Likelihood Estimate (MLE) on Conditional Logit Model (CLM). Studies by Goetz (1993), Henderson and McNamara (1997) and Brown et al., (2009) used Ordinary Least Square (OLS) technique.

Since various empirical studies have used different variables, literature on variable measurements has been restricted to only those variables used in this paper. In relation to agglomeration economies, focus on MFs per square area has been adopted by Rosenthal and Strange (2003), Figueredo et al., (2002), Bartic (1989) and Guimaraes (2004). Lambert et al., (2009) 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. 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.

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 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, (2011) used choice variable to proxy access to land as a factor under business environment. Concerning insecurity, Fernandez and Sharma (2012) used per capita murder rate as a determinant of clusters in Indian manufacturing. Lastly, various empirical studies have used various dummy variables to capture regional effects. Arauzo and Manjon (2011) used a dummy variable for shore lines in order to determine whether industrial location favored coastal regions, Henderson & McNamara (2000) used a dummy variable to capture the effect of a city on industrial location and Figueredo et al., (2002) included a dummy variable to account for state level characteristics.

In terms of empirical results, availability of road infrastructure has been found to influence firm’s location decisions (Basile, 2004; Cieslik, 2005; Coughlin and Segev, 2000; Holl 2004a and Coughlin et al., 1991). Secondly, land availability has been found to influence firm’s location decisions (Bartic, 1985; Papke, 1991; Woodward, 1992 and Figuerendo et al., 2002).

Owing to the fact that this study lays more emphasis on locational characteristic of Kenyan counties then the most appropriate theoretical approach to inform the conceptual framework is the neoclassical approach since it focuses on locations as the units of analysis. Due to lack of firm level data on firm’s behavioral characteristics across all counties, the behavioral approach cannot be focused upon. Further, given that institutional approach may require the presence of operational county governments, then focusing on this theoretical approach cannot be feasible for the Kenyan case as at now. It is important that future studies should try and focus on these approaches. It is evident that empirical research on industrial location in African economies is not extensivean indication of knowledge gap especially for a country like Kenya which has now embraced devolved governments. Secondly, insecurity level and availability of water has not been extensively considered in many studies probably because western countries where the majority of such studies have been done have limited internal security and water challenges. This therefore serves as a motivation to include the two variables in this study given that they are a major concern in Kenya (RPED, 2004) and also since the two are hypothesized to influence location decisions (Badri, 2007). Land remains a major issue in Kenya hence it will also be critical to investigate its role in industrial location.

Lastly, given that the number of MFs attracted in counties is count in nature and that firm level data on industrial location determinants for all counties is unavailable, this paper has therefore chosen to use CDM in the analysis as detailed in section 3.2. As indicated by Cameron and Trivedi (1998), the nature of data available to econometricians, including how it has been measured, may dictate the use of count models regardless of the economic theory.

The conceptual framework for this study was drawn from the neoclassical theoretical approach since the focus of this study is the industrial location as opposed to the locating firm. 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 & Sanjoy, 2005 and Brown et al., 2009). Weber (1929) opines 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 to Weber (1929), Isard (1956) and Hayter (1997), the ability of a given location to attract MFs will depend 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.

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. However, this paper has conceptualized the following characteristics as to affect the number of MFs attracted in Kenyan counties.
Empirical Model Specification

Owing to the fact that the dependent variable is a count, and it would be critical for this study to capture the nine Kenyan counties with zero counts, then Count Data Model (CDM) becomes more applicable in this study as compared to Discrete Choice Model (DCM). Under CDM, zero observations not only contribute to the likelihood function but also provide interesting insights about data generation process (Lambert et al., 2006; Mullahy, 1997; Cameron and Trivedi, 1998). The advantage of CDMs rest on the assumption of a discrete probability distribution for the count variables, followed by the parameterization of the mean of the discrete distribution as a function of explanatory variables (Winkelmann, 2008; Lambert et al., 2006 and Cameron and Trivedi, 1998). Drawing from Guimaraes et al., (2003) and Greene (1994), it will therefore be appropriate for this study to avoid DCM since the likelihood function is always zero for those locations that have not attracted any firm.

Under CDM, the industrial location decisions can be empirically examined by calculating how changes in location characteristics affect the number of firms attracted in location \( j \) in a given period of time (Becker and Henderson 2000; Arauzo and Manjon 2004; Alanon et al., 2007), as extensively explained by Winkelmann (2008) and Cameron and Trivedi (1998). \( \lambda_i \) is defined as an exponential function of a linear index of the explanatory variables in order to account for observed heterogeneity i.e \( \lambda = \exp(\beta_1 x_{1i} + \ldots + \beta_k x_{ki}) \). This exponential form ensures that \( \lambda_i \) remains positive for all possible combinations of parameters and explanatory variables (\( X_i \)). Consequently, the expected value of \( y_i \) is given as:

\[
E(y_i) = \lambda_i
\]
As explained by Cameron and Trivedi (1998), in standard regression analysis, modeling of count data requires supplemenatary estimation with additional tests to determine whether the fitted model is adequate and whether a specific deficiency of any initially entertained model can be removed by progression to a less restrictive model. Consequently, this calls for conducting misspecification tests designed to highlight inadequacy of the maintained model in specific directions (Winkelmann, 2008; Cameron and Trivedi, 1998; Greene, 1994). The misspecifications tests are anchored on various assumptions of Poisson distribution as given below.

Foremost, the key assumption of the Poisson model is that the mean and variance are equal (Mullahy 1997, Cameron and Trivedi, 1998 and Winkelmann, 2008). Owing to overconcentration of firms in some counties as elaborated in figure 2, the variance for the dependent variable is greater than the mean a situation called over-dispersion problem. Over dispersion arises from the existence of unobserved heterogeneity in conditional mean parameter (Mullahy1997, Cameron and Trivedi 1998 and Winkelmann 2008) and implies that inferences from maximum likelihood estimates are no longer valid. From table 3b, given that the variance for the dependent variable is 24171.94 and exceeds the mean of 44.62 by a huge figure of 24127.82 the use of a PRM becomes inappropriate hence an initial justification for the use of a compound Poisson distribution like NB distribution.

The NB model is a generalization of the Poisson, where the variance of the distribution is allowed to be different from the mean and is motivated by desire for a greater flexibility to account for frequently observed overdispersion in data and to provide for a better fit (Cameron and Trivedi 1998). This implies that the over-dispersion problem is accounted for by a more accurate modeling of variance (Arauzo, 2005 and 2008; Lambert et al., 2006; Holl 2004a; Coughlin and Segev, 2000).

Beyond NB modeling for the observed heterogeneity (observed differences among sample members) just like the PRM, it also allows for multiplicative unobserved heterogeneity into the conditional mean (Long and Freese, 2001) by assuming that:

\[ E[y_i/x_i] = \lambda_i = e^{\beta' x_i} \] ...............................................................1

Equation 1 above is linearized as follows:
\[ \ln \lambda_i = \beta' x_i \] ...............................................................2

The second assumption of the Poisson involves an excess of zero counts whereby a problem arises if their number is excessive (Winkelmann 2008; Cameron and Trivedi 1998; Greene, 1994). In case of excess zeros, zero inflated NB is used since it assumes a degenerate distribution whose mass is concentrated at zero (Arauzo and Manjon 2007). However, zero inflated NB requires theoretical underpinning that some locations are ineligible for a response (Winkelmann, 2008). However, this cannot be feasible since there is no theoretical underpinning or any form of restriction that any given county in Kenya is eligible for a non-zero response in terms of attracting MFs. The only apparent scenario is that in nine Kenyan counties, the response has not yet occurred. Consequently, owing to over dispersion problem and the fact that all Kenyan counties are eligible for a count, then drawing from equation 3 above, this study has employed the NBM fully specified below:

\[ \ln y_i = \alpha + \beta_1 \text{INSECURITY}_{i} + \beta_2 \text{AGGLOMERATION}_{i} + \beta_3 \text{WATERACCESS}_{i} + \beta_4 \text{ROADS}\text{AVAILABILITY}_{i} + \beta_5 \text{COSTOFLAND}_{i} + \beta_6 \text{REGIONALDUM}_{i} + \varepsilon_i \] ...............................................................5

The choice of independent variables has been informed by two reasons. Primarily, majority of the variables are those that can be altered especially in the short run by both the county and/or the national government. Secondly, as highlighted in the literature, insecurity level, water access and cost of land have least been investigated and are key concerns in Kenya. The dependent variable \( y_i \) in equation 5 is the count of MFs observed in county \( i \) and which is drawn from NB distribution with parameter \( \lambda_i \) defined as in equation 3, and which is related to the county characteristics on the RHS as well as to the unobserved heterogeneity in various counties given by \( \varepsilon_i \).

The study used cross sectional data gathered from various sources.
Results and Discussion

Summary Statistics

The results of summary statistics are given in table 3a and 3b below.

**Table 3a – Summary Statistics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFs</td>
<td>47</td>
<td>44.61702</td>
<td>155.4733</td>
<td>0</td>
<td>1053</td>
</tr>
<tr>
<td>Insecurity level</td>
<td>47</td>
<td>0.268353</td>
<td>0.2485892</td>
<td>0.0315</td>
<td>1.52503</td>
</tr>
<tr>
<td>Agglomeration</td>
<td>47</td>
<td>5.130099</td>
<td>23.38772</td>
<td>0</td>
<td>151.5108</td>
</tr>
<tr>
<td>Water accessibility</td>
<td>47</td>
<td>44.54633</td>
<td>14.47062</td>
<td>14.9891</td>
<td>75.69897</td>
</tr>
<tr>
<td>Roads availability</td>
<td>47</td>
<td>87.73877</td>
<td>90.51038</td>
<td>6.66</td>
<td>435</td>
</tr>
<tr>
<td>Cost of land</td>
<td>47</td>
<td>405.8615</td>
<td>882.5898</td>
<td>4.1</td>
<td>4516</td>
</tr>
<tr>
<td>Regional dummy</td>
<td>47</td>
<td>2.297872</td>
<td>0.5866224</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

*Source: Data analysis*

From table 3a above, the number of observations is 47 implying that all the 47 Kenyan counties have been brought on board including all the variable measurements. In regard to agglomeration economies, cost of land, insecurity level and roads availability, the mean is quite close to the minimum value an indication that there exists some extreme values/ disparities between some counties on these characteristics. Given the mean measure of water accessibility is 44.54633 and that the minimum and maximum measures are 14.9891 and 75.69897 respectively, then per capita household’s access to improved water does not exhibit very huge disparities across counties.

**Table 3b – Detailed summary statistics for the dependent variable (Manufacturing Firms)**

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Smallest</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Variance</th>
<th>Skeweness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>0</td>
<td>0</td>
<td>Observations</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>1</td>
<td>0</td>
<td>Sum of Weight</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td>5</td>
<td></td>
<td>Largest Mean</td>
<td>44.61702</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Std. Deviation</td>
<td>155.4733</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td>28</td>
<td>126</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td>91</td>
<td>128</td>
<td>Variance</td>
<td>24171.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95%</td>
<td>128</td>
<td>189</td>
<td>Skeweness</td>
<td>6.006992</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99%</td>
<td>1053</td>
<td>1053</td>
<td>Kurtosis</td>
<td>39.33019</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Data analysis*

From Table 3b, it is evident that there is non-equality of the mean (44.62) and the variance (24171.94) of the dependent variable which is an indication of overdependence. The implication of this is that the appropriate regression model should be a compound Poisson model like Negative Binomial Model which takes into account non equality of the mean of the mean and variance. Given that the mean of the dependent variable is 44, minimum value is 0 and the maximum value is 1053, then the implication is that the number of MFs attracted across counties exhibits substantial disparity.

**Regression Results**

The econometric software of stata was used to generate the regression results on effects of various factors in attracting MFs in Kenyan counties as presented in table 4.
Table 4 – Negative Binomial Regression results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Standard errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of obs: 47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR chi2(7) = 66.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob&gt; chi2 = 0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log likelihood = -158.05047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood ratio test of alpha=0: chi2(01) = 405.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob&gt; chi2 = 0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dep. Variable</td>
<td>Manufacturing firms</td>
<td></td>
</tr>
</tbody>
</table>

From results in table 4, three critical issues are evident. Foremost, all counties even those with zero observations have been captured by the NB regression as evidenced by 47 as the number of observations. Secondly, the log likelihood given as 66.23 has prob>chi2 = 0.000. Since the prob>chi2 is significant, we reject the null hypotheses that all the regression coefficients are simultaneously equal to zero implying that the variables used are joint determinants of the number of manufacturing firms attracted across Kenya counties. Thirdly, the chibar2 (01) = 405.13 (this is the likelihood ratio chi-square test that the dispersion parameter alpha is equal to zero) is large and the Prob>chi2 = 0.000 is significant. This suggests that the dependent variable is over dispersed and is not sufficiently described by Poisson model.

From the results, insecurity level, agglomeration economies, water accessibility, availability of roads and cost of land are significant determinants of the number of MFs attracted across Kenyan counties. They are all significant at 95% confidence level. Findings on insecurity are consistent with RPED (2004) and Fernandez and Sharma (2012) while findings on agglomeration economies concurs with those of Rosenthal and Strange (2003) and Guimaraes (2004). Further, findings on roads availability concurs with Cieslik and Ryan (2005), Fernandez and Sharma (2012) and R PED (2004). Findings on water access reinforce Kenya’s vision 2030 which states that water supply is critical for manufacturing sector development. Findings on cost of land are consistent with Figuerendo et al., (2002) and McNamara & Kriesel (1991).

Taking the case for insecurity, for a unit increase in insecurity level, the difference in the logs of expected counts of the MFs is expected to decrease by the 333.48 units (which is also equivalent to a decrease by 95 percent of the expected counts of the MFs given the other predictor variables in the model are held constant. Secondly, for a unit increase in agglomeration economies, the difference in the logs of expected counts of the MFs is expected to increase by 0.0276 units (which is also equivalent to an increase by 3.5 percent of the expected counts of the MFs) given the other predictor variables in the model are held constant. Thirdly, for a one unit increase in water availability, the difference in the logs of expected counts of the MFs is expected to increase by 302.66 units (which is also equivalent to a 30.26 percent of the expected counts of the MFs) given the other predictor variables in the model are held constant. Further, for a one unit increase in roads availability, the difference in the logs of expected counts of the MFs is expected to increase by 0.018 units (which is also equivalent to an increase by 2.4 percent of the expected counts of the MFs) given the other predictor variables in the model are held constant. Finally, for a one unit increase in cost of land, the difference in the logs of expected counts of the MFs is expected to decrease by 0.00178 units (which is also equivalent to a decrease by 0.2 percent of the expected count of the MFs) given the other predictor variables in the model are held constant.

Although the results reveals that there is no statistically significant difference between the two regions analyzed and the city region, it is worth noting that the implication for this is that that arid
and semi-arid counties should consider promotion of manufacturing as an economic and development policy and not view this as a policy favoring developed regions like cities.

Conclusion and Policy Recommendations

Conclusion

This paper sought to analyze the impact of various location characteristics on the number of MFs attracted across Kenyan counties. By employing Negative Binomial Regression technique, the study has found that insecurity level, agglomeration economies, availability of water, availability of roads, and cost of land affect the number of MFs attracted across Kenyan counties. However, it is worth noting that some variables under institutional theoretical approach like business permit charges, which are theorized to impact on firm’s location decisions (and which will be within the scope of county governments to handle as per the constitution of Kenya, 2010) have not been captured since county governments were not operational during the time of this study.

Policy Recommendations

The above findings are important for county’s development agenda especially if the focus is to attract MFs as a key strategy of reducing unemployment and poverty.

Foremost, County leadership should focus on reducing crime incidents in order to boost investor’s confidence and thus attract and retain MFs and by extension other investments in the county. This can be done by complementing and supporting initiatives like community policing aimed at curbing crime incidents and also by organizing forums between county leadership and the public to dialogue on security concerns. Any other venture believed to reduce criminal incidents like support for youth empowerment ventures, strengthening dispute resolution mechanisms and maintaining peaceful coexistence between communities needs to be pursued. The national government should on its part sustain and support police reforms as a long term strategy of curbing insecurity. Lastly, counties also need to establish systems of monitoring the effects of crime incidents on existing and prospective firms.

Secondly, County leadership 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 to 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 and/or special economic zones to attract more firms and thus reap the benefits of agglomeration economies. Rural counties where agglomeration economies level is low but land is cheap and available can capitalize on establishing such parks as a way of attracting MFs.

Given that most of MFs in Kenya are involved in agri-based processing (KNBS, 2010) and that sustainable agricultural production in Kenya is primarily anchored on availability of water, then increasing water access in counties will go a long way in supporting agri-based processing. Water providers in the counties can supply industrial water at subsidized rates. Firms can also be allowed to directly tap industrial water from sources within the counties.

As per the constitution of Kenya (2010), counties have been mandated to handle county public works hence channeling of funds to projects that can increase roads connectivity and availability is a positive strategy for attracting MFs and other investments. The national government through its various road authorities should sustain road construction and repairs. Further, support of other transport means to ease pressure on roads should be encouraged.

Lastly, since it is highly unlikely that land costs will reduce, then county leadership should consider leasing of land to MFs at a lower cost as an alternative. This will in turn make the county reap the benefits of local employment, market for local goods and other benefits. If this is not done, such MFs may be obliged to locate in counties exhibiting more flexibility on land availability at subsidized cost.

References


Cameron, A.C. and Trivedi P.K. (1998), Regression Analysis of Count Data, CUP.
Hayter, Roger (1997), The dynamics of industrial location the factory, the firm and the production system. Chichester, UK: Wiley.
Isard, W. (1956), Location and space-economy; a general theory relating to industrial location, market areas, land use, trade, and urban structure, Cambridge.


