

## **Investigation of Location Dynamics of Automotive Industry: The Case of Kocaeli/Turkey**

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### **Keywords**

Automotive Industry, Location Dynamics, Industrial Development, Industrial City, Kocaeli.

### **Abstract**

the Automotive industry has been internationalized for 30 years as a result of vertical disintegration and modular production changes in the structure of the industry. Simultaneously with such changes, Eastern part of Marmara Region (specifically Kocaeli City) in Turkey which had little evidence in terms of automobile concentration before 1980s has become emerging automotive production geography within the periphery of Europe especially after 1990s. This study investigates the location dynamics of automotive suppliers in Kocaeli. Besides the cost related location reasons, factors like quality, relationship between actors, just in time production and delivery are the subjects waiting to be studied for the study area since it is a developing cluster for 20 years. Data on existing structure and historical restructuring process of the region is obtained via government reports and statistics. To explain the location reasons of suppliers, interviews with supplier firm managers are conducted due to the registry records obtained from Kocaeli Chamber of Industry. Subjects on the location reasons of suppliers, the reasons of supplier selection of carmakers, satisfaction with existing location / reasons of relocation (push and pull factors), relationships between car makers and suppliers in model development, components of competitiveness of the firm and firms' adaptation to restructuring of the automotive system have been investigated in interviews. Answers of the firm managers are grouped into categories and findings are rendered and interpreted through descriptive statistics and frequency tables.

### **1. Introduction**

From the beginning of the nineteenth century to today, Industrial location dynamics have been evolved due to developments in world's technology, economy and industrial structure. Today, the concepts such as competitive advantages, innovation, qualified labor pools, expansion to the new markets, local production knowledge, relationships between actors, just in time production and delivery, role of local governments, R & D institutions and universities, quality of life of the region are added to the traditional location factors like labor costs, proximity to market and raw materials, transportation costs and costs in manufacturing process (Assink & Groenendijk, 2009; Brenner & Mühlig, 2007; Mccann & Sheppard, 2003).

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Economic crisis have been overcome through structural and technological changes (vertical disintegration, flexible specialization, IT technologies) in the production systems. Technological developments on information, communication and transportation made globalization and access to emerging markets possible. Since the 2008 crisis, the focus on modular production which make it possible for car makers to meet the needs of ever differentiated demands of customers, have been increased. Today, the world automotive geography is influenced by the changes in the relationship between actors, decentralization of noncore production activities, search for new production geographies to reduce costs and cover new markets (Ferrazzi & Goldstein, 2011; Hudson, 1994; Lung, 2004).

In automotive geography, where the level of internationalization is ever increasing, automotive producers in Japan, America and Europe have foreign direct investments and joint ventures in developed and developing markets. In the case of Europe, design and product development activities and plants of luxury segment cars are located in the industrial heartlands of the continent (blue banana). Conversely, technologically stable, low risky, medium segment cars are assembled in the peripheral regions like Eastern and Southeastern Europe. This situation leads to a regional specialization of the production related activities of the international brands in Europe (Lung, 2004). This multi-stage decentralization and regional specialization process causes dispersed automotive industry developments in European countries like Spain, Portugal, Ukraine, Czech Republic, Romania, Hungary and Turkey (Schlie & Yip, 2000). In 90s, automotive clusters (AC Styria, NRW, ACICAE, TOSB etc.) were established in these countries by local governments and institutions as well as automotive suppliers (Stratmann & Dimitrova, 2008; Şenlier, Salihoğlu, & Yildiz, 2011).

In this context, Turkey and Eastern Mediterranean Region offer competitive advantages for automotive sector as a peripheral region in Europe (İl Özel İdaresi, 2011; Yaşar, 2013). In automotive industry of Turkey, factors such as capital structure, presence of experienced suppliers, quality of workforce and low labor costs, proximity to mature European market and developing regional markets are among the strong aspects of the sector in terms of competition.

Kocaeli Metropolitan Area which is located in Eastern Marmara Region drew the attention of many industrial firms and global suppliers players particularly and turned into a gradually growing cluster since 1990s, because of the advantages of the region such as the proximity to the largest metropolises like Istanbul, Ankara, Bursa and İzmir, its location on national and international trade axis and nodes and proximity to European market (Şenlier et al., 2011; Yaşar, 2013).

The study is intended to explain the spatial development and location dynamics of automotive industry on the example of Kocaeli automotive industrial region. In this framework, structural features and historical development of automotive industry in Kocaeli, subjects on the location reasons of suppliers, the reasons of supplier selection of car makers, satisfaction with existing location / reasons of relocation (push and pull factors), relationships between car makers and suppliers in model development, components of competitiveness of the firm and firms' adaptation to restructuring of the automotive system are investigated through interviews with supplier managers, government reports and statistics.

## 2. Evolution of Industrial Location Theory

Location decision of a firm which the theory dates back to 19<sup>th</sup> century as an effort of minimizing transportation costs has been influenced by the ever changing factors such as labor costs, configuration of the market and characteristics of the demand, economies of scale and scope, externalities, innovations, relationships between firms, Just in Time (JIT) supply, institutional relations and infrastructures, competition - cooperation, lean production, coordination of suppliers, face to face interactions, transfer of tacit knowledge, knowledge spillovers, decision making process of firms and industrial policies for nearly 190 years Authors like Assink and Groenendijk (2009); Eickelpasch, Lejpras, and Stephan (2007); Murphy and Redmond (2009) describe this evolution as a cumulative process from hard location factors to soft ones which will define historically in the following parts.

Pioneer theories were interested with the characteristics of the production process. Land and distance are deterministic factors in the transformation of production inputs to physical commodities in these theories (Mccann & Sheppard, 2003).

Hayter (2004) criticized the three characteristics of neoclassical location theory which;

- Involves economic variables such as transportation and labor costs and excludes historical, political, and social processes in the analysis.
- Operates in an “abstract” space and tries to answer where the activities are supposed to locate and,
- Presumes that rationality and perfect competition is a universal law.

Because of these features, It was mostly seen as a modeling problem by the scholars from neoclassical school (Assink & Groenendijk, 2009; Hayter, 2004).

In the year of 1826 which the agriculture is still the leading industrial sector in Germany; Von Thunen -by drawing the rings of profitable cultivation of lands-proposed the agricultural land use theory to supply agricultural products to market quickly and continuously . Land profitability in Von Thunen’s theory formed the basis of Ricardo’s “Land Use Theory” in subsequent years (Mccann & Sheppard, 2003)

Alfred Weber in his work “On Industrial Location (1903) approached to industrial location as a transportation problem of the relationship between inputs and outputs of the production. He focused on the spatially differentiated costs and defines two types of costs which are;

- Distance related costs and
- Location specific costs (Mccann & Sheppard, 2003; Zook, 1997)

Weber also investigated the conditions to locate whether close to raw material or market. He developed classifications on types and weights of the raw materials to minimize transportation costs for various types of industrial products (Larsson, 1999; Zhu & Ding, 2006). The lowest costs location for a firm was also adjusted by the labor costs and agglomeration which Weber identified as secondary factors.

Hotelling, criticized the perfect competition assumption of early theories and emphasized the role of market in location of economic activities (Zook, 1997). He developed “the market area analysis” which focused on the principles of market competition to explain why the firms are concentrated around specific markets (McCann & Sheppard, 2003).

Lösch (1954;1975) concentrated on the differentiated market areas of industrial sectors. These areas are overlapping each other in some places which agglomerations emerged by the influence of the relationships between firms (Zook, 1997)

Walter Isard (1956) discussed a general equilibrium model which is mostly developed in abstract spaces under the constraints of the real world. Isard saw location as the specific outcome of the production functions of the firms and developed solutions for the location problem including substitutions among factors (McCann & Sheppard, 2003).

In the same period, Perroux (1950) worked on externalities which are created by dynamic and integrated industries concentrated around a locomotive industry. According to “growth pole theory” of Perroux, externalities are the reason of differences on spatial distributions of industries (Nuur, 2005; Zhu & Ding, 2006; Zook, 1997). In his theory, the externalities could be covered around the large urban areas which have necessity prerequisites to attract firms (Christofakis & Papadaskalopoulos, 2011).

According to Assink & Groenendijk (2009), investments on industrial and urban infrastructures after World War II caused decreases in transportation costs. Simultaneously, labor mobility increased and regional inequalities on wages are narrowed. New concepts on industrial location such as agglomerations forces were came up with the impacts of these changes.

There are 3 reasons behind the agglomeration idea which is first expressed by Alfred Marshall in 1890;

- Skilled specialized labor pool,
- Specialization of inputs and services / intermediate goods,
- Technological Spillovers (Dicken & Lloyd, 1990; Head, Ries, & Swenson, 1995).

Puga (2009) expanded this view by stating that 3 mechanisms are active in the agglomeration economies;

- Sharing local infrastructure and facilities, a variety of intermediate input suppliers or a pool of workers with similar skills,
- Better matching between employers and employees, buyers and suppliers or business partners,
- Learning by widespread adoption of new technologies and business practices.

After the crisis in 1970's, there have been a second industrial divide which is recognized by the shift from mass production to flexible specialization (Piore &

Sabel, 1984). In this process, large scale industrial firms which are independent and limited relationships with other actors broken up into vertically disintegrated cluster of relative small firms spatially continuous and linked together by horizontal relationships such as Italian Industrial Districts in 3rd Italy (Storper & Christopherson, 1987)

Small scale firms in these neo Marshallian Industrial Districts were specialized in certain type of outputs which are not large quantities often. The skills and capabilities of the workforce were critical in this craft production system (Tappi, 2001). Economic relationships among agents were the most important factor behind proximity of firms. Competition and cooperation among the actors in the district, cost reduction of using the local market, flow of bottom up innovations, vertical mobility of labor and image of the district were the other features of Italian Districts (Alberti, Salvatore, Carmine, & Visconti, 2008; Zhu & Ding, 2006). In the case of Orange Country, Scott (1988) pointed out the role of economies of scale and scope and transaction costs on adopting of vertically disintegrated firms to market conditions (Zook, 1997). Saxenian (1996) suggested the network approach and explained the role of complex and historical relations between firms, social structures and institutions on the birth and development of Silicon Valley and Route128.

There have been various concepts since the outcomes of spatial concentration gained importance among the dynamics for the location of firms. In their recent studies, by using the variables such as firm size, characteristics of the relationship, membership, accessibility, space outcomes, analytical approach and space notion Mccann & Sheppard (2003) grouped these various types of firm co-locations and clusterings into 3 categories which are pure agglomeration, industrial complex and social networks.

Pred (1967) criticized the neoclassical location theory which doesn't simulate the real world because of its assumptions on rationality, free competition, homo-economicus and perfectly informed individual. He proposed a behavioral theory in which the location is a part of firm's decision making process that is complex, uncertain, subjective, strategic and long-term (Pen, 1999). Plant size, employment, technology, financing, management, marketing and distribution, engineering and construction were the other stages of the decision making according to behavioral approach. Decision is determined by the information, skills, rationality level and preferences of firm managers (Hayter, 2004). It is flexible, comprehensive and includes feedbacks. The behavioral approach is criticized in terms of explaining changes which are external to the firm (Tekeli, Şenyapılı, & Güvenç, 1991)

Assink and Groenendijk (2009) asserted that the industrial geography is affected by the social changes such as the rise of network society, the knowledge economy and the creative economy after 1970's. Subjects like globalization of labor market, just in time delivery, increases in quality of transportation, transfer of tacit knowledge, sustainability of innovation, proximity and relationships between firms, decentralization of non-core production phases and quality of life gained importance in location theory with the introduction of post-modern society (Bozkurt, 2006).

Structuralist approach to location theory is introduced to explain these supranational industrial policy and strategy shifts. It is the global forces and relations in production process which play important roles in the formation of industrial geographies and location dynamics of firms according to structuralists (Hayter, 2004; Tekeli, Şenyapılı, & Güvenç, 1991). The approach is accused of opacity, over emphasis on global forces, underestimation of the role of individuals, institutions and business organizations (Hayter, 2004).

### **3. Recent Changes in the World Automobile Production System and Location Strategies of the Firms**

Scholars such as Kondratieff and Storper (1935), Schumpeter (1928), Hall (1985) and Toffler (1980) that take capitalist economy as a cycle, pointed that the declining profits lead to depression in the world economy which results as crises. It is the technological innovations which recover the system and provide solutions to reach the desired growth rates.

In 1970s, mass production plant typologies which aim to achieve economies of scale and scope failed, because of the stagnations in the market, increased competition and unresponsive firm structures (bulky, inflexible, rigid) to differentiated demands (Bozkurt, 2006; Okten, Sengezer, Camlibel, & Evren, 1998; Zook, 1997). Industrial restructuring which named *Second Industrial Divide* Piore and Sabel (1984) later was constructed for the craft production and niche markets instead of mass production and consumption to overcome the crisis in these years (Bailey, de Ruyter, Michie, & Tyler, 2010).

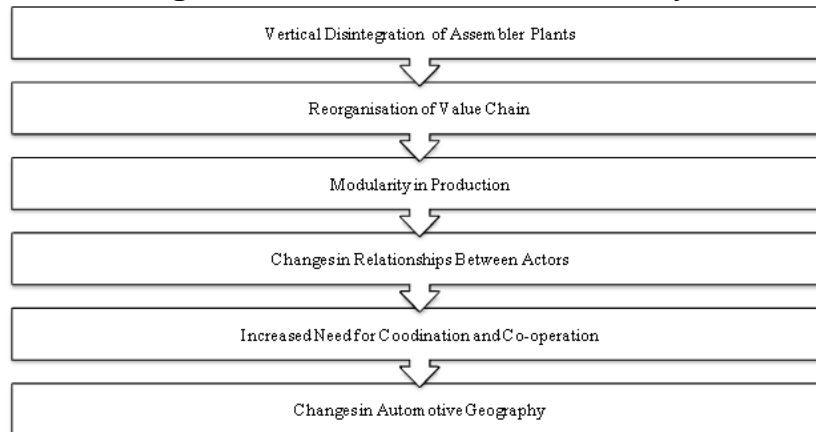
Flexible specialization, lean production and just in time production and delivery was the characteristics of post-fordist production which is the result of this restructuring (Bailey et al., 2010; Bedir, 2002). Vertical disintegration which is a tendency to obtain inputs from specialized outside suppliers rather than making them within an integrated plant has been a significant move for firms to adopt to the post-fordist production (Holmes, 1999; Özatağan, 2011). Disintegration of the production allowed firms to locate their facilities in low cost regions. Thus, globalization of the production has been started coupled with the expansion policies to new markets. The location problem of production transformed into a global optimization problem of the production (Okten et al., 1998; Schlie & Yip, 2000)

Subjects such as intense interaction, cooperation inside firms and cooperation between suppliers and assemblers added to price-based relationships between firms and became important dynamics for the industry. In the new relation-based system, proximity between firms became critical for both firms and regions (Larsson, 1999). 3rd Italy (Piore & Sabel, 1984), Silicon Valley (Saxenian, 1996) and Orange Country (Scott, 1988) are the most famous examples of the role of vertical disintegration on localization (Stigler, 1951) and the development of neo Marshallian districts.

### 3.1. Structural Changes in the Auto Industry

Vertical disintegration of production has been caused further changes in industries which have high level of complexities as in the automotive industry. These changes are concluded in the figure below:

**Figure 1.** Causation in automotive industry



Dissolution of various phases of production which is the responsibility of relatively smaller firms in new industry caused a hierarchical structure in supplier system. The relationship with car makers was mostly cost-based and short term in the tiered supply system (Gules, Burgess, and Lynch, 1997). Suppliers were responsible only for the production of the ordered goods by car makers. They have had limited role on the design and development of the products.

In addition to reorganization of value chain, modular production has been raised due to the cost-reductive technological innovations on product and process design (Frigant, 2007; Fasnacht and Jacobs, 2003) in automotive industry which faced declining growth rates and diseconomies of scale and scope thanks to the market saturation (Colovic and Mayrhofer, 2011), increased demand for model diversity (Schlie and Yip, 2000) and competition on price, quality and innovation (BSTB, 2013).

Frigant (2007) defines modular production as “decomposing a final product and rearranging it into a series of sub-assemblies that inter-connect via standardized interface”. Modularization allowed car makers and suppliers to design and develop independent innovations for each component without touching the others. For car makers, modularization has provided economic advantages and flexibility to meet the constantly changing customer needs besides benefits of economies of scale and scope by using the same module in different car models (Frigant & Lung, 2002). After the definition of the architecture of the modules by car makers, it is possible to separately produce by different suppliers.

Modular production has made further changes in the relationships between actors of automotive industry. An evolution has taken in buyer - supplier relations which named differently as “exit / voice” (Hirschman, 1970) or “subcontracting race /

autonomous supply” (Sako, 1992) by various scholars (Evren, 2002; Gules et al., 1997). There has been a shift in buyer supplier relationship from price and short term contracts to quality, delivery, engineering, price and long term contracts (Gules et al., 1997).

According to Hudson (1994), this relationship is very often between first tier suppliers and car makers. Car makers are only responsible for the development of core activities. They have transferred production responsibility of the of non-core activities to limited number of first tier suppliers - FTS (Özatağan, 2011). FTSs have no longer been seen as “salesman” (Evren, 2002) that are judged with prices and on-time delivery but have become as dynamic collaborators involved in R&D and joint design (BSTB, 2013; Fasenfest & Jacobs, 2003). In fact, some of the FTSs have become vital associates to the car makers which are referred as “0.5 suppliers”. The characteristics of the suppliers in the hierarchical system are described by Özatağan (2011) as below;

- 0.5 Suppliers: are required to supply globally, have innovation, design and product development skills and rich financial resources.
- FTSs: are needed to have design, innovation and product development capabilities, may supply globally in some cases.
- Tier 2 Suppliers: are required to worth to specification of assemblers and have competencies to cost, flexibility and quality,
- Tier 3 Suppliers: are necessary only to compete on basis of costs.

Modularity also brought the search for competitive-cooperative relationships between car makers via strategic alliances and joint ventures. These alliances have paved the way to access to expertise of Japanese car makers on distribution networks and market accesses. Strategic alliances based on mutual benefits between Honda and Rover in 1990s was such an example of the changing relationship in-between car makers (Hudson, 1994). On the other hand, European and American based companies developed similar partnerships for lowering R&D costs and sharing their knowledge such as best practices in production (Hudson, 1994).

Likewise, the restructuring has affected the capital – labor relationships. Skills and commitments of workforce are gained importance together with the cost based expectancies. Japanese companies for instance, measure these skills and commitments with the tests in recruitment process. Training and specialization status of labor force are the competitive dynamics besides the labor costs in the new system (Bedir, 2002; Hudson, 1994; BSTB, 2013).

In parallel to these developments in the sector, governments started to compete to attract automobile investments (Brenner and Mühligh, 2007; Lecler, 2002) by developing clustering policies (Porter, 1990). Government incentives, regional taxation system, unionization level and regional wage levels are the subjects in relation with the location decision of firms. On the other hand, industrial infrastructures, R&D institutions, technical schools and management of the cluster are decisive in the future vision of automotive companies in a region (Hudson, 1994; Ferrazzi and Goldstein, 2011; Porter, 1990).



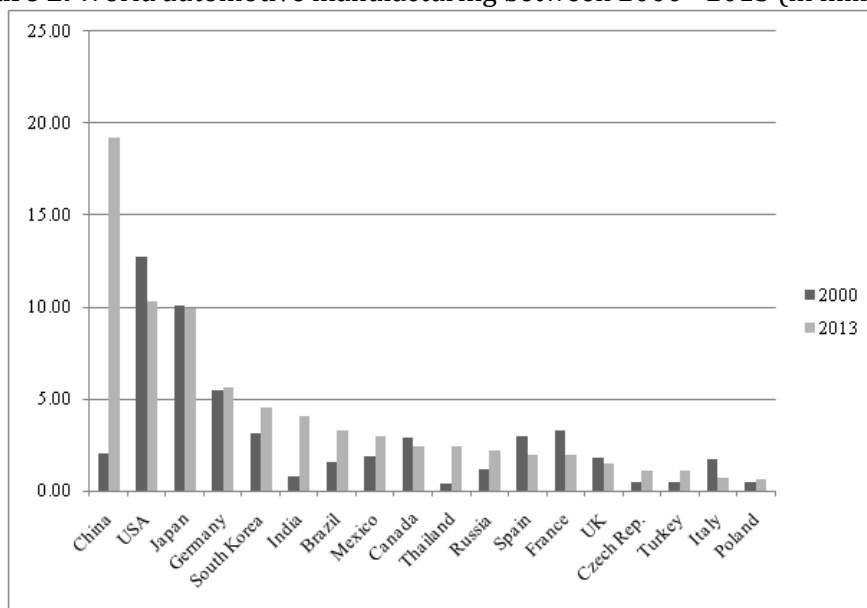
With the effects of these development started in 1980s and accelerated in 2000s, automotive industry is transformed into more integrated global industries from national industries (Colovic and Mayrhofer, 2011). Changes in the relationship between actors have brought the need for full coordination between global plants and suppliers.

### 3.2. Changes in World Automotive Geography

Because of the intense competition, saturation in the existing markets and declining profits corporations in the automotive sector began to develop strategies to cope with challenges to increase efficiency and reduce product development costs (Bailey et al., 2010; Schlie & Yip, 2000; Spatz & Nunnenkamp, 2002). According to Ferrazzi and Goldstein (2011), the relocation of the facilities have important place in the corporate strategies after 2008 together with consolidation, globalization and operational excellence.

The year of 2009 was a break point in the world automotive industry thanks to the relocation strategies. The first time in the automotive history, production in the emerging markets have been greater than the triad nations (North America, Europe and Japan). Since the 2009, China takes the first place as the largest automotive producer with the total of 19.2 million units and BRIC countries produce 1/3rd of the production. Between 1999 and 2009 Latin America and Eastern Europe doubled their shares of production (Ferrazzi & Goldstein, 2011; OICA, 2013).

**Figure 2.** World automotive manufacturing between 2000 - 2013 (in millions)



Source: Authors' elaboration on OICA (2013) data

As shown in Figure 2. USA, Japan, Canada, France, UK and Italy are the losers of the 2000-2012 period and this trend continues today.

Search for new markets, labor costs and productivity, capital availability, quality of infrastructure, transport costs and governmental support are the factors effecting these relocations to emerging countries mostly (Ferrazzi & Goldstein, 2011)

In the meantime in Europe, Lung (2004), described the hierarchical framework (center-periphery) in European automotive industry as a polarized region by specialization of division of labor and agglomeration. Location of the production of the top of the range models and design activities were continuing to stay in the central areas of the Europe, because of the factors such as competitive advantages based on innovation, product differentiation and quality, links between design and manufacturing, interaction between actors during product development phase and location inside the final market. On the contrary, small cars which are stable in terms of technology and architecture, low risky and suitable for the economies of scale and scope, are located dispersedly in South and Eastern Europe thanks to benefit from low cost but capable workforce, proximity to markets and raw materials and government incentives (Lung, 2004). Because of the JIT and logistical constraints, risk sharing between actors and organizational proximity in terms of JIT problem solving and transfer of tacit knowledge, the proximity between car makers and suppliers are decisive factor on intra-regional location of firms (Frigant and Lung, 2002). Automotive clusters such AC Styria and Upper Austria (Austria), ACICAE (Spain), Braga and Setubal (Portugal), Samara (Russia), TOSB (Turkey) are the results of these proximity needs (www.autoanalysis.co.uk; Şenlier, Salihoğlu, and Yildiz, 2011; Stratmann and Dimitrova, 2008).

Changes in the supplier geography which is mostly in triad nations until 1980s, was quite similar to carmakers' globalization. After the 1980's, the industry moved towards emerging economies such as Thailand and Malaysia first and China, India, South America and Eastern Europe later. Plant openings are continuing in China and Eastern Europe since 2001. According to KPMG (2009), three factors including following customers, search for covering new markets and costs are illustrative in the globalization of suppliers;

- Following Customers: Car makers demand suppliers to follow their investment around the world. The pressure of carmakers is active on the investments of suppliers in South America, Eastern Europe and South Africa (KPMG, 2009; MAGNA, 2013)
- Search for Covering New Markets: Investment in the home country of car maker is a competitive advantage to enter targeted markets. Search for new markets is more important location dynamics in China and India cases than following customers (Frigant, 2007; KPMG, 2009)
- Costs: Pressures of car makers on suppliers to cut costs is resulting as delocalization of certain phases of production of suppliers to low cost countries (Frigant, 2007). According to KPMG (2009) report; suppliers delocate if the cost is not reduced by the production and process optimization strategies. Labor, capital and energy costs, local incentives, regional interest rates, wages and trade agreements are the location dynamics of these alternative regions (KPMG, 2009; TESMA, 2004)

According to Frigant (2007), these factors cause two types of location patterns in supplier geography;

- Module mounting activities which the relationship between suppliers and car makers are very strong tend to locate close to car makers, because of the

increased need of proximity.

- On the other hand, production of the components of the module which the proximity need is negligible, delocates to low cost countries.

#### **4. Location Dynamics of the Automotive Industry in Kocaeli**

As a consequence of globalization of automotive industry, car makers have begun to invest in Kocaeli and suppliers followed them. In this manner, Kocaeli have been an automotive cluster with the assembly plants, component and part makers, R&D institutions, university and technical schools and automotive institutions since 1990s. **The aim of this study** is to explain the automotive concentration in Kocaeli in terms of location dynamics of firms. In this context the study has three research questions as below:

**Q1:** What are the characteristics of auto industry in Kocaeli?

Subjects such as production, employment, competitiveness, firm structures, export rates, advantages and problems of the metropolitan area in terms of industrial production etc. were evaluated to explain the status of the industry in Kocaeli via the data obtained by the statistics and reports of the government and private institutions (For the detailed structure of data, see Table 1.)

**Q2:** How does location of firms in Kocaeli change historically and spatially?

Materials on firm addresses, establishment dates, number of employers are obtained from registry records of Kocaeli Chamber of Industry (KOSANO). Periodical maps were drawn by using the KOSANO data.

**Q3:** Which subjects were taken into consideration on firm location in Kocaeli by suppliers? Interviews with firm managers were conducted to explain the location reasons. Total of 41 firms were selected in the study. Stratified sampling methodology was used in sampling plan. Figure 3 shows the distribution of these samples in the metropolitan area.

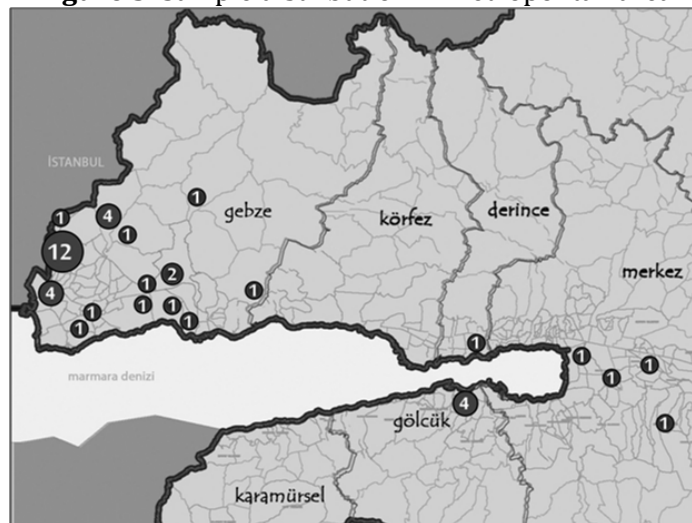
**Table 1.** Data on automotive structure of Kocaeli and Turkey

Source	Type of Data	Attributes
KOSANO (Kocaeli Chamber of Industry)	Registry Records	Firm addresses, establishment dates, relocation dates, number of employees, capital structure,
KOTO (Kocaeli Chamber of Trade)	Report	Automotive employment numbers among all sectors of Kocaeli,
BSTB (Ministry of Science, Industry and Technology)	Reports	Turkey's position in world automotive production, automotive industry among the 500 biggest industrial establishments, country and region level automotive employment stats, intermediate goods production in Kocaeli,
KB (Ministry of Development)	Report	Kocaeli in inter-cities development index,
TUIK ( Turkish Statistical Institute)	Statistics	Share of industrial employment in total employment in Kocaeli,
MARKA ( Marmara Development Agency)	Reports	Advantages locating Kocaeli, results of competitiveness analysis of automotive industry among the industrial sectors in Kocaeli, R & D institutions in Kocaeli,
TAYSAD (Association of Automotive Parts and Components Manufacturers)	Report	Location advantages of TOSB
Deloitte (Private Global Research Institute)	Reports	Automotive firms structure in Turkey, export rates in automotive, Turkey's position in European Auto Production,
KPMG (Private Global Research Institute)	Report	Distribution of Carmakers in Turkey,
URAK ( National Competitiveness Research Institutions)	Report	Kocaeli's position in competitiveness index of Turkish cities,

**Source:** Authors Elaborations

The various answers to open ended questions were grouped into certain categories and results were evaluated through descriptive statistics such as frequency tables and graphs.

**Figure 3.** Sample distribution in metropolitan area



**Source:** Authors' Elaborations

#### 4.1. Development of Turkey's Automotive Industry

The automotive sector in Turkey which started in 60s, became globally integrated after 80s while it was local and withdrawn before. The automotive stage was set by import substitution policies until 1980's. The protective tools such as incentives to local producers, input restrictions, high tariff walls were implemented parallel to these policies (Bedir, 2002; Evren, 2002). As consequences of these implementations, production capacity increased and supplier industry started to develop in these years. TOFAŞ (1968) and Renault (1971) were established in Bursa. 70 percent of the total production was produced by these two plants in these years.

In the process of restructuring after the 70s' crisis in the World, Turkey started to shift from import substitution to export oriented policies (Deloitte, 2010). National Industry opened to foreign investments via decreasing import restrictions (Evren, 2002), lowering tariff walls and government incentives (Bedir, 2002) to the plant investments which have a certain sized annual production capacity (Deloitte, 2010).

The share of foreign products increased in domestic market by the impact of these strategies (Evren, 2002). Increased competition in the sector made local firms to adopt their production processes to new technologies of up to date automotive framework (Bedir, 2002; Deloitte, 2010). These technologies increased the production capacity of the firms (Deloitte, 2010). Because of low cost production inputs in the region, new assembly lines were established (Honda, Hyundai, Ford and Toyota) in this period of time. Hereby these progresses, Turkish car industry started to integrate in to the global production and distribution networks (Bedir, 2002; Evren, 2002).

Because of the recent changes in the world automotive industry and industrialization policies of the country, Turkish automotive industry entered to upward development trend (see Figure 4.) As of 2012, Turkey is the world's 16th largest automotive manufacturer with 1.1 billion vehicle production (BSTB, 2013; OSD, 2013). The country is also the leading bus manufacturer, 3rd largest light vehicle manufacturer and 7th largest car manufacturer in Europe (BSTB, 2013; Deloitte, 2010; KPMG Turkey, 2013).

Automotive sector is the leading industrial sector for Turkey with its production, employment and export rates. The share of automotive industry among the biggest 500 industrial establishments list increased from 5.6 percent in 1982 to 14 percent in 2011 (BSTB, 2013). The share of automotive industry in total export is 12.5 percent with 16.9 billion USD. This share is 24 per cent among the biggest 500 industrial establishments list in 2012 while it was 3 per cent in 2002 (BSTB, 2013). 70 per cent of components and parts are exported to European market (Deloitte, 2010).

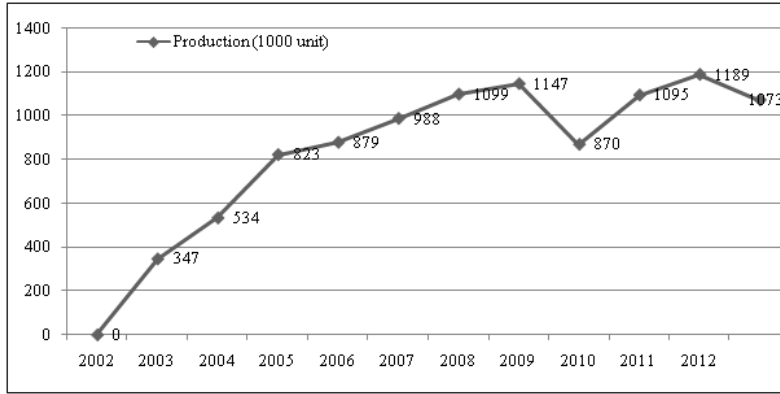
In Turkey, six of the car makers are European based while seven of them are non-European. There are six joint ventures, 3 FDI plants and four of the car makers are producing under the foreign licenses (Deloitte, 2010).

There are 50.000 people working in assembly lines and 200.000 workers in

suppliers industry. The share of automotive industry employment in total employment of Turkey is 4.8 percent. The number is 13 percent among the biggest 500 industrial establishments list in 2012 (BSTB, 2013).

Automobile plants are located in ten cities at the western part of the country. 10 of these 12 plants are located in Marmara Region (KPMG Turkey, 2013; Yaşar, 2013).

**Figure 4.** Automotive production between 2002-2013



Source: OSD, 2013

**Figure 5.** Distribution of automobile industry in Turkey



Source: KPMG Turkey (2013)

76,9 percent of the firms are concentrated in Western Marmara which is the triangle formed by İstanbul, Bursa and Sakarya (Yaşar, 2013). 85,4 percent of the automobile employees are also residing in this part of the Marmara Region (BSTB, 2013). The region is also a cluster for the automotive related industries. This kind of industrial polarization of the country is related with the industrial decentralization policies implemented by government in 1980's (Evren, 2002; Şenlier et al., 2011; Tümertekin, 1997). According to Yaşar (2013), this triangle is one of the leading cluster among European automotive clusters.

#### 4.2. Kocaeli Automotive Industry

Kocaeli which have a critical role in Turkey's industry and city hierarchy is also an important component of Western Marmara automotive cluster with its car makers (Honda, Hyundai Assan, Ford Otosan and Anadolu Isuzu) and suppliers around them (see Figure 6.).

According to Kalkınma Bakanlığı (2013) report, Kocaeli is among the first level most developed cities in Turkey while it is the 5th most competitive city in URAK (2010) study. The city is also in the 4th position in socio – economic development ranking of Turkish cities.

Kocaeli's share of the total export in Turkey is 8.4 percent which makes the city in second place in total exports by cities ranking. 22.4 percent of the production of intermediate goods and 13 percent of total manufacturing in Turkey is produced by Kocaeli plants (BSTB, 2012). Industrial employment is the secondary sector behind service sector with 26.5 percent (136.000 people) share of total employment (TUIK Stats, 2013). Two of four firms (Ford and Hyundai) which have the largest number of employees are producing in automotive sector in Kocaeli(BTSB, 2012).

According to report of İl Özel İdaresi (2011), the location advantages of Kocaeli manufacturing are; proximity to leading metropolitan cities like İstanbul, Bursa and Ankara; locating on the nationally and regionally important transportation axis (İstanbul – Baghdad Railway; E-80 European Motorway and D-100 Highway) and nodes (Sabiha Gökçen and Atatürk Airports; Haydarpaşa, Ambarlı, Yarımca and Derince Ports).

On the other hand; negativities of industrial investments are also clear in BSTB (2012) report which are; lack of infrastructure, energy losses, recycling of the waste, quality of industrial fairs and promotional activities, lack of knowledge on government incentives and narrow and short term vision of firms.

According to İl Özel İdaresi (2011) study which have the similar methodology of Porter's (1990) diamond model, automotive industry is the most competitive sector among the industrial sectors in Kocaeli. On the other hand, it is a medium level competitive sector compared to automotive industries in the world. Capabilities of firms, special importance given to R & D are the dynamics of competition of the sector.

The city has a supplier structure developed around main industries. 80 per cent of the components and parts which assembled to cars can be produced in Kocaeli. These parts are exported to 150 countries (69 percent to European market). Total production capacity of the 4 car makers in Kocaeli is 250.000 unit per year (İl Özel İdaresi, 2011).

**Figure 6. Location of Kocaeli**



Interactions with R&D institutions, cluster management and capable workforce are the important for a region in terms of competitiveness. In Kocaeli; Kocaeli University, Sabancı University, Gebze Institute of Technology, Marmara Research Center, TÜBİTAK MAM (The Scientific and Technological Research Council of Turkey) , TSE (Turkish Standards Institute) Central Laboratories and techno parks are the main R&D institutions. TOSB (Automotive Parts and Components Industry Association Organized Industrial Zone) is a specialized industrial districts on automotive parts manufacturing which has a role in supply of sector specific infrastructural needs and promotion and representation of the cluster (İl Özel İdaresi, 2011). Although 18 technical schools with total capacity of 25300 students are important potentials for competitiveness, deficits in terms of labor capabilities are on the agendas of Kocaeli Chamber of Industry ([www.kosano.org.tr](http://www.kosano.org.tr)).

#### **4.3. Intra-Metropolitan Spatial Development of Kocaeli Automotive Industry**

Spatial development of Kocaeli automotive industry is shown in Figure 7 according to time periods. 1990-1999 period is a turning point for Kocaeli automotive industry. Number of the firms which located in Kocaeli geography, have increased due to transition to financial liberalization of the national economy and support programs for Small and Medium Enterprises (SME). Establishment of Honda-Gebze (1996) and Hyundai-İzmit (1997) factories have a significant role in the development of the cluster. Based on the presence of these firms, suppliers tended to locate in Kocaeli; firms from other regions were also observed to move into the region.

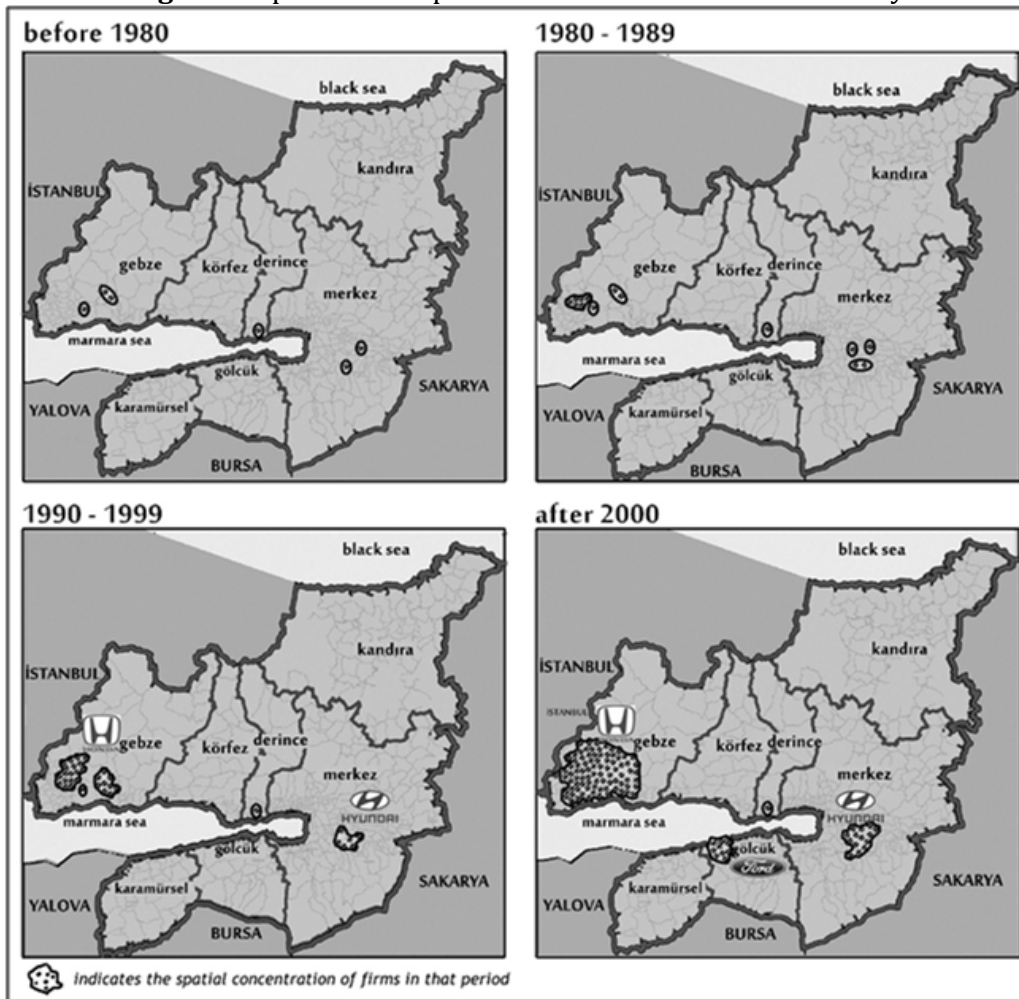
The developments in communication and transportation technologies particularly in 2000s, globalization, increased possibility of reaching new markets and reducing costs strategies also had impacts on Kocaeli automotive geography. In the period after the 2000, as the assembly plants gained importance within global networks, Kocaeli region turned out to be an increasingly growing cluster with its competitive advantages for the global suppliers. Today, the most leading companies in automotive sector such as Hyundai, Honda, Isuzu, Ford invested in / around Kocaeli Region (Figure 8).

A total of 108 automotive firms are located in Kocaeli metropolitan area as of 2013. Among these, Honda-Gebze, Ford-Gölcük, Hyundai-İzmit and Isuzu- Gebze are the assembly lines producing *Ford Transit Connect, Custom, i20, Civic, City* models. By the introduction of supplier industry following the location decisions of assembly lines, Kocaeli has become as an automotive cluster in ten years after 1990s.

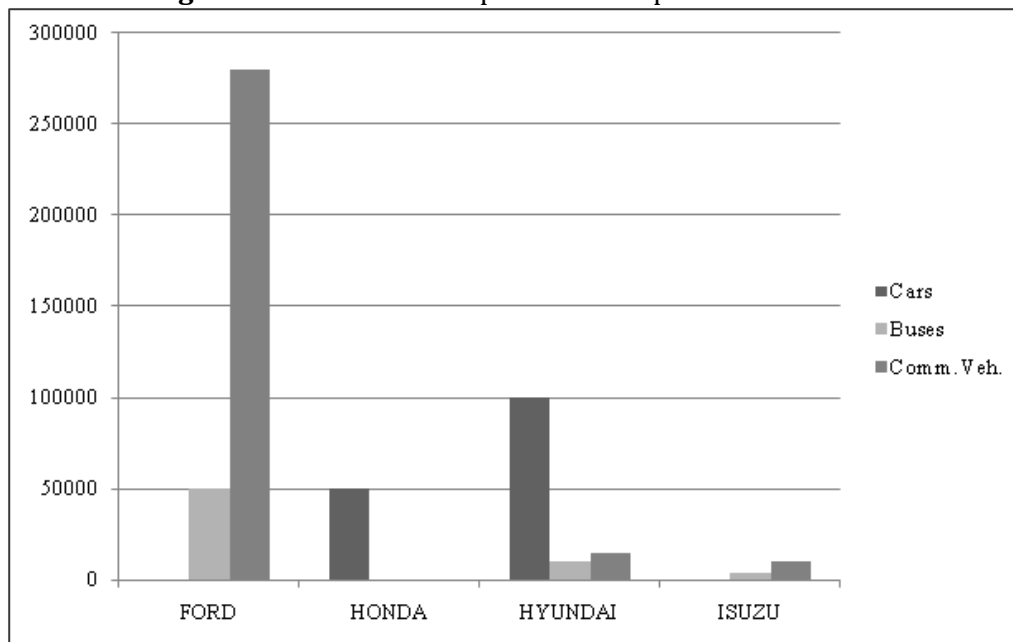
Most of the suppliers are located close to assembly lines. 77 of the suppliers located in Şekerpınar district / Gebze and its vicinity, where Honda is located (See Figure 9). The fact that TOSB Organized Industrial Zone which is a specialized zone in spare parts and Gebze Organized Industrial Zone which has the most developed and modern services and infrastructures among Turkish industrial zones are located in Kocaeli as the other determinants of firms' location. The firms benefit from the advantages of being located in such a specialized region such as cost sharing, cooperation and shared knowledge with the firms in the same sector ([www.taysad.org.tr](http://www.taysad.org.tr)).



**Figure 7.** Spatial development of Kocaeli automotive industry



**Figure 8.** Car makers and production capacities in Kocaeli



**Source:** Authors' Elaborations on KPMG Turkey (2013) Data

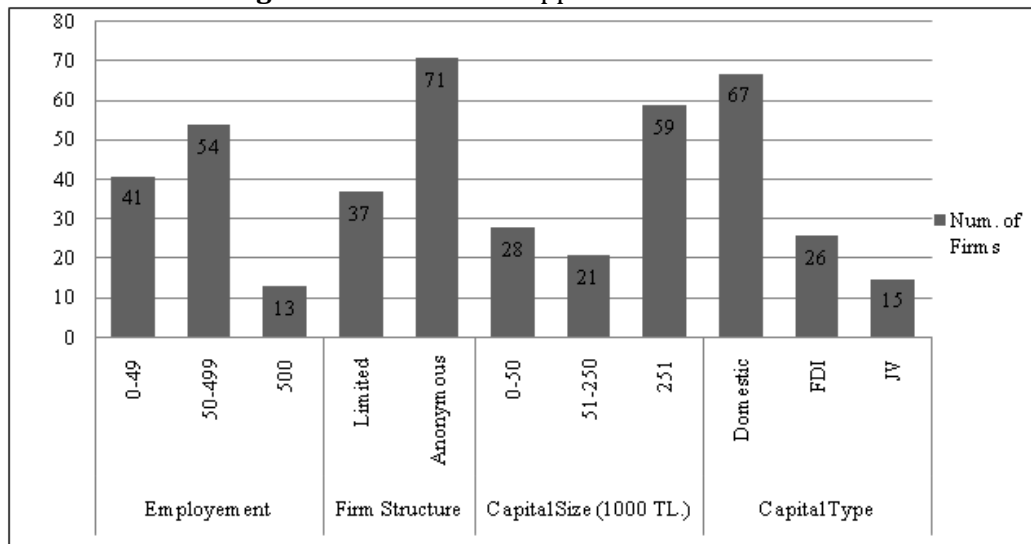
The other supplier firms in the region are mainly concentrated around Hyundai and Ford. There is a coexistence with 13 supplier firms in İzmit city center where Hyundai-Assan is located. Two of these firms in the region were of foreign investment while three were joint ventures (JV). As in Gebze, factories like *Pirelli*, *Brisa*, *Beksa*, *Lassa*, *Kordsa* in İzmit are producing in automotive-related sectors such as tires, rim, oil and metal industry. There is an input-output relationship between these sectors and automotive firms in the metropolitan area.

Supplier strategies adopted by Ford-Otosan show differences from other automotive producers. With the establishment of Ford-Otosan plant in Gölcük, supplier firms were also located in supplier park established within the borders of assembly line. Beside it is contributing to just-in-time delivery, the investing in the supplier parks emphasizes the importance of trust-based relationship between car maker and supplier.

The majority (55%) of the firms which are located in Kocaeli automotive region and currently continued manufacturing consist of medium-sized firms which employ 49-500 people (See Figure 9). Of the firms, 88% were SMEs which are dynamic and innovative players of the economy. As for the number of workers, in a system consisting of SMEs' with relatively low number of workers, the fact that the firms are mostly limited companies is a significant indication of capital-intensive production instead of labor-intensive production which is a component of post-fordist production style and one of the principle qualifications of the automotive system which undergoes a process of restructuring.

Automotive firms in Kocaeli in terms of capital type are generally domestic capital firms (67 firms). The level of FDI (26 firms) and joint ventures (15 firms) are lower as Turkey is an emerging production zone.

**Figure 9.** Structure of supplier firms in Kocaeli



**Source:** Authors' Elaborations on KOSANO Registry Records

#### 4.4. Location Dynamics of Automotive Suppliers in Kocaeli

Suppliers' reasons of location in Kocaeli are investigated via the interviews with firm managers. To determine which firms are going to be interviewed, stratified sampling method is conducted. Kocaeli metropolitan area is separated into layers which have at least 1 automotive plant. Random samples were selected proportionally from these layers. Thus, a total of 41 samples from 17 layers are selected. The list of layers and samples are given in Table 2.

The subjects below were investigated in the interview form;

- Location reasons in the region,
- Site conditions where plant is located
- Push and pull factors of the recent and previous locations (if available),
- The main reasons that car makers choose them as supplier,
- The role of R & D and innovation in relation with car makers,
- Factors effecting competition with other suppliers.

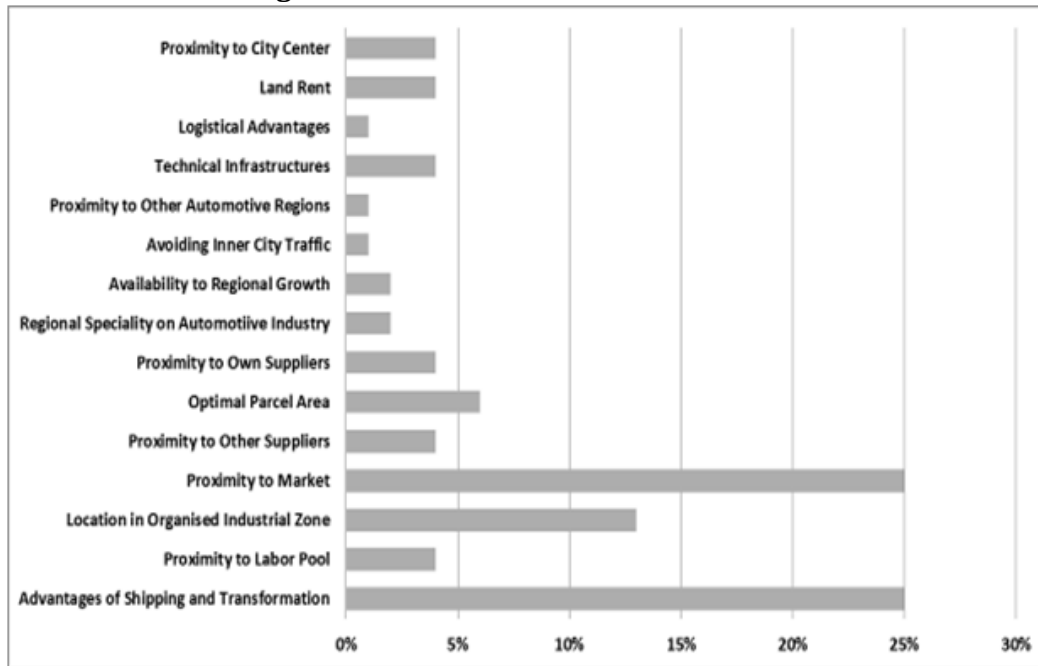
As for the location causes, it was observed that the firms which participated in the questionnaires preferred Gebze Organized Industrial Zone (GOIZ) and TAYSAD Organized Industrial Zone (TOIZ) within the region. Since these regions have higher quality infrastructure, have the *advantages of the proximity to each other and main manufacturers*, have *superior technological qualities* than other regions and are *close to important transportation connections* were the most important reasons for preferring these regions. The factors affecting location preferences of the firms are presented in Figure 10.

**Table 2.** Samples by strata

Districts	Municipalities	Neighborhoods	Samples	
GEBZE	DARICA	Kazımkarabekir	1	
		Atatürk	12	
	ŞEKERPINAR	Cumhuriyet	1	
		DİLOVASI	Diliskelesi	1
	CENTRAL	VILLAGES	Barış	1
			İstasyon	1
			Sulanorhan	1
			Çayırova	3
			Muallimköy	1
			Balçık	5
			Pelitli	1
			Çerkeşli	1
			Tavşanlı	2
			Denizli	1
DERİNCE	CENTRAL	Derince	1	
GÖLCÜK	CENTRAL	İhsaniye	4	
		Saraybahçe	1	
		Arslanbey	1	
İZMİT	VILLAGES	Köseköy	1	
		Kullar	1	
		Total Sample Size		41

**Source:** Authors' Elaboration on KOSANO (2013) data

**Figure 10.** Site conditions in location choice

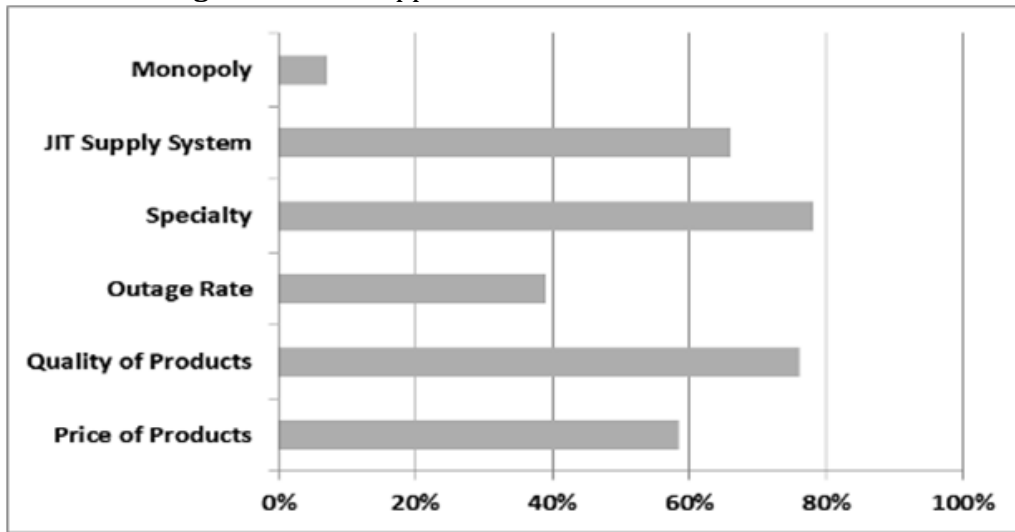


Advantages of transportation and shipment and proximity to the market were prominent among these factors. On the other hand, the wish to be located within the organized industrial zone was evaluated as another important location factor. Spatial factors such as proximity to their own supplier industries, proximity to the other suppliers and labor pools ranked lower. This phenomenon is closely related with technological development. The factors of proximity to labor and raw material which come forward in classical location theories gradually lost importance in automotive sector due to the possibilities of transportation technologies. The situation in Kocaeli have similarities with the location dynamics of suppliers in the world in terms of proximity to market, JIT supply and cost reduction (See Klier, Ma, and Mcmillen (2004), Williams (2013)).

Supplier industry firms were asked why assembly lines preferred them; quality of products, having know-how and specialization to contribute to these high-quality and complicated parts in terms of design, manufacturing and maintenance were found to be important reasons for preference (Figure 11). The basic preconditions for signing contract with main manufacturers are quality and specialization level. Car makers are mostly focused on quality issues for supplier selection because of the similar labor, land, energy, taxation and logistical costs in metropolitan area.

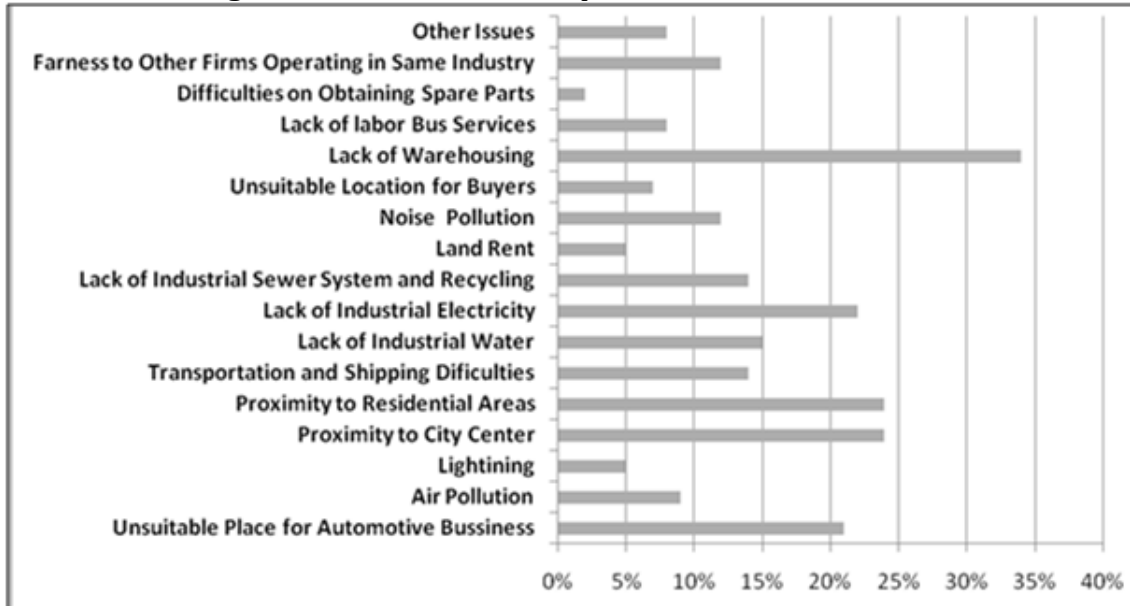
As for the competitiveness of the firms with their present locations, 34% of the firms reported that they had lack of warehousing (Figure 12). The firms which are located in the organized industrial zones expanded their manufacturing spaces by purchasing or renting neighboring plots in time due to their increased work and capacity. On the other hand, the factors of distance to city centers and workers' residential areas ranked second among the complaints. The firms reported that distance to services, finance, accommodation and trade functions offered by urban centers posed problems. Local government's transportation services are not adequate according to firm managers.

**Figure 11.** The Supplier selection criteria of car makers

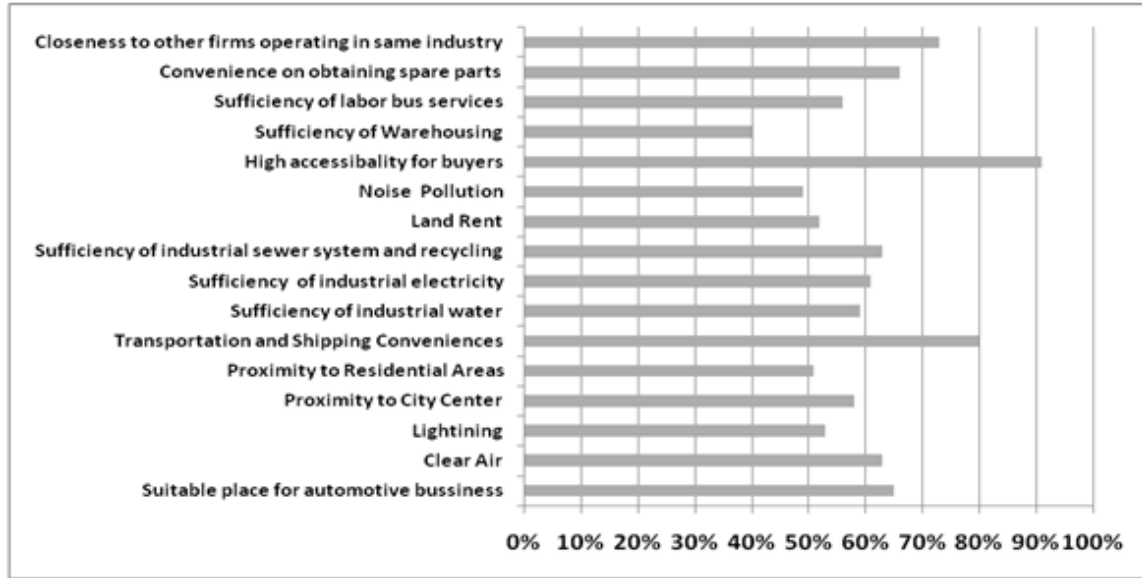


The firms were generally satisfied with accessibility statuses of their present locations (Figure 13). The issues the firms are highly contented with their locations included accessibility for customers (assembly line) (91%), closeness to the firms which do the same work (73%) transportation and shipment conveniences (80%). This is considerably parallel to the factors affecting location decisions of the firms. In regional scale, it was observed that transportation infrastructures were of high-quality and integrated.

**Figure 12.** Problems with the present location of the firms



**Figure 13.** Issues which the firms are satisfied with present locations



Causes of relocation in the region were evaluated in connection with the driving factors causing the firms to move from their present addresses. Driving factors include negative situations and complaint levels in their previous addresses. Among a total of 11 factors presented to the firms, the desire to expand the facility was determined to be the most effective factor (95%). Majority of the firms which changed their locations came out of Kocaeli, mostly from Istanbul. National and regional industrial policies and decentralization processes from Istanbul were effective in relocation decisions of the firms (Evren, 2002; Şenlier et al., 2011; Tümertekin, 1997).

Of the firms which changed their locations, 50% reported that they changed their locations to be closer to the customers (assembly line). The firms which previously manufactured for local markets tended to shift their market areas to the region when global manufacturing companies like Ford, Hyundai, Honda, Toyota and Isuzu came to the region. Thus, supplier industries which previously manufactured to the local market became integrated to the global system by signing contracts with big players. Studies of Evren (2002), Yaşar (2013) and Özatağan (2011) showed that this integration is based on cost reducing and doesn't include organizational proximities such as intense cooperation between suppliers and car makers.

When the relocated firms were asked to report their problems about their previous work places, difficulties regarding the shipment of goods and raw material (40%), distance of their location to assembly line (36%) and distance to other firms in the sector due to land prices and high rentals (27%) were the most common complaints. Mostly Istanbul-based firms reported that their previous locations remained in city center in time and they experienced the problems of high land and rental prices and traffic congestion. Of the firms which changed their locations 54% moved after 2000; 23% moved between 1990 and 2000 and 14% moved in 1980-1990 period.

The fact that 86% of model development processes were conducted by main

manufactures in Kocaeli region is an important disadvantage for the region. While specialized firms play a role in design and model development processes of many leading automotive regions, in Kocaeli these engineering and design activities are performed in the factories of car makers and applied by the supplier industry. In Kocaeli, co-design or active participation to model development processes were not the most important factors in terms of relationship with car makers as Evren (2002) and BSTB (2013) pointed out for Turkey.

Analysis of the components affecting competitive power of the firms in terms of location and cluster dynamics, low labor force, production and shipment costs and high product quality were observed to be the most important factors. Interviewed firms reported that awareness of latest technology and manufacturing techniques (91%) and manufacturing with these types of machines (81%) brought important advantages. In addition, having internationally recognized certificates (86%) was a precondition for manufacturing in the sector and signing contracts with large manufacturers. In addition to high quality goods, quality, timely and cheap shipment and transportation were also found to be effective on competition between the firms.

Although it was highlighted in reports (Deloitte, 2010; İl Özel İdaresi, 2011; KOTO, 2011) as competitive power of the region, firms in Kocaeli found it hard to adopt the changes in the automotive industry framework in following subjects; importance of R & D, membership to business networks, workforce education, relationships with institutions, policy shifts from cost reduction strategies to cost / quality optimization strategies.

66 percent of the supplier firms in the region do not have an R&D unit. The ones which have R&D unit do not organize activities to develop their R&D units. This indicates that the region does not have a special concentration of technology and innovation production. This situation is also clear in KPMG Turkey (2013) report; 38 percent of the automotive related actors suggested that the must improve area of the supplier industry is the R & D infrastructure.

Membership to networks connecting manufacturers and suppliers was the least important factor among all cluster dynamics (20%). This factor is given a special importance in cluster theory because of its contribution to competitiveness of firm and region (Pavlinek & Janak, 2007; Porter, 1990; Szanyi, Csizmadia, & Illéssy, 2010). The attitude of supplier industry firms indicated that they failed to develop behavior and strategies at regional scale.

It was found that 68% of the supplier firms received training and counseling support offered by assembly lines. This is a characteristic of Toyotist manufacturing style and a significant indication of changing relationship between the assembly line and supplier industry (see Wagner and Krause (2009)). It can be stated that assembly line and supplier industry firms located in Kocaeli region adapted to such a structural change in time. Training and counseling programs, provided by assembly lines, generally concentrated on quality and manufacturing techniques. These training programs aim to shorten manufacturing periods, reduce error rates and to improve quality of the products.

Although the research institutions and universities in the region created important

potentials for location (especially for R&D location, see Andersson et al., 2006) and cluster dynamics (Stratmann and Dimitrova, 2008), when the firms were asked to mention the contributions of these institutions to automotive sector, 78% of the firms reported that the relationship between industry and university (research institutions) is not strong. According to study on the role of universities on cluster development (U.S. Economic Development Administration, 2004), established clusters with mature products and processes (like the products in Kocaeli) are less receptive to innovation generated in universities and institutions.

As for the structural adaptation processes of the firms (Frigant, 2007; Hudson, 1994; Özatağan, 2011); developing firm strategies that are similar to the policy and strategies determined by the car makers (74%), training, counseling and guidance services to increase ability of labors (72.5%), reorganization of the physical structure of the firms in such a way to allow for just-in-time manufacturing (68%) and creating a competitive environment encouraging quality products instead of cheap manufacturing (60%) were the important structural changes performed by the firms. Conversely, worker exchanges between partners, activities to increase commitment and work ethic of the workforce, partnerships and joint ventures to transfer technologies and knowledge, were the issues which firms have failed to restructure.

## **5. Discussion**

The share of production of emerging economies such as Turkey which is located near the mature markets and produced relatively cheaper is dramatically increased after the transition of automotive geography from national industries to globally integrated industries in 1980s.

Due to the changes in the world economic geography, the location dynamics such as coordination of the relationship between actors, just in time delivery, capabilities of labor, R&D infrastructures and innovation capacity, covering the new markets, cooperation with institutions and universities are gained importance aside from cost-based classical location factors.

The study is attempted to explain what extent are these changes realized in Kocaeli. In this context, explanations are made through the answers to research questions.

**Q1:** What are the characteristics of auto industry in Kocaeli?

Depending on the government reports about the sector, the role of automotive industry for Turkey and Kocaeli in terms of production, employment and export rates is dramatically increasing for 30 years. It is also precious production geography for European market in car, light commercials and bus production. Today, the automotive manufacturing is the most competitive sector among the industrial sectors in Kocaeli. Technology intensive and flexible firm structures in the metropolitan area which are promoted by the government aids have similarities with the successful cases around the world.

**Q2:** How does location of firms in Kocaeli change historically and spatially?

Due to the globalization of the automotive production, after 1990s, the car makers



have begun to invest in Kocaeli and suppliers have followed them. It is pointed out in the reports that the cluster has both advantages in terms of transportation and proximity and structural problems such as inadequate industrial and R&D infrastructures, labor skills and institutional relations. While car makers are mostly locate on the transportation axis and nodes, supplier locate in the organized industrial zones which are close to car makers. Specifically for the firms located in Gebze district, the related industries and specialized industrial zones such as TOSB (Automotive Part & Components Manufacturers Organized Industrial Zone) and GOSB (Gebze Organized Industrial Zone) are the attractive elements in the location. Because of the relocations which are mostly from İstanbul, the relations of the Kocaeli automotive concentration with the Sakarya, Bursa and İstanbul is a matter to be investigated in further studies.

**Q3:** Which subjects were taken into consideration on firm location in Kocaeli by suppliers?

Depending on the interviews with firm managers, market - oriented proximity and transportation issues are the main location dynamics of the automotive suppliers in Kocaeli. Proximity to labor and raw materials has lost their importance in Kocaeli case. On the other hand, interaction based proximities to other suppliers and related industries are not seen as important issues during the location decision. Also, the goal to locate close to car makers is not for the organizational proximity, it is for the just in time delivery only.

Physical conditions such as lack of warehousing and lack of electrical infrastructure and accessibility to other functions such as CBD and residential areas in the city are the main problems linked to existing location. For the firms which have moved from outside of the metropolitan area, expanding their manufacturing places and search for new customers are the pull factors, there are also push factors such as traffic congestion, transportation and proximity issues to customers and land prices of the previous location.

Because of the similar production input costs in the metropolitan area, production and transportation quality is the main reason of car makers' supplier choices.

Dynamics such as R&D, relationships between actors, the collaborator role of supplier in module and model design, supplier networks and partnerships with universities and governmental institutions are not the primary issues which have gained importance in location and regional development literature in recent years for the firms. On the other hand, firms have adopted their production lines to restructuring of the industry in terms of cost reduction, high tech production and just in time delivery.

In this study, the changes of location dynamics are discussed on the case of Kocaeli as an emerging automotive cluster. Today, at this point, Kocaeli has become an emerging automotive geography which has similarities with the world examples on cost based factors, JIT production and proximity to mature and emerging markets. For the sake of the sustainability of this upward development trend, there are needs for improvement at the point of importance given to R&D, institutional relations, development of design firms, partnerships with universities for innovation creation and management of supplier networks. In this context,

incentives and leadership of the regional development agencies and central governments which attach great importance for the development of the sector need to play critical roles. There is also a need for in-depth research to understand the reason of each of these similarities and backwards emerged as a result of the study.

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