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Original Paper

The Location of Industries: The Effect of Chance or Rational Choice?

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Abstract

The choice of location plays a major role in the strategies of firms. They are looking for qualified labor, a potential market, but also infrastructure, good accessibility, etc.: an "optimal" location. Indeed, the location is influenced by a greater or lesser number of factors whose weight and diversity vary greatly from one situation to another and the same factor can exert different influences. So, a single factor cannot explain the location of a firm.

This study analyzes the location factors of industrial companies in the commune of Littoral. The data used come from the base of the RGE 2, 2008, and the base of the Statistical and Fiscal Declarations (DSF) available to the INSAE and covers the period from 2012 to 2016. After a descriptive analysis of the companies according to the distance to the center of Cotonou, we have developed a probit model under the STATA software using the factors identified in theoretical and empirical work.

It emerges from the descriptive analysis that distance influences the location of industrial enterprises. The tests revealed that the distance, the market across, the sale of the manufactured products and services positively influence the location decision of the companies. So, companies locate in Cotonou to benefit more from the market.

Keywords

industry, location factor, territory

1. Introduction

Studies on the location of companies exist in the form of theoretical and empirical work and under a multiplicity of angles of analysis. This paper addresses the factors related to the location of businesses in the Littoral department in Benin. In the literature, theoretical work addresses the paradigms presented by Ponsard (1988) where models of urban economy have their origins in the work of Von Thünen then in the residential location of firms in an urban environment and later in the model of Krugman's geographic economy which generates externalities.

1.1 Models of Urban and Geographic Economy

The analysis of localization depends on several factors described in different theories. Von Thünen (1826) as one of the first having taken into account space in the economy and having given rise to the paradigm. The father of location theories explains the optimal locations of agricultural activities according to distance and specifically the cost of transport. Sensitive crops are located near residences and less distant from urban centers than multi-year crops. According to the author, the cost of transport is the central element of localization. However, the assumptions of this model constitute these own limits because it is difficult to apply in reality. The localization of agricultural activities was reinforced by the analysis of the localization of industrial activities by Alfred Weber (1909). According to him a minimum cost of transport defines the optimal location of industries. Weber's work has been theorized by Losh from different forms of localization of economic activities. Christaller (1933) and Lösch (1940) develop the theory of central places and Aydalot (1980).

The context of analysis allows nuance of the explanatory factors. In the case of the Republic of Benin, the country has twelve departments and seventy-seven municipalities. The industrial companies opt to set up in a few localities and local authorities in the country. Data from the general census of enterprises (RGE2, 2008) reveals that Benin has 526 industrial establishments. The breakdown by department has shown that 30% of industrial establishments are found in the Littoral department; the departments of Atlantique, Zou, Borgou and Collines are found respectively with 12.7%, 11.2%, 10.3%, and 8.9% of industrial establishments. Also, depending on the location, 78% of industrial establishments are located in urban areas; 22% are found in rural areas. Apart from the Atlantic, Couffo de Ouémé, and Zou departments, for which there are still a significant number of establishments in rural areas, the establishments listed in the other departments are largely in urban areas. The secondary sector remains in Benin dominated by industry, more than 2/3 of the activities of which are concentrated in the territory of the commune of Cotonou through food industry, brewing, cement, textiles, soap, tobacco factory, Buildings and Public Works. Why do some industrial companies set up in one territory rather than another? Analyzing factors related to the location choices of industrial companies in Cotonou could be an answer. Based on the assumption that the market, the distance or raw materials influence the location of industrial companies at the agglomeration level in Cotonou. The goal of this paper is to analyze the factors which explain the localization in the commune of littoral

trough the typologies of industruals companies in Benin (Activities's branch, areas, distance) which are the key factors of the choice of localization.

1.2 Clarification of Some Concepts

1.2.1 Location factors

The term localization is by its nature polysemic. Thus, for Brunet and alii (1993, p. 304), it designates both "the act of choosing a place, to exercise an activity, install equipment, a home" and "the location (of a city, of a factory, of an activity), considered from its location in the geographic space".

A location factor is a variable that usually acts on the location decisions of a type of urban activity. These decisions are generally those of the space users, the most decisive, but also those of other stakeholders (promoters, financiers, public authorities, etc.).

A distinction is made between the inter-urban location and intra-urban location (Oyono, 2015). In "inter-urban location", factors influence the location decisions of businesses in general, when it comes to choosing a city, affecting the attractiveness of that city for the business in question. These factors are necessarily different (or at least weighted differently) for the establishment of a factory or the establishment of a head office or a divisional office.

Concerning "intra-urban location", we must first distinguish the factors on the supply side from those on the demand side. The factors on the demand side (industry, size, etc.) are the most important and the most studied, because it is the space user who dictates his choice of location according to his requirements and its constraints. The supply-side factors relate to the space itself and the location conditions (the characteristics of the infrastructure and its constraints, the neighborhoods with its amenities as well as neighboring uses, etc.). It should be noted that these supply-side factors have a significant impact, since they condition the adaptation of the location.

1.2.2 Industrial Companies

"The company is economic unit autonomous and judicially with human and material resources which it combines to produce goods and services intended for the market." (G. BRESSY and C. KONKUYT, 2000)

The company is an economic unit, legally autonomous, organized to produce goods or services for the market. There are large companies, Small and Medium Enterprises (SMEs), Small and Medium Industries (PMI) as well as Micro-enterprises in the informal sector. Any enterprise which fulfills the following conditions is considered as an SME/SMI: be legally constituted, keep regular accounts, not be a subsidiary of a multinational, have a workforce of 5 to 10 permanent employees, have a share capital between 1 and 50 million or have made an investment of between 5 and 500 million. The companies are grouped according to the legal form and we distinguish:

- the sole proprietorship (natural person) which does not have a legal personality distinct from that of the natural person of its operator;
- the member company, for example Limited Company (LC), Limited Liability Company (LLC), etc.

According to the INSAE: National Institute of Statistics Applied to the Economy, fall within the industry, economic activities that combine production factors (installations, supplies, work, knowledge) to produce material goods intended for the market.

"Industry is the whole of transformation activities for the production of material goods". (Mérenne-Schoumaker, 2008 p. 11)

Since 2001, AFRISTAT member states have had common classifications for activities (NAEMA) and products (NOPEMA). This constitutes an important harmonization tool available to States for statistical work and their coordination, in particular for the collection of statistical data and the preparation of national accounts. These classifications have been designed based on the United Nations international classifications, in particular the international standard classification by industry of all branches of economic activity (ISIC, rev 3) and the Central Classification of Products (CPC, rev1).

In Benin, the nomenclature has been adopted and takes account of 22 branches of activity (Appendix).

1.2.2.1 Territory: A polysemous Concept

For (Maryvonne Le Berre, 1992), *"The territory can be defined as the portion of the earth's surface, appropriated by a social group to ensure its reproduction and the satisfaction of its vital needs. It is a spatial entity, the group's place of life, inseparable from the latter" it becomes the stake of competing and divergent powers and finds its legitimacy with the representations that it generates, both symbolic, patrimonial and imaginary, same nourished by the dominant language spoken by the populations of this territory.*

"The territory is often called upon to explain the dynamics of local development" (B. Kherdjemil, 1999).

"The territory can be considered as a space transformed by human work" (Claude Raffestin, 1986).

"The territory translates a mode of division and control of the space guaranteeing the specificity and the permanence, the reproduction of the human groups which occupy it" (Guy Di Méo, 1988).

1.2.2.2 Theory of Location of Firms

"We choose what is best based on what we want and based on what is available" (Merenne-Schoumaker, 2003). The location of economic activities is influenced by the characteristics of the establishments and by the characteristics of the territories.

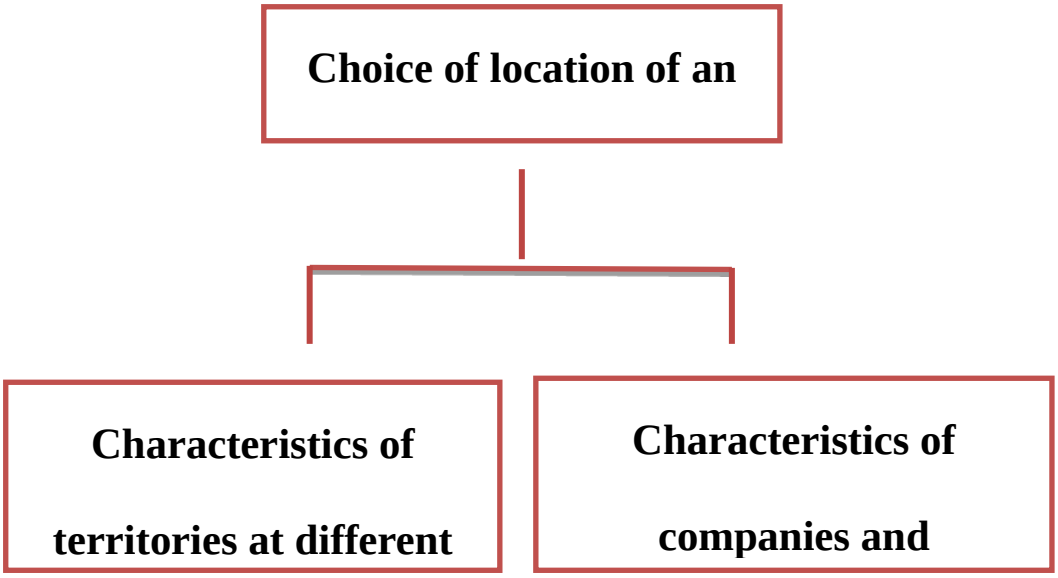

Figure 1. The Determinants of a Location of Industrial Companies

Source: Merenne-Schoumaker, The localization of industries, 1991.

Among the location criteria, some are "classic", others are less so and seem to be linked to the characteristics of supply, demand, and location. They could be grouped by major types of factors, to which correspond the main reasons for location.

Classic factors

Accessibility		
	Revealed and declared criteria	**Main reasons**
	Near motorways	Near structuring axes
		Accessibility
		Proximity TVG
Cost		
	Revealed and declared criteria	**Main reasons**
	Rental cost and purchase price	Cost
Economies of agglomerations		
	Revealed and declared criteria	**Main reasons**
	Customer proximity	Customer proximity
	Proximity to staff residence	Industrial or economic fabric
	Location in the agglo. Lyonnaise	Secondary proximity
		Close to the center of Lyon
Other factors		
Logistical and / or functional advantages		
	Revealed and declared criteria	**Main reasons**
	Possibility of parking	Converted premises
	Land availability	Logistics advantages
	Possibility of extension	Possibility of local extension
		Developed area
Quality		
	Revealed and declared criteria	**Main reasons**
	Quality of premises (new)	Proximity to decision-maker residence

(Source: Aguilera-Belanger, Location of activities and mobility, 1999)

Figure 2. Main Factors in the Location of Industrial Companies

1.2.2.3 The Factors That Characterize Companies

The choice of location varies according to the specific characteristics of companies and establishments. But each case differs from the others and it is not possible to consider everything. Merenne-Schoumaker (1991) identifies 05 characteristics; (1) the influence of the industry and the establishment and life cycle of the product, the influence of other features of the establishment: (2) size, (3) function and (4) the nature of the location operation from which it results; (5) the level of geographic presence of businesses (multinational firms, foreign firms from neighboring countries, national firms with multiple headquarters and local firms). In our study, we will focus on the industry and size.

1) The branch of activity of the establishment and the life cycle of the product

The location of the different types of activities meets specific criteria. It is difficult to generalize (to synthesize) on the location of sectors, except for a few specific sectors such as the steel industry. Location factors are influenced by business needs related to the product lifecycle. Because the big cities of developed countries combine characteristics favorable to the launch of new products. While peripheral areas, and more particularly the Third World, are more suited to the production of mature products.

2) The size of the establishment

The size of the establishment has an impact on labor and surface requirements. The more the size increases, the more the number of implantation sites which can be suitable decreases. Because, on the one hand, the vast well-located land is relatively scarce and, on the other hand, the number of workers available and the means of communication must be sufficient in the area of influence of the site. If the site is well served and the modes of transport are fast and inexpensive, the area of influence increases.

3) The function of the establishment

There are differences between the location of industrial service activities and production activities.

- The activities of the industrial tertiary sector seek to locate themselves near large urban centers and often oppose exurbanization. Tertiary functions no longer need a quality urban environment;
- In contrast, production activities, especially those that require few qualified personnel, move more easily and more often choose small towns or rural areas. The availability, reputation, and low cost of labor are more attractive.

4) The nature of the location operation

The nature of the location operation, that is to say, the type of situation which leads to the decision of a new location. Three situations can be envisaged: the creation of an establishment, the extension of an existing business, and the transfer of an already operating unit. There are intermediate situations, for example, the transfer can concern the whole company, only production or a specific activity. In the case of an extension, companies can seek to minimize the distance between the old and the new establishment, to allow the arrival of raw materials, the flow of products, and contacts between

divisions. In the case of a transfer, different factors can explain the limitation of the distance such as, the location of the clientele.

5) The level of geographic presence of companies

Merenne-Schoumaker (1991) distinguishes four levels of geographic presence, to which different behaviors correspond.

The locations of the firms are different depending on whether they are multinational firms, foreign firms from neighboring countries, national firms with several offices, or local firms. For multinational firms, the creation of a new unit is achieved using an already more or less proven technique and some experience. The new location is part of a complex network within the firm. The company deals above all with the national authorities and is not very sensitive to regional traditions. Foreign firms from neighboring countries frequently own a limited number of establishments. As they often find it difficult in their own country to expand, they seek to locate themselves not far from the borders to limit travel between their new establishment and the parent company. This new location should allow them to solve problems: labor, land, funding, regulations, etc. The national companies have several establishments spread over the territory. The number, location, and nature of their activities influence the decision. Generally, the new unit is part of an overall program where the market factor plays an essential role. However, certain transfers or extensions may have as their primary motive the resolution of a specific problem, in particular, that of the recruitment of the workforce. Finally, regional or local companies are often family businesses with only one establishment. The creation of a new unit (or the transfer of the only existing one) then constitutes a real adventure. These firms know their environment well and are very sensitive to local aspects. They almost always come into contact with local or regional authorities who can thus have an important influence.

1.2.3 The Factors That Characterize the Territories

Merenne-Schoumaker in "The localization of industries" (1991) differentiates two levels of territorial analysis: the level of large economic areas and countries; the level of regions, localities, and land. For this analysis it is the level of regions, localities, and land that interests us. At the level of regions, localities, and land we can identify three main groups of factors: the general framework, the factors of production, and the economic, human, and political environment.

1.2.3.1 The General Framework

- **The geographic location** is a relative concept, because it designates the position

concerning other places or other localized phenomena (market, communication roads, etc.) This factor has a greater impact at regional or local level than at national level or international. Because on this scale the elements of polarization of activities, traffic, populations, and qualitative differences in distributions are more important (for example the role of seaports or cities are far from identical). Besides, not all situations are the same, in particular about the infrastructure and superstructure available (certain business leaders may refuse to settle in certain places despite the financial advantages offered to them by public officials) (Merenne-Schoumaker, 1991).

• **The market** plays a less important role at regional and local levels (Merenne-Schoumaker, 1991; Davin, 1969). However, certain activities remain closely linked to the air circulation of their products: during high transport costs (industries of needs), when the product quickly loses its value (daily press).

1.2.3.2 Production Factors

• **Transport and Accessibility**: One of the most important factors for companies in the industry is transportation. Transport costs vary according to the type of activity. For industry, the location of factories is dependent on transport costs, if the share of direct transport costs in the cost price of products exceeds 5% (Merenne-Schoumaker, 1991). This is why a large number of industrial companies aim to minimize the costs linked to transport. Companies are increasingly demanding in terms of infrastructure and the organization of the movement of their goods and staff. Firms want to be well served, for this they have to choose between several modes of transport (Davin, 1969; Merenne-Schoumaker, 1991). But industries favor more and more, the road and the motorway as a mode of transport, because the motorway infrastructures are very accessible. In contrast, the use of rail and inland waterways has declined (Davin, 1969; Raymond & Jayet, 1998). The new activity zones have a location close to motorways, ports, and airports. But this proximity does not necessarily imply its use (these zones offer advantages in terms of land such as large areas at attractive prices, the difference with the population, and few neighborhood problems). Location decisions are also influenced by telecommunications services. Because, if the delays in obtaining telephone lines are too long, industries are less established than in areas where networks are abundant and of high quality (Merenne-Schoumaker, 1991). Thanks to accessibility, companies quickly have all the factors of production and the intermediate goods they need, reducing transport costs and time. It also makes it possible to collect a maximum of strategic information with a temporal advantage over their competitors (Camagni, 1992).

• **Raw materials, water, and energy**: The location of raw materials and energy availability has been restricted in recent years due to technical change (MERENNE-SCHOUMAKER, 1991):

- Changes in manufacturing, for example the reduction in the quantities of raw materials and the development of recycling.
- Increase in the number of materials intervening within the same manufacturing (each material sometimes intervening only in limited quantity and frequently being in a different place from the others) there is consequently competition and even often cancellation between the different influences.

The changes that have taken place in the field of transport have brought about a reduction in the relative importance of costs and an increase in possibilities. But this can change with the increase in the price of oil. With the increase in needs and the depletion of reserves, the role of water has become more important. This is why large consumers of water are set up on the edge (for cooling, power plants, the steel industry, and automotive assembly). The problem of water is also qualitative, because it must be of a certain quality, particularly in the food sector.

• **Availability of land and buildings**: Companies have increasing space requirements; they are as much about quantities and quality. The search for low-cost equipped land located in a quality environment. The available buildings are a location factor, if the building is new or in good condition it is easily reusable. The multiplication of industrial parks and the development of industrial real estate modify the procedure for choosing a location (Merenne-Schoumaker, 1991). The activity zones have an impact on the organization of the territories, the activity zones are defined as "a set of land acquired and grouped by a client, general public, sometimes private, and previously equipped to facilitate the 'installation, the functioning and development of establishments of an economic nature'" (Moatti, 1968 cited by Million, 2004). These activity zones constitute a challenge for companies through the spaces, equipment, and services they offer for their establishment and development. For establishments in Greater Lyon located outside the center, 28% of the total are located in an activity zone. For industries, almost half of the industrial establishments (48%) are located in an activity zone (MILLION, 2004). 28% of the total are located in an activity zone. For industries, almost half of the industrial establishments (48%) are located in an activity zone (MILLION, 2004). 28% of the total are located in an activity zone. For industries, almost half of the industrial establishments (48%) are located in an activity zone (MILLION, 2004).

• **The quantitative and qualitative aspects of the workforce**: Labor is the main location factor for most industries, this comes from two facts: on the one hand, the reduction in traditional production constraints for a large number of companies and the increase in the main job -work and on the other hand an increasingly marked intervention of the public authorities. The workforce has four aspects (Merenne-Schoumaker, 1991): availability, qualification, reputation, and cost. Availability plays a role at the level of large companies (limited recruitment difficulties). The availability of labor also has a qualitative aspect in terms of age and sex (for example, some companies seek to recruit young staff). From the qualification point of view, companies have requirements for the required training, some companies reject rural areas or on the contrary they seek areas where the qualification of the population is less advanced. The reputation of the workforce includes qualitative elements such as regularity (absenteeism), speed (training in the workplace), efficiency, stability, etc. But it is difficult to assess these characters correctly, the appreciation of the workforce on these points is sometimes based on stereotypical images or old statements and can become completely false. The cost of labor is an important criterion of location but to be balanced by productivity. The reputation of the workforce includes qualitative elements such as regularity (absenteeism), speed (training in the workplace), efficiency, stability, etc. But it is difficult to assess these characters correctly, the appreciation of the workforce on these points is sometimes based on stereotypical images or old statements and can become completely false. The cost of labor is an important criterion of location but to be balanced by productivity. The reputation of the workforce includes qualitative elements such as regularity (absenteeism), speed (training in the workplace), efficiency, stability, etc. But it is difficult to assess these characters correctly, the appreciation of the workforce on these points is sometimes based on

stereotypical images or old statements and can become completely false. The cost of labor is an important criterion of location but to be balanced by productivity.

1.2.3.3 The Economic, Human and Political Environment

• **The economic environment**: the choice of a location can be influenced by finding proximity to other businesses. The search for proximity can be explained by the direct relations existing between the new establishment and those established in the surroundings. The consideration of the economic climate of the region, the search for a particular neighborhood (example: search for firms of the same nationality, same activity, or contrary to small firms who wish to locate next to a larger one). This behavior of firms aims to minimize risks (Merenne-Schoumaker, 1991). The proximity of firms has the effect of energizing the environment and creating ripple effects (incentive for modernization, innovation, creation, etc.). External economies play an important and complex role, they are the collective benefits that companies perceive under their relative position, independently of any market exchange. As we saw earlier, agglomeration economies are made up of localization and urbanization externalities. The localization savings result from the agglomeration of similar or neighboring activities and the urbanization savings are linked to the sectoral diversity on the territory. The agglomeration savings can be sought by two types of companies. Companies linked to the population and companies linked to production. For companies linked to production, companies' search for agglomeration economies leads to the development of "generalist" or technological cities. "Generalist" cities are defined by Aguilera-Belanger et al. (1999) as cities with diversified industrial activities and sometimes specific skills in certain sectors. Technological cities developing based on an industrial sector, specializing in innovative technology. The Lyon urban area is characterized by its "general" functions, based on a large number of small and medium-sized enterprises, and by the importance of certain sectors that have been established in the city for a long time (Aguilera-Belanger et al., 1999). The search for agglomeration economies is therefore interesting for businesses and these agglomeration economies can also attract new businesses. But from a certain agglomeration threshold,

• **Environmental concerns and constraints**: awareness of the problems of safeguarding the environment, regional planning policies, and the protection of nature restrict the possibilities of choice for many industries. Environmental protection measures are becoming an obstacle for the most polluting companies. But the regulations concerning them vary according to countries, cities, and regions. The most polluting companies move from the most regulated areas to the most tolerant. Nuclear power plants are also concerned with the protection of the environment because, they cannot be established without the approval of the population which sets up anti-nuclear demonstrations.

The framework of life is a factor increasingly mentioned in recent work, but it is rarely defined. Merenne-Schoumaker defines it as follows: "it includes the following elements: coordinates of the physical environment (scenic beauty, duration of sunshine), housing conditions (availability, price and above all quality), tourist attraction, presence of equipment in the fields of education (especially university and international school), commerce, medical care, culture and leisure, etc.; the ease of

access to these facilities or to neighboring tourist sites (in particular, the communication facilities with the metropolis or the neighboring large city), finally, factors of atmosphere (sufficient number of people of similar socio-professional categories, regional habits, degree of openness of the environment to newcomers, etc.).” These elements are not decisive but, on equal economic conditions, they can take the decision. The regions and/or municipalities are making efforts to improve their brand images and to try to offer “more”. Taking this factor into account leads managers to choose locations close to major cities or tourist regions.

Government intervention: Two groups of interventions are important (Merenne-Schoumaker, 1991): the regionalized interventions of the central power and the interventions of regional or local leaders. The majority of regional policies are incentive policies (financial and fiscal measures, orientation of investments towards this or that region, decentralization of growing centers towards the backward peripheries). However, their impacts are weak in regions in difficulty despite the aid, which does not change the image of regions that business leaders have of the minimum operating conditions. Also, the advantage obtained is not permanent and cannot be compared with permanent advantages such as infrastructure or high skill level of the workforce.

2. Methodology

In this section, it will be a question of specifying the nature and source of the data used, the analysis method, the procedure for estimating the model, and the variables chosen to justify the hypotheses.

2.1 Nature and Source of Data

Two different bases were the subject of our study. The first relates to the RGE2 (General Census of Enterprises) database, 2008 and the second relates to Statistical and Fiscal Statements (DSF) available to INSAE and which covers the period from 2012 to 2016.

2.2 Method of Analysis

The method of analysis used to achieve the objectives set by this study is essentially quantitative. The data was processed using STATA software version 14.

The characteristics of the observation units were analyzed using descriptive statistics across frequencies, position parameters (arithmetic mean), dispersion parameters (standard deviation). An econometric regression model, the model probit has been completed. In this model, it is assumed that decisions are made based on a utility maximization objective that is a function of several factors. By assuming the utility sought as a linear function of its determinants “X” leads to the following equation:

$$\text{We have } U_{ij} = X_i^A \beta_i + \varepsilon^z \quad (1)$$

Where i represents the ith company having to decide to settle (A = 1) or not (A = 0) in Cotonou, U the utility of the company, X_i^A is a vector of variables that influence the utility of companies, and β_i the vector of parameters to be estimated. The decision of companies to set up in Cotonou can then be specified as follows:

$$Y_i = \begin{cases} 1 \quad si \quad U_{ij} \geq 0 \Leftrightarrow X_i^A \beta_i \geq -\varepsilon^z \\ 0 \quad si \quad U_{ij} < 0 \Leftrightarrow X_i^A \beta_i < -\varepsilon^z . \end{cases} \tag{2}$$

The conceptual model can be expressed as follows:

$$Y_i = F(I_i) = \int_{-\infty}^{\beta X_i} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt \tag{3}$$

Or Y_i is the dependent variable which takes the value 1 if the company decides to settle in Cotonou and 0 if not. *Xi* is the matrix of independent variables relating to the decision to set up the business in a given municipality, βi the vector of the parameters to be estimated, and Fi the delocalization index.

2.3 Significance of the Regression

The maximum likelihood estimator $(\widehat{\theta})$ follows approximately a multivariate normal distribution $N_p(\theta, \widehat{Var}(\widehat{\theta}))$, where P is the number of coefficients. To assess the significance of the coefficients, one can use the tests below.

- **Wald test**

The Wald test assesses the relevance of the individual covariatesx_j. To this end, we consider the assumptions:

$H_o: \theta_j = 0$ against $H_1: \theta_j \neq 0$

We calculate the realization $z_{obs}$of: $Z_* = \frac{\hat{\theta}_j}{\widehat{\sigma(\theta_j)}}$

Statistics Z_* follow a reduced centered normal law.

- **Likelihood ratio test**

For this test, we consider the following hypotheses:

H_o: $\theta_1 = \theta_2 = \cdots = \theta_p = 0$ Against H_1: there is at least one non-zero coefficient.

To do this, we calculate the likelihood ratio statistic:

$x_{LR}^2 = -2(l_o - l_1)$

Where l_o is the value of the log-likelihood under H_o and l_o and l_1; the log-likelihood value evaluated in θ. Under H_o, x_{LR}^2 follows approximately a chi-square law with p degree of freedom.

The quality of the model is assessed by using the likelihood of the model which follows a Chi-square law. The model is said to be globally significant, when the value of the likelihood is greater than that of the Chi-square at the same degree of freedom, and a given threshold (1%, 5%).

2.4 The Explained Variable

The variable explained is made up of the company's decision to settle in a given municipality. It is a binary variable. It takes the value 1 (y = 1) for the case where the company is installed in Cotonou and the value 0 (y = 0) for the case where the company is not installed in Cotonou.

Table 1. Variables Used

Variables	Description	Empirical sources	Expected signs
Wind_prodf	Indicates the sale of manufactured products	Oyono (2015) Djinsu (2013)	+
Trav_serv	Indicates the work and services rendered	Oyono (2015) Djinsu (2013)	+
Ctransp	Indicates the cost of transport provided by companies	Oyono (2015)	-
Charg_pers	Indicates the expenses of the personnel supported	Oyono (2015)	-
Chiffr_aff	Indicates turnover	Oyono (2015)	+

Source: Author, 2020.

3. Analysis of the Results

3.1 Descriptive Analysis

3.1.1 Typology of Companies by Industry

The industrial sector in Benin is made up of 09 branches of activity. Table 2 presents the nomenclature and typology of industrial enterprises in Benin.

3.1.2 Sector Structure

The sector is dominated by the Wood and Furniture industry. More than half of the industrial companies listed (54%) are found in the "Wood and furniture" industry; the "Food products" branch accounts for 16% of economic units. Companies in the "Printing" branch represent 10% of the economic units listed; whereas the branches of activity relating to the manufacture of chemical products, and the production and distribution of water and electricity represent only 4% and 5% respectively. There is very little representation from companies manufacturing textile products. Besides, the cotton ginning branch accounts for 2% of industrial companies in Benin. The table below demonstrates this.

Table 3. Distribution of Companies by Industry by Location

	Setting up environment		Total	Proportion (%)
Branches of activity	Urban	Rural		
Wood and furniture	209	74	283	53.8%
Water and Electricity	23	3	26	4.9%
Cotton gin	8	3	11	2.1%
Printing	48	6	54	10.3%
Food industry	16	5	21	4.0%
Chemical industry	0	1	1	0.2%
Glass and materials manufacturing industry	13	9	22	4.2%
Extractive industry	73	11	84	16.0%
Heavy industry and metal products	4	1	5	1.0%
Textile industry	4	1	5	1.0%
Other industrial activities	12	2	14	2.7%
Total	410	116	526	100.0%

Source: RGE 2, INSAE 2008.

3.1.3 Distribution of Municipalities by Class

The basis of the RGE 2 made it possible to understand the location of companies according to distance. Consider Cotonou as the center. By categorizing base companies according to the distance (km) from Cotonou (Appendix). We obtain 08 classes of intervals equal to 100km, namely: [0-100], [100-200], [200-300], [300-400], [400-500], [500-600], [600-700], [700-800]. The table below shows the distance as the crow flies from Cotonou concerning the different municipalities.

Table 4. Distribution of Municipalities by Distance Class

DISTANCE (KM)	COMMUNES				
[0-100]	Abomey-Calavi	Adjarra	Adjohoun	Aguegues	Akpro-Misserete
	Allada	Athieme	Avrankou	Good	Come
	Dangbo	Grand Popo	Houeyogbe	Ifangni	kpomasse
	Littoral	Ouidah	Porto-Novo	Sakete	Seme-kpodji
	So-Ava	Ze			
[100-200]	Abomey	Adja-Ouere	Agbangnizoun	Aplahoue	Bohicon
	Bopa	Cove	Djakotomey	Djidja	Dogbo
	ketou	Klouekanmey	Lalo	Lokossa	Ouinhi
	Pobe	Toviklin	Zagnanado	Za-kpota	

[200-300]	Bante	Dassa	Glazoue	Savalou	Save
[300-400]	Bassila	Ouesse	Tchaourou		
[400-500]	Copargo Perere	Djougou	N'dali	Ouake	Parakou
[500-600]	Bembereke Nikki	Boukoumbe Sinende	Gogounou Tanguieta	Kouandé Toucountouna	Natitingou
[600-700]	Cobly Pehunco	Kalale	Kandi	Kerou	Materi
[700-800]	Banikoara	Karimama	Malanville	Segbana	

Source: Author, 2020

3.1.4 Location of Industrial Companies in Benin

Analysis of the table below reveals that 41% of companies in the Wood and Furniture branch have a distance between 0 and 100km, 32% between 100 and 200km, and 10% between [400-500]. Only 1% of companies are located between 700 and 800km.

The enterprises of the printing branch constitute 78% in the first-class [0-100], 15% in the area of Parakou, and its surroundings. From class [500- and up], this branch is non-existent. The textile industry is found at 40% in the category [100-200]; and 20% in the categories [0-100], [400-500], then [600-700]. It is zero in the other municipalities. The extractive industry and manufacturing of glass and materials are present only in the town of Littoral and its surroundings.

Table 5. Location of Companies by Distance

DISTANCE (KM)	**[0-100]**	**[100-200]**	**[200-300]**	**[300-400]**	**[400-500]**	**[500-600]**	**[600-700]**	**[700-800]**	**TOTAL**
AAI	33.3%	26.7%	6.7%	0.0%	13.3%	13.33%	6.7%	0.0%	100.0%
BA	41.0%	32.2%	8.5%	3.2%	9.9%	1.8%	2.5%	1.1%	100.0%
EE	38.5%	23.1%	15.4%	3.8%	7.7%	3.8%	7.7%	0.0%	100.0%
EC	9.1%	9.1%	18.2%	0.0%	27.3%	9.1%	27.3%	0.0%	100.0%
IMP	77.8%	5.6%	1.9%	0.0%	14.8%	0.0%	0.0%	0.0%	100.0%
IA	61.9%	13.1%	7.1%	2.4%	7.1%	2.4%	3.6%	2.4%	100.0%

IC	80.0%	5.0%	5.0%	5.0%	5.0%	0.0%	0.0%	0.0%	100.0%
IFAVEM	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
IE	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
ILOM	63.6%	22.7%	0.0%	0.0%	9.1%	0.0%	0.0%	4.5%	100.0%
IT	20.0%	40.0%	0.0%	0.0%	20.0%	0.0%	20.0%	0.0%	100.0%

Source: Author, 2020

The businesses of Cotonou and its surroundings show uniformity. As one moves away from Cotonou, businesses are not uniformly located. From this graph, it appears that distance influences the location of companies. The further we go from Cotonou, the fewer companies we see. Companies tend to cluster in certain areas, that is, around the urban areas of Cotonou, Abomey, Parakou. The concentrations are formed between [0-100], [100-200], and [400-500]. This reflects the Beninese reality around the big cities Cotonou and its surroundings, Abomey and its surroundings, Parakou, and its surroundings.

The histogram below reflects the location of businesses by distance.

3.1.5 Factors for the Location of Industrial Companies in Benin

The empirical results of the analysis model of the factors linked to the location choices of industrial companies in Cotonou show that the value of the global significance test of the model ($\chi 2$) is significant at the 1% threshold. We deduce that the model explains the factors that influence the choice of location for industrial companies in Cotonou. All the variables included in the model do not have the expected signs and are significant at the 5% level. Even up to 1% we have our results. We conclude that the variables are strongly linked. The percentage of exact prediction is also high (64.40%) and testifies to the validity of the model to make good predictions (Annex 4).

Table 6. Summary of the Probit Model Results

Variables	Coefficients	Standard error	Z value	Pr (Z = | z |)
Ctransp	-4.24e-10	1.62e-10	-2.63	0.009 * * *
Charg_pers	2.60e-10	1.15e-10	2.26	0.024 * *
Wind_prodf	4.48e-11	1.64e-11	2.73	0.006 * * *
Trav_serv	9.43e-11	2.61e-11	3.61	0.000 * * *
Chiffr_aff	-4.36e-11	1.51e-11	-2.88	0.004 * * *
_conscons	.3302237	.0296254	11.17	0.000 * **
% correct prediction			**64.40%**	
Chi-square	**18.52 * * ***			0,000
df (0)				

Source: Author, 2020

NB:**; *** significance level at 5% and 1% respectively

3.1.6 Results Analysis

All the factors identified explain the choice of location for industrial companies in Cotonou. These are the cost of transport, personnel costs, the sale of manufactured products and services, and then turnover. These variables have significant coefficients other than zero. Consequently, the choice of location of industrial companies in Cotonou is determined by the cost of transport, personnel costs, the sale of manufactured products and services, and turnover.

The cost of transport has a negative influence on the probability that the company is located in Cotonou. This factor is a solution to the problem of the optimal location of industrial companies. Indeed, companies want to minimize the costs related to transport to make more profit and become more efficient. Any downward or upward variation in transportation costs immediately improves or degrades the company's margin. The negative impact generated is immediate and without delay. These companies are concentrated more in the city with minimum transport costs. This result corroborates those of the authors of space economists who show the effect of the minimization of distance on the location and the formation of agglomerations. It also reinforces those of the followers of the new

geographic economy like Krugman who maintain that even at zero cost of distance, companies generate economies of scale and agglomeration.

Staff costs positively influence the probability that the business will be located in Cotonou. The companies use social and human capital strongly present on the territory of Cotonou. This demographic potential is beneficial for supply and also for demand. Ease of access to the market is therefore an asset linked to location.

The sale of manufactured products and services positively influence the probability that the company will be located in Cotonou. The production unit is set up for profit and this is demonstrated by the marketing policies established by it. The company sets up to meet the needs of populations in terms of industrial goods and services. The disposal of its finished products is then necessary.

The town has great potential in terms of population, which can represent a vast market made up of potential consumers. Their establishment is mainly motivated by the ease of access to consumer markets (consumption basins or seaports for export) as seen in Cotonou. Therefore, the presence of the market can explain the decision to locate companies in Cotonou.

Turnover negatively influences the probability that the company will be located in Cotonou. This result is contrary to our expectations. As just explained above, the sale of manufactured products and services should induce that turnover has a positive influence. Several companies in the industrial sector located in Cotonou do not have a high turnover. There are many service companies whose quality depends on staff resources.

Several authors have carried out empirical studies on this subject. Among them is (Oyono, 2015) whose work focuses on industrial location in the Center-Cameroon region. These variables relate to (total workforce in the sector, external services, turnover, customers, cost of transport, and products manufactured). All of these variables were significant at the 5% level. These variables (workforce, external services) present in our database and applied to the Beninese context do not explain the location of companies in Cotonou.

On the other hand, the variables cost of transport and products produced are as significant in Cameroon as for our results in the Beninese context.

Analysis of the context of the study therefore nuances the variables linked to location.

For its part, Djinsu (2013) notes in its study that proximity to factors of production is a factor in the location of industrial companies. These companies attract others to a territory which strengthens my agglomeration.

Bouvard in 2008, in his work, identifies the localization factors of economic activities regarding the urban area of Lyon. Its results show that the distance to the center, the number of jobs, the areas of activity as well as the population positively influence industrial location.

The location factors, therefore, vary according to the context of analysis, the size of the population, and the level of development.

4. Conclusion

The objective of this study is to analyze the factors of the location of industrial companies in the commune of Littoral. The theoretical and empirical literature has made it possible to understand the various factors linked to the location of industrial units. The results show that the location of businesses is influenced by distance. Indeed, **the descriptive analysis reveals that distance plays a very important role in the location of industrial companies.** Companies tend to cluster in certain privileged areas. We note that concentrations form around the agglomerations of Cotonou, Abomey, Parakou. This reflects the Beninese reality around large cities. The presence of industries in Cotonou can be explained by the underlying economic logic specific to the locality. The commune of Cotonou occupies a place of choice in Benin especially on the economic level, with the port and the airport which are the most important economic entities of the country. It is a port department, a large administrative and commercial center, and a point of convergence of goods inland and to neighboring countries. Likewise, companies want to minimize their transportation costs and maximize the sale of products and services. **Market presence attracts businesses and promotes** proximity to structuring axes, develops logistical advantages and accessibility to other innovation factors favorable to business networks.

As the original question suggests, the high concentration observed in the commune of Littoral is not the result of chance, there are therefore many reasons for locating a company. The motivation, in general, is linked to the search for efficiency gains: economies of scale, exploitation of specific advantages, search for dominant positions. These effects promote technological innovation, knowledge. The choice of a location is the result of a greater or lesser number of factors whose weight and diversity vary greatly from one situation to another, from one period to another. The location factors in an empirical study can only be understood in a piecemeal fashion. This field of study is still very broad to understand in the case of the Republic of Benin.

The final selection of a location is always a question of compromise and options because, as Richard Muther says, “it is rare to find a perfect location, allowing a perfect location for a perfect price”. Entrepreneurs, therefore, choose “what is best” from “what they want” and “what is available”.

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Appendix

Table 2. Typology of Companies by Industry

Id_Branche	Branch_Label
030	**PEACH; FORESTRY, EXPL. FORESTRY, SERV ANNEX.**
030010	Sylvic, exploit. Forest., Picking, annexed act.
030020	Peach
040	**EXTRACTIVE ACTIVITIES**
040010	Crude oil and natural gas extraction
040020	Other extractive activities
050	**AGRIFOODS INDUSTRIES**

050010	Slaughter, processing and preserving of meat, fish
050020	Manufacture of fatty substances
050030	Work grain and animal feed, amyl prod.
050040	Manufacturing of prod. cereal-based foods
050050	Beverage manufacturing
050060	Food production nec
050070	Manufacture of tobacco products
060	**MANUFACTURING. TEXTILES, COOKING, TRAVEL ART, SHOES.**
060010	Cotton gin
060020	Prod. Production textiles and clothing
060030	Leatherwork; manufacturing art. travel shoes
070	**RAFF PETROL, FABRIC. PROD CHEMICAL, RUBBER. AND PLAST**
070010	Oil refining
070020	Chemical manufacturing
080	**MANUFACTURE OF GLASS, POTTERY, AND CONST MATERIALS.**
080000	Glass, pottery, and const materials manufacturing.
090	**FOB. OPEN. METALS, MACH, RADTV EQU, MED, MAT TRANSP**
090010	Metallurgy; foundry; fabric metalwork
090020	Machines, mat div, TV rad eq, medic mat, transport
100	**OTHER MANUFACTURING INDUSTRIES**
100010	Woodworking and manufacturing of articles of wood and basketwork
100020	Paper, cardboard, publishing, printing
100030	furniture manufacturing
100040	Other manufacturing and recovery activities
110	**ELECTRICITY, GAS AND WATER PRODUCTION**
110,000	Product. and distribution of electricity, gas, water

Source: INSAE, 2001