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INFLUENCE OF AUTOMOTIVE CLUSTERS IN REGIONAL DEVELOPMENT

Literature
review

Keywords

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JEL Classification

R10, O18, F20

Abstract

This paper proposes an overview of the evolution in the automotive sector in the process of regional development. The fundamental changes made by the component supplier sector improved the regional development and manufacturing process. Automotive industry is one of the modern sectors in many countries that benefits of a high technology impact and creates jobs that reduces unemployment across Europe. The auto industry changed cities, regions and countries into poles of development and it becomes more and more efficient. The high foreign direct investments from the automotive sector play an important role in regional development process. Continuous changes are being made in the economy, society, and company; in conclusion the automotive clusters will always be a subject of analysis.

1. Introduction

In recent years, “cluster strategies” have become an economic development trend among state and local policymakers. An industry cluster is defined as a group of firms, related economic actors and institutions, which as a result draw productive advantage from their mutual proximity and connections. Cluster analysis contributes to diagnosing a region’s economic strengths and challenges and identifying realistic means to shape the region’s economic future. However, many policymakers and practitioners possess a limited understanding of what clusters are and how to build economic development strategies around them (Cortright, 2006).

Business clusters are important for countries because they significantly increase countries’ competitiveness. In Europe there are several countries with major business clusters. On a top 10, Italy ranks 2, Finland is on position 6, Germany occupies 8 level, then come Switzerland and the United Kingdom. It is proof that these countries have profitable clusters in a wide industry range (Ketels, Memedovic, 2008). The European Commission supports clusters through different mechanisms. Significant amounts are allocated for the creation of clusters (such as “Action Collective” in France and “ZIM-NEMO” in Germany), information services to enhance overall company sophistication, or guide research efforts (University of St. Gallen, 2013). Also, funding is allocated to promotion activities, especially through investment promotion agencies. The main targeted sectors are: ICT, Pharmaceuticals, Medical devices, Biotechnology, Aerospace, Automotive, Energy and Environmental Technologies (UNCTAD, 2013).

2. Clusters under analysis

The analysis of industrial clusters became a very actual topic for academic debates and for Governments trying to foster economic growth. An industry cluster is a geographically bounded collection of similar and/or related firms that together create competitive advantages for member firms and the local economy.

Clusters are a specific form of spatial organization of multiple sectors of industry and services. Overall seen, clusters are the most mature form of organization of production in the post-industrial era. Research made on existing cluster structures prove that clusters are an important promoter of regional development. Clusters have positive impact on the other sectors of local and regional economy and notably contribute to the development of their international competitive advantage (Bojar, Bojar, 2011). Through external effects, such as technological spill-over, clusters influence other sectors of local and regional economy and hence lead to raising their

international competitive advantage. The cluster-like structures are seen as stimulators of regional development capable to contribute significantly to the growth of export and attract considerable amounts of foreign investments (European Commission, 2006). Partnership within the cluster structures leads to a wide array of synergy effects and thus cluster participants can benefit even more. Especially small and medium-sized enterprises can benefit from this cooperation, taking into consideration that they can put together their innovative potential, then team up and apply for external funds more effectively. Cluster structures represent an important step towards explaining the reasons for non-uniform distribution of economic activities in space and resultant disparities in economic development between various regions. (Bojar, Bojar, Zminda, 2008).

“Cluster” notion is a derivative of the diamond theory and refers to interconnected groups of firms and institutions associated in a similar domain, geographically concentrated. If the existence of the four elements of the diamond is important, then it is expected that clusters appear and evolve because they are an efficient production structure in which firms can operate (Pralea et al, 2006).

An effect of the systemic nature of Porter’s diamond is that nations don’t have a single competitive industry; contrary, the diamond creates an environment that promotes competitive industrial clusters (Martin, 2002). Competitive industries are not isolated, but connected by vertical connections (buyer-seller) or horizontal (clients, technologies and commune channels). In addition, they are not dissipated, but geographically concentrated. A competitive industry helps create another through a mutual supported process. Once formed a cluster, industries within it are mutually reinforcing. Benefits are transmitted and used at all levels, vertically and horizontally. Fierce competition in an industry affects the rest of the cluster industries through products, bargaining power and diversification (Tiemstra, 1994). The entry of other industries in cluster hurry the upgrading by stimulating diversity of approaches in research and development and by facilitating the introduction of new strategies and skills. Because of the suppliers or customers behavior who have contact with other competitors, information freely disseminate and innovation is quickly transmitted. Interconnections within cluster, often unanticipated, lead to the observation of new ways to compete or opportunities (Kärkkäinen, 2008). Thus, the cluster becomes a vehicle form a intaining diversity, helping to overcome inertia, inflexibility and convenience that may occur in the competitive environment, phenomena that low or halt the competitive modernization and innovation.

In other words, clusters support the competitiveness based on the multitude of

connections that are made between the component factors of the diamond (European Commission, 2003). Geographical concentration of firms allows more efficient access to information, labor and specialized suppliers. Opportunities for innovation are more easily perceived in the cluster. Also, clusters reduce barriers to entry, given that new firms have access to a stable source of resources. A major challenge for any economy is to update their sophistication of clusters to more advanced high-value activities (Snowdon, Stonehouse, 2006).

3. Automotive industry – an overview

The automobile industry is a pillar of the global economy, a main driver of macroeconomic growth and stability and technological advancement in both developed and developing countries, spanning many adjacent industries (AT Kearney, 2013).

In recent years automotive electronic systems extend beyond the vehicle itself and are turning into connected vehicle technology. Using the most advanced innovations in this sector they want to achieve a better safety, mobility and environmental protection. (Hill, 2012).

The car is one of the most complex objects that buyers can purchase. The automotive industry remains one of the most competitive industries in the world and is one in which new ideas in design meet the latest innovations. The automotive industry adopts new vehicle technologies relating to vehicle electronics, connectivity low emissions, powertrain fuel economy, safety that make the companies in this sector to benefit from the opportunities given by these clusters and to locate closer to the most important research centers. The main development trends in the automotive industry are (Stratmann, Reiner, 2010):

- Markets are characterized by worldwide overcapacities and increasing competition.
- Car manufacturers will respond by an offensive model policy, reduced development times and a shortening of the product cycle and by outsourcing more complex development tasks to first and second suppliers resulting in a declining vertical range of manufacture.
- Rapid changes in technology (car electronics, fuel cell, etc.) will contribute further to the transformation of the supply chain (figure 1).

The resulting pressure of large enterprises on suppliers will translate into a high innovation and cost pressure especially for SMEs. Clusters have proven a successful framework for suppliers to respond to high cost and innovation pressure in terms of facilitating enterprise access to resources such as technology, qualification, information on market requirements, business support services and finance (OECD, 2007).

The core automotive industry (vehicle and parts makers) supports a wide range of business

segments, both upstream and downstream, along with adjacent industries (figure 2).

This leads to a multiplier effect for growth and economic development. Furthermore, R&D and innovation within automotive can benefit other industries, such as the insurance industry's use of innovative ideas (for example, automotive telematics).

Automotive contributes to several important dimensions of nation building: generating government revenue, creating economic development, encouraging people development, and fostering R&D and innovation (figure 3) (Center for Automotive Research, 2011).

Generating revenue. The automotive sector contributes significant tax revenues from vehicle sales, usage-related levies, personal income taxes, and business taxes. Production and sales of new and used vehicles, parts, and services deliver excise, sales, value-added, and local taxes and import duties. For instance, in Japan, auto-related taxes totaled \$7.72 billion in 2012, roughly 9 to 10% of all tax revenues, according to the Japan Automobile Manufacturers Association. In the United States, auto contributes \$135 billion per year, including 13% of state tax revenues and 2% of federal tax revenues. In India, duties collected from sales of motor vehicles, accessories, and fuel contributed 7 to 8% of central tax collections in 2012.

Additionally, as automakers reap the benefits of globalization through exports, they also generate foreign exchange earnings. This is crucial to a country's current-account performance and trade balance with other economies. Not surprisingly, the share of automotive exports is higher in developed countries than in emerging economies—18% in Germany and 17% in Japan, compared with 6% in Brazil and 5% in India. However, for some developing economies, 4 to 6% of export earnings are offset by vehicle imports and auto components.

Economic development. The automotive industry is important to global economic development. Globally, automotive contributes roughly 3% of all GDP output; the share is even higher in emerging markets, with rates in China and India at 7% and rising.

There is also a close correlation between foreign direct investment (FDI) inflows and automotive output, particularly in developing economies. For example in China, the correlation between growth in auto output and FDI is almost 1 to 1, as the automotive industry's rise has closely tracked that of China's economy. Automotive FDI also brings investment in related industries and can lead eventually to the development of a wider automotive ecosystem. In South Korea, for example, 40% of total FDI in 2000 was for the automotive industry, providing the country a crucial step out of its recession following the 1997

Asian financial crisis. Today, South Korea is the world's fifth-largest vehicle producer, and has benefited from a multiplier effect as adjacent industries (such as steel and finance) also profit from the growth. Steel sales, for example, went from 55 thousand tons in 2002 to 210 thousand tons in 2012. Every job in the core auto industry leads to more than four additional jobs in upstream or downstream industries.

Economic development is primarily in two areas:

- *Industrial development.* Across the world, auto is a spark for regional development. Industrial clusters form as original equipment manufacturer (OEM) plants are surrounded by component manufacturing facilities, including steel plants, glass manufacturers, used car dealerships, aftermarket shops, and transportation service providers. These clusters lead to new municipalities with solid road infrastructures, railway and freight connectivity, and new housing developments. Most major auto economies have these clusters, including Detroit in the United States and Ulsan in South Korea. In developing countries, these clusters include the ABC region near São Paulo in Brazil; Pune, Gurgaon, and Chennai in India; and Guangzhou province in China, where more than 55 automakers, 100 component suppliers, and 200,000 workers now reside. In 2007, Guangzhou contributed to 13 percent of China's total GDP and had a GDP per capita roughly 75 percent higher than the national average.

- *Mobility.* Automobiles have revolutionized the concept of mobility, with goods and people now easier than ever to move across geographic regions. For decades, developed countries have witnessed how increased vehicle ownership and improved transport infrastructures have led to counter-urbanization—the migration of people, businesses, and industry from cities to newly developed suburban areas. This trend is spreading to emerging economies. In New Delhi, for example, significant development has arisen in the suburbs of Noida and Gurgaon, bringing crucial revenue sources for their respective states.

People development. Worldwide there is one motor vehicle for every five people; in the United States there is one car for every 1.25 citizens. Automobiles can increase quality of life through increased mobility, comfort, and safety.

The industry also contributes to job creation and skill development. Its numerous forward and backward links bring both direct and indirect employment. To put this in context, 313,000 people were employed by OEMs in the United States in 2010, and another 1.1 million worked for adjacent industries. All told, 5% of the U.S. workforce had direct or indirect links to automotive. In South Korea, OEMs accounted for 270,000 jobs in 2011, and related industries added 1.4 million jobs overall—a multiplier of more than five—adding up

to 7% of the country's workers. In Japan, the industry employs 5.4 million people, representing 8 to 9% of the total workforce.

Given the complex nature of the industry, employees develop valuable skills covering R&D, design, sourcing, manufacturing, supply chain, sales, and marketing. In this regard, automotive is a training ground for developing technical and managerial expertise valuable in many industries—and for the entire economy.

Fostering R&D and innovation. R&D investment by automakers is driven by consumer demands for more product variety, better performance, improved safety, higher emission standards, and lower costs. Auto companies spend the third most on R&D of any industry—\$108 billion compared to \$111 billion spent by technology companies and \$120 billion spent by pharmaceuticals. Automotive makes up a significant percentage of total manufacturing R&D spending in the auto hubs of Germany (33%), Japan (20%), and South Korea (18%).

The automotive industry remains at the forefront of cutting-edge manufacturing technology, which has spread to other industries. Production processes that germinated in automotive—for example, Ford's assembly line manufacturing and the lean principles of the Toyota Production System—are now common in many industries. Automotive pioneered the use of robots as an automation solution; robotics today is a \$25 billion industry, with food and beverage, pharmaceuticals, and communications among the industries using this technology extensively. The auto industry's supply chain integration and modular sourcing have been influential as well. Automakers were among the first companies to transfer direct task responsibilities, such as design, engineering, R&D, and purchasing, to suppliers. By focusing on core processes, automakers have improved profitability and served niche markets more efficiently (AT Kearney, 2013).

4. Clusters in practice – The case of Europe

The automotive industry in Europe is undergoing a period of change marked by increasing global competition, a far-reaching transformation of the supply chain and high innovation dynamics. The resulting innovation and cost pressure is felt particularly hard at the level of small and medium-sized enterprises (SMEs). Over the last years cluster initiatives in the automotive sector have been established across Europe with the aim to support the regional supply industry. Innovation networks between car manufacturers, suppliers, research institutions as well as supporting institutions have proven successful in responding to new market and technological challenges (Deloitte, 2009).

On a global level, The European Union is one of the largest producers of motor vehicles. It is an important employer of proficient workforce and a promoter of knowledge and innovation. It represents Europe's largest private investor in research and development (R&D). It also makes a significant contribution to EU's Gross Domestic Product (GDP), and the level of exports is higher than the imports. Thus, the automotive industry is essential for Europe's welfare.

Shaping new networks and strengthening existing clusters will improve the competitiveness of the European automotive industry. Transnational clustering of the European automotive supply industry and the development of strategic partnership between existing clusters will help strengthening the European automotive sector (Stratmann, Reiner, 2010).

The main objectives of the European Commission regarding the automotive sector are (European Commission, 2006):

- a. To intensify the competitiveness of the automotive industry - The aim is identifying and assessing policy issues of significant importance to the competitiveness of the EU automotive industry and finding solutions that involve economic, social and environmental objectives.
- b. To complete, adapt and simplify the Internal Market regulatory framework - The work on improving the Internal Market is built upon the introduction of the EC Whole Vehicle Type-Approval System which allows manufacturers to have a vehicle "type" approved in one Member State and after that to have the ability to market the vehicle in all other Member States without any other tests.
- c. To promote globalization of the technical regulatory framework through UNECE - Global technical harmonization is a key factor in strengthening the competitiveness of the European automotive industry world-wide. The EU is a Contracting Party to two agreements of the United Nations Economic Commission for Europe (UNECE): the 1958 Agreement on Uniform Technical Prescriptions for Vehicles, and the Global Agreement of 1998.

Some of the best known global automotive players have their roots in Europe. German and French companies hold four spots in the global production top ten. Additionally, Europe has some strong niche players especially in the premium segment. Not surprisingly, a strong European network of sophisticated suppliers has developed. The role of suppliers in the production process is increasing because of technological innovation and especially

through organizational innovations in the value chain. Again, EU enlargement facilitates this development by combining affordable labor with the proximity to traditional European automotive clusters. Globalization is a driving force in the industry as reflected by the fact that new supplier and manufacturing locations are predominantly built up in Eastern Europe. The other side of globalization is the success on international markets. The industry is traditionally strongly positioned in trade and invests abroad, too. Especially markets as China and Russia have become promising sources of growth and profits (figure 4) (Elms, Low, 2013).

Automotive clusters, including cars, buses and truck assembly, engines and other components, are an area where Europe is among the strongest regions in the world economy. This success builds on a network of 39 regional clusters (out of a total of 259 regions) that meet two or three of the cut-off values and account for more than 50% of all European employment in the category. These regional clusters are interlinked by international strategies of manufacturers and suppliers, which can capitalize on the differentiation of local cluster conditions (European Commission, 2013).

The European Cluster Observatory, defined by owning statistical information and analysis in what concerns European clusters, identified the top performing clusters from the automotive sector. The classification was made by the following criteria: size (sufficient share of total European employment) specialization (more specialized than country average) and focus (large share of regional employment).

Countries which possess clusters in the automotive industry are: Czech Republic, France, Germany, Italy, Sweden and United Kingdom. All these represent a total of 653,381 employees.

For being more specific,

- Czech Republic has two separate clusters: in Severovychod (30,191 employees) and in Stredni (28,842 employees);
- France has two advanced clusters, in Franche-Comté (21,483 employees) and in Lorraine (17,878 employees);
- Italy has an important automotive cluster in Piemonte (61,098 employees).
- Germany represents a powerful pillar in the automotive sector, with a total of seven specialized automotive clusters. These clusters are present in: Niedersachsen (124,680 employees), Stuttgart (115,385 employees), Oberbayern (84,360 employees), Karlsruhe (39,293 employees), Kassel (18,420 employees), Unterfranken (17,949 employees) and Niederbayern (16,986 employees).

A survey of cluster organizations in Europe reveals that cluster organizations put their focus on building an identity, a strategy and brand for the cluster, and enhancing innovation through collaboration across innovation gaps and joint R&D projects. Less focus is put on business development among member firms (export promotion, commercial cooperation and joint purchasing). Thus, clusters have carved out a position as important vehicles within the innovation agenda for Europe (Ketels, Lindqvist, Solvell, 2012).

During the last decades EU has shifted political focus to innovation, the knowledge economy and sustainable competitiveness. Cluster based strategies have become central place in industry policy, but also in connection with regional and science policy at the EU level.

Cluster based strategies – as part of industry, innovation, regional and science policy – should account for both a rejuvenation of established industries in Europe, as well as paving the ground for new emerging industries. The chances of success are improved if such policy initiatives are fact-based.

5. Conclusions

Globalization has, somewhat paradoxically, strengthened the role of clusters and furthered their development. Companies face increasing choices for locating their activities in places that provide the best business environment for their specific needs. The more markets globalize, the more likely it is that resources will flow to more attractive regions, reinforcing the role of clusters and driving regional specialization. In this process, clusters tend to become increasingly specialized and increasingly connected with other clusters providing complementary activities.

Due to clusters, many European regions have developed competitive advantages in specialized activities such as financial services (London), petrochemicals (Antwerp), flowers (Holland), and biopharma (the Danish Swedish border region). Successful clusters have also significantly increased their global reach – attracting people, technology and investments, serving global markets, and connecting with other regional clusters that provide complementary activities in global value chains.

Regions that do not specialize may be in danger of falling behind. Therefore all of them need to be provided with the conditions and opportunities to participate successfully in this process.

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References

- [1] Bojar, E., Bojar, M., Zminda, T. (2008), The clusters as a factor attracting foreign direct investment in less developed regions, *Romanian Journal of Regional Science*, 2 (1), 54-67
- [2] Bojar, E., Bojar, M. (2011). *Clusters as a vehicle for regional development*, <http://www-sre.wu.ac.at/ersa/ersaconfs/ersa11/e110830aFin al00058.pdf>
- [3] Cortright, J. (2006). *Making Sense of Clusters: Regional Competitiveness and Economic Development*, <http://www.brookings.edu/research/reports/2006/03/cities-cortright>
- [4] Elms, D., Low, P., (2013). *Global value chains in a changing world*, http://www.wto.org/english/res_e/booksp_e/aid4tradeglobalvalue13_e.pdf
- [5] Hill, K. (2012). *Knowledge Clusters in the Automotive Industry*, <http://www.areadevelopment.com/Automotive/Auto-Industry-Site-Selection-Guide-2012/US-automotive-innovation-knowledge-clusters-1176144.shtml>
- [6] Kärkkäinen, R., (2008). *Clustering and International Competitiveness of Information Technology Industry in the Saint Petersburg Area*, Faculty of Technology Management, Department of Industrial Management, Lappeenranta, Research report 199
- [7] Ketels, C., Memedovic, O. (2008). From clusters to cluster-based economic development, *Int. J. Technological Learning, Innovation and Development*, Vol. 1, No. 3, 375-392
- [8] Ketels, C., Lindqvist, G., Solvell, O., (2012). *Strengthening Clusters and Competitiveness in Europe*, <http://www.clusterobservatory.eu/system/modules/com.gridnine.opengms.modules.eco/provider/getpdf.jsp?uid=24556356-27a4-4be4-8c38-e71775018a19>
- [9] Pralea, S., Maha, L., B Ițătescu, S., (2006). *Teoria comerțului internațional*, Ed. Univ. Al.I.Cuza, Iași
- [10] Snowdon, B., Stonehouse, G. (2006). Competitiveness in a globalised world: Michael Porter on the microeconomic foundations of the competitiveness of nations, regions, and firms *Journal of International Business Studies* 37, 163–175
- [11] Stratmann, G., Reiner, R. (2010). *Clustering in the automotive sector*, European Innovation Workshop, ftp://ftp.cordis.europa.eu/pub/paxis/docs/gerrit_stratmann.pdf

- [12]Tiemstra, J., (1994). Competitiveness and Industrial Policy, *International Journal of Social Economics*, Vol. 21 Iss: 8, 30 - 42
- [13] ATKearney, (2013). *The Contribution of the Automobile Industry to Technology and Value Creation*, http://www.atkearney.ro/paper/-/asset_publisher/dVxv4Hz2h8bS/content/the-contribution-of-the-automobile-industry-to-technology-and-value-creation/10192
- [14] Center for Automotive Research, (2011). *Green and Connected*, <http://www.cargroup.org/assets/files/green.pdf>
- [15] Deloitte, (2009). *A new era: Accelerating toward 2020 — An automotive industry transformed*, http://www.deloitte.com/assets/Dcom-Peru/Local%20Assets/Documents/pe_A_New_Era_Online_final.pdf
- [16] European Commission, (2003). *A Study on the Factors of Regional Competitiveness*, http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/3cr/competitiveness.pdf
- [17] European Commission, (2006). *CARS 21- A Competitive Automotive Regulatory System for the 21st century*, http://ec.europa.eu/enterprise/sectors/automotive/files/pagesbackground/competitiveness/cars21finalreport_en.pdf
- [18] European Commission, (2013). *Innovation Clusters in Europe: A statistical analysis and overview of current policy support*, http://www.central2013.eu/fileadmin/user_upload/Downloads/Tools_Resources/Cluster.pdf
- [19] European Commission, (2014). *Automotive industry*, http://ec.europa.eu/enterprise/sectors/automotive/index_en.htm
- [20] OECD, (2007). *Moving Up the Value Chain: Staying Competitive in the Global Economy*, <http://www.oecd.org/industry/ind/38558080.pdf>
- [21] University of St. Gallen (2013). *Clusters*, <http://www.g2e-lab.com/clusters-in-europe.html>
- [22] UNCTAD, (2012). *Investment Policy Framework for Sustainable Development*, http://unctad.org/en/PublicationsLibrary/diaepcb2012d5_en.pdf

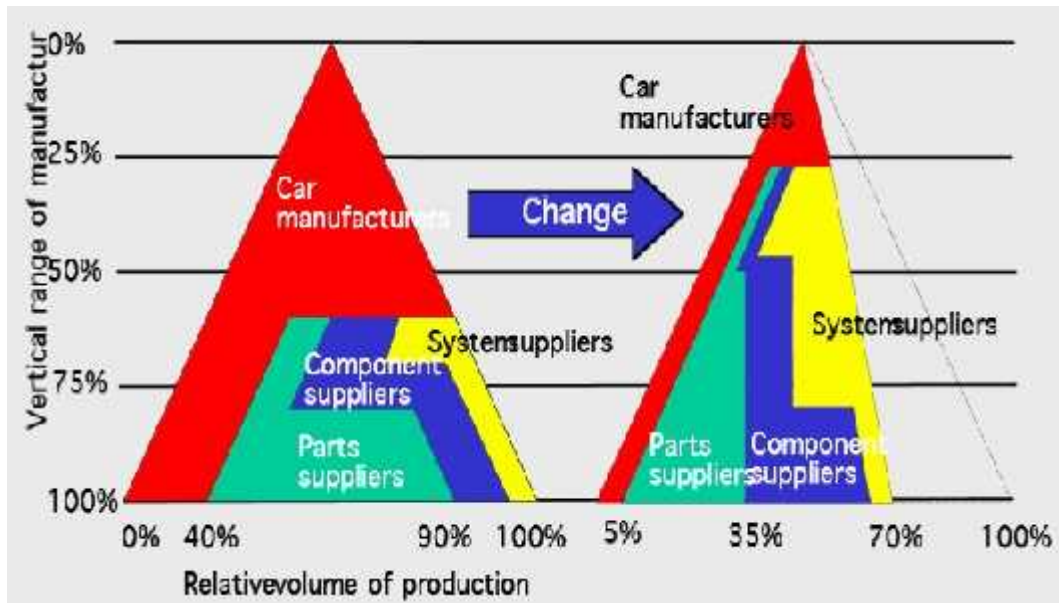


Figure No.1. Changes in the supply chain in automotive industry

Source: Stratmann, G., Reiner, R. (2010). *Clustering in the automotive sector*, European Innovation Workshop, ftp://ftp.cordis.europa.eu/pub/paxis/docs/gerrit_stratmann.pdf

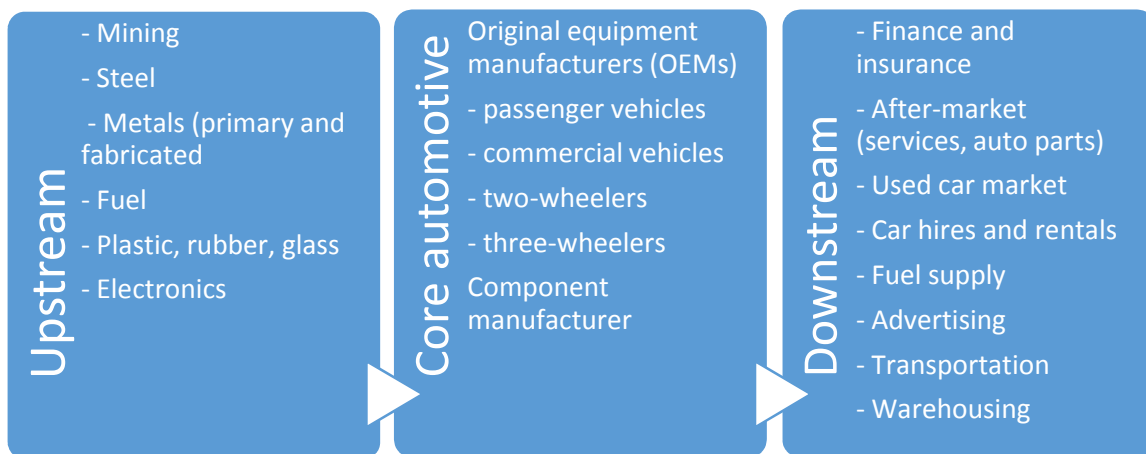


Figure No.2. Business segments adjacent to automotive industry

Source: Center for Automotive Research, (2011). *Green and Connected*, <http://www.cargroup.org/assets/files/green.pdf>

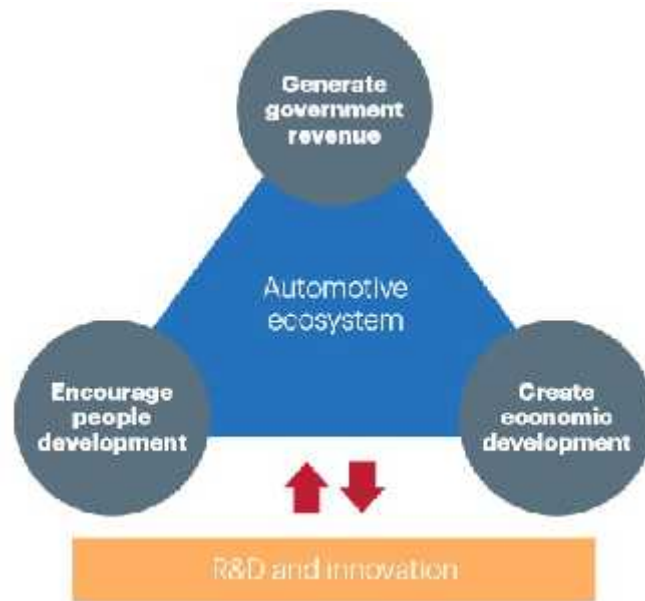


Figure No.3. Automotive contribution to national development
Source: Center for Automotive Research, (2011). *Green and Connected*,
<http://www.cargroup.org/assets/files/green.pdf>

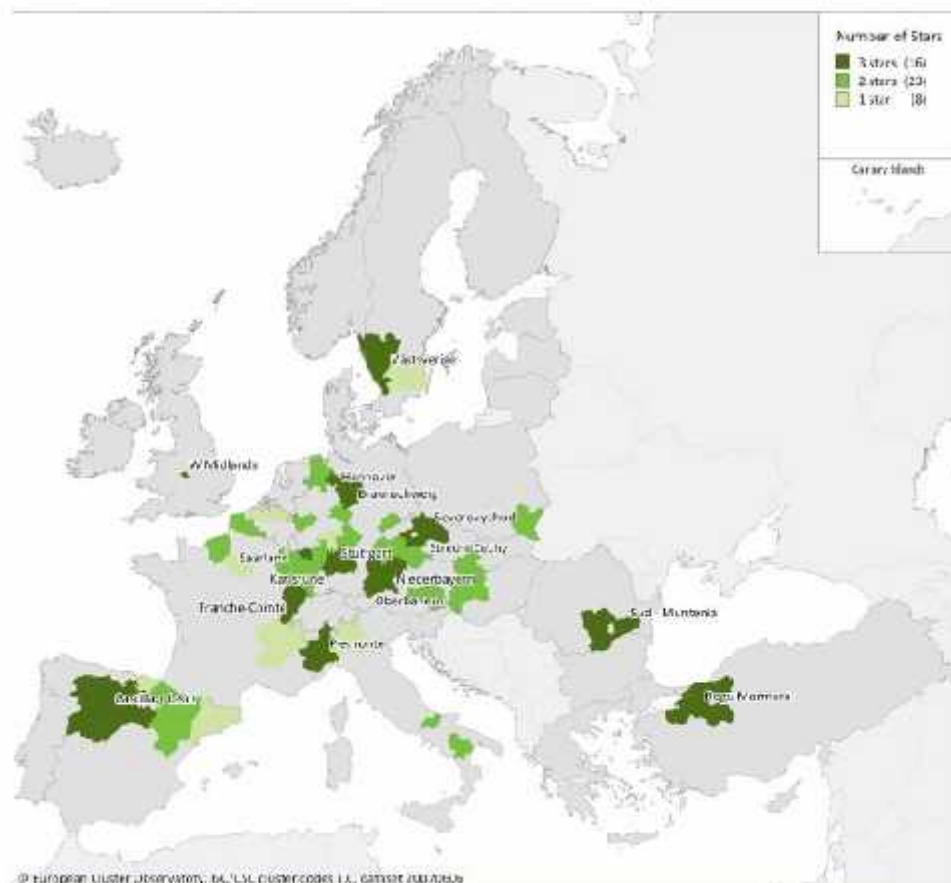


Figure No.4. Automotive clusters in Europe
Source: Elms, D., Low, P., (2013). *Global value chains in a changing world*,
http://www.wto.org/english/res_e/booksp_e/aid4tradeglobalvalue13_e.pdf

