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Clustering Factors of Textile Firms Case Study: Istanbul Metropolitan Area

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Abstract: Concerning with developing countries, the implementation of location theories and approaches seems to be very intricate. The degree of reliability of most location theories are based on economic as well as political factors existing in the countries. The instability of economic and political structure characterizing developing countries makes the application of location theories complicated. Because of all this reasons, we thought that the best way to avoid these complications is to investigate the study area to determinate the industrial location factors and trying to explore their relations. In this context, our major objective is to introduce a statistical model, ÷2 test that can be applied to industrial location studies. This model is used with contingency table, either to confirm or to reject the hypothesis of the relations that can be between location factors of textile manufacturing being located in Istanbul metropolitan area in Turkey as developing country.

Key words: Industrial location, industrial clustering, location determinants, textile industry

INTRODUCTION

Since the research is on industrial location, we will give a brief review of the importance of the manufacturing location in urban area: The need of manufacturing industry for good accessibility has weakened considerably in the last thirty years. A firm workers need to be able to get to work easily and when those journeys were predominantly by public transport, firms benefited by being near to public transport nodes, especially the city centre. As more and more people travel to work by car, it is not just the point of high accessibility of movements from the city centre to the suburbs but that the accessibility advantages become dispersed and cease to be concentrated in a few places. As well as needing labour, a firm needs energy. When that was supplied by coals, the high cost of transporting the energy to many firms clustering around coalfields and as more and more firms use gas, oil or electricity, another clustering tendency is weakened (David, 1981).

In addition, a firm requires low transport cost. When transport was by rail or workers, access to transport was focused in a few locations. Industrial transport is now largely by road and the road system disperses accessibility advantages. In this way, the need of manufacturing plants to have good accessibility does not cause plants to cluster as closely as they once did.

Those arguments do not apply, however, to some firms where close contact is essential, for example, the clothing sector. In concerning of external economies, there are some one which manufacturing firms may be able to realise if the firms locate to each other: in so far as firms require special roads or engineering services these can be provided more cheaply for several firms together than for the same firms separated. Some services for the workers ca be provided more cheaply for a group. A firm may be able to sub-contract part of its work to a specialist firm which, by being a sub-contractor able to find enough work only by working for several firms (Needham, 1977). Therefore studies on industrial location in urban areas must be encouraged. This study will focus on the textile sector used by most developing countries in economic development, since it is labour intensive, labour which is available both, in quantity and low costs, represents as a competitive advantage over developed countries having high level of technology.

Location theories and developing countries: Before the First World War, the theory of location was focused on individual firms. It was based on the concept of Equilibrium State in which at any disturbance from location of the firm was determined by the perception of the manufacturer to the forces; distances, raw material and markets. Between the two World Wars, two different directions arose: at first, all types of land use that consisted of urban zones were analysed according to the same topic of Von Thunen model on agricultural lands (Hoover, 1948; Harris, 1945).

The type of land use was taken as a starting point, in which they intended to explain land use by analogy with animals and vegetal species. Secondly, the interest of ecologist on concentric urban areas studying land use has influenced other research that has taken into consideration the city centre area, similar to market place of Von Thunen and the space organisation as a hierarchical system. At the end of the Second World War,

location theories took new approaches in explaining location problems: the concept of equilibrium state in which at any disturbance from outside, a new equilibrium could be reached. Furthermore, decisions are taken rationally in order to choose an optimum location for an activity (Isard, 1960).

In the 1960s, Walter Isard stated his general equilibrium analysis, taking into consideration the factor of distance and incorporated transport input with production inputs into the concept of spatial transformation

Among recent approaches, it has been found that the most suitable is a regional approach since it takes in account the factor of globalisation. The continued works on firm's location behaviour at a particular point in time is well supported and preferred by regional analysts. However, the optimum location has not yet been reached, since the urban system is getting more complex. This complexity of the system makes the prediction of future urban events difficult (Cagmagni , 1991).

Unfortunately, the difficulty of implementing location theories in developing countries is more stimulated by constraints which they suffer from. Since most location theories are based on economic factors, their degree of reliability is related to the economic environment. The instability of economic and political factors characterising developing countries makes the application of those theories impossible. Among these handicaps, the problem of landownership in which is largely owned by politically and wealthy persons, as a result while applying urban plans difficulties came up. At second, the market imperfection makes the economic expectations unreliable, which make the mathematical models designated for location issues so far from the fact Stillwell, (1992). Moreover the divergence between interests of governors and low incomes groups creates a political instability in which the result will influence negatively on the quality of labour. As a result all this problems and instabilities will certainly decrease the reliability of data by what we intend to plan. In addition to the unreliability of the data, the instability of developing countries causes time and money wastes (Blair, 1972).

The purpose of the study: The objective of this research is to explore the location determinants of textile manufacturing firms being located in Istanbul metropolitan area in Turkey, then testing by Chi square test the relationships between the defined location factors and their significances. This will help us in understanding the textile firms' clusters in certain zones of the metropolitan. In the other words, a questions came up, why the textile firms location is not homogeneously distributed in the metropolitan? What are the factors for the specific cluster? And are they any relations between these factors?

MATERIALS AND METHODS

After a theoretical background about the textile sector to find answers, a survey form was settled up over four major groups: Firm characteristics, accessibility, labour and environment problems.

To delimitate the study area, at first a general introduction of the 500 most exporter textile firms in Istanbul metropolitan area is chosen. Among these 500 firms 15 firms are excluded since they are out of the boundaries of the metropolitan. Taking into account the main cluster areas, a sample of 180 firms among the 400 firms. Sampling operation was based on random and oriented sampling methods. The obtained survey forms were controlled. The reliable result was a sample of 131 firms. The remaining firms are eliminated either because of the lack of the data or because of the bankrupt of the firms. To make the analysis easy, the data was coded and organised in a matrix, using excel programme.

Before the interpretation, I preferred to make a statistical description of the survey results. For a deep analysis two methods to analyse the results are introduced: At first drawing maps. The maps, considered as graphs, represent different location of the surveyed firms according to a specific factor of location (Fig. 1), at second Chi square test is applied. Maps are needed to look if there are any relations between the firms' characteristics and the type of space. In the other word, it was intended to determine the location prefers of the surveyed firms according to their characteristics. Chi square tests are used to test the relation between non countable variable or nominal scale variables.

Definition of tested variables: The more sophisticated methods for analysing relationships require that all variables must be measured along interval scales, but this is not always possible: many important relationships often involve variables that are measured on long nominal scales. The chi square test is a statistical model often used for identifying relationships between two nominal scaled variables (Donald and Krueckeberg, 1974). Before introducing the results it is better to define the factors of clustering tested by chi square test. The survey data has not permitted to test all variables, either because of the conditions of applying the test is not respected, or because of the unreliability of the answers:

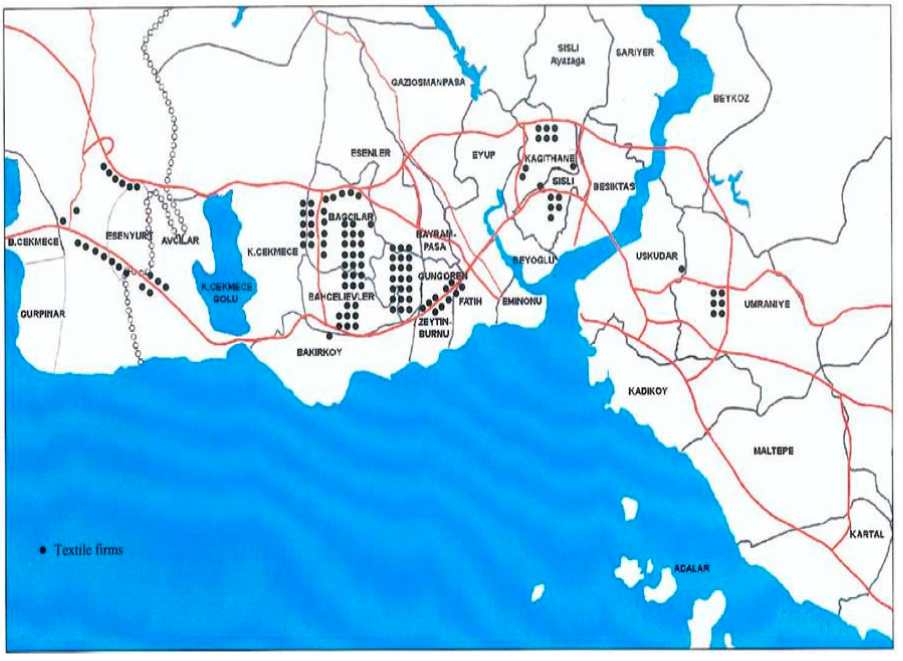

Fig. 1: Location of textile firms being located in Istanbul metropolitan area

- Annual sales and annual production of firms were defined as follows: High and Low. The limit of annual sale is decided to be 7M$. Concerning the annual production, the limit was decided to be 5000 units.
- Level of technology: It has been supposed that high level of technology concerns firms that use computer programmes in their production process.
- Location of financial institutions: Not far: < 10 km, far: >10 km
- Location of customers: Not far: 0-5 km, Far: >10 km
- Location of firms on European side or on Asian side
- Location of firms according to the administrative boundaries of Istanbul: Location of firms either inside the boundaries or outside.
- Contact Type (Tél-email or face to face): the type of contact that textile firms base on while working.

Calculation steps of the chi-square test:

- Détermine 'r' categories using nominal scales with the first variable. Then collect samples of size N and dustribute among the cells of the r x c contingency Table 1. Be sure that N is large enough so that observed frequencies within each cell is greather or equal to 5.
- Assume that the two variables are independent(H_0).

Table 1: Observed probabilities

Variables	Variable1	Variable1	Total
Variable2	$ni_{=1}$/ N	$ni_{=2}$/ N	$(ni_{=1}+n_{=2})/N$
Variable2	$ni_{=3}$/ N	$ni_{=4}$/ N	$(ni_{=3}+ni_{=4})/N$
Total	$(ni_{=1}+ni_{=3})/N$	$(ni_{=2}+n_{=4})/N$	1

Table 2: Expected probabilities

Variables	Variable1	Variable1
Variable2	$nj_{=1}$	$nj_{=2}$
Variable2	$nj_{=3}$	$nj_{=4}$

$n_{j1}= (ni_{=1}+ni_{=3}) /N * (ni_{=1}+ni_{=2})/N$, $n_{j2}= (ni_{=2}+ni_{=4}) /N * (ni_{=1}+ni_{=2})/N$, $n_{j3}= (ni_{=1}+ni_{=3}) /N * (ni_{=3}+ni_{=4})/N$, $n_{j4}= (ni_{=2}+ni_{=4}) /N * (ni_{=3}+ni_{=4})/N$

- Calculate the observed probabilities by dividing all ovserved frequencies n_i ($ni_{=1}$, $n_{=2}$,…$n_{i=n}$) by N. N is the total observation show in Table 2:
- Calculate expected probabilities nj:
- Calculate the value of chi-square test

$$\chi^2 = N.\left[\Sigma\left(\frac{Op - Ep}{Ep}\right)^2\right]$$

N = total of observed firms, Op: observed probabilities, Ep: expected probabilities.

- Obtain degrees of freedom : df= (r-c) * (c -1) and state significance level (0.1%, 1%. Or 5%).
- Dtermine critical value of χ^* in the table of $\chi 2$ distribution, then, if $\chi 2 > \chi^* 2$, reject our hypothesis Ho and if $\chi 2 < \chi^* 2$ accept it.

RESULTS AND DISCUSSION

Results of the study will be introduced as general observations of the survey and significant relations explored by using chi square test.

Survey findings: The outcomes of the analysis applied to the survey data are numerous. During their location process the investigated firms are mostly interested in market potential for their products, customer location and high accessibility. If we examine the map indicating the distribution of the investigated firms we observed four clustered groups. The attraction of customers and the easy transfer of semi-finished products between firms are the main causes of this clustering.

The European side is found to be the most preferred area of location for textile exporters because of the labour and population potential. The origin of this labour is the migration of the population from Balkans after the collapse of the Ottoman Empire. Most firms pinpoint the Importance of the low labour costs and high accessibility. Finally, textile manufacturing does not have any hazardous effect on the urban environnement especially on the human health. However its effect on urban space can be seen as playing a negative role in the traffic congestion. Actually the surveyed areas because more and more congested as a result of industrialisation and urbanisation.

χ2 test findings:

- Annual production and the level of technology are two dépendant variables with significance level of 5%. This tested relation, confirm the choice of location of the investigated firms on the metropolitan. A metropolitan means a huge amount of informations and availabilty of tchnology.
- Annual sales and location of financial institutions are two dépendant variables with significance level of 5%. Since the firms are exporters, be closed to financial institutions is a necessity.
- Annual sales of the textile firms and location of customers are two dépendant variables with significance level of 5%.This relation confirms the importance in to be located on a metropolitan caracterised by its attraction, services and commodities.
- Annual production and the location of the firms either on the European side or on the Anatolian side of the metropolitan are two dependant variables with significance level of 5%. This relation confirms another reality behinded about Istanbul. In fact, the textile sector began to appear as a part on the land scape of the metropolitan at first on the European side so to choose it can be explained by historical reasons and the labour potential.
- Annual production and the location of the textile firms either inside or outside administrative bouandries of the metropolitan are two dependant variables with significance level of 5%. This tested hypothesis confirms that firms located far away from government institutions can relise higher annual production and sales since they are reltively far from government controls.
- Annual production of the firms and the mode of contacts (face to face or others) are two dependant variables with significance level of 5%.
- This dependance confirns that, the type of contact between firms is important to increase the production of the firms. That means operating face to face between managers makes up trust and as a result an increase on the amount of information either on production process or about the market conditions.

CONCLUSION

In conclusion, industrial clustering in developing countries can not be easily understood and explained by location theories introduced above. The only way until now is to do a local investigation and try to explore the different relations between location factors. This relation can be came up by several statistical methods, among them Chi square test. This objective can be reached by regression and correlation methods between two or more variables. However, we were restricted to descriptive analysis and chi square test because of the outcomes of the survey. The results of the findings of the survey and the different relations tested between textile location factors are introduced, respectively as follow:

- Most firms explain their locations on the metropolitan by the following factors High accessibility, security, mrket potential and low labour cost. This factors are more available on the European side than the Asian or Anatolian side. In addition, the European side is characterised by labour more qualified than the Asian side.
- Concerning tested reltions between custering factors of the inevestigated textile firms, relation between annual production and the level of technology.

Annual Production and the location of the firms either on the European side or on the Anatolian side of the metropolitan, annual sales and location of financial institutions, annual sales of the textile firms and location of customers and annual production of the firms and the mode of contacts (face to face or others).

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