

AN ANALYSIS OF AGGLOMERATION ECONOMIES AND THEIR ECONOMIC  
IMPACTS IN TURKEY THROUGH THE LENS OF NEW ECONOMIC GEOGRAPHY  
APPROACH

A THESIS SUBMITTED TO  
THE INSTITUTE OF SOCIAL SCIENCES  
OF  
YILDIRIM BEYAZIT UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR  
THE DEGREE OF MASTER OF SCIENCE  
IN  
THE DEPARTMENT OF ECONOMICS

AUGUST 2013



Approval of the Institute of Social Sciences

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## **ABSTRACT**

### **AN ANALYSIS OF AGGLOMERATION ECONOMIES AND THEIR ECONOMIC IMPACTS IN TURKEY THROUGH THE LENS OF NEW ECONOMIC GEOGRAPHY APPROACH**

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August 2013, 117 pages

The new economic geography approach bringing spatial aspect to the economic analysis has gained importance as a theory based on agglomeration economies and concentration. Determination of agglomeration economies and externalities in regional level provides vital information for developing region-specific policies.

The purpose of this study is to analyze the presence of agglomeration economies in Turkish manufacturing industry and their economic effects. The study covers NUTSI and NUTSII level regions of Turkey. The data covering the period between the years 2003-2008 is obtained from the Annual Business Statistics by TÜİK (Turkish Statistics Institute) in accordance with NACE Rev. 1.1 classification. As the analysis method, the static panel data analysis method is employed.

As a result of the analysis, the types of agglomeration economies and their effects on economic growth are determined both regional level and country-wide for Turkey. The result that localization economies and the Marshallian externalities are powerful all across Turkey is obtained. Additionally, urbanization economies, which appear as the increase of industrial diversity, are observed to have a negative effect on economic growth.

Keywords: New Economic Geography, Agglomeration Economics, Manufacturing  
JEL Codes: C23, L60, R12

## ÖZET

### YENİ EKONOMİK COĞRAFYA PERSPEKTİFİNDEN TÜRKİYE'DEKİ YIĞILMA EKONOMİLERİNİN VARLIĞI VE EKONOMİK ETKİLERİ

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Tez Yöneticisi: Prof. Dr. Fuat Oğuz

Ağustos 2013, 117 sayfa

İktisadi analize mekan boyutunu katan yeni ekonomik coğrafya yaklaşımı, yığılma ekonomilerini ve yoğunlaşmaları temel alan bir teori olarak önem kazanmıştır. Bölgesel düzeyde yığılma ekonomileri ve dışsallıkların belirlenmesi, bölgeye özgü politikaların geliştirilmesi için önemli bilgiler sunmaktadır.

Bu çalışmanın amacı, Türk imalat sanayiinde yığılma ekonomilerinin varlığını ve ekonomik etkilerini analiz etmektir. Çalışmaya, Türkiye NUTSI ve NUTSII düzeyinde yer alan bölgeler dahil edilmiştir. 2003 - 2008 yılları arasını kapsayan döneme ait veriler, sektörel olarak NACE Rev. 1.1 sınıflandırmasına göre TÜİK'in 'Yıllık İş İstatistikleri' nden elde edilmiştir. Analiz yöntemi olarak, statik panel veri analizi yöntemi kullanılmıştır.

Analiz sonucunda hem Türkiye genelinde hem de bölgeler bazında yığılma ekonomilerinin türleri ve ekonomik büyümeye etkisi belirlenmiştir. Türkiye genelinde, yerleşme ekonomilerinin ve Marshallyan dışsallıkların etkili olduğu sonucuna ulaşılmıştır. Bununla beraber, endüstriyel çeşitliliğin artması şeklinde görülen kentleşme ekonomilerinin büyümeyi olumsuz etkilediği gözlemlenmiştir.

Anahtar Kelimeler: Yeni Ekonomik Coğrafya, Yığılma Ekonomileri, İmalat  
JEL Kodları: C23, L60, R12

## **ACKNOWLEDGMENTS**

I wish to express my deepest gratitude to my supervisor Prof. Dr. Fuat Oğuz for his guidance, advice, encouragements and insight throughout the research.

I would also like to thank Prof. Dr. Recep Kök for his suggestions.

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## LIST OF ABBREVIATIONS

### ABBREVIATIONS

UN-Habitat	United Nations Human Settlements Programme
R&D	Research and Development
MAR	Marshallian
US	United States
USA	United States of America
CES	Constant Elasticity of Substitution
OECD	Organization for Economic Co-operation and Development
NUTS	The Nomenclature of Territorial Units for Statistics
ISIC	International Standard Industrial Classification of All Economic Activities
NACE	Nomenclature des Activités Économiques dans la Communauté Européenne
LQ	Location Quotient
n.e.c.	Not elsewhere classified



## **1. INTRODUCTION**

Economic activities have a regionally unbalanced distribution all over the world. It is known that there are very limited economic activities whereas more intense and profitable economic activities are observed in some other regions. As a result, between regions there occur significant differences, in terms of social and economic development. Therefore, the importance of the “location” concept which falls into the process of executing economic activities has been increasing in the field of economics, and it has become a popular issue. Determining the areas where economic activities concentrate within a country and examining the properties of these locations itself is an important topic.

The economic geography approach tries to explain the differences between regions primarily by using information specific to region, along with considering the spatial aspect of economies. Reasons of regions’ specializing in different economic activities, why there are economic differences between regions and how these differences can be eliminated, development of region specific policies for economic growth constitute the main field of study for the economic geography branch. The fundamental analysis method of the economic geography approach is the examination of concentrations and agglomerations resulting from closely locating of economic activities.

Since the beginning of 20<sup>th</sup> century, spatial aspect of economics has been studied within the field of economic geography. However, the monopolistic competition model of Dixit-Stiglitz (1977) “iceberg” transport costs function of Samuelson (1958) and increasing returns to scale model of Krugman (1991) established a ground causing a new movement. This movement, called new economic geography, analyzes the tendency of firms to locate close to each other and economic effects generated by these factors via

using the mentioned new models, yet without losing the contact with the traditions of economic geography.

The core of this study is the determination of agglomeration economies in Turkish manufacturing industry and examining its effect on economic growth. According to the new economic geography approach, agglomeration economies are discussed in terms of static and dynamic externalities. This study also employs this approach as the basis. The study covers the period between the years 2003 and 2008. The main motivation of the study is that there are no other studies in the literature, which are conducted with the data covering the mentioned period. The study is crucial since Turkish manufacturing industry of the period 2003-2008 is analyzed for the first time in regard to agglomeration economies and its effect on economic growth.

The main goal of the study is to provide the necessary data for creating accurate economic policies in regional and sector level by analyzing the agglomerations present in Turkish manufacturing industry. The success of regional and sector policies depend on a true interpretation of the effects specific to the region and sector. Therefore, Turkish manufacturing industry is analyzed separately in regional level in this study. In accordance with this purpose, the key sector method and the econometric panel data analysis method are employed. To determine the sectors in which concentrations occur in regions, the key sector method; to determine the effects of agglomeration economies on economic growth, the panel data analysis method is used.

As a result; firstly, localization economies are determined to be dominant throughout Turkish manufacturing industry. It is observed that labor intensive and natural resource based sectors still have a great influence in Turkish manufacturing industry. In accordance with this result, it is determined that the presence of localization economies positively contribute to economic growth in almost all geographical regions and country-wide in Turkey. On the other hand, the presence of urbanization economies is slowing economic growth down, in contrast with the expectations in the literature. When regionally examined, no positive effect of urbanization structure is determined in any regions. Last, it is determined that increases in wages also increase economic growth by increasing concentrations in the parts of Turkey other than Eastern Anatolia and Southeastern Anatolia regions.



In the first section of the study, the new economic geography approach is introduced. In addition, the models leading to new economic geography's advancement are explained in detail. In following parts, an agglomeration economy, which is the fundamental analysis topic of the approach, is discussed. While factors creating agglomeration economies are explained in the second section, in the third section agglomeration economies and its different types are defined. In the fourth section of the study, a broad theoretical and empirical literature review is presented. The second part, constituting the analysis part of the study, begins with the fifth section which includes the determination and interpretation of key sectors. In the sixth section, the effects of agglomeration economies on economic growth are analyzed with econometric methods and findings are presented. The study ends with the conclusion section.

## **2. NEW ECONOMIC GEOGRAPHY**

In recent years, differences in economic development of countries and regions became a topic that attracts more attention of economists, as the boundaries of economics diminish gradually. The efforts to explain these development differences lead many new movements. In this context, related to the geographical aspect of development, the analyses based on distribution of economic activities within the country appear to be a new movement. This new economic movement consists of two approaches having a paradox between them. First approach tries to explain the differences in economic development between varieties of locations by underlying various differences that are inherent to those locations. This approach follows a relational method such as the tendency of countries with tropical climates to have low per capita incomes or of large cities with rich harbors to demonstrate more economic development. The other approach, called new economic geography, typically investigates why regions differ even when they do not have any advantages or disadvantages inherent to those regions. (Krugman, 1998)

There are three reasons especially why starting to make economic geography is important. First of those is the topic that the importance of the places where economic activities are conducted within countries. Second, on some important occasions, the line

between international economics and regional economics becomes blurred. And third, the most important reason to re-examine economic geography is the intellectual and empirical laboratory it provides. (Krugman, 1991)

Yet, there is no commonly accepted general definition for this newly developing concept. This definition problem of economic geography, according to (Fujita & Krugman, 2004), is in fact related to explanation for the structure of the great differences economic agglomeration demonstrates along geographical locations. In this context, the location decisions of economic activities is seen as the first step of explaining the regional economic differences and becomes a fundamental question for which new economic geography seeks an answer.

The theory of new economic geography is developed for the first time in Krugman's works in 1991. In parallel to these pioneering works, it is mentioned that the concept of new economic geography can be best defined as a "style". New economic geography is a style of economic analysis, which tries to explain spatial structure of economics by using specific technical methods to develop models with increasing yields, and markets that characterized by imperfect competition (Krugman, 1998)

Epistemologically, new economic geography is defined as the concretized version of an old idea based on theories of location. According to this definition, if simply handled, commercial models are developing into another important dimension; the dimension of "location" (Surico, 2003). In modern theories, effectively specifying the regions in which the commercial activities will be conducted is assumed to be at least as important as the quality and the quantity of trade for economic development.

The factors encouraging the aggregation of some economic activities on a specific location and the results of the geographical pattern caused by this aggregation becomes one of the fundamental questions that new economic geography intends to explain. New economic geography particularly tries to explain centripetal and centrifugal forces affecting agglomeration tendency, why agglomerations occur in a specific location and why different regions expertise on different economic activities. However, there is no unique and global model that can be employed for explaining these questions. (Fujita & Thisse, 2002). Because every location subject to analysis is different from others in terms

of local dynamics, level of development and organizational structure. The branch of economic geography, trying to explain spatial economic relations and to make forecasts by developing theoretical models on these fundamental problems, can be defined a special field of expertise in the science of general economics (Küçüker, 2000).

## **2.1. Intellectual History of New Economic Geography**

### **2.1.1. Von Thünen's Isolated State Model**

When the literature of new economic geography is in discussion, Von Thünen's model is discussed first. However, Thünen's article ‘‘Der Isolierte Staat in Beziehung auf Landschaft und Nationalökonomie’’ written in 1826 had not been translated into English until 1966 and did not draw great attention of economists from other countries. In that period, the literature of spatial economics was dominated by German economic tradition. The article became a center of attention for spatial economists when Wartenberg presented this work to literature in English in 1966 with the name ‘‘Von Thünen's Isolated State’’.

The hypothesis ‘‘Land Rent and Use’’, a part of this work, makes it a pioneer by adding spatial aspect and transport costs to standard analyses on industrial organization. In this manner, it can be said that Ricardian trade theory dominating that period assumed immobility of production factors and free movement of goods. Contrarily, in Von Thünen's model, labor moves freely within the region and also while giving the location decision itself, the freightage for transportation of goods must be borne. (Fujita & Krugman, 2004) In the model, the key determinant becomes transport costs.

Thünen, in his model, tries to explain how agricultural activities distributed around cities in pre-industrial Germany under perfect competition and constant returns conditions. (Fujita & Thisse, 2002) In order to explain the distribution, he designed a mono-centric city. The lands around this city are completely homogenous in terms of land fertility. In the

exact center of the city, there is a market in which farmers sell their products and the fields of farmers are located around this market within a circular arrangement.

The locations where fields lie are characterized by factors such as for which product the soil conditions are suitable, geographical position and so on. Land utilization and rents differ related to these properties. Thünen developed his theory by focusing on the differentiation of transport costs between locations. Each location ( $r$ ) is identified by its distance ( $r$ ) to the city center. And, the density of land is equal for each location and equal to  $2\pi r$  for a land with distance ( $r$ ).

Basically in this mono-centric city, following assumptions are valid:

- a) Producers operate under constant returns to scale conditions.
- b) Entry for any economic activity is completely free.
- c) All economic agents are price takers.
- d) The city has no connection to the rest of the world and close economy conditions are applicable.
- e) Consumers are uniform in terms of choices and incomes.

The models assumptions for transportation market are as follows:

- a) For each product and location there is a single way of transportation.
- b) In transportation market full competition conditions are applicable.
- c) Transport costs are directly proportional to distance.
- d) Instead of transporting intermediate inputs to the market in the city center, their being a subject to trade on local basis is partially assumed.

As a result of assumptions on land and transportation markets, the opportunity cost of each unit land is equal to zero. Consequently, the cost of a product and the value of any land suitable for that product are determined by that location's distance to city center. Thünen, in his model, builds a process in which farmers making their bids for each unit of land by considering the surplus that can be gained from the land. (Fujita & Thisse, 2002)

Thünen, in his article published 1826, modeled a isolated mono-centric city, tried to explain land utilization decisions by defining assumptions and properties, yet the model was mathematically formalized by Launhart (1993), Lösch (1954) and Dunn (1954). (Fujita & Thisse, 2002)

In the model, for each agricultural product, a total of n economic activities exist:

$$i=1, 2, 3, \dots, n$$

To produce 1 unit of product i, the only needed input is  $a_i$  units of land. In this case, the production function is formulized as follows:

$$q_i(r)=1/a_i \tag{1}$$

The product i is sold in the market in the city center with a price of  $p_i$ . At the same time, for each unit of product i and each unit distance, there is a cost of transportation  $t_i$ . Consequently, the surplus for farmers ( $\Psi_i(r)$ ) can be calculated as follows:

$$\Psi_i(r) \equiv (p_i-t_i r)/a_i \tag{2}$$

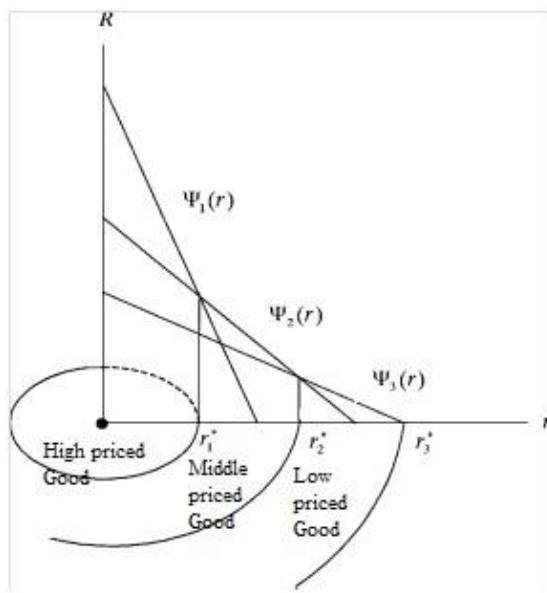
The surplus function for farmers corresponds to their bid function for each unit land. Since farmers are rational individuals, they will aim to maximize their profit. The profit function of farmers is developed as follows by placing the production function (1) into the profit function (2);

$$\pi_i(r)= (p_i-t_i r)q_i(r) - R(r) = \Psi_i(r) - R(r) \tag{3}$$

Due to the assumptions of constant returns to scale and perfect competition, all farmers will receive zero profits despite having positive outputs. However, at the same time, the land rent cannot be negative in the equilibrium position. Consequently, at the end of the process, the actor having the highest bid while all farmers will have zero profit will use each location.

$$R^*(r) \equiv \max_{i=1, \dots, n} \{ \max_{i=1, \dots, n} \Psi_i(r), 0 \} = \max_{i=1, \dots, n} \{ \max_{i=1, \dots, n} (p_i-t_i r)/a_i, 0 \} \tag{4}$$

The land rent function is defined so. When the structure of the function is observed, if the transport costs function is a linear function dependent on the distance, the equilibrium distribution for the land rent seen above has a linear and convex structure. When the farmers situate near the market, some of transportation costs disappear and the farmers take them as savings. As it can be understood from the function; as a result, the land rent for each economic activity is equal to these savings, which will be done off the transport cost of the product.



**Figure 1.** Land rent graphic and Thünen circles ( $n = 3$ )

**Source:** (Fujita & Thisse, 2002)

### 2.1.2. Central Place Theory

Since Thunen's analysis, in location theories, the partial analysis method became the traditional procedure. Weber (1929) employing the partial equilibrium analysis after Thunen expanded the analysis. Weber (1929) in his pioneering work, which paved the way for Core-Periphery Model, discusses the location problem from the point of individual producers that take all the data about prices and other companies' location decisions from

the market. Producer, in this model, tries to minimize total cost coming out of production and transport costs. Thus, it becomes possible to examine location theories with regard to companies and markets and to analyze location theories micro-economically.

In his work Weber (1929) categorizes the factors that must be considered while deciding the optimal location for industrial activities. According to Weber (1929) location factors are classified by various criteria:

- General Location Factors: Factors which are applicable for all industries.
- Special Location Factors: Factors which are applicable for some specific industries.
- Natural-Technical Factors: Factors which are related to the natural structure and physical conditions of a region.
- Socio-Cultural Factors: Factors which are related to the social structure of a region.

Another important contribution of Weber is that he classified the raw materials and specified the impact of raw materials to the location decision. According to Weber, raw materials can be divided into two main sections: resources which can be found in all regions and those which can be found in only specific regions. While resources which can be found in all regions do not affect the location, special raw materials are effective in specifying the location with respect to their ratios of participating in production process.

One of the points which distinguish Weber, who considers transport costs and distance for location decisions like other works in the same period do, from his contemporaries is that he includes labor into the model.

In 1929, another study is Hotelling (1929) make a contribution to localization theories. Hotelling (1929) describe the relationship between firms' pricing behaviours and location choice over the competition. This model analyzes the spatial competition for the market. According to the model's conclusion; if the market has competition, the firms want to situate nearby. When the transportation costs increase, the agglomeration tendency of firms also increases.

Another succeeding important work is Christaller (1966) explains the Central Place Theory depending upon the sizes of cities. According to this study, larger cities can support a much larger number of economic activities. The resulting city structure is in a form of central place hierarchy. In another recent study, Lösch (1940) suggests that the effective city structure is in a hexagonal form. Accordingly, some economic activities can be conducted only in specific regions of the city.

### **2.1.3. The Core – Periphery Model**

After Spatial Equilibrium Theories, two sub disciplines, namely regional economics and new economic geography, have developed in the literature. With the regional economics discipline, which is mainly based on mathematical analyses, new economic geography developed. New economic geography is based on cumulative causation, German location theory, social physics, land use and reestablishment of rent theory and local external economics traditions through advanced mathematical techniques. However, in contrast with the regional economics, the development of the discipline new economic geography reaches to the later twentieth century. The reason beyond this is assumed to be the fact that new economic geography refuses the fundamental assumptions of mainstream economics theory.

New economic geography, first with Krugman's work "Increasing Returns, Monopolistic Competition, and the International Trade" published in 1979, opposes the constant returns to scale assumption of the mainstream economics. This study tries to analyze the structure of international trade under the existence of increasing returns. In this study, which is an important part of the new trade theories examining the existence of increasing returns, it is assumed that there exists monopolistic competition in some markets. The assumption of mainstream economics claiming that perfect competition conditions are applicable to all markets is being replaced by Dixit-Stiglitz type monopolistic competition assumption. In the study "Scale Economics, Product Differentiation, and the Pattern of Trade" also published by Krugman in 1980, the structure



of international trade is explained by assuming that increasing returns and monopolistic competition exist in sectors with product differentiation.

In brief, new economic geography approach conducts an analysis based on the assumptions of Dixit-Stiglitz type (Stiglitz & Dixit, 1977) monopolistic competition, increasing returns to scale and iceberg transport costs. Within this context, in new economic geography models, Krugman (1998) mentions four important aspects in terms of modeling technique:

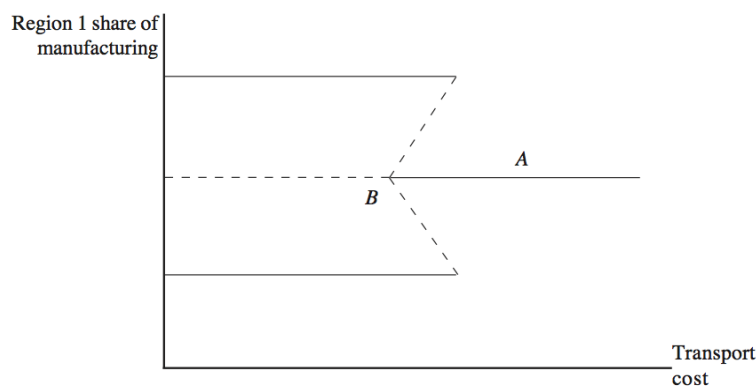
- **The Dixit-Stiglitz Model:** In this model based on monopolistic competition and optimal product diversity, even though all the markets are under perfect competition conditions, monopolistic competition conditions dominate the markets in which differentiated local products are sold. Thus, maintaining the product differentiation at optimal level is one of the models determinants. Diversity in both consumer goods and production inputs results in obtaining the increasing returns on scale even if all firms gain normal profits. In this case, large cities have more product and input diversity with respect to the scale sizes of cities. This situation explains cities' being more efficient in terms of production and their historical formation.
- **Icebergs:** In location theories, assumptions related to transport costs which must be borne while transferring goods from their production locations to market places, is one of the aspects determining the results of location theories. Handling the transportation sector separately like other product sectors makes the solution of the models complicated. Additionally, adding transport costs to the Dixit-Stiglitz model, which new economic geography approach is based on, violates the model's constant demand elasticity assumption. As a solution to this problem, instead of adding a specific transport cost, an "iceberg" formulation, which assumes some part of the product melts during transportation was first suggested by Samuelson (1952). Accordingly, a product's domestic market price can be calculated by dividing its value to vanishing ratio and products price in foreign market can be calculated by dividing its value to not-vanishing ratio.

- **Evolution:** In new economic geography perspective, as in the example of production factors aiming the location in which they can obtain the highest real wages, evolutionary processes are accepted. Evolutionary processes can be based on an economic base, as it is in this example, or can include arbitrary treatments. In another example, in the process of concentration of firms, some firms state that many other firms operating in the same sector being located in the region can be determinant in location choices.
- **The Computer:** To be able to conduct analyses of new economic geography, usually dynamic simulations are employed and computers are needed.

The Core-Periphery Model, constituted within the frame of four modeling techniques, is generally accepted in the literature as the fundamental model of new economic geography. The Core-Periphery Model, in a world of only two regions and two sectors, examines the size of the population with location choices of economic activities and the situation of real wages in these two regions. In the model, there are agricultural sector and manufacturing sector, which have different conditions. Traditional agricultural sector includes the assumptions of mainstream economics. According to this, in agricultural sector perfect competition conditions are applicable and homogenous commodity is produced. In addition, agricultural sector has constant returns to scale. As the production of agricultural goods depends on suitable soil conditions, productivity may vary with respect to the production location. At the same time, while there are no transport costs for transportation of agricultural goods, labor in agriculture is completely immobile. As a result of these assumptions, the prices of agricultural goods and consequently, incomes of agricultural labor are equal for the two regions.

On the other hand, in manufacturing sector, in addition to increasing returns to scale, differentiated monopolistic competition of Dixit-Stiglitz type is the matter of discussion. Additionally, in manufacturing sector, production has equal productivity everywhere in both regions. At the same time, labor in the manufacturing sector can move between regions in accordance with wages they receive under complete mobility. However, in transportation of manufacturing goods, there are Iceberg type transport costs. In addition to these assumptions, it is also assumed that profits will be zero when there are numerous manufacturing firms and there is free entry to market.

Under these assumptions, the Core – Periphery Model primarily analyzes the relationship between location choice of economic activities with transport costs and agglomeration. For this purpose, it is thought that there two initially symmetric regions. The trade between two regions remains in low levels when transport costs are high. As it can be predicted, the trade between regions increases when transport costs are low. Additionally, firms can conduct sales in both regions when transport costs are low. However, firms in manufacturing sector are encouraged to make production in the large city with higher population since there are more opportunities of market access in a large city. Consequently, firms can pay more to their employees and thus in the crowded city real wages are higher. In the crowded city, not only the real wages but also the purchasing power will be higher since the access for consumer goods is better. As a result, real wages are determined with respect to the existence of local competition and population size.

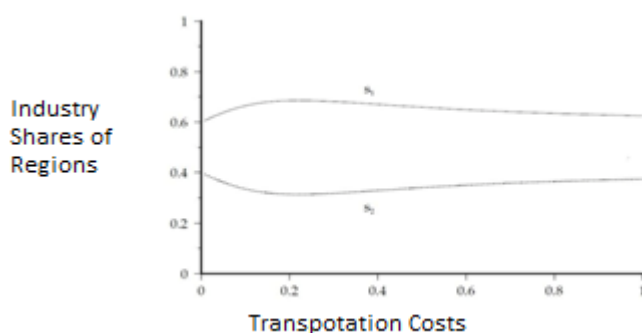


**Figure 2.** The relationship between transport costs and manufacturing industry concentration in the Core-Periphery Model

**Source:** (Krugman, 1999)

In Figure 2, the relationship between transport cost and location choice of economic activities can be observed as described previously. Accordingly, it is thought that we are on the point A, where two symmetrical regions exist initially. On the point A, the share of manufacturing industry is equal in both regions due to high transport costs. However, if it is thought that transport costs are decreasing due to an external reason, there occurs moving from point A to point B. On the point B, manufacturing industry experiences concentration in a region.

In the initial situation, if it is assumed that there is a larger core and a smaller periphery instead of two symmetrical regions, it appears as Figure 3. According to this, the cities' shares in manufacturing industry changes with respect to transport costs. In Figure 3, it is assumed that the central region has the 60% of the total factor endowment. When there is no trade between the regions, the share of central region in country's manufacturing industry becomes 60%. When trade between the regions begins, it is observed that this ratio changes with respect to the transport cost. In case of low transport cost, concentration of manufacturing in the central city observed due to the fact that the manufacturers in the central region can sell their products in the other region more easily. At the same time, another interesting result is that the share of central city in manufacturing industry becomes higher than factor endowment's share in all factors when there are measurable absolutely positive transport costs. In other words, the central city is in the net exporter position in terms of manufacturing industry and the difference between two shares tends to change non-uniformly (Ottaviano & Puga, 1998).



**Figure 3.** The relationship between transport costs and manufacturing industry in the Core-Periphery Model

**Source:** (Krugman & Venables, 1990)

Depending upon the Core – Periphery model, the change between transport costs and real wages in manufacturing industry can be seen in Figure 4. In Figure 4, “ $f$ ” on the horizontal axis demonstrates the ratio of people working in the manufacturing industry in the first region to the total population. In other words, it shows the concentration of manufacturing industry in the first region. “ $T$ ” stands for transport costs. Accordingly, at low transport costs like 0.75, the real wages gained by workers in the first region increases

as the concentration in the first region increases. According to this result, which is compliant to concentration literature, low transport costs results in an increase in the concentration in the first region and consequently companies paying higher real wages. However, the relation becomes reversed when transport costs have a large value like 0.5. In the presence of high transport costs, as a result of the concentration in the first region, it does not seem possible for a firm in the first region to gain profit by conducting sales in the second region. Thus, the competition effect due to the concentration in the first region has a larger influence and real wages decreases. Consequently, concentration effects apply when transport costs are low; local competition effects apply when transport costs are high.

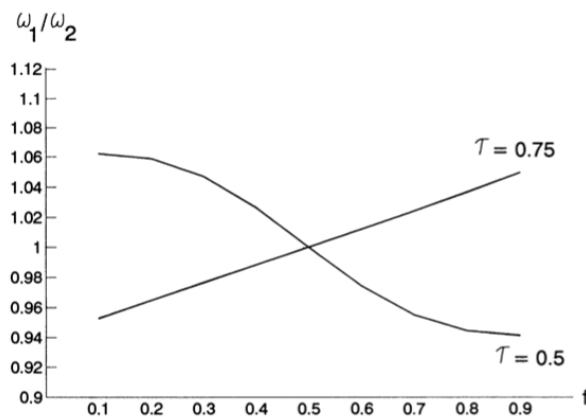


FIG. 1

**Figure 4.** The relationship between transport costs and real wages in manufacturing industry in the Core-Periphery Model

**Source:** (Krugman, 1991)

### **3. AGGLOMERATION ECONOMICS**

The economic geography approach is developed within location theories. Basically, it aims to analyze the location selection decisions of economic activities. As a result of location selection decisions, structures like agglomeration economies, concentrations, and so on, develop. Agglomeration economies and concentrations are the structures which develop by them with respect to the factors specific to the region. The primary analysis method of the new economic geography approach is the examination of concentrations and agglomeration economies developing due to closely locating of economic activities.

In the process of defining economic agglomeration, the studies of Porter (1998) are in a pioneering position. First, Porter defined industrial clusters as “geographical concentration of companies which are both in competition and cooperation in some fields, of specialized suppliers and service providers, of companies in related industries and related institutions ” with reference to growth poles concept of Perroux (1950). Becoming highly popular, the concept of industrial clusters paved the way for the definition of agglomeration economics and exploration of its properties (Porter, 1998).

When economic activities are observed, in the regions where activities take place, both observable and economically measurable concentration of some industries is seen. The concept of agglomeration economics, developing in this context, is defined as gathering of firms or individuals in a specific geographical region (Nakamura, 1985).

Locating in a specific region and closed to each other creates various advantages and disadvantages for the companies in an industry. The primary force promoting agglomeration is the will of companies to benefit from these advantages. In this point of view, agglomeration economics is defined as advantages provided by spatial closeness of good and service production facilities in an economy with internal connection.

The advantages, which firms have by locating close to each other, arise in different types and scales. Firms can receive benefits in various fields such as supply chain, input markets, production process and sales channels. These opportunities created by agglomeration are shaped by the structure of the industry and its needs and the region's inherent properties. According to Agarwalla (2011) emphasizing the contribution of this situation to production process, spatial concentration of economic activities creates a positive impact on the productivity of economic units in the settled region. These positive impacts are defined in fundamental forms such as decline in the costs, specialized and developed labor market and spread of technological knowledge.

In these markets, specialized labor is easily accessible because a large labor pool develops in the region, in addition to the decrease in training cost of labor. Additionally, there occurs decline in costs by the spread of knowledge, the sharing of know-how, the encouraging environment for technological progress created by increasing competition. In this manner, agglomeration economics holds a central position in urban economics and represents the decline in costs resulting from the gathering of economic activities in a specific spatial region. (McDonald, 1997).

Centripetal forces encouraging concentration cause a new market to emerge or an existing market to expand and diversify in the region. This process makes the region a center of attraction for firms of related industries, labor force and suppliers in addition to firms operating in the industry. The collaboration and cooperation of all these economic elements enrich the positive externalities arising in the newly created market. Industrial agglomeration, when considered in terms of market , is a representation of an industry in optimal coordination within market economy. (Xuehua & Li, 2006)

On the other hand, according to Henderson (1997) agglomeration economies are a result of positive spillovers between firms sharing the same location. While firms individually operate in perfect competition markets under constant returns to scale conditions, the agglomeration of economic activities provides externalities, which increase the productivities of all companies sharing the same geographical location and operating within a specific industry (Hanson, 2000).

But when we back to the location theories, we realize that the agglomeration effects are different. According to location theories and specially Hotelling (1929), the competition between the firms causes the agglomeration effects. The firms have similar pricing behavior. Because of this, the firms have tendency on the location which has fierce and inelastic competition. As a basis, agglomeration effects which are in the location theories originate from the motivation of minimum transportation costs and demand density. On the other hand according to the externality theories, between closely located firms have competition and also they have important externalities as information exchange and technology transfer. Closely located firms enrich the labor pooling as well. In this respect according to the externality theories, agglomeration effects' resource is positive externalities which are built in closely located firms.

The agglomeration or clustering of economic activities can occur in different geographical levels. In the simplest form, it can occur as a small-scale agglomeration of a sector. In this level of agglomeration, concentration is valid for only one industry and spillover effect is on the local scale. For instance, restaurants of a city are usually located on the same street. Similarly, mall concept, which developed in recent years, came out of the idea of small retailers being together in the same location. On the other side, agglomeration can be observed as city structures. In this structure, intensive externalities and intensive spillovers of technology and knowledge created by numerous interacting industries are at stake. This is a large-scale agglomeration creating a very large urban market for many markets. Many cities, which became industrial centers or financial centers of the world, can be listed examples of this type of agglomeration, known as urbanization economies in the literature.

The extreme point of industrial agglomeration is a core-periphery dualism, which removes the borders of regions and countries (Fujita & Krugman, 2004). It is a dualism of a well organized core city or region, which has the concentration of value-added production, specialized labor and higher per capita income, and a peripheral region which has labor intensive production and lower incomes. The "Hot Banana" area between Milano and London, containing Northern Italy, Germany and the Ruhr area, South East France, Belgium, the Netherlands, and South East England, is in the core of Europe, the remaining regions are considered to be the peripheral region. (Ottaviano & Puga, 1998)



### **3.1. Factors Determining Agglomeration Economics**

#### **3.1.1. Economies of Scale: Increasing Returns to Scale**

Basically economies of scale, increasing returns, external economies and imperfect competition structure cause spatial agglomeration of economic activities. In models aiming to explain the location decisions of economic activities, it is seen that the concept of increasing returns to scale emerges as determinant among these factors. In other words, in recent theories, the common theme causing industries to spatially agglomerate is increasing returns to scale (Hanson, 2000). Thus, it can be argued that increasing returns are the primary factor in explaining the geographical distribution of economic activities (Fujita, 1999).

Traditional trade theories state that technological differences or differences in factor endowment causes international trade. Yet, increasing returns to scale is used in explaining the trade between the countries which have industrialized during the expansion period after the Second World War. Accordingly, the phenomenon causing trade between countries is not the difference between technology or factor endowment but one of the countries' having the capability of production with increasing returns to scale. Herein, however, the concept of increasing returns to scale is not a single dimension structure which consists of only an efficiency relationship between inputs and outputs. Increasing returns to scales is endogenous for firms under favor of market mechanism and it brings important exogenous benefits to firms. Consequently, in the markets with increasing returns to scale, firms locate close to each other in order to get benefit from the externalities within the market mechanism. Therefore, structures in concentration and agglomeration forms occur.

However, neoclassical trade theory traditionally evaluates countries as dots independent of spatial dimension and frequently by assuming zero transport costs (Krugman, 1991). These theories, placing importance only on relative factor endowment, assuming no transportation costs during trade and, by doing so, trying to determine the goods of which countries are advantageous for production, have been criticized even by the contributors of the theory since the earliest stages. According to Ohlin (1933), it is not possible to understand international trade theory by excluding general location theory. Although the factors of production are intransitive between countries, goods are transported freely and at no cost. Consequently, there are solid assumptions like constant returns to scale and diminishing returns in the basis of these standard models with factor-price equalization.

The assumptions of constant returns and diminishing returns take the economic structure into a “Robinson Crusoe” structure in which every economic individual produces for own self. In this structure, each dwelling unit produces the goods it need in small scales. At this point, there is no reason for firms to concentrate in a location, in an economic structure without economies of scale and increasing returns (Mills, 1972). Mills, who made one of the most important criticisms on about this structure, calls such a structure “a world without cities”. Accordingly, a structure, in which every location has the same number of people and the same combination of production activities and which is based on economic activities having constant returns to scale is defined.

In economic geography theory, the basis on understanding geographical agglomeration of economic activities is the trade-off between transport costs and production with increasing returns. It explains the spatial dimension of economics by a structure of increasing returns, specialization and imperfect competition. According to (Krugman, 1995), the paradigm of constant returns – perfect competition fails to explain the emerging and development of economic agglomeration. However, the reason why economic geography models were not included in mainstream economics and did not draw intense interest until 1990 is the assumptions of increasing returns and imperfect competition. In the pioneering work of Stiglitz and Dixit (1977), a new industrial organization theory, including the imperfect competition model first after modeling monopolistic competition, was mentioned. Afterwards, the assumptions of mainstream

economics were relaxed when new trade theory is founded, which the international trade theory is operating in the existence of increasing returns.

**Table 1.** From Standard Economic Analyses to New Economic Geography: Basic Differences and Similarities

	Neo-Classical Theory	New Trade Theory	New Economic Geography
Market structure	Perfect competition	Monopolistic competition	Monopolistic competition
Product differentiation technology	No	Yes	Yes
Factor mobility	Constant returns to scale	Increasing returns to scale	Increasing returns to scale
Determinants of trade	No	No	Yes
Trade structure	Comparative advantages	Increasing returns to scale and trade costs	Increasing returns to scale and trade costs
Determinants of the pattern of industrial location	<ul style="list-style-type: none"> <li>• Differences in technology</li> <li>• Differences in factor endowment</li> <li>• Differences in factor intensity</li> </ul>	<ul style="list-style-type: none"> <li>• Degree of increasing returns to scale</li> <li>• Elasticity of substitution of differentiated goods</li> <li>• Size of home market (which is exogenously determined)</li> </ul>	<ul style="list-style-type: none"> <li>• Centripetal forces (backward and forward linkages)</li> <li>• Centrifugal forces (factor immobility, cost differentials for immobile factors)</li> <li>• Trade costs</li> </ul>
Distribution of economic activities	Exogenous (determined by initial factor endowments)	Endogenous (once the home-market size is given)	Endogenous (determined by factor mobility, especially labor one)

Relationship between economic integration and agglomeration	<ul style="list-style-type: none"> <li>• Monotonic</li> <li>• Unique equilibria</li> </ul>	<ul style="list-style-type: none"> <li>• Non monotonic</li> <li>• Unique equilibria</li> <li>• Bifurcate or u-shaped</li> </ul>	<ul style="list-style-type: none"> <li>• Non monotonic</li> <li>• Multiple equilibria</li> <li>• Bifurcate or u-shaped</li> </ul>
Main contributions	Ohlin (1933)	Krugman (1980); Helpman and Krugman (1985); Krugman and Venables (1990)	Marshall (1890); Krugman (1991a); Krugman and Venables (1995); Venables (1996); Puga (1999)

**Source:** (Surico, 2003)

### 3.1.2. External Economies

Definitions of external economies are few and unsatisfactory. It is agreed that they mean services and aids conducted free of compensation, by one producer to another, but there is no agreement on their form and structure or on the reason for their being free (Scitovsky, 1954). There are many factors beyond the tendency of economic activities for gathering in a specific geographical region. Diversification of production processes and specialization, increase in product diversity, increase in the opportunities of access and matching to qualified labor and existence of large markets for goods are general reasons causing firms to locate close to each other. More specifically, a company's locating close to another company or other companies and advantages, and sometimes disadvantages, due to this collaboration is generally called externalities.

Externality, in general terms, is the benefits which companies provide to each other out of market relations and results from agglomeration of companies operating in the same industry branch, in a geographical region (Beeson, 1987). The advantages which firms provide each other can occur in different forms. For this reason, externalities are categorized with respect to the advantages they provide the firm and their functions. In the

literature, it is observed that externalities are classified as intra- and inter-industry externalities initially. According to intra-industry externality concept, firms concentrating in the same region and operating in the same industry obtain benefits due to the technological spillovers of information, the decline of transport costs in the trade between firms and the increase in the diversity of local products available (Henderson, 1997). This externality remains to be in industrial scale. In inter-industry externality, firms operating in different industry branches receiving benefits by locating close to each other and a structure of industrialization or urbanization in the region are at stake.

On the other hand, externalities are classified as static and dynamic externalities with respect to the time dimension of their contribution to the production functions of firms. Among the production functions of firms, externalities, which develop out of market mechanism and are directly dependent on the relations between firms are called static externalities. Dynamic externalities, on the other side, are defined as changes occurring due to more specialization, spillovers of information and technological progress and their effects tend to continue over time.

A more special type of externality is complementary externalities. Although other types of externality depend on the level of utilization of economic agents, complementary externality depends on relative choices or ordering of alternatives due to similar activities chosen by others (Küçükler, 2000). In other words, complementary externalities increase directly proportional to the number of firms choosing the activities creating this externality. The market domination of “qwerty” keyboards is considered to be the best illustration to complementary externalities. In this example, qwerty system was selected and placed in the market by the producing firm in order to prevent the key locks which users face, despite the fact that “dvorak” system has the letter order which is most suitable for fast typing and has a lower cost when compared to the qwerty system. The system becomes widespread among the users by the producing firms releasing the qwerty system for these mentioned reasons. Afterwards, no other system, even if it is more optimal or at lower costs, could become a rival in the market due to the complementary externalities resulted by common choice of numerous users.

Beginning from the first studies, externalities are mentioned in the basis of explanation for economic agglomerations. However, there are different opinions in the

literature for how externalities affect agglomeration. According to the first approach discussed in Krugman (1995) and Fujita and Thisse (1996), externalities encourage agglomeration. According to Krugman (1995), there are different opposing forces determining agglomeration and the existence of positive local externalities absolutely encourages the concentration of production in the region in question. On the other side, according to other approach, Tolley and Crihfield (1987) and Mills and Hamilton (1989) argue that the existence of positive externalities has a discouraging effect on agglomeration and negative externalities encourage agglomeration. According to Mills and Hamilton (1989), the scale of a region grows as the numbers of firms in that region increases and later on the process, production costs for firms in the city decreases. This decrease in the production costs generates difficulty for firms in entry to the region; it discourages potential entries to the region and consequently, in this point of view, urbanized large cities are in fact very small.

Herein, Tolley and Crihfield (1987) show that market conditions cause an over-concentration in the city with higher population density when negative economies of scale exist. Mills and Hamilton (1989) criticize this argument by stating that the productivity area can exceed the consumption area and consequently agglomeration can result in external economies of scale. According to the study claiming that it cannot be know which of these two areas is larger, in this situation, external economies of scales may prevail over negative economies of scale and market conditions may result in a distribution more than it should be.

According to Scitovsky (1954), the concept of externality is classified in two types with respect to the structure of the benefit provided and to its contribution to growth. Technological (pure) externalities examine the direct effects of nonmarket interactions on production functions of firms and utilities of individuals. The basic form of technological externalities is spillovers of technology and knowledge. In the region where agglomeration takes place, there is a - in a sense - collective product which is a result of the spillovers of technological knowledge, know-how's and experiences of firms. The firms newly entering the region can benefit from this collective product free of charge. The encouraging power of agglomeration is these technological spillovers. On the other side, a second type called monetary externalities is the advantages that emerge via prices within the market mechanism. Monetary externalities are based on the imperfect competition structure in the

market. Firms have an influencing power on the prices with the limited monopolistic power they have due this structure. However, monetary externalities were ignored because the assumption of perfect competition was present in the economics literature without dispute until recently.

These two externalities are related to each other in accordance with the scale of the conducted analysis (Fujita & Thisse, 1996). When considered in local scale, spillovers of knowledge are fairly effective. Data and bits of information coming together via various communication channels generate a pool and everyone can benefit from this pool. This situation, also called communication externalities, states that technological externalities are efficient in local scale. However, the physical contact and spillover of knowledge between the actors of economy appears to be inadequate when large-scale agglomerations, crossing the regional or country borders, are discussed. When explaining an agglomeration of this scale, monetary externalities occurring within market conditions are accepted to be the reason.

### **3.1.3. Imperfect Competition Markets**

The concept of imperfect competition is generally used for structures, which do not have perfect competition in the discussed market. In such structures, firms have the influencing ability on markets in contrast with the operating of perfect competition markets. Firms' ability to influence the market process is called "monopoly power". The structures of imperfect competition are usually called monopolistic competition. Monopolistic competition tries to define the existence of monopoly power, without going far from the simplicity of traditional supply-demand on goods and services approach (Fujita & Krugman, 2004).

In the context of agglomeration economics, the contributions about imperfect competition structures primarily employed Chamberlin's (1933) paradigm. According to the pioneering work of Chamberlin (1933) on the concept of monopolistic competition, consumers have several choices. While firms are producing these several choices, they are

in competition for scarce production resources as they face increasing returns (Fujita & Thisse, 2002). Later, the monopolistic competition structure is modeled in detail by Stiglitz and Dixit (1977). Since the equilibrium solution of Dixit-Stiglitz imperfect competition model is much less problematic than the equilibrium solution of the general equilibrium models, which are modified to consider imperfect competition, it took an important place especially in the new economic geography literature (Bonanno, 1990).

Dixit-Stiglitz approach tries to explain monopolistic competition via optimum product diversity. In the model, there are two types of goods. The first type is differentiated local goods, which have the structure of firms in every region becoming the sole producer of their goods by completely differentiating them. For this reason, in the market of differentiated local goods, there exists increasing returns and monopoly power of each firm for its own product. Firms are the sole producers of the goods they differentiated. According to Stiglitz and Dixit (1977), monopoly power is usually considered to have an effect of distorting resources away from the sector concerned. But, in the study, it is stated that monopoly power cannot prevent market entry and there is no obvious relationship between monopoly power and market structure. For all the goods subject to trade, other than completely differentiated local goods, constant returns to scale conditions and perfect competition market structure apply. According to the model, income elasticity for all the goods is identical and price elasticity of demand is constant (Stiglitz & Dixit, 1977).

As a result of all these assumptions, consumer's utility depends on the amount of differentiated local goods consumed and diversity of these goods. Similarly, the diversity in production inputs increases the profit of firms and generates externality. When the result of the model, which is important in terms of agglomeration economics, is examined, it is seen that centrifugal and centripetal forces develop. First of all, the demand of immobile labor for the differentiated local goods must be satisfied. This demand encourages some companies to get out of the concentrated region. A secondary centrifugal force is that competition will increase with agglomeration. On the other hand, product diversity and input diversity will increase as the number of the firms producing differentiated local goods in a region increases. The increase in the local goods diversification and the prices' being lower than the other region will cause the production factors in the other region to move to this region. Due to the labor force coming to this region in order to have higher



life standards, the demand for local goods and diversity will increase. This process occurs in the way of the Myrdal type circular causation<sup>1</sup>.

Consequently, under the monopolistic competition conditions, market size effect may be strong enough to offset the competition effect (Ottaviano & Thisse, 2001). In other words, even externalities have a critical role in the structure of agglomeration; another important cause triggering agglomeration is the structure of monopolistic competition in the market.

### **3.2. Types of Agglomeration Economies**

According to the new economic geography approach, agglomeration economies have different types. Different agglomeration structures develop with respect to the structure of the externalities present in the industry. Basically, externalities constituting the agglomeration determines the structure and the effects of agglomeration economies. In this respect, agglomeration economies are discussed with regard to static and dynamic externalities.

#### **3.2.1. Agglomeration Economies in Terms of Static Externalities**

The literature of agglomeration economics, after the definition of agglomeration and clustering, consists of the works trying to empirically identify the existence of agglomeration economics and to observe their effects. In this primary works, it is accepted that the concept of agglomeration economies is divided into two subgroups as localization and urbanization economies. Localization economies develop as an industry's specialization in a small geographical region. Urbanization economies are considered to be

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<sup>1</sup>The Myrdal type circular causation: In developing countries, it is observed that left alone markets in such environments ([http://www.musiad.org.tr/contentimages/arastirmalaryayin/pdf/arastirma\\_raporlari\\_46.pdf](http://www.musiad.org.tr/contentimages/arastirmalaryayin/pdf/arastirma_raporlari_46.pdf)).

a structural form based on the information exchange of many industries in an urban area. Thus, the primary works developed for detecting these effects and their properties.

When the empirical literature on this subject is examined, it is seen that primarily the subject of study is the effect of geographical concentration of especially manufacturing activities on productivity and growth. The first aim in these works is to analyze the effect of localization and urbanization economies on the productivity of firms. Shefer (1973), the first study on this topic, reaches the conclusion that productivity increases as cities become larger. In the results of Carlino (1979), which is the first work to discuss localization and urbanization economies separately, both types of agglomeration positively affects the productivity of firms. Later, Sveikauskas (1975), Sveikauskas, Gowdy & Funk (1988), Moomaw (1981) and Moomaw (1985) report similar results. Also, in some succeeding important works, such as Nakamura (1985), Henderson (1986), Henderson (1997) and Ciccone and Hall (1996), it is mentioned that localization economies have a special importance with respect to its positive effect on productivity. Nevertheless, it is determined that urbanization economies also increase the productivity even relatively less (Rosenthal & Strange, 2003).

In the new empirical methods developing as a complementary to this primary approach, the relationship between concentration and increase in employment is focused in the presence of both localization and urbanization economies (Henderson, 2003). Different from the first approach, the increase in the total employment is accepted as the measure of economic growth instead of the performance of firms. The pioneering work of Glaser (1992), which studies the subject within this framework, proves that both types of agglomeration undoubtedly increase the total employment in the studied geographical region. Similarly, Henderson, Kuncoro and Turner (1995) shows the effect of agglomeration on the increase of employment in the US and Brazil; Nakamura (1985) shows the same for Japan. The works of Henderson (2003) and other studies, which discuss the agglomerations together, reach the conclusion that localization economies have a stronger effect while similarly emphasizing agglomeration's positive contribution on the increase of employment.

### **3.2.1.1. Localization and Urbanization Economies**

According to the UN-Habitat report published by the United Nations in 2007, urbanization is rapidly increasing globally. In this study, it is reported, for the first time, that more than 50% of the world population lives in cities (UN-HABITAT, 2007). In addition, it is observed that specialized industrial and commercial zones, run by commercial clusters aimed at a specific industry branch, are proliferating globally. At the same time, governments have been applying active clustering policies and increasing the subsidies for such regions in the last ten years. When these two facts are considered together, it is understood that the importance of localization and urbanization economies is increasing gradually.

When theoretically examined, it is seen that agglomeration economies are divided into two groups as urbanization and localization economies in their traditional classification. Localization and urbanization economies are based on traditional agglomeration sources such as forward-reverse connections and supply-demand connections. After Marshall's (1890) pioneering work defining agglomerations and especially in 1980s, in the analysis of agglomerations it is tried to determine the presence of urbanization and localization economies and which of them is influential. The studies researching the effects of agglomeration effects initially ground on agglomeration occurs in two types namely urbanization and localization.

### **3.2.1.1.1. Localization Economies**

The main separation point of localization and urbanization economies is whether agglomeration is limited to an industry (alternatively: how many industries it includes) or not. When considered in terms of localization economies, firms' operating in the same industry branch concentrating in a specific region enables these firms to benefit from a common advantage. The benefits, which all the economic actors in a region benefit from lower transport and coordination costs by locating close to each other are referred to as "localization economies" (Groot, Poot, & Smit, 2008).

The firms benefiting from localization economies are in tendency to concentrate in some small regions. By this, while being protected against increases in incomes due to local ground rents and congestion costs, they can also benefit from all generated externalities. This benefit generated by firms, at the same time, is an attraction factor for new firms to enter the region and every new firm increases this common benefit. A circular Myrdal causation process, in which cause-effect relationships trigger each other, proceeds this way. It is observed that especially food production, textile, iron and steel and forestry products sectors are in tendency to concentrate in relatively small regions.

The common benefit generated in localization economies holds external qualification for firms and internal qualification for the industry, but it does not provide any benefits to firms of other industries (even if they are located in the same region). In this point of view, localization economies resemble to Marshallian externalities according to a more modern classification.

### **3.2.1.1.2. Urbanization Economies**

In urbanization economies, the firms in a relationship of economic benefit are operating in different industry branches. In the urbanization type of agglomeration economies, the factor creating the economic benefit is firms' operating in different sectors locating in the same region and generating industrial diversity? Diversity increases by different industries coming to the region and additionally, urbanization structure emerges gradually. As the scale of economic activity expands, in labor pool, an expansion in the sector of demanding position and final demand occurs. Consequently, the scale and concentration effects emerging in urban region is called urbanization economies (Groot, Poot, & Smit, 2008).

Urbanization economies come into prominence especially by its defining the formation and growth of cities. It is thought that urbanization economies process has an important role in development of cities in a modern way. Accordingly, the increase in the diversity and enrichment of local environment is the encouraging factor of urban agglomeration. However, from the point of urban economies, the benefit generated by agglomeration has an internal characteristic for urban area whereas it has external characteristic for both firms and industry. Thus, urban economies centering industrial diversity and knowledge spillovers correspond to Jacobs-type externalities. It is observed that the sectors of finance, media and R&D exhibit agglomeration in developed urban areas.

### **3.2.2. Agglomeration Economies in Terms of Dynamic Externalities**

#### **3.2.2.1. MAR, Jacobs, Porter Externalities**

Since 1990s, with the importance on knowledge spillovers assigned by modern economic growth theories, the studies in the field of agglomeration economies have started to take on new dimensions. In the 1990s, begging from the Glaeser's (1992) pioneering work, agglomeration economies started to become subject to a new classification. Glaeser's (1992) pioneering work reformulated externalities defined in the studies of Marshall (1890) and Arrow (1962) by combining them and gave them the name MAR externalities. For the first time, in Glaeser's (1992) study, dynamic externalities are discussed in detail as MAR, Jacobs and Porter externalities (instead of localization and urbanization economies).

Thoughts on externalities started to take place in the literature with Marshall-type externalities, which is the basis for MAR externalities formulized later by Glaeser. According to this idea, an industry's concentration in a specific geographical region causes the growth of industry and city via knowledge spillovers and cost advantages. Marshall (1890) argues that firms are willing to locate geographically close to each other because there are strong common benefits encouraging firms for this. According to Marshall (1890), the benefit generated by intra-industry knowledge transfers, the decrease in transport costs of input and output, and efficient labor markets encourages firms for concentration (Beaudry & Schiffuerova, 2009).

### **3.2.2.1.1. MAR Externalities**

According to Marshallian externalities thought, agglomeration emerging in the form of localization has two sources other than knowledge spillovers: labor market pooling and input sharing. According to Marshall (1890), firms operating in the same industry have some inputs, which they can use commonly. Additionally, another type of input sharing is the transport cost advantage, which firms gain by locating close to input producers. Firms in the same industry concentrating in a region decrease the transport and distribution costs by bringing other related firms in the supply circle to the region. Labor market advantage, which is a type of Marshallian externalities, is the benefit firms have by creating an educated and rich labor market in the region. At this point, both firms experience no difficulty in finding educated employees and the matching problem decreases.

Similarly, Arrow (1962) emphasizes the importance of knowledge spillovers within dynamic externalities. According to Arrow (1962) technological progress, which is the driving force behind economic growth, develops depending upon accumulation of knowledge and learning by practicing. Accumulation of knowledge increases cumulatively through knowledge spillovers between firms operating in the same industry. In endogenous growth theory of Romer (1994), knowledge spillovers are accepted as the basic dynamic of technological progress and growth. Similar thoughts of Marshall, Arrow and Romer on externalities are given the name MAR externalities through reformulating by Glaeser. According to this, by the concentration of the firms of the same industry in the same region following benefits are obtained (McDonald, 1997):

- Currently produced products are improved.
- The chance of finding a new product increases.
- New ideas in production methods emerge and production process advances technologically.

### **3.2.2.1.2. Jacobs Externalities**

Jacobs, as distinct from Marshall, focuses on industrial diversity. According to Jacobs (1969) the dynamic of innovation is diversity because the diversity and increase in the labor market increases the inherent potential capacity, which allows economy to produce a new kind of goods and services (Jacobs, 1969). It is argued for the first time by Chinitz (1961) that industrial diversity is necessary for economic growth. Accordingly, large urban areas have more suitable environment for growth since they have more diversity when compared to small and limited dwelling areas. Yet, Jacobs (1969) mentioned knowledge spillovers in the literature for the first time and argued that knowledge spillovers would occur between different industries via industrial diversity.

According to Jacobs (1969) knowledge spillovers occur via industrial diversity instead of geographical specialization and spreads over industries. According to Jacobs, the presence of different industries positively affects knowledge spillovers and more necessary for economic growth than specialization. Accordingly, knowledge spillovers, and consequently economic growth, are related to local industrial diversity (Carlino, 2001).

### **3.2.2.1.3. Porter Externalities**

Porter (1990), in his work, defends opinions on externalities similar to those of Jacobs after defining the concept of clustering in agglomeration economics for the first time. According to Porter (1990), the most important source of externality is knowledge spillovers and knowledge generation. He argues that knowledge can spillover not only in a single industry but also between industries and so new knowledge can be generated. At his



point, the main actors of knowledge spillovers are vendors and purchasers operating in related sectors.

**Table 2.** Types of Externalities

	<b>MAR</b>	<b>Jacobs</b>	<b>Porter</b>
<b>Specialization</b>	+	-	+
<b>Diversity</b>	-	+	+
<b>Competition</b>	-	+	-

**Sources:** (Beaudry & Schiffuerova, 2009)

**Table 3.** Sources of Externalities

		<b>Type of Market</b>	
		High competition	Low Competition
<b>Predominant Source of Agglomeration</b>	Specialization (Intra-industry)	Porter Externalities	MAR Externalities
	Diversity (Inter-industry)	Jacobs Externalities	-

**Source:** (Lucio, Herce, & Goicolea, 2002)

### 3.2.3. Competition Structure and Externalities

In modern endogenous growth theories, Romer (1986) and Lucas (1988) argue that technological progress causing economic growth occurs via knowledge spillovers. Externalities related to knowledge spillovers are considered to be the engine of growth (Henderson, Kuncoro, & Turner, 1995). As previously mentioned, the core element of endogenous technological progress resulting in economic growth is the accumulation of

knowledge via knowledge spillovers between firms. However, for knowledge spillovers to occur, closeness is a very important point. Knowledge spillovers find the most suitable atmosphere when firms operating in one or more industry branches concentrate in a limited urban area. A network of knowledge between concentrated firms develops and knowledge spillovers become easier due to trust and relations increasing over time.

There is an agreement in literature on knowledge spillovers effect on economic growth. On the other hand, there is a conflict on the effect of competition structure in the market on knowledge spillovers like the conflict on the structure of knowledge spillovers. MAR and Jacobs externality approaches differ from each other in this perspective. On this topic, Jacobs (1969), defining knowledge spillovers in the literature for the first time, mentions that firms put emphasis on innovation activities when they are in a competitive environment. In addition, the key idea of the first approach on competition structure's effect on knowledge spillovers is presented by Porter (1990). According to Porter, dynamic externalities occur as a result of the competition between local firms and competitive structure is a necessary condition for growth because firms in a competitive structure get into an invent-or-perish position as Jacobs suggests. Thus, they assign more importance on R&D expenditures and innovation activities to survive. In addition to the innovation encouragement by competitive pressure, the number of firms in the industry being large due to the competitive structure increases the accumulation of knowledge. So, productivity and knowledge accumulation of firms increases; ergo economic growth occurs. On the contrary, it is argued that firms are prevented from developing new products and production methods in a monopolistic industry structure (Carlino, 1979).

Contrarily, in the second approach as Glaeser (1992) states "local monopoly is better than local competition for innovation and growth". According to this approach, local competition structure gives the chance to internalize the benefit and rent due to its innovativeness for inventing and product developing. This situation creates a more suitable environment for growth as it decreases the spillover of knowledge to other firms. According to MAR approach, firms can only collect the returns of their R&D activities and innovation efforts, only in the presence of a monopolistic structure. Contrarily, competition threatens the innovation activities by bringing incomplete property rights and for this reason decreases the productivity of firms.

### **3.3. Literature Review on Agglomeration Economies**

After primary works like Marshall (1890) and Jacobs (1969) which define externalities, Henderson (1974) and Henderson (1988) defined agglomeration, in their pioneering works, initially as positive spillovers between firms which share the same region. In his works, Henderson discussed agglomeration in industrial activity context for the first time. In addition to this, he discusses dynamics, boundaries and varieties of city structure.

Henderson (1974) searches answers for main questions with setting up a simple general equilibrium model in which production and consumption activities occur in cities. Firstly, he researches why an economy shaped in the form of big cities in some regions, instead of operating countrywide. According to Henderson (1974) there are two reasons of the development of city structures that he recognizes as a form of agglomeration. The first of these is that vast majority of economic activities are not land intensive. The other is the effect of technological economies of scale being powerful. Additionally, why cities experience specialization in production of some goods is assumed to be another topic to take into consideration. In this point, it is thought that cities specialize in a product because there are no benefits in terms of production in two industries' locating in the same region and on the contrary, this may increase the total costs.

However, cities have boundaries in terms of their size. Factors creating the boundaries are another question Henderson seeks an answer. According to Henderson (1974) agglomeration economies occur in consequence of the economies of scale advantage which city gains due to the production of the good it exports. In addition to this, this economic activity has increasing resource cost per unit. Because employees are working in the central region where their workplace is located and they reside in periphery regions. They have to travel the distance between these two places. When these two are considered together, if resource cost per unit exceeds the primarily emerging advantage of

the economies of scale; it can be said that efficient city size is exceeded. The reason of cities has boundaries in terms of size, they have increasing resource cost per unit (Henderson, 1974) Also he relates the reason why the sizes of cities demonstrate variation to their difference in opportunities of market access and in public services in cities. Consequently, this can be considered as a guideline for the works following the results of cities having natural boundaries and each city being obliged to specialize in a product.

Another important work about city structures existence belongs to Hohenberg and Lees (1985) who studies emerging of city structures and rapid increase of urban population historically since pre-industrial period in Europe. In the study, which mentions the increase in city structures in Europe beginning from 1500's to the modern industrial revolution, it is stated that regional inequalities, industrialization and urbanization go parallel with the emerging of city structures.

The literature of agglomeration economies develops in two branches. In both theoretical and empirical studies, the presence and effects urbanization and localization economies are handled separately. This distinction of agglomeration economies having two types namely "urbanization" and "localization" is first proposed by Hoover (1948). In defining properties and causes of localization economies which are endogenous for a firm and exogenous for an industry, Venables's (1996) idea of localization economies being created by the expansion of buyer-sellers connections, Henderson's (1986) idea of localization economies being created by easier access to public intermediate goods and Glaeser's (1992) idea stating that information spillovers are an important aspect of localization economies are considered as important contributions.

On the other side, in the intellectual development of urbanization economies which are of exogenous qualification for both firms and industry, Scott's (1986) contribution stating that urbanization economies are resulted from specialized rich labor market is important. In addition to this, Jacobs (1969) mentions that easy access to supporting services, financial opportunities and control mechanisms is one of the important advantages of urbanizations economies.

Theoretically, the difference of urbanization and localization economies bring about the necessity of examine the contribution of agglomeration economies to either

economic growth or productivity separately. The ability to theoretically and empirically examine urbanization economies and their effects to economic performance separately causes the birth of a new discipline as urbanization economies. In this direction, Black and Henderson (1999) examine theoretically the effects of urbanization economies to economic growth with combining urbanization economies and endogenous growth models. Given endogenous growth and exogenous population growth, it is being examined how urbanization affects growth and how growth affects urban structure in economics. As a consequence, Black and Henderson (1999) indicate that there are externalities in the structures of cities and human capital externalities and these two qualifications causes growth, by analysing the relationship between urbanization economies and growth via endogenous growth models.

After defining the properties and effects of localization and urbanization economies, in the literature empirical studies gain importance. Usually, in the studies, which examine the effects of agglomeration economies on economic growth and productivity increase, positive evidence is presented. However, before that, Hanson (2001) mentions that validity of presented evidence in empirical studies is questionable and there are some prerequisites for accepting it. According to Hanson (2001) empirical studies, which try to validate the theoretical arguments are mistaken in estimation step due to several reasons. Some of regional properties' not being measurable, simultaneous regional data, externalities having multiple sources and lack of suitable data are the problems, which empirical studies face.

In the empirical line of agglomeration economies literature, early works focus on the relationship between agglomeration economies and productivity. Whether agglomeration of some industries in certain regions or city structure has an effect on productivity is examined. Sveikauskas (1975) and Segal (1976) are pioneering works among the studies of the same purpose. Sveikauskas is testing empirically interaction of productivity with city structures and agglomeration in his article named "The Productivity of Cities" which was published in 1975. Sveikauskas (1975), who finds modern cities being highly urbanized worth studying, examines the productivity of 40 industries in several cities of the world for the year 1965. It is reported that doubling the city size increases regional labor productivity at a rate of 5.98%. In accordance with these results,

Sveikauskas (1975) emphasizes that the main factor on development and urbanization of big cities is the increase of the productivity.

Another pioneering work, which empirically validates the theoretical argument about a positive relationship between city structures and productivity, is the examination of productivity structure in USA for 58 industries by Segal (1976). Segal (1976) aims to research mainly whether increasing returns to scale on development of city structures exist or not. In the study stating that a third of the USA population lives in large cities, which can be considered to be metropolises in the studied period, it is found that agglomeration forces affect productivity positively. In the study, it is mentioned that agglomeration increases capital productivity in cities by 8% and consequently, larger cities are more advantages than small cities in terms of production and living.

Moomaw (1981) criticizes the evidence presented by Sveikauskas (1975) and Segal (1976) about agglomerations increasing productivity and consequently, the primary reason of emerging of cities being productivity increase. The study aims to empirically test the relationship between city sizes and productivity. Yet, in addition, Moomaw (1981) indicates that he faces biased econometric results due to two fundamental mistakes in these two pioneering studies. It is stated that the author employs a CES-type production function in the work of Sveikauskas (1975) but there is no data for the studied time period for the Hicks neutral productivity index “g”, which is a part of the function. Therefore, Moomaw criticizes Sveikauskas for using labor efficiency, which is added value per worker, as the representation of productivity. According to Moomaw (1981), wage variable related to population density cannot be placed in the equation since labor efficiency is used instead of productivity. Both exclusion of wage variable and neglecting capital density in the model, it is claimed that there is bias in the econometric forecast. As a result, it is claimed that the effect of city size on labor efficiency has been found biased and it will be 2.5% instead of 6% when calculated again.

On the other side, Moomaw (1981) indicates that the number of cities and urban population were increasing in the period which Segal (1976) analysed and consequently Segal calculates the capital stock of previously founded cities lower than newer cities. Moomaw (1981) concludes that productivity increase is lower and applicable to nonmanufacturing industries when recalculated by avoiding the measurement error.

Consequently, Moomaw (1981) proves that the bias errors in the contributions of Sveikauskas (1975) and Segal (1976) cause the effect appear larger than they are. When the real effects are calculated, he obtains the result that productivity increase is not a very important factor in the emerging of city structures.

Similarly, the study of Henderson (1986) analyses the relationship between city sizes and agglomeration economies with productivity. In the study, manufacturing industries in the US and Brasil are examined for the years 1970 and 1972. The study covering especially the urbanized regions, mentions primarily the existence of a positive relationship between industrial agglomeration and productivity. On the other side, it is reported that city sizes create a positive effect on productivity but above a certain size this effect disappears. According to the study, in small and medium scale cities agglomeration and expansion of city significantly increase productivity but in large cities this effect is not present.

Bertinelli and Black (2004) among the studies seeking the reason of productivity increase in urbanized cities in city sizes; different from previous studies, includes the element of human capital in the analysis. The study employing the urbanization theories investigates the presence of dynamics effects such as economies of scale, agglomeration, etc in optimum and equilibrium city sizes. Consequently, it is emphasized that concentration of production activities in a specific region has positive effects on productivity. Dynamic benefits created by human capital in large enough cities are argued to be effective on productivity increase. Another important aspect of the Bertinelli and Black's (2004) study is that it approaches to the analysis of the relationship between agglomeration economies and productivity by considering the location dimension for the first time. Another study supporting the relationship between agglomeration economies and productivity is presented by Mikkala (2003) on Finnish production industry. Mikkala (2003) concludes that in manufacturing industry between the years 1995-1999 localization and urbanization economies have been effective in productivity increase and localization has a greater effect when firm sizes are relatively small.

After the studies examining the relationship between productivity increase and city sizes, which constitute an important portion of the empirical literature, different phenomena that may cause productivity increase are examined. First, the effects of the two

types of agglomeration economies, namely urbanization and localization economies, on productivity are analysed separately. In the study of Beeson (1987), the relationship between regional productivity increase and agglomeration economies is analysed for the states of the USA. In the study, the effect of urbanization and localization economies on total factor productivity for the period between the years 1959 and 1973 is econometrically analysed by employing the distance model. In the study, Beeson (1987) discusses urbanization particularly and determines that there is no relationship between urbanization and productivity.

Feldman and Audretsch (1999) and Capello (1999), in their studies, emphasize that there is a strongly positive relationship between urbanization and productivity. Capello (1999) tries to determine whether the total factor productivity of firms is affected by urbanization or localization or not. The primary questions are “Which effect is stronger in location choices of firms” and “which effect increases productivity”. Capello (1999), in his study, includes 66 firms in the analysis, which have been operating in southern Milan region of Italy. According to Capello (1999) the reason for this selection is that the firms in the region have a production structure requiring high technology. Consequently, Capello (1999) examining mostly high technology production sectors in this study emphasizes that both types of agglomeration economies have an increasing effect on efficiency and urbanization economies have a greater effect.

Although it is thought that the generalization of the results is not accurate due to the firms included in Capello’s (1999) study, there are many empirical studies in the literature supporting the relationship between urbanization and productivity. Bracalente, Perugini and Pompei (2008) analyses the relationship of urbanization and localization with productivity in six manufacturing industries of 13 Western European countries for the period between 1995 and 2003. According to this study, externalities are shaped depending on economical, social and organizational structure of the region. Urbanization economies, varying from country to country due to this reason, have a positive and strong effect on productivity.

One of the studies examining different phenomena resulting in productivity increase is the study of Ciccone and Hall (1996), which concludes that the reason beyond productivity is labor concentration. The primary goal of the study is to explain the



difference of efficiency among American states. In the study with this purpose, the American manufacturing industry data belonging to the years 1988 is used. Two models, one depending on labor concentration and the other depending on local diversity, are analyzed in the study. As a result, it is reported the reason for the difference of efficiency between American states is labor concentration; doubling the labor concentration causes a 6% increase in the efficiency of workers.

Otsuka, Goto and Sueyoshi (2010) analyse the reason of productivity increase by examining other variables like market access, public transfers along with agglomeration economies. The study covers the period between 1980 and 2002 for Japan. The study examining the effects causing efficiency in Japanese industries within the subject period is remarkable due to including sectors other than production sector. Otsuka, Goto and Sueyoshi (2010), in the study, obtain the result that public transfers have no effect. On the other side, the presence of agglomeration economies and the increase in opportunities to market access are mentioned to be the phenomena increasing productivity in industries. A similar study on Japan, Mitra and Sato (2007), obtains similar results by using the sector data. In the study, it is stated that externalities increase the efficiency in production and this effect is stronger especially in light goods.

In brief, the reasons of productivity differences and increases occurring in a specific region or sectors constitute a significant part of the empirical literature. The mainstream in this topic develops as examining the relationship of productivity with agglomeration economies and agglomeration types. In the studies conducted within the framework of this stream, the idea that agglomerations and especially urbanization economies cause productivity increase is dominant. In addition, some other dynamics are also discussed as reasons of productivity increase. In these studies, briefly, the results that concentration of labor in a specific region and increase in opportunities to market access increase productivity in the subject region or industry is dominate.

An important part of the empirical literature of agglomeration economies focuses on the relationship between agglomeration economies and economic growth. After empirical studies analyzing productivity increase via agglomeration, the article of Glaeser, et al. (1992) pioneers by providing a theoretical basis regarding agglomerations' being effective on economic growth and an empirical framework. In the study, technological

spillovers' being important in endogenous growth models is used as base. Glaeser et al. argue that technological spillovers will occur in cities where human interactions happen frequently and at this point, agglomeration forces will be effective. Within this framework, the relationship between the presence of agglomeration forces and economic growth in cities is theoretically defined.

Glaeser, et al. (1992), examine the relationship between economic growth and agglomeration in the cities of the USA for the period between 1956 and 1987 in the above-mentioned theoretical framework. Another important aspect of the study, other than suggesting a new research subject and the results it found, is that it developed the necessary indexes needed for testing the mentioned relationship. According to this, in the study, the increase in the number of people employed in the region or the sector is used as a representation of economic growth. More importantly, as a representation of localization and urbanization economies, the indexes like regional specialization and local diversity, forward-backward linkages are defined and used for the first time. Urbanization and localization economies being defined as indexes with several effects cleared the way for other studies which would empirically examine the relationship between growth and agglomeration.

Consequently, Glaeser, et al. (1992) obtained the findings empirically supporting the idea that agglomeration economies have an impact on economic growth. Local competition and urban diversity affects economic growth positively and meaningfully via technology spillovers. On the other hand, it is reported that regional specialization has no effect on economic growth. The conclusion that localization and urbanization economies' being the factors providing economic growth, but localization economies in the form of specialization' having no effect, is achieved.

After the pioneering work of Glaeser, et al. (1992), the study of Bostic et al. (1997) takes an important place in the literature historically. Bostic, Gans and Stern (1997) study the growth experienced in the cities of the United States of America in 1880s. As the causes of the growth, traditional economic factors and geographical factors are empirically examined. The large-scale study conducted for 79 cities of the USA between the years 1880 and 1890 consequently indicates that geographical factors related to externalities have a positive effect on economic growth. In more detail, localization economies and

exogenous forces provide economic growth by creating input advantage in cities. In addition, the study reaches the conclusion that agglomeration economies increasing economic growth do not have any effects on productivity.

The idea, which states localization economies and local diversity being important explanatory factors of development in America in 1880s in Bostic, Gans and Stern (1997), is later analysed by Henderson (2000) in a way to include several countries. Henderson (2000) investigates the reasons of urbanization and the existence of if any relationship between urbanization economies and economic growth for 80 to 100 countries of different development levels. Henderson (2000) combines and applies the methods mentioned in the studies Henderson (1986), Ciccone and Hall (1996), and Glaeser, et al. (1992). In the study, the theoretical idea that urbanization economies making a positive contribution to economic growth is supported empirically. When the results are examined, it is seen that this effect is very strong especially in developing countries. The causality between growth and urbanization is significant. It is seen that the urbanization economies affect the growth positively. According to Henderson (2000), economic progress means countries' transition to industry and services sector. As cities agglomerate in industry and services sector, their progress becomes stronger. As a result, Henderson (2000), one of the studies supporting the presence of a positive relationship between agglomeration and growth, states that regional inequalities, urbanization and industrialization are the locomotives of economic growth.

The results of Henderson (2000) are also verified by applying different models for other countries. Crozet and Koenig (2005) support the results of Henderson (2000) in their study for 15 European countries between 1980-2000. In contrast with the previous studies, Crozet and Koenig (2005) report the same results despite the fact that they conduct the analysis by employing regional economic growth models. They approve the result that agglomeration of economic activities in specific regions and economic inequalities due to this reason causing more rapid growth in those regions. Geppert and Stephan (2008) obtain the same finding again for European countries by using the method of Markov chain analysis of cross-section data.

Some various relationships are also analyzed other than the relationships between agglomeration and growth and productivity which constitute the two main branches of

empirical literature. Barkley et al. (1999) tested whether there is relationship between industrial agglomeration and employment rate for the states of the USA, in the period between 1981 and 1992. In the study which they conducted with control variables, reflecting regional properties, such as diversity of the local economy, industry mix, average plant size and availability of urbanization economies, they reach the conclusion that agglomeration economies do not cause any change in employment rate. Martinho (2011) investigates the question whether there is a relationship between agglomeration economies and firms' labor demands. In the analysis conducted for Portugal with the data set including the period between 1986 and 1996 by using the fixed effect panel data method, it is reported that the demand of firms for labor increases as the coefficient of agglomeration increases.

Davis and Weinstein (1999), Davis and Weinstein (2003), and Hanson and Xiang (2002) study the domestic market effect in agglomeration economies. Davis and Weinstein, in their studies, started from the question whether comparative advantages or increasing returns to scale are effective in production structure and trade. As a consequence, in the study employing both Heckscher-Ohlin model and Krugman's (1980) New Economic Geography model, it is mentioned that the domestic market effect is effective in both foreign trade and agglomeration. Similarly, in Hanson and Xiang (2002), the result claiming that the domestic market effect is determinant in international trade and the domestic market effect is affected by agglomeration was obtained.

After the presented evince about a positive relationship between agglomeration economies and economic growth, in the empirical literature, the effort of determining the optimal agglomeration level has developed. In this direction, Henderson (2003) tries to find the optimum urbanization level increasing productivity and the optimal industrial diversity level providing economic growth. In addition, he aims to calculate the cost industries face when they are below or above the optimum level. The study, having a detailed data set consisting 70 OECD countries in the period between 1960 and 1995, briefly concludes that the optimum urbanization and agglomeration level decreases as the city size and the development level increase. Accordingly, in the first phase of development, it is beneficial agglomeration and urbanization to be as high as possible.

Additionally, Bhagat (2003), empirically demonstrates the positive effects of agglomeration economies of urbanization type on social variables like literacy rate, mortality rate and Beule and Beveren (2011) does the same for agglomeration economies on innovativeness of firms. He (2003) the presence of agglomeration economies has a determining role in the location choice of foreign investment entering the country.

In addition to all these, in the empirical literature, there are studies examining the presence and the effects of agglomeration economies in different countries. Crawley and Hill (2010) examines the presence of agglomeration economies in manufacturing industry of Wales, which they define as a small open economy. Between the years 1980 and 2007, the total employment in manufacturing industry decreases in Wales as it does in all developing countries. Consequently, the gradual increase of agglomeration and the presence of agglomeration economies in more than the half of the manufacturing industry are determined despite the decrease of total employment in the manufacturing industry. Similarly, Bertinelli and Decrop (2010) examines the presence of agglomeration economies for Belgium. In the study covering the period between 1997 and 2000, the agglomeration indexes found by Ellison and Glaeser (1997) are used. They obtain the result that agglomeration economics apply for more than 30% of Belgian manufacturing industry. In another study conducted for European countries, Monseny (2009) determines the presence of both localization and urbanization economies for Catalonia region of Spain within the years 1995 and 2002.

Mukkala (2003), in the study which examines the Finnish economy, after determining the presence of agglomeration economies, states that localization and urbanization economies cause productivity increase. A result similar to Mukkala (2003) is reported by Agarwalla (2011) for India. Agarwalla (2011) examines 25 regions of India for the years between 1980 and 2006. The study, discussing localization and urbanization types separately, states that both types of agglomeration are present in most of the sectors. In addition, it is reported that urbanization economies result in productivity increase for services and manufacturing sectors. Despite some differences between regions, the conclusion that regional diversity is generally more effective than localization is obtained.

Mano and Otsuka (2000) conduct analysis for five important manufacturing sectors in Japan in the period between the years 1970 and 1995 by dividing it into three periods. In

the study spanning a large period of time, it is indicated that the presence of especially urbanization economies is detected. In addition, it is found that localization and urbanization cause employment increase in specific industries.

Among the studies on China, Xuehua and Li (2006), in the study in which they employ regional panel data for eight manufacturing sectors between 1990 and 2005, prove the presence of agglomeration economies in all sectors. Additionally, the presence of agglomeration not only in sectors requiring high technology but also in labor intensive manufacturing sectors is determined. In another important study on China, Fan and Scott (2003) investigate the agglomeration economies in underdeveloped countries with China. It is stated that there is a positive relationship between the presence of agglomeration economies and economic growth in China and this effect is stronger in China when compared to underdeveloped countries.

When Turkey is the subject, it is seen that the literature on agglomerations is very limited. The empirical studies on the subject begin after 2000s. Early studies on this topic mostly were mostly conducted in order to determine the sectors in which agglomeration occurs. One of these studies, Akgüngör, Kumral and Lenger (2003) and Akgüngör (2003) mainly aim to determine the clustering in Turkish manufacturing industry. For this purpose, they try to determine the industries with similar buying-selling structures according to input-output tables. Determining the clustering industries and regional specializations by presenting value added, employment, number of firms and sectoral compositions of clustering industries are the primary purposes of the studies. In the analyses, input-output tables of 60 manufacturing subsectors in 1990 are examined with Feser and Bergman (2000) method. As a result, it is stated that in Turkey, there are 6 important manufacturing industry clusters (food and agriculture, stone industry, engineering, information and communication technology, textiles and leather, chemical industries). In more details, the clusters of textiles in the Aegean Region, food and agriculture in Central Anatolia, stone industry in the Black Sea Region, information and communication technology and textiles and leather in the Mediterranean Region, food and agriculture in Eastern Anatolia and textiles and leather in Southeastern Anatolia are found. In addition, it is stated that formal or informal interactions between firms in the same cluster generate spillovers of technical knowledge and technology and this turns into growth potential.

Another important study to determine the concentrations in Turkish manufacturing industry, Kumral (2004), aims to determine the key sectors in manufacturing industry. Sectors in which concentration is above a specific level are assumed to be key sectors and thought to be the locomotives of economic growth. Accordingly, in the study, by using the NUTS1 level industry data of the years 1990 and 2000, agglomeration criterion is calculated. Consequently, the most of the key sectors in Turkish manufacturing industry are found to be resource-incentive and low technology sectors. In addition, the result that the subsector of alcohol and tobacco products manufacturing has a high potential of clustering is obtained.

In a similar study, Eser and Köse (2005), examine the agglomeration in Turkish industry sector by employing some criteria. The analysis, in which the slice data of 44 provinces and 12 manufacturing sectors in the year 2000 is studied, aims to examine agglomeration and localization tendencies. However, Eser and Köse (2005) calculate different agglomeration criteria including value added and export data by thinking that agglomeration criterion only depending on employment is not sufficient. Consequently, in the study, which states that industry sector in Turkey distributed, spatially imbalanced and polarized, it is emphasized that industry concentrates on traditional industry centers and their hinterlands. Concurrently, it is concluded that sectors that require high technology and have high added value operate in only a few cities and sectors that are labor intensive and require low technology concentrate in cities of low and middle income.

After primary works trying to determine agglomerations on sectoral basis, studies examining the causes and effects of agglomerations are also conducted. It is seen that the only study examining the relationship between agglomeration and economic growth in Turkey is Filiztekin (2002), which analyses the effect of agglomerations in Turkish manufacturing industry between 1980 and 1995 on economic growth. The study, which takes the employment increase as economic growth, obtains the result that agglomeration economies of type localization have a negative effect on economic growth in the short term. Additionally, in the study it is concluded that industrial diversity, which is a parameter of urbanization economic, has no effect on economic growth and forward-backward linkages' being strong causes an increase in employment.

The study of Kıymalıoğlu ve Ayoğlu (2006), which is the only one to examine the causes of agglomeration economies, applies the Glaeser, et al. (1992) model to Turkish manufacturing industry. In the study analyzing the data of 9 manufacturing subsectors in 67 provinces between the years 1985 and 200 with respect to NUTS2 classification via dynamic panel method, it is indicated that specifically specialization causes agglomeration. Karaalp and Erdal (2009) examine whether the agglomeration economies in Turkey have an effect on the income convergence between provinces and between regions. In the study examining the data set of the years 1993-2001 via panel method, different effects on different levels are determined. In the inter-regional level, it is found that agglomeration economies have a negative effect on income convergence. In other words, agglomerations have a Myrdal- type effect, which ostracizes the periphery. In the inter-provincial level, it is determined that agglomeration economies in Marmara, Mediterranean, Eastern and Central Anatolia regions have a decreasing effect on the income difference between cities.

When the empirical literature on agglomeration economies in Turkey is examined, it is seen that only a limited number of studies are present. Especially in the topics of determining the causes or analyzing the effects of agglomeration economies, it is seen that there exists only one study in each. Moreover, all the studies on this topic in Turkey including only manufacturing industry is a significant limitation for generalizing the results. In addition, it is also seen that studies in Turkey usually examine the period before 2000. The absence of any studies with the data after 2000 appears to be an important shortcoming in the literature.

#### **4. DETERMINATION OF AGGLOMERATION ECONOMIES: IDENTIFICATION OF KEY SECTORS**

“The effects of agglomeration economies on economic growth” is one of the most important topics in regional development studies. Determining the properties of sectors operating in the region is the first component in regional development studies. At this point, determination of agglomeration which took place in the region is a substantial start.



Accordingly, in this section, the key sectors will be identified in Turkey manufacturing industry at the regional level of NUTS 2.

Key sectors can be defined as sectors which have a key role in regional and country employment and impetus position in industry. In determination of key sectors ‘‘LQ’’ (location quotient) values are taken as a basis. LQ concentration rates demonstrate the cities whom LQ rate is over the significant null hypothesis threshold. These are the localization economies (Eser & Köse, 2005). To be accepted the industry which has concentration in the area, this industry must have significant and greater concentration in the city than country’s average. For this reason, assuming that the inspected industry has equal distribution to the country and then the calculation is made again. In this situation, the cities which are over the average give the threshold for the concentration degree. For the previous Turkish Manufacturing Industry calculations, the threshold is identified 1.25. In this study, for LQ calculation, using Kumral 2004 study as a base.

LQ index for determining the degree of sector concentration at the regional level is calculated in this way (Kumral2004):

$$LQ = \frac{\frac{E_{ij}}{\sum_i E_{ij}}}{\frac{\sum_T E_{iT}}{\sum_i \sum_T E_{iT}}} \quad (5)$$

- $E_{ij}$  : employment of industry i in region j
- $\sum_i E_{ij}$  : total manufacturing industry employment in region j
- $\sum_T E_{iT}$  : total national employment of industry i
- $\sum_i \sum_T E_{iT}$  : total employment of all industries in all regions

There are two important criteria in determination of key sectors:

- At first, calculated LQ value must be 1.25 or more. It means that the regional employment of the examined sector is 25% more than Turkey average.

- In the second stage, constituting the dividend of the LQ Formula, the sectors which have a minimum of 0.2% share in regional employment are selected.

#### **4.1 Manufacturing Industry Findings**

LQ index method is calculated for the period from 2003-2008 in order to determine the key sectors in Turkish manufacturing industry. It is utilized from ‘‘Annual Business Statistics’’ that was published with two-digit NACE Rev. 1.1 classification by TUIK, for the examined calculation. According to NACE Rev. 1.1, two-digit manufacturing industry codes are enclosed in Appendix A, according to NUTS classification region codes in Turkey are enclosed in Appendix B. The key sectors which are determined by LQ index, based on the employment data, can be seen below in regional tables. The tables given in this section include only the findings of the key sectors and the LQ index values of all the sectors are presented in Appendix C.

In addition to this, following the changes in key sectors within the examined time period is important for the creation of regional development policies as well as the determination of key sectors. Concurrently, the changes in key sectors provide clues for regional and national economy within the observed time period.

##### **4.1.1. İstanbul Region**

İstanbul Region with the code TR1 includes the city İstanbul. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 4.** TR1 İstanbul Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>18</b>	1,6187	<b>18</b>	1,7115
<b>19</b>	1,5454	<b>19</b>	1,5671
<b>22</b>	1,3623	<b>22</b>	1,6064
<b>24</b>	1,4432	<b>24</b>	1,2667
<b>25</b>	1,2705	<b>25</b>	1,2971
<b>31</b>	1,5443	<b>31</b>	1,9079

When the table is examined, it is determined that in 2003 there are 6 key sectors which are manufacture of wearing apparel; dressing and dyeing of fur sector with number 18, manufacture of leather and leather products sector with number 19, publishing, printing and reproduction of recorded media sector with number 22, manufacture of chemicals and chemical products sector with number 24, manufacture of rubber and plastic products sector with number 25, and manufacture of electrical machinery and apparatus n.e.c. sector with number 31. The total share of the 6 key sectors in the regional employment is 40%. Among these key sectors, the ones with the highest concentration ratio are manufacture of wearing apparel, dressing and dyeing of fur sector with number 18, manufacture of leather and leather products sector with number 19, and publishing, printing and reproduction of recorded media sector with number 22.

When the calculations conducted for the years 2008 are reviewed, it is seen that a sector is replaced in the list. Manufacture of rubber and plastic products sector with number 25 has lost its property of being a key sector. At the same time, in contrast with 2003, in the year 2008, manufacture of other transport equipment sector with number 35 has got a key sector position.

Consequently, it can be observed that the key sectors in the sub-sectors of manufacturing industry demonstrate a heterogenous distribution. It is seen that concentrations are present in the primary manufacturing sectors except metallic products and wood products. On the other hand, when the year 2008 is examined no big changes are

observed in the concentrations within the sectors. It is seen that manufacture of other transport equipment sector with number 35 has developed during the studied five year period. It can be observed that manufacture of building and repairing of ships and boats sub-sector which has largest share in the studied sector increase the productivity capacity present in the region.

#### 4.1.2. Western Marmara Region

Western Marmara Region with the code TR2 includes the cities Tekirdağ, Edirne, Kırklareli, Balıkesir and Çanakkale which are included in Tekirdağ and Balıkesir subregions. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 5.** TR2 Western Marmara Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	1.5770	<b>15</b>	1.3439
<b>17</b>	1.5129	<b>17</b>	2.1620
<b>19</b>	1.469	<b>19</b>	1.2918
<b>26</b>	1.4713	<b>20</b>	1.715
		<b>26</b>	1.2211

For the year 2003, it is determined that there are 4 key sectors, namely manufacture of food products and beverages sector with number 15, manufacture of textiles sector with number 17 Manufacture of leather and leather products 19, Manufacture of other non-metallic mineral products 26,. The key sectors determined in Western Marmara Region constitute the 60% of regional employment. Among these key sectors, the one with the highest concentration ratio is manufacture of food products and beverages sector with number 15. When the calculations conducted for the year 2008 are examined, there are not

important changes in the list. Additionally, it is observed that Manufacture of wood and wood products enter the list in 2008.

Consequently, among the sectors operating in Western Marmara Region, the ones in leading position are seen to have a significant portion of production and employment capacity of the region. While manufacture of food products and beverages sector maintain its leading position, labor intensive sectors like leather sector and wood products sector rise to the key sector position. Briefly, it is seen that in Western Marmara Region, between the years 2003 and 2008, labor intensive production structure are growth and consentrated sectors are reduced.

#### 4.1.3. Aegean Region

Aegean Region with the code TR3 includes the cities İzmir, Aydın, Denizli, Muğla, Afyonkarahisar, Kütahya, Uşak and Manisa. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 6.** TR3 Aegean Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>16</b>	2,1185	<b>16</b>	1,333
<b>26</b>	1,507	<b>26</b>	1,7087

In Aegean Region, presence of only two key sectors is determined in both 2003 and 2008. Key sectors in 2003 are Manufacture of tobacco products sector with number 16 and Manufacture of other non-metallic mineral products sector with number 26. These sectors exhibiting concentration constitute only 10% of the region employment. Among these two key sectors Manufacture of tobacco products sector with number 16 has the highest concentration ratio.

When the calculations conducted for the years 2008 are reviewed, manufacture of other non-metallic mineral products sector with number 26 is on the list instead of manufacture of tobacco products sector with number 21. It is appointed that manufacture

of other non-metallic mineral products sector with number 26 maintain its key sector position in the examined time period. On the other hand, it is seen that one of the important conventional sector of the region manufacture of tobacco products sector loses its concentration when it comes to the year 2008. In other words, sectors demonstrate homogenous distribution relatively.

#### 4.1.4. Eastern Marmara Region

Eastern Marmara Region with the code TR3 includes the cities Bursa, Eskişehir, Bilecik, Sakarya, Düzce, Bolu, Yalova and Kocaeli. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 7.** TR4 Eastern Marmara Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
		<b>31</b>	1,5261
<b>34</b>	3,3261	<b>34</b>	3,0209

When the table examined, it is observed that the number of key sectors leading manufacturing in Eastern Marmara Region is very limited in the examined time period. In 2003, only key sector n Eastern Marmara Region is manufacture of motor vehicles, trailers and semi-trailers sector with number 34. This sector constitutes 12% of regional employment.

It is observed that manufacture of motor vehicles, trailers and semi-trailers sector with number 34 sustains its key sector position and manufacture of electrical machinery and apparatus n.e.c. sector with number 31 has developed into a key sector in the year 2008.

When the calculations of the years 2003 and 2008 are considered together, it is seen that concentrations in the region are very limited. Only 12% of the regional employment,

which exhibits a heterogenous structure, operates concentratedly. The destruction of Marmara Earthquake in the year 1999 is considered as the reason beyond this heterogenous structure. It is known that natural disasters, such as earthquakes, cause declines mostly in concentrated sectors. On the other side, it is seen that manufacture of motor vehicles, which has been present since the beginning of the studied period, is the most important sector in the region. It is already known that manufacture of vehicles investments in form of partnership with foreign firms are one of the important dynamics of the region.

#### 4.1.5. Western Anatolia Region

Western Anatolia Region with the code TR5 includes the cities Ankara, Konya and Karaman. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 8.** TR5 Western Anatolia Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	1,3094	<b>15</b>	1,3257
<b>22</b>	2,0935	<b>22</b>	1,7296
<b>27</b>	1,3092		
<b>28</b>	1,6042	<b>28</b>	1,7605
<b>29</b>	2,1563	<b>29</b>	1,7999
<b>34</b>	1,2586	<b>34</b>	4,5179
<b>36</b>	1,5749	<b>36</b>	1,5775

In Western Anatolia Region, 7 key sectors are found in the year 2003, which are manufacture of food products and beverages sector with number 15, publishing, printing and reproduction of recorded media sector with number 22, manufacture of basic metals sector with number 27, manufacture of fabricated metal products, except machinery and equipment sector with number 28, manufacture of machinery and equipment n.e.c. sector with number 29, manufacture of motor vehicles, trailers and semi-trailers sector with

number 34 and Manufacture of furniture; manufacturing n.e.c. sector with number 36. The share of the 7 key sectors, determined in Western Anatolia Region, in regional employment is 63%. Among these sectors, the ones with the highest concentration ratio are publishing, printing and reproduction of recorded media sector with number 22 and manufacture of machinery and equipment n.e.c. sector with number 29.

When the key sectors determined for 2008 are observed, it is seen that two key sectors lose their significance and a new sector has risen. It is determined that the concentration in manufacture of basic metals sector with number 27 and manufacture of motor vehicles, trailers and semi-trailers sector with number 34 has declined. It is seen that manufacture of medical, precision and optical instruments, watches and clocks sector with number 33 has become a rising key sector in the place of these two sectors losing their leading position.

Before analyzing the structure and the changes of key sectors in the studied period, it is beneficial to remind that Western Anatolian Region is made of two subregions with different properties. Ankara subregion, which is a subregion of Western Anatolia Region, is a region where the government is situated and capital intensive sectors concentrate. On the other side, the other subregion of Western Anatolia Region is Konya subregion which is the host of Konya Plain and has advantages in terms of agricultural activities. The simultaneous presence of these two subregions causes the observation of both capital intensive and labor intensive sectors. In conclusion, capital intensive basic metals and machinery and equipment industries sustain their position in the studied period by the contribution of Ankara subregion and manufacture of food products and beverages industries sustain their position by the contributions of Konya subregion.

#### **4.1.6. Mediterranean Region**

Mediterranean Region with the code TR6 includes the cities Antalya, Isparta, Burdur, Adana, Mersin, Hatay, Kahramanmaraş and Osmaniye. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.



**Table 9.** TR6 Mediterranean Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	1,4283	<b>15</b>	1,2533
		<b>17</b>	1,4031
<b>20</b>	2,2757	<b>20</b>	1,6448
		<b>24</b>	1,5178
		<b>26</b>	1,5936
<b>27</b>	2,0730	<b>27</b>	1,9999

When the table is observed, a total of 3 key sectors are detected in the year 2003, which, are manufacture of food products and beverages sector with number 15, manufacture of wood and wood products sector with number 20 and manufacture of basic metals sector with number 27. The 3 key sectors determined for the Mediterranean region constitute 30% of regional employment. Among these key sectors, it is seen that the highest concentration ratio belongs to manufacture of wood and wood products sector with number 20.

In the year 2008, it is observed that new sectors are developing while old key sectors sustain their importance. It is seen that manufacture of textiles sector with number 17, manufacture of chemicals and chemical products sector with number 24 and manufacture of other non-metallic mineral products sector with number 26 get into the list. In addition, it is seen that the share of concentrated key sectors in the regional employment rises to 50%.

As a result, it is seen that Mediterranean region structures around three important sectors in the studied period. Along with manufacture of food products and beverages sector with the contribution of Çukurova in the region, manufacture of basic metals and manufacture of wood and wood products sectors are detected to be the three locomotive industry groups of the region. When it is the year 2008, in addition to continuity of this triad structure, it is observed that industrial diversity increases. It can be said that the concentration in the region considerably increased in the studied 5 years period by

considering both the increase in the number of key sectors and the increase in the share in employment.

#### 4.1.7. Central Anatolia Region

Central Anatolia Region with the code TR7 includes the cities Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir, Kayseri, Sivas and Yozgat. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 10.** TR7 Central Anatolia Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>26</b>	1,3686	<b>26</b>	
<b>29</b>	1,7956	<b>29</b>	1,3251
<b>36</b>	3,6007	<b>36</b>	3,3777

In 2003, manufacture of other non-metallic mineral products sector with number 26, not elsewhere classified manufacture of machinery and equipment n.e.c. sector with number 29 and manufacture of furniture; manufacturing n.e.c. with number 36 are determined to be the 3 key sectors. The total share of the 3 key sectors in the regional employment is 41%. It is seen that among these key sectors, manufacture of furniture; manufacturing n.e.c. sector with number 36 has the highest concentration ratio by a wide margin. The sector embodies the half of the concentrated employment.

In the year 2008, it is observed that manufacture of other non-metallic mineral products with number 26 lost its property of being a key sector and a new key sector is not identified. In brief, it is seen that manufacture of furniture is the leading sector in the manufacturing industry of the region during the studied period. manufacture of furniture

sector, which has a great importance for the region, is in the most important manufacturing sector position for the region. Additionally, manufacture of machinery and equipment n.e.c.sector also generates an important employment for the region.

#### 4.1.8. Western Black Sea Region

Western Black Sea Region with the code TR8 includes the cities Zonguldak, Karabük, Bartın, Kastamonu, Çankırı, Sinop, Samsun, Tokat, Çorum and Amasya. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 11.** TR8 Western Black Sea Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	1,5442	<b>15</b>	1,6639
<b>16</b>	4,4504		
<b>20</b>	2,9589	<b>20</b>	2,6011
<b>26</b>	1,4093	<b>26</b>	1,6319
<b>27</b>	5,6427	<b>27</b>	3,837
		<b>35</b>	1,9209

In the year 2003, a total of 5 key sectors are identified which are manufacture of food products and beverages sector with number 15, manufacture of tobacco products sector with number 16, manufacture of wood and wood products sector with number 20, manufacture of other non-metallic mineral products with number 26 and manufacture of basic metals sector with number 27. Key sectors identified in Western Black Sea region have a total share of 57% in the regional employed. Among these key sectors, the ones

with the largest concentration ratios are manufacture of tobacco products sector with number 16 and manufacture of basic metals sector with number 27.

When the calculations conducted for the years 2008 are reviewed, it is seen that a sector is replaced in the list. Manufacture of tobacco products sector with number 16 has lost its property of being a key sector. At the same time, in contrast with 2003, in the year 2008, manufacture of other transport equipment sector with number 35 has got a key sector position.

Consequently, it is clearly seen that sectors based on natural resources are leading the manufacturing industry in Western Black Sea region in 2003. Sectors based on natural resources, such as wood products, tobacco products, food products sectors, are in the locomotive position in the region in the year 2003. When the year 2008 is examined, no big changes are observed. In the year 2003, tobacco products sector, which is also a sector based on natural resources, loses its significance due to the followed economic policies and incentive policies. Additionally, manufacture of other transport equipment sector with number 35 gains a key sector position due to the increase in sea transportation vehicles as it is observed in the other cities on the coast of Black Sea. In brief, the sectors which are based on natural resources and agriculture are the indispensable dynamics of the region in addition to manufacturing of basic metal being very important for Western Black Sea Region.

#### **4.1.9. Eastern Blacksea Region**

Eastern Blacksea Region with the code TR9 includes the cities Trabzon, Ordu, Giresun, Rize, Artvin and Gümüşhane. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table 12.** TR9 Eastern Black Sea Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	4,6519	<b>15</b>	4,1979
<b>20</b>	3,1135	<b>20</b>	3,4360

When the table is examined, it is determined that there are 2 key sectors, namely manufacture of food products and beverages sector with number 15 and manufacture of wood and wood products sector with number 20 in the year 2003. The share of the 2 key sectors determined in Eastern Black Sea Region in employment is 65% in total. When the calculations conducted for the year 2008 are examined, no changes are observed in the list.

To conclude, Eastern Black Sea Region is evaluated as a region with significantly low industrial diversity when LQ index values are examined. As a natural result of this, the concentrated sectors have a large share in employment although there are only 2 key sectors present. When the sectors are reviewed, manufacture of food products and beverages and manufacture of wood and wood products sectors are important and indispensable locomotives of the region. These two sectors are the sectors based on natural resources as Western Black Sea Region. The region's known geographical properties are effective in manufacture of wood and wood products and tea plantation in the region is effective in manufacture of food products and beverages.

#### **4.1.10. North-eastern Anatolia Region**

North-eastern Anatolia Region with the code TR10 includes the cities Erzurum, Erzincan, Bayburt, Ağrı, Kars, Iğdır and Ardahan. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table13.** TR10 North-eastern Anatolia Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	4,0470	<b>15</b>	4,0392
<b>20</b>	3,4478	<b>20</b>	2,7103
		<b>22</b>	1,2848
		<b>26</b>	2,3431

When the table is examined, it is determined that there are 2 key sectors, namely manufacture of food products and beverages sector with number 15 and manufacture of wood and wood products sector with number 20 in the year 2003, the same as Eastern Black Sea Region. The share of the 2 key sectors determined in the region in employment is a total of 58%. When the LQ index values of 2008 are examined, it is seen that the two key sectors sustain their position. In addition, it is determined that publishing, printing and reproduction of recorded media sector with number 22 and manufacture of other non-metallic mineral products sector with number 26 enter the list as rising key sectors.

In Northeastern Anatolia Region, manufacture of food products and beverages sector with number 15 and manufacture of wood and wood products sector with number 20 are the primary dynamics, which is the same as its neighbor Eastern Black Sea Region. However, it is seen that's stockbreeding is effective in manufacture of food products and beverages, not tea plantation as in Eastern Black Sea Region, when examined in detail. Another important development for the region is that it has been able to create new key sectors in the period until the year 2008.

#### **4.1.11. Middle-eastern Anatolia Region**

Middle-eastern Anatolia Region with the code TR11 includes the cities Malatya, Elazığ, Bingöl, Tunceli, Van, Muş, Bitlis and Hakkari. In following table, key sectors

found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table14.** TR11 Middle-eastern Anatolia Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	2,5450	<b>15</b>	1,9901
<b>17</b>	1,2689	<b>17</b>	1,3000
		<b>20</b>	2,4703
<b>21</b>	1,8895	<b>21</b>	3,6400
<b>26</b>	1,4487	<b>26</b>	1,3289
<b>33</b>	3,9916		
		<b>34</b>	1,6566

It is identified that there are a total of 5 key sectors in the year 2003, which are manufacture of food products and beverages sector with number 15, manufacture of textiles sector with number 17, Manufacture of wood and wood products sector with number 20, manufacture of other non-metallic mineral products sector with number 26 and manufacture of medical, precision and optical instruments, watches and clocks sector with number 33. The share of the 5 key sectors, determined in Middle-eastern Anatolia region, in employment is a total of 69%. Among these key sectors, the ones with the largest concentration ratios are manufacture of other non-metallic mineral products sector with number 26 and manufacture of food products and beverages sector with number 15.

When the calculations conducted for the year 2008 are examined, it is seen that manufacture of medical, precision and optical instruments, watches and clocks sector loses its property of being a key sector. Concurrently, it is observed that manufacture of pulp, paper and paper products sector with number 21 and manufacture of motor vehicles, trailers and semi-trailers sector with number 34 exhibit concentrations in the year 2008. In the region having a heterogenous structure with respect to the properties of key sectors; in addition to the prominence of labor-intensive sectors such as food, textile, wood products,

it is also observed that capital-intensive sectors, such as mineral products, vehicles also exhibit concentration. A great portion of the regional employment, 69% is employed in the concentrated sectors.

#### 4.1.12. South-eastern Anatolia Region

Southeastern Anatolia Region with the code TR12 includes the cities Gaziantep, Adıyaman, Kilis, Şanlıurfa, Diyarbakır, Mardin, Batman, Şırnak and Siirt. In following table, key sectors found as a result of calculation conducted for the region within the years 2003 and 2008 are given.

**Table15.** TR12 Southeastern Anatolia Region Key Sectors List

<b>KEY SECTORS</b>			
<b>2003</b>		<b>2008</b>	
<b>Sector</b>	<b>LQ index</b>	<b>Sector</b>	<b>LQ index</b>
<b>15</b>	1,5648	<b>15</b>	1,3245
<b>17</b>	2,3752	<b>17</b>	3,0642
		<b>19</b>	1,3733

When the table is examined, it is identified that there are 2 key sectors present in the year 2003, which are manufacture of food products and beverages sector with number 15 and manufacture of textiles sector with number 17. The key sectors detected in the Southeastern Anatolia Region have the 53% of the regional employment. When the calculations conducted for 2008 are investigated, the key sectors of the year 2003 keep their positions. Additionally, manufacture of leather and leather products sector with number 19 has become a key sector in 2008.

In Southeastern Anatolia Region, manufacture of food products and beverages is in a fundamental component position, as it is in the neighboring regions. In addition, concentration in textile sector is observed. In this 5 year period, concentration gradually



increases in textile sector in the region. As of 2008, textile sector generates the 40% of regional employment alone. In parallel with this advancement, leather sector has become a key sector in 2008 along with the concentration in tekstil sector.

#### **4.1.13. In Lieu of Conclusion**

It is crucial in understanding the structure of Turkish manufacturing industry to consider the changes between the years 2003 and 2008 within the determined key sectors together. The first step of constituting accurate economic policies is the elaborative analysis the structure of manufacturing industry and the changes it went through in recent years. Especially, a probable success of incentive policies which are to be designed for manufacturing industry depends on a solid understanding of the sector and region in which the incentive is applied. Thus, there will be an effort to explain some results by considering the key sector concentrations as a whole, which are calculated above one by one for NUTS2 regions of Turkey.

First, it can be stated that manufacture of food products and beverages sector with number 15 sustains its property of being the fundamental dynamics of Turkish manufacturing industry despite all industrialization efforts. In 8 of 12 regions in Turkey, which are NUTS2 level, gıda ve içecek sector is in a key sector position. The sector's being the most concentrated sector in Turkey is an important result. Additionally, it is also understood that Turkey's traditional agricultural activities and traditional regions have strong effects on food and beverage sector. It is seen that the plains of Konya and Çukurova thrust food and beverage sector to the forefront in their regions. In addition, it is observed that the activities of tea plantation in Eastern Black Sea Region and stockbreeding in Eastern Anatolian region constitute an important part of manufacture of food products and beverages sector.

In line with the developments in Turkish manufacturing industry between the years 2003 and 2008, it is seen that some industries have lost their significance and some industries have risen. Manufacture of tobacco products sector with number 16 is the top of the sectors which are in decline since 2003. Tobacco farming, which is one of traditional agricultural activities in some specific regions of Turkey, is a key sector in Aegean and

Western Black Sea Regions in 2003. However, it is seen that tobacco farming does not exhibit concentration in any regions when it comes to the year 2008. Moreover, in some sectors, concentrations have increased during the studied 5-year period. Especially, Manufacture of pulp, paper and paper products sector with number 21 and manufacture of other transport equipment sector with number 35, which do not exhibit concentration in any regions of Turkey in 2003, have become new key sectors concentrating in some specific regions. Manufacture of wood products sector is determined to be a key sector in Western Marmara, Aegean and Middle-eastern Anatolia Regions in 2008. Concurrently, other transportation sector has become a key sector in neighboring İstanbul and Western Black Sea regions. It can be argued that the investments made on the coast of Black Sea in building and repairing of ships and boats sector are effective in this transformation. Briefly, it should be emphasized that tobacco farming in Turkey has been abandoned between the years 2003 and 2008, and at the same time, manufacture of paper and building and repairing of ships and boats sectors have made great progress.

When analyzed regionally, it is understood that the regions in Turkey exhibit very different properties in terms of concentration economies. It is clearly seen that in some regions of Turkey, urbanization economies, which are supported by forward-reverse linkages and have high industrial diversity, are applicable; and in some other regions, localization economies, which are characterized by low industrial diversity but high concentration levels, are applicable. The number of key sectors is more than five in İstanbul, Western Anatolian and Mediterranean Regions. However, the shares of these key sectors in regional employment are not very high. For instance, despite there is six key sector in İstanbul Region, the sharing of this six sectors' in the total employment is 40%. But for instance in Middle Eastern Anatolia Region there is also six key sector, but its share is 69%. As a result, it can be said that there is high industrial diversity and urbanization economies are applicable in these three regions. On the contrary, strong effects of localization are determined in Western Marmara, Western Black Sea, Eastern Black Sea, Northeastern Anatolia, Southeastern Anatolia regions. The presence of only a few key sectors in these regions implies low industrial diversity. Despite the low number of key sectors, key sectors having more than the half of regional employment is an evidence for localization economies where employment concentrates in one or two sectors. On the other side, as a third group, in Aegean, Eastern Marmara and Central Anatolia

regions none of the two types of concentration is observed. These regions exhibit diversity in terms of sectors while the number of key sectors and of people employed in these sectors are very low.

Last, two more important results are obtained when analyzed regionally. It is a very important result that in İstanbul and Ankara, which are the two of the three largest cities of Turkey, strong urbanization economies effects are determined while concentrations in İzmir are very small if any. In addition, neighboring regions constituting the northeastern part of Turkey (Western Black Sea, Eastern Black Sea, Northeastern Anatolia and Central Anatolia) are very similar to each other in terms of sectoral structure. In these regions, looking like a block, manufacture of food products and beverages; Manufacture of wood products ve Manufacture of other non-metallic mineral products sectors commonly come to the front. It is observed that the economic activities of the regions are very similar to each other and concentrated in sectors based on natural resources.

## **5. DETERMINATION OF THE EFFECTS OF AGGLOMERATIONS ON ECONOMIC GROWTH IN TURKISH MANUFACTURING INDUSTRY**

### **5.1. Theory**

In the literature, it has been tried to prove whether agglomerations have an effect on economic growth by various methods. The presence of different types of agglomeration economies makes difficult to conduct an integrated empirical analysis on the presence of mentioned effect. At this point, production function approach handled in firm level simplifies analysis of the effects of agglomeration economies. The method used by Glaeser et al. (1992) and Henderson, Kuncoro and Turner (1995) is based on the Cobb-Douglas type production functions of firms operating in a specific region and in a specific sector:

$$Y_t = A_t F(L_t) \tag{6}$$

In this production function of firms;  $A_t$  represents the general technology level and  $L_t$  represents labor input. In this simplifying model employed for the analysis of

agglomerations, only production input used is labor. As a result, any physical capital innovations providing savings in labor are out of question. Additionally, firms receive prices, wages and technology as inputs. Under these circumstances, firms obtain the profit maximization on the point where the marginal product of labor is equal to the marginal cost of labor.

$$A_t f'(l_t) = w_t \quad (7)$$

If we re-organize the statement as growth;

$$\text{Ln}\left(\frac{A_{t+1}}{A_t}\right) = \text{Ln}\left(\frac{w_{t+1}}{w_t}\right) - \text{Ln}\left(\frac{f'(l_{t+1})}{f'(l_t)}\right) \quad (8)$$

At this point, Glaeser et al. (1992) assumes that technology has components of both national and local level. Accordingly, Glaeser et al. (1992) formulates technology as:

$$A = A_{\text{LOCAL}} A_{\text{NATIONAL}} \quad (9)$$

In addition, Glaeser et al. (1992) associates the growth of technology present in local level with various externality types by making use of theoretical literature discussions on agglomerations.

According to this, specialization, local competition, diversity and initial conditions determine the growth of technology. If we reorganize the growth equation in this way, we obtain the following equation:

$$\text{Ln}\left(\frac{A_{t+1}}{A_t}\right) = \text{Ln}\left(\frac{A_{\text{local},t+1}}{A_{\text{local},t}}\right) + \text{Ln}\left(\frac{A_{\text{national},t+1}}{A_{\text{national},t}}\right) \quad (10)$$

Glaeser (1992)'s growth model compatible with externalities and agglomeration economies. LQ variable which is in Glaeser's basis equation represents localization economies and MAR externalities. Accordingly, the firms which are in the same industry get different externality advantages with positioning closely. While the productivity increasing by knowledge spillovers and externalities, economic growth is expected in the region. For this reason LQ variable's coefficient and significance will demonstrate that there any localization effects in Turkish Manufacturing Industries based on Glaeser (1992)'s basis econometric estimation's results.

On the other hand, DIV variable represents urbanization economies in the equation. It is accepted that showing up the city forms with increasing industrial diversity will be increase economic growth. In this respect, variable of DIV will demonstrate externalities and urbanization economies which are the elements of agglomeration economies in Turkish Manufacturing Industry.

In other respects, the important part of agglomeration economies is relevant to wages. According to Core-Periphery Model, it is supposed that if wages increases, the employment will decrease and then agglomeration will decrease. This effect gets strong when the transportation cost decrease. As a result it is expected that the variable of wage has a negative effect on agglomeration and economic growth. In this study, wage variable in the regression provide the effects of wage increases on Turkish Manufacturing Industry.

## **5.2. Data Set**

The data used for the determination of the presence of agglomeration economies in Turkish Manufacturing Industry and analysis of the effects of agglomerations on economic growth in sectoral and provincial basis is taken from “Annual Business Statistics” published with two digit ISIC (International Standard Industrial Classification of All Economic Activities) Revision 1.1 classification by TÜİK (Turkish Statistics Institute). The data set includes the observations covering 23 sub sectors of manufacturing industry between the years 2003 and 2008, and 26 regions. In the data set, the data of the year 2005 are not published and at the same time, the data is not visible in the sectors having only one firm due to confidentiality concerns. The econometric studies are conducted under these limitations.

### 5.3. Variables

The dependent variable of this model, in which we analyze the effects of agglomerations on economic growth, is labor growth. In literature, there is several variable to represent economic growth. Some studies use increase in value added per worker. On the other hand Gleaser (1992)'s study which is pioneering study in the literature use increasing of employment as defining economic growth. As a result of lacking another manufacturing datas and especially using increasing of employment in the literature, in this study the increasing of employment is used as a growth variable. Labor growth is addressed as the indicator of growth and represent as follows;

$$E = \ln (E_{ijt} / E_{ijt-1}) \quad (11)$$

Labor growth is found by taking the natural logarithm of the division of the labor in the province j in the sector i in the period t to the labor in the previous period.

One of the independent variables is the relative growth in wages. This variable is expressed as follows;

$$W = \ln (E_{ijt} / E_{ijt-1}) \quad (12)$$

Growth in wages is found by taking the natural logarithm of the division of the wages in the province j in the sector i in the period t to the wages in the previous period. As an increase in the wages of employees in a specific region and industry implies an increase in the costs of firms; it is thought to negatively affect agglomerations. On the other side, the increase of wages in a region encourages the mobile labor in neighboring regions to migrate into the region. In total of these two effects, the variable wg is expected to have a negative impact on employment growth (Mano and Otsuka, 2000)

The LQ Index, as mentioned before, is an important criterion measuring the

concentration level. It measures the share of a specific industry in a specific region within the national economy.

$$LQ = \ln\left(\frac{\frac{E_{ijt}}{E_{jt}}}{\frac{E_i}{E_t}}\right) \quad (13)$$

LQ variable indicates how much an industry has concentrated in a specific region and represents localization economies. A higher value of LQ determines the presence of MAR or Porter type externalities. Also according to Hotelling (1929), if LQ variable has great value, there is seen that intense competition. On both sides, the variable is usually expected to have a positive sign.

COMPT variable aims to relatively measure the competition which firms face. It is calculated by taking the natural logarithm of the division of regional share of the number of the firms operating in the sector to the national share of the firms operating in the same sector.

$$COMPT = \ln\left(\frac{\frac{F_{ijt}}{E_{ijt}}}{\frac{F_t}{E_t}}\right) \quad (14)$$

F represents the number of firms. In the literature, there are different arguments on the COMPT variable. This variable's having a positive value, in other words strong competition triggering economic growth, is a commonly expected result. However, according to Marshallian Externalities, strong competition has a negative impact on economic growth and its sign is expected to be negative.

DIV variable is suggested by Glaeser et al. (1992) in order to measure industrial diversity. The industrial diversity for an industry in a specific region is calculated by taking the natural logarithm of the division of the employment of all the industries other than the subject industry to the regional employment.

$$DIV = \ln(E_{jt} - E_{ijt} / E_{jt}) \quad (15)$$

Industrial diversity represents urbanization economies. This variable's having a positive sign indicates that agglomerations of urbanization economies type increase economic growth.

The variable I represents investments. It is calculated by taking the natural logarithm of the increase ratio of investments in a specific industry operating in a specific region.

Glaeser et al. (1992) argue that technological progresses, which will cause economic growth, have both national and local components. Investments are selected as a variable to cause technological growth on a national basis. This variable is expected to have a positive sign.

#### 5.4. Methodology

Panel data analysis is employed to determine the effects of agglomeration economies on economic growth on a regional level. Whereas it is possible to make estimations separately via cross-section data or times series, panel data analysis enables the collective use of cross-section data with time dimension. Basically, the panel data model equation is as follows:

$$Y_{it} = \beta_{1it} + \beta_{2it}X_{2it} + \dots + \beta_{kit}X_{kit} + e_{it} \quad (16)$$

In this equation, N represents the cross-section units and t represents the time dimension. For each cross-section unit, there are different observations present for all times. The equation above is represented in a more compact, more general statement as follows:

$$Y_{ijt} = \alpha_i + \beta' X_{it} + \varepsilon_{it} \quad (17)$$

In this equality, which is the basis equation of panel data model,  $y_{it}$  represents the dependent variable and  $x_{it}$  represents all of the explanatory variables.  $\beta$  represents the slope coefficients of the explanatory variables.  $\varepsilon$  is the error term where as  $\alpha$  is the constant of the equation. In this direction, the model used in the study is obtained as follows:

$$\ln e_{ijt} = \beta_{1it} + \beta_{2it} \ln W_{2it} + \beta_{3it} \ln I_{3it} + \beta_{4it} \ln LQ_{4it} + \beta_{5it} \ln DIV_{5it} + \beta_{6it} \ln COMPT_{6it} + \varepsilon_{it} \quad (18)$$



Time dimension of the model is the 5 years in between the years 2003 and 2008. For the reason that the data for the year 2005 is not collected by TUIK where the data is obtained, the observations for this year are not present. The cross-section dimension consists of 23 subsectors operating in 26 regions. Yet, some observations are missing due to the hiding of the data because of a sole company operating in some regions. Thus, the model has “unbalanced panel” property.

In panel data models, it is usually assumed that slope coefficients do not change from unit to unit on cross-section dimension. Additionally, the constant terms of the model changes between cross-section. The constant term of each cross-section unit differentiates from the general constant term due to the unobservable properties specific to the unit. This differentiation is called “individual effect”. Similarly, the differentiation observed in the time dimension among periods is called “time effect”. In panel data analysis, the first decision to be made before starting the analysis is whether individual or time effects are “fixed” or “random”. Herein, the decision whether the distribution of individual effects is fixed or random is an “a priori” decision (Baltagi, 2005). When the whole of a specific sample is taken as data, fixed effects; when data is taken randomly from the sample, random effects are applicable. From this point forth, it is possible to say that the fixed effects model is applicable in this study, since the data set used covers the whole of Turkish manufacturing industry sample. In brief, fixed effects are present in the analyzed model and constant term can change between cross-section or from year to year.

The next step of the analysis is to analyze whether fixed effects on the subject are present in cross-section level and in the time dimension. In other words, the difference in the constant term may occur between the units in the cross-section dimension or between the years in the time dimension or both.

Therefore, the presence of fixed effects must be tested first. A series of F-test trials conducts the necessary testing accordingly. In order to test the presence of fixed effects; the following F-tests are applied respectively:

#### I. Testing of the Presence of Individual and Time Effects

$H_{0i} : \mu = \lambda = 0$  : There are no Individual and Time effects.

$H_A$ : At least one of them is non-zero. At least one effect is present.

## II. Testing of the Presence of Individual Effects

$H_{0i} : \mu = 0 / \lambda \neq 0$  : In the presence of time effects; there are no individual effects.

$H_{0i} : \mu \neq 0 / \lambda \neq 0$  : In the presence of time effects; there are also individual effects present.

## III. Testing of the Presence of Time Effects

$H_{0i} : \lambda = 0 / \mu \neq 0$  : In the presence of individual effects; there are no time effects.

$H_{0i} : \lambda \neq 0 / \mu \neq 0$  : In the presence of individual effects; there are also time effects present.

**Table 16.** The F-Tests Results for Fixed Effects

<b>The F-TESTS For Fixed Effects</b>			
	$H_{01}$	$H_{02}$	$H_{03}$
$F_{OLS}$	77.9824	71.2076	41.5808
Prob.	0	0	0

The F-Tests results are seen in Table 16. Accordingly, the null hypotheses are rejected in the three tests. In the first test, the rejection of the null hypothesis implies the

presence of at least one of the effects; in the second test, the rejection of the null hypothesis implies the presence of individual effects; and in the third test, the rejection of the null hypothesis implies the presence of time effects. Briefly, the presence of both individual and time effects is determined according to the F-test results. Thus, the model to be used in the analysis is the “two-way fixed effects” model.

Another important assumption in panel data models is that the error term of the model has normal distribution. After determining the right model in the analysis, it must be tested whether the error term of the model has normal distribution. Therefore, it must be examined whether the model has heteroscedasticity and autocorrelation problem. In order to test the presence of heteroscedasticity, the LM test for heteroscedasticity, which is mentioned in Greene (2008), is employed. To test autocorrelation, the test developed by Baltagi and Li (1995) (its citation in the survey) is used in panel data models. As an assistant test for autocorrelation, the Wooldridge (2002) test is employed.

**Table 17.** The results for Heteroscedasticity and Autocorrelation tests

<b>HETEROSCEDASTICITY AND AUTOCORRELATION TESTS</b>			
	Greene HC Test	Baltagi&Li AC Test	Wooldridge AC Test
Test Statistics	0.0034	1.1350	3.36
Prob.	1	0.2867	0.068

According to the results demonstrated in Table 17, it is interpreted that the model does not have heteroscedasticity and autocorrelation problems. When the Greene Heteroscedasticity test results are observed, it is seen that there is no heteroscedasticity problem. According to the Wooldridge test and Baltagi&Li test which is an autocorrelation test suitable for fixed effects method, there is no autocorrelation in the model. Briefly, after all these tests, it is determined that the right model is the two-way fixed effects model and it does not have heteroscedasticity and autocorrelation problem.

In the study, both a panel data analysis estimation covering all subregions of Turkey and separate panel data analysis estimations for all subregions will be done. Thus,

along with the country-wide interpretations on Turkey, it will be possible to evaluate which effects are present in which regions separately. Therefore, the process above, which is conducted to determine the model specification, will be conducted again separately for the data set of each region. The results of the tests conducted to determine the model of each geographical subregion are illustrated in Appendix F.

## 5.5 Findings

First, the data set covering all the geographical regions of Turkey is analyzed. However, in the estimation phase of panel data models in which the fixed effects are applicable, a dummy variable for each cross-section unit has to be added to the model. Yet, by adding N dummy variables into the model; “dummy variable trap” occurs. In other words, the coefficients cannot be estimated by distinguishing them since dummy variables are used excessively. In order to overcome this problem, a constraint must be introduced to the model. Here, there are two methods. It is possible to overcome this problem via a constraint which equals any cross-section unit to zero. But, all individual effects must be interpreted with respect to the excluded unit, since normalization operation is conducted in accordance with the excluded cross-section. Except for exceptional cases, it is not beneficial to examining all the data by comparing to a certain cross-section unit. Instead, all the data can be seen as deviations from the average by introducing a constraint which equals the average of all effects to zero. The estimation conducted with this method is called within estimation. After determining the model specification, the two-way fixed effects model is estimated by using the within estimator.

**Table 18.** The results of the analysis conducted for the whole of Turkish manufacturing industry

Variables	Coefficients	t/prob.
Lnw	0.238	17.52/0.000
Lni	0.020	4.04 /0.000
Lndiv	-2.01	-9.49/0.000
Lncompt	0.030	2.02/0.044
Lnlnq	0.504	30.36/0.000

In Table 18, the results of the analysis conducted for the whole of Turkish manufacturing industry. Accordingly, one of the interesting results is that the increases in wages result in employment increase. Theoretically, labor is disposed to move slowly to regions which have high wages (Küçüker, 2000). Thus employment concentration increases because of the migration from regions where higher wages have. However, employment concentration decreases because of the migration from regions where lower wages have. However, it is accepted that creates cost element for firms. It is accepted that these total of these two effects' sign will be negative (Mano & Otsuka, 2000). According to the results of analysis, increase in wages has positive effects in Turkey on the contrary the theoretic expectation. This result might be coming from that effect: the positive effects of the increasing in employment of labor migration are greater than the negative effects of the high wages cost disadvantages. Consequently, a wage increase in Turkish manufacturing industry increases employment via increasing agglomerations by attracting labor.

One of the main goals of the analysis is to determine the effects of localization and urbanization economies on economic growth. Another important result in this manner appears to be that the LQ variable representing localization economies has a positive and significant effect on employment growth. In other words; localization economies, which mean the concentration of an industry in a geographical region, is an important element increasing the economic growth in Turkish manufacturing industry. On the other hand, the variable representing urbanization economies is the variable DIV. As it can be seen in the table, industrial diversity has a negative effect on employment growth. In contrast with the expected results in the literature; urbanization economies slow down economic growth in Turkish manufacturing industry. The evaluation of this interesting surprise result is important. The result can be argued to come of the fact that labor-intensive and of low technology sectors, which are suitable for localization economies, are dominant among the subsectors constituting Turkish manufacturing industry. Briefly; technological advancement and urbanization are still not completed in Turkish manufacturing industry and labor-intensive or natural resource based sectors are in dominant position. As a result, the presence of localization economies throughout Turkish manufacturing industry becomes a locomotive to economic growth; whereas industrial diversity negatively affects growth in contrast with the expectations.

COMPT variable measures the intensity of competition which an industry experiences. As it can be clearly seen in Table 18; competition increases employment in Turkish manufacturing industry. It is seen that the employment level increases in the intense competition industries. Finally, it is determined that investments, which is the control variable added to the model in order represent the nationwide technological progress, have a positive contribution to employment increase as expected.

Additionally, for each NUTS 2 level geographical region; Turkish manufacturing industry is analyzed. The region specific estimation results are given together in Table 19.

**Table 19.** Estimation results for sub-regions

<b>Region</b>	<b>Variable</b>	<b>Coefficient</b>
<b>TR10</b>	Lnw	<b>0.356</b>
	Lni	0.019
	Lndiv	<b>-4.124</b>
	Lncompt	0.017
	Lnlq	<b>0.642</b>
<b>TR21</b>	Lnw	<b>0.408</b>
	Lni	0.003
	Lndiv	<b>-5.723</b>
	Lncompt	-0.008
	Lnlq	<b>0.280</b>
<b>TR22</b>	Lnw	<b>0.326</b>
	Lni	-0.011
	Lndiv	<b>-1.402</b>
	Lncompt	0.024
	Lnlq	<b>0.555</b>
<b>TR31</b>	Lnw	<b>0.423</b>
	Lni	0.038
	Lndiv	<b>-3.821</b>
	Lncompt	-0.019
	Lnlq	<b>-0.438</b>
<b>TR32</b>	Lnw	0.055
	Lni	<b>0.057</b>
	Lndiv	-3.184
	Lncompt	0.003
	Lnlq	<b>0.819</b>
<b>TR33</b>	Lnw	<b>0.247</b>
	Lni	-0.006
	Lndiv	<b>-4.662</b>
	Lncompt	0.0218
	Lnlq	<b>0.423</b>
	Lnw	<b>0.303</b>

<b>TR41</b>	Lni	0.006
	Lndiv	-1.816
	Lncompt	0.067
	Lnlq	<b>0.814</b>
<b>TR42</b>	Lnw	<b>0.307</b>
	Lni	-0.008
	Lndiv	<b>-7.190</b>
	Lncompt	<b>0.116</b>
	Lnlq	<b>0.307</b>
<b>TR51</b>	Lnw	<b>0.154</b>
	Lni	0.037
	Lndiv	<b>-5.959</b>
	Lncompt	-0.034
	Lnlq	<b>0.431</b>
<b>TR52</b>	Lnw	-0.043
	Lni	0.005
	Lndiv	-2.239
	Lncompt	0.044
	Lnlq	<b>0.933</b>
<b>TR61</b>	Lnw	<b>0.149</b>
	Lni	0.004
	Lndiv	-0.228
	Lncompt	0.035
	Lnlq	<b>0.915</b>
<b>TR62</b>	Lnw	<b>0.228</b>
	Lni	<b>-0.030</b>
	Lndiv	<b>-2.729</b>
	Lncompt	0.046
	Lnlq	<b>0.732</b>
<b>TR63</b>	Lnw	<b>0.430</b>
	Lni	-0.028
	Lndiv	<b>-3.642</b>
	Lncompt	<b>0.164</b>
	Lnlq	0.033
<b>TR71</b>	Lnw	0.062
	Lni	0.007
	Lndiv	-0.438
	Lncompt	-0.019
	Lnlq	<b>0.806</b>
<b>TR72</b>	Lnw	<b>0.196</b>
	Lni	0.003
	Lndiv	<b>-6.162</b>
	Lncompt	-0.069
	Lnlq	<b>0.509</b>
	Lnw	0.078
	Lni	0.030
	Lndiv	<b>-2.965</b>

<b>TR81</b>	Lncompt	-0.045
	Lnlq	<b>0.722</b>
<b>TR82</b>	Lnw	0.018
	Lni	0.028
	Lndiv	<b>-1.63</b>
	Lncompt	0.046
	Lnlq	<b>0.805</b>
<b>TR83</b>	Lnw	<b>0.194</b>
	Lni	0.001
	Lndiv	-1.607
	Lncompt	<b>0.144</b>
	Lnlq	<b>0.744</b>
<b>TR90</b>	Lnw	0.036
	Lni	0.017
	Lndiv	-0.963
	Lncompt	-0.144
	Lnlq	<b>0.745</b>
<b>TRA1</b>	Lnw	-0.034
	Lni	0.032
	Lndiv	-0.734
	Lncompt	0.065
	Lnlq	<b>1.017</b>
<b>TRA2</b>	Lnw	0.053
	Lni	0.015
	Lndiv	0.205
	Lncompt	-0.119
	Lnlq	<b>0.776</b>
<b>TRB1</b>	Lnw	0.043
	Lni	0.003
	Lndiv	-0.995
	Lncompt	-0.061
	Lnlq	<b>0.797</b>
<b>TRB2</b>	Lnw	0.011
	Lni	0.016
	Lndiv	-1.194
	Lncompt	0.198
	Lnlq	<b>0.905</b>
<b>TRC1</b>	Lnw	-0.030
	Lni	<b>0.052</b>
	Lndiv	<b>-2.545</b>
	Lncompt	-0.038
	Lnlq	<b>0.916</b>
	Lnw	-0.013
	Lni	-0.003
	Lndiv	<b>-0.807</b>
	Lncompt	-0.050



<b>TRC2</b>	Ln <sub>lq</sub>	<b>0.911</b>
	Ln <sub>w</sub>	-0.025
	Ln <sub>i</sub>	0.050
	Ln <sub>div</sub>	-2.187
	Ln <sub>compt</sub>	-0.065
<b>TRC3</b>	Ln <sub>lq</sub>	0.812

\*: The dark results are significant in 5% significance level.

When the results are observed in general, it is seen that they are not in conflict with the findings of the analysis conducted for the whole of Turkish manufacturing industry. If we examine the effect of wage increase on employment increase; it is seen that in 13 of the 26 regions, wage increase has significant and positive effects. In other words, in the half of Turkey, wage increase positively affects economic growth in manufacturing industry. On the other hand, the regions where wage increase is effective or not in employment increase demonstrate more striking results. The regions where wage variable does not result in employment increase are the subregions of Aydın and Konya the geographical regions Southeastern Anatolia and Eastern Anatolia. In the subregions within the borders of Southeastern Anatolia and Eastern Anatolia Regions; wage increase does not effect economic growth. In these regions where agriculture, stockbreeding and labor-intensive sectors constitute almost the whole of economic activities; positive effects generated by wage increases on agglomerations cannot be observed.

When the competition variable is examined, it is determined that it affects employment increase in only a few regions in Turkey. It is observed that competition effect is applicable only in Kocaeli, Samsun and Hatay subregions. Apart from these regions, no evidence for competitive environment triggering economic growth is obtained.

It is also seen that in most of the regions, similar results have been obtained for the LQ variable, which is one of the important variables to be examined and represents localization economies. LQ variable does not have a significant effect on employment growth in only Hatay and Mardin subregions. On the other hand; it is seen that localization economies have a negative effect on employment increase in İzmir subregion. Yet, in all the regions other than these; significant and positive effects of the presence of localization economies on employment growth are proven. Briefly, in all regions except Hatay, Mardin and İzmir, supporting the concentration of industries singularly helps employment increase and economic growth.

DIV variable, which is another important variable due its representing the effects of agglomerations and which reflects industrial diversity, provides important results. DIV variable has a negative effect on employment growth in 14 of the 26 subregions. DIV variable measures the size of industrial diversity and implies the presence of urbanization economies. Contrary to the expectations in the literature; it is a remarkable result that this variable has a negative sign in 14 subregions in Turkey and does not positively effect growth in any regions. This result can be argued to arise from Turkey's being a developing country and having a manufacturing industry dominated by labor intensive and natural resource based sectors. When the regions where urbanization has a negative effect on employment increase, it is noticed that these regions are the coastal regions of Turkey and Ankara.

## **6. CONCLUSION**

In this thesis study, agglomeration economies, in the example of Turkish manufacturing industry, are discussed. New economic geography models are utilized in the analysis of agglomeration economies. In which regions and which sectors the types of agglomeration economies are present and whether they affect economic growth are analyzed by econometric estimation methods. Within this scope, for the period between the years 2003 and 2008, Turkish manufacturing industry data, which is generated in the NUTSII regions level and in accordance with NACE Rev. 1.1 sector classification, is used. The mentioned data is obtained from the Annual Business Statistics published by TÜİK (Turkish Statistics Institute).

First, key sectors are determined in each region, in accordance with Turkey NUTS1 regions classification. Key sectors are found for the years both 2003 and 2008 and thereby it is aimed to see the changes occurred in the mentioned period. According to this, it is seen that at least one key sector is present in every region of Turkey. When the country-wide findings for Turkey are evaluated, some important results are discovered. First, food and drink production appears to sustain its dominant position in Turkish manufacturing sector since it is in a key sector position in 8 of the 12 regions. Additionally, when changes

are examined for the 2003-2008 period, it is observed that tobacco farming lost its significance and in contrast an important increase in the manufacturing of other transportation vehicles has occurred.

When the regional and sector structure of key sectors present in Turkish manufacturing industry, it is seen that labor intensive and natural resource based sectors are still in a dominating position. While food and drink production sustains its lead in manufacturing industry, the traditional agricultural centers of Anatolia maintain their importance. When regional findings are examined, the presence of two blocks in Turkey draws the attention. The area starting from the north of Turkey and covering the eastern border cities and southeastern regions demonstrates similar properties.

The most important common characteristic of this region is to have a small number of key sectors and to have a large share of key sectors in total regional employment. These findings prove the operating of localization economies and Marshallian externalities in the region. Additionally, according to a more important finding, only labor intensive and natural resource based sectors have experienced concentration in the whole of this region. In other words, in the region where localization economies are observed, only low value adding sectors have become widespread and most of the employment is working in these sectors.

On the contrary, in the line made of Istanbul, Western Anatolia and Mediterranean regions, a completely opposite structure is observed. Along this line from Marmara to southern coasts, a few key sectors are discovered in the regions. Additionally, the share of key sectors in total employment remains low. This implies the presence of urbanization economies along the line. In these regions, the structure of key sectors determined also varies. Along with food and drink production sector, some capital intensive sectors are observed to concentrate.

After determining the key sectors, the effects of different types of agglomeration economies on economic growth are econometrically estimated via the panel data analysis method. Estimation is conducted both country-wide and separately for the regions of Turkey. The effects of localization economies and urbanization economies, which are

different types of agglomeration economies, are examined. Another purpose of the analysis is to determine the effects of externalities which are influential in regional level. In the study, employment growth is used as a representation of economic growth in accordance with the method. According to the results of the estimation, it is concluded that localization economies increase economic growth throughout Turkey. Urbanization economies, in contrast, negatively affect economic growth. Another vital result is that an increase in wages increases employment.

When the regional results are examined, it is seen that they do not conflict with the overall results. In almost all of the sub-regions, localization economies help economic growth. Industrial diversity, representing the urbanization economies, has a negative effect in almost the half of the sub-regions. In parallel with the overall results, an increase in wages appears mostly to have a positive effect on economic growth. However, at this point, it is an important result that the regions where wage increases cannot affect economic growth are Southeastern Anatolia and Eastern Anatolia regions where localization economies are quite strong.

As a result, it begins to be widely accepted in the literature that economic policies, especially development and incentive policies, should be designed in a region specific manner. Instead of solutions assuming uniformity in all the regions of a country; policies considering region-specific properties need to be developed. The success of regional economy policies depends of their being design in accordance with the properties of the region. Herein, the findings of this thesis study provide vital results for developing regional economic policies.

Food production being the leader in Turkish manufacturing industry and labor or natural resource based sectors being usually dominant make one think that modern industrialization process has not been completed yet. The concentration of employment in low value adding sectors appears to be a primary problem to be solved. With this point of view, it must a priority in industrial to increase the development of high value adding sectors. However, it is understood that applying incentives to new sectors requiring high technology production and bringing high value added is not an accurate policy for the whole of Turkey because it is found that industrial diversity, which increases by such

incentives, decreases employment and economy in more than half of Turkey. In other words, incentives on new sectors usually cause present resources to be diverted in here and to be used less efficiently than established developed sectors. In brief, applying the same incentive to all regions affects economic development negatively whereas the development of high value adding industry sectors appears to be absolutely necessary. It is seen that the incentive policies to be applied in this context should not be via simple methods like incentives per workplace or worker employed in the sector on subject. Incentive policies which will ensure the effective use of resources and the establishment of effective production structure should be applied. They are supported with technological infrastructure support, trainings and social policies.

On the other hand, in the findings of the study, it can be seen that localization economies is beneficial to almost all regions. This result implies the presence of Marshallian externalities in all regions. According to Marshallian externalities, firms have great advantages in locating closely. This situation, similarly, shows that efforts for more concentration in the key sectors in which regions are advantageous and have specialized will provide positive results, instead of encouraging new sectors. In other words, regional development policies should not omit to support the concentrated sectors in which knowledge and experience are significantly accumulated in regions.

Another important result belongs to the relationship between wages and employment. According to this, it is seen that increases in wages have no negative effects in any regions of Turkey. Even in contrast, an increase in wages of employees increases economic growth in the half of the sub-regions of Turkey. The reason beyond is the relationship of wage increase with concentration and efficiency. Localization economies' being effective throughout Turkey implies the presence of Marshallian externalities in terms of dynamic externalities. In addition, according to the new economic geography models; an increase in wages of any region increases concentrations by making the region more attractive. The increase of concentration brings along important Marshallian externalities, such as labor market pooling and input sharing, to firms. Briefly, the externalities benefits which firms obtain by an increase in concentration are greater than the cost born due to increase in wages.

In this thesis study, agglomeration economies and its effects in Turkish manufacturing industry are in the focus. Agglomerations in regional level are determined and examined. Additionally, externalities in effect are investigated. The results of agglomerations are emphasized more than the causes of agglomerations. Explaining of the factors causing agglomerations in Turkey, analyzing why different types of agglomerations occur in different regions should be handled as a different research subject. Similarly, the analysis on the effects of agglomeration economies in important areas in Turkey, other than the manufacturing industry, such a services and so on, is another subject to be studied.

One of the important limitations of this study is the lack of up-to-date data of Annual Business Statistics of TÜİK. The reason for this is that TÜİK publishes the data with delay. Timely publication of Annual Business Statistics by TÜİK will be beneficial in terms of the timeliness of the studies.

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## APPENDIX A

<b>CLASSIFICATION OF ECONOMIC ACTIVITIES IN THE EUROPEAN COMMUNITY (NACE) REVISION 1.1 MANUFACTURING CODES</b>	
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
19	Manufacture of leather and leather products
20	Manufacture of wood and wood products
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastic products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture; manufacturing n.e.c.
37	Recycling

## APPENDIX B

<b>NUTS-1, 12 REGIONS FOR TURKEY (Nomenclature of Territorial Units for Statistics)</b>	
TR1	İstanbul
TR2	Western Marmara
TR3	Aegean
TR4	Eastern Marmara
TR5	Western Anatolia
TR6	Mediterranean
TR7	Central Anatolia
TR8	Western Black Sea
TR9	Eastern Black Sea
TRA	North-eastern Anatolia
TRB	Middle-eastern Anatolia
TRC	South-eastern Anatolia



## APPENDIX C

<b>NUTS-2, 26 SUB-REGIONS FOR TURKEY (Nomenclature of Territorial Units for Statistics)</b>	
TR10	İstanbul Sub-Region
TR21	Tekirdağ Sub-Region
TR22	Balıkesir Sub-Region
TR31	İzmir Sub-Region
TR32	Aydın Sub-Region
TR33	Manisa Sub-Region
TR41	Bursa Sub-Region
TR42	Kocaeli Sub-Region
TR51	Ankara Sub-Region
TR52	Konya Sub-Region
TR61	Antalya Sub-Region
TR62	Adana Sub-Region
TR63	Hatay Sub-Region
TR71	Kırkkale Sub-Region
TR72	Kayseri Sub-Region
TR81	Zonguldak Sub-Region
TR82	Kastamonu Sub-Region
TR83	Samsun Sub-Region
TR90	Trabzon Sub-Region
TRA1	Erzurum Sub-Region
TRA2	Ağrı Sub-Region
TRB1	Malatya Sub-Region
TRB2	Van Sub-Region
TRC1	Gaziantep Sub-Region
TRC2	Şanlıurfa Sub-Region
TRC3	Mardin Sub-Region

**APPENDIX D**

<b>LQ INDEXES FOR KEY SECTORS (2003)</b>												
	<b>TR1</b>	<b>TR2</b>	<b>TR3</b>	<b>TR4</b>	<b>TR5</b>	<b>TR6</b>	<b>TR7</b>	<b>TR8</b>	<b>TR9</b>	<b>TRA</b>	<b>TRB</b>	<b>TRC</b>
<b>15</b>	0.432632	1.577035	1.081205	0.785388	1.309412	1.428308	1.085954	1.544239	4.651994	4.047061	2.545014	1.564877
<b>16</b>	-	-	2.118549	-	0	-	0	4.450434	-	0	-	-
<b>17</b>	1.020326	1.512983	0.976769	1.099755	0.320834	1.084693	0.894348	0.32287	0.084531	0.058684	1.268941	2.375267
<b>18</b>	1.618778	0.980892	1.039741	0.603178	0.414275	0.503741	0.25994	0.596564	0.38022	0.237836	0.565697	0.315978
<b>19</b>	1.545401	1.469	1.007303	0.299658	0.913382	0.373836	0.244069	0.483164	0.370634	-	0.342715	1.039529
<b>20</b>	0.309192	1.022513	1.015165	1.053689	1.156426	2.275746	0.809418	2.958919	3.113551	3.447894	1.889564	1.134041
<b>21</b>	1.165254	0.665296	1.388012	0.960268	0.482495	0.724152	-	0.220005	-	-	0.194859	0.640375
<b>22</b>	1.362301	0.462936	0.563759	0.644272	2.093555	0.78928	0.360281	0.964279	0.570016	0.979753	0.613819	0.397394
<b>23</b>	0.356336	-	1.554347	2.221778	-	-	-	0.774489	-	0	-	-
<b>24</b>	1.443232	0.551514	1.051104	0.849018	0.573597	1.145633	0.301372	0.305549	0.454667	0.191219	0.128428	0.346287
<b>25</b>	1.270549	0.549586	0.840161	1.113792	0.89255	0.627937	0.973211	0.936875	0.503352	0.598855	0.268099	0.988277
<b>26</b>	0.541123	1.471326	1.507051	1.043966	1.030599	1.247334	1.368655	1.409345	0.879713	1.21504	1.448781	0.825716
<b>27</b>	0.658159	0.387211	0.594512	1.220221	1.309255	2.073063	-	5.642785	0.179837	0.112192	0.210339	0.092956
<b>28</b>	0.930023	0.497685	0.978908	1.074718	1.604256	1.235201	1.154366	0.642272	0.678073	1.222331	0.762964	0.803224
<b>29</b>	0.902761	0.499849	0.953516	1.059058	2.156398	0.959523	1.79566	0.569978	0.386818	0.300696	0.48648	0.353213
<b>30</b>	2.409971	85.01416	11.35203	-	-	-	0	0	-	0	-	-
<b>31</b>	1.544891	-	0.442625	1.047541	1.02497	0.387063	0.443703	0.143196	0.16238	0.319125	0.85377	0.293619
<b>32</b>	1.028147	0.067315	0.706893	0.070149	-	0.021428	0	0	-	-	-	0.076333
<b>33</b>	0.956482	0.670586	2.012951	0.439378	2.312549	1.200395	0.596862	1.431817	0.275118	-	3.991686	0.054994
<b>34</b>	0.501725	0.028008	0.708626	3.32616	1.258635	0.343557	0.515642	0.193475	0.07097	0.36701	-	0.058457
<b>35</b>	1.386221	2.632687	0.719707	0.708101	-	0.13168	-	0.538937	0.514228	-	-	-
<b>36</b>	0.974359	0	0.56519	0.887386	1.574977	1.051127	3.600738	1.075292	0.796441	0.963226	0.412593	0.445447
<b>37</b>	-	0	0	-	-	-	-	0	-	0	0	-

## APPENDIX E

LQ INDEXES FOR KEY SECTORS (2008)												
	TR1	TR2	TR3	TR4	R5	TR6	TR7	TR8	TR9	TRA	TRB	TRC
15	0.45344	1.343907	1.148654	0.861119	1.3258	1.253387	0.986927	1.66391	4.197915	4.039228	1.990113	1.324559
16	-	-	-	-	0	-	0	-	-	0	-	-
17	0.85950	2.162049	0.854556	1.046488	0.238298	1.403181	1.019629	0.198763	0.136172	0.047287	1.300049	3.064263
18	1.71150	0.980581	1.003604	0.52175	0.3494	0.401328	0.407099	1.056288	0.682249	0.279402	0.618506	0.484331
19	1.56719	1.291871	1.283547	0.159125	1.128548	0.297887	0.23208	-	0.437689	-	0.202024	-
20	0.46584	1.741511	0.959287	1.082669	0.523622	1.644847	0.851681	2.601196	3.436031	2.710397	2.470324	0.813981
21	1.27535	0.972796	1.333073	0.724572	0.59477	0.657243	0.356673	-	-	-	3.640013	0.732164
22	1.60642	0.316977	0.664366	0.36242	1.729676	0.930525	0.615794	0.421895	0.734336	1.284814	0.586936	0.679872
23	0.25765	-	-	2.097344	-	-	-	-	-	0	-	-
24	1.26674	0.878553	1.03441	0.920126	0.757276	1.517887	0.331838	0.503177	0.353169	0.450442	0.288764	0.488165
25	1.03195	0.827523	1.069977	1.206401	0.863296	0.933304	0.869651	0.640052	0.905277	0.824489	0.607487	0.889745
26	0.47265	1.221168	1.708791	0.942829	0.768968	1.593647	1.177551	1.631935	1.092574	2.343143	1.328921	1.188641
27	0.60567	-	0.831228	1.15996	0.94663	-	0.719585	3.837443	0.407263	-	-	-
28	0.89012	0.472518	1.071447	1.121028	1.760531	1.182679	0.922108	0.575097	0.493287	0.820045	0.878834	0.689301
29	1.02368	0.444782	0.91031	1.086499	1.799934	0.729974	1.325157	0.537516	0.479976	0.527397	0.356648	0.953417
30	2.39611	0	-	-	1.099241	-	0	0	-	0	-	-
31	1.29718	0.616728	0.833547	1.526192	0.835156	0.31914	0.725284	0.35506	0.264981	0.728518	0.352826	0.227445
32	1.21697	-	-	0.080398	-	-	0	0	-	-	-	-
33	0.76874	0.111949	0.781568	0.322265	-	-	1.4225	-	-	0.673395	-	-
34	0.48575	0.518425	0.742798	3.020927	0.949255	0.484732	0.635409	-	0.041847	-	1.656617	-
35	1.90796	-	-	0.856886	-	0.242101	-	1.920957	0.69963	-	-	-
36	1.02516	0.417853	0.649618	0.856665	1.57758	0.934675	3.377795	1.204626	0.718462	0.606797	0.52846	0.19836
37	-	0	0	-	-	-	-	0	-	0	0	-

## APPENDIX F

F TEST RESULTS FOR EACH REGION				
F TESTS				
		H <sub>01</sub>	H <sub>02</sub>	H <sub>03</sub>
TR10	<b>F<sub>OLS</sub></b>	67.75	65.88	1.29
	<b>PROB.</b>	0	0	0.28
TR21		77.16	88.73	0.7412
		0	0	0.56
TR22		82.73	33.37	4.83
		0	0	0.0014
TR31		100.05	92.73	8.49
		0	0	0.0008
TR32		295.15	340.16	9.77
		0	0	0.000156
TR33		89.75	100.77	6.25
		0	0	0
TR41		58.44	42.77	3.06
		0	0	0.02
TR42		72.88	75.27	11.96
		0	0	0.00001
TR51		62.16	39.87	4.58
		0	0	0.0021
TR52		29.93	26.96	6.54
		0	0	0.000125
TR61		68.88	49.63	8.15
		0	0	0.00001346
TR62		103.89	108.72	5.56
		0	0	0.00050
TR63		26.98	19.95	7.42
		0	0	0.000036
TR71		96.21	90.57	30.95
		0	0	0
TR72		50.05	38.96	4.10
		0	0	0.0044
TR81		147.43	87.31	15.43
		0	0	0
TR82		228.82	200.26	45.38
		0	0	0
TR83		99.53	97.73	6.07
		0	0	0.0002
TR90		75.92	82.47	16.46
		0	0	0
TRA1		104.11	118.59	28.63
		0	0	0
TRA2		1463.86	1412.39	756.47
		0	0	0
TRB1		122.94	142.58	61.9
		0	0	0
TRB2		138.61	139.42	174.08
		0	0	0
TRC1		105.65	85.11	17.82
		0	0	0
TRC2		234.93	274.27	36.58
		0	0	0
TRC3		149.271	127.55	113.94
		0	0	0

**APPENDIX G**

<b>HETEROSCEDASTICITY &amp; AUTOCORELATION TESTS</b>				
		<b>Greene HC Test</b>	<b>Baltagi&amp;Li AC Test</b>	<b>Wooldridge AC Test</b>
<b>TR10</b>	<b>Statistics</b>	0	0.1107	27.22
	<b>Prob</b>	1	0.7393	0.000
<b>TR21</b>		0	6.95	2.56
		1	0.008	0.1486
<b>TR22</b>		0	0.026	5.58
		1	0.869	0.0502
<b>TR31</b>		0	0.1591	7.02
		1	0.6899	0.0158
<b>TR32</b>		0	2.0109	8.56
		1	0.1561	0.0152
<b>TR33</b>		0	0.104	13.19
		1	0.74	0.0039
<b>TR41</b>		0	8.27	28.15
		1	0.004	0.0001
<b>TR42</b>		0	0.133	1.85
		1	0.715	0.1937
<b>TR51</b>		0	0.401	16.31
		1	0.526	0.001
<b>TR52</b>		0	4.2064	18.56
		1	0.0402	0.0010
<b>TR61</b>		0	4.035	11.48
		1	0.4455	0.0054
<b>TR62</b>		0	0.2999	0.48
		1	0.5839	0.5008
<b>TR63</b>		0	7.5000	1.17
		1	0.0061	0.3048
<b>TR71</b>		0	1.4295	7.64
		1	0.2318	0.0220
<b>TR72</b>		0	0.9570	4.36
		1	0.3279	0.0608
<b>TR81</b>		0	2.919	0.03
		1	0.087	0.8727
<b>TR82</b>		0	0.879	7.71
		1	0.348	0.0691
<b>TR83</b>		0	0.2834	4.44
		1	0.594	0.0568
<b>TR90</b>		0	0.0437	2.08
		1	0.834	0.1836
<b>TRA1</b>		0	3.53	51.26
		1	0.599	0.0190

<b>TRA2</b>		0	29.58	0.40
		1	0.00005	0.5930
<b>TRB1</b>		0	3.439	0.85
		1	0.063	0.3863
<b>TRB2</b>		0	0.00001	55.53
		1	0.9965	0.0050
<b>TRC1</b>		0	2.53	23.56
		1	0.111	0.0007
<b>TRC2</b>		0	4.88	45.74
		1	0.0271	0.0011
<b>TRC3</b>		0	0.063	0.86
		1	0.800	0.4513

## TEZ FOTOKOPİSİ İZİN FORMU

### ENSTİTÜ

Sosyal Bilimler Enstitüsü

### YAZARIN

Soyadı : Kargın Akkoç

Adı : Gamze

Bölümü : İktisat

**TEZİN ADI:** An Analysis of Agglomeration Economies and Their Economic Impacts in Turkey Through the Lens of New Economic Geography Approach

**TEZİN TÜRÜ :** Yüksek Lisans

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir.
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir.
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz.